

Environment and Climate Change in Bolivia

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Challenges and Opportunities for Development

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Table of Contents

SUMMARY.....	3
1. INTRODUCTION.....	5
2. KEY ENVIRONMENTAL PROBLEMS, OPPORTUNITIES AND THE MILLENNIUM DEVELOPMENT GOAL NR 7	6
2.1. OPPORTUNITIES FOR GREEN GROWTH	6
2.2. KEY ENVIRONMENTAL PROBLEMS	8
2.2.1. <i>Water pollution and water management</i>	8
2.2.2. <i>Air pollution</i>	9
2.2.3. <i>Deforestation</i>	10
2.2.4. <i>Land degradation and soil erosion</i>	10
2.2.5. <i>Loss of Biodiversity</i>	11
2.3. THE MILLENNIUM DEVELOPMENT GOALS	12
3. POVERTY, HEALTH AND THE ENVIRONMENT.....	13
4. CLIMATE CHANGE, VULNERABILITY AND ADAPTATION.....	15
4.1. CLIMATE CHANGE.....	15
4.2. VULNERABILITY, ADAPTATION AND RESILIENCE	16
5. ENVIRONMENTAL CHALLENGES RELATED TO NATIONAL DEVELOPMENT PLANS AND KEY ECONOMIC SECTORS.....	17
5.1. INTEGRATION OF ENVIRONMENT IN THE BOLIVIAN NATIONAL DEVELOPMENT PLAN	17
5.2. ENVIRONMENTAL CHALLENGES FOR KEY GROWTH SECTORS AND REFORM PROCESSES	18
5.2.1. <i>Land reform and agriculture:</i>	18
5.2.2. <i>Forestry sector reform:</i>	19
5.2.3. <i>Water sector reform</i>	20
5.2.4. <i>Mining</i>	21
5.2.5. <i>Oil and gas:</i>	22
5.2.6. <i>Energy</i>	23
6. THE POLICY AND INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT ...	23
6.1. POLICY FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT	23
6.2. IMPLEMENTATION CHALLENGES	26
7. CONCLUSIONS AND ISSUES TO CONSIDER.....	28
7.1. CONCLUSIONS	28
7.2. ISSUES TO CONSIDER FOR SWEDISH DEVELOPMENT COOPERATION	29
REFERENCES	33
APPENDIX: SELECTED ENVIRONMENTAL INDICATORS	35

Summary

This Environment and Climate Change Policy Brief was written as an input to the development of a new strategy for Swedish development cooperation with Bolivia. It aims at discussing key challenges and opportunities for achieving Millennium Development Goal 7 “Environmental sustainability” in Bolivia as well as the role of Swedish development cooperation. The analysis was conducted as a desk-study in February 2013.

Poverty in Bolivia is aggravated by a number of serious environmental problems such as water pollution, air pollution, soil erosion, deforestation and natural disasters. The poor, and particularly women and children, are disproportionately affected by environmental degradation since they have least capacity to cope with health problems related to poor water and air quality, food insecurity and economic shocks following natural disasters.

Evidence of climate change is compelling in Bolivia and the country is subject to several climate-related risks. The most significant disaster risks are floods in the flat eastern regions and droughts in the western mountainous and semiarid part of the country. Changes in temperature and precipitation also affect water flows and agricultural conditions making a large portion of Bolivia’s population extremely vulnerable to the effects of climate change. Increasing the resilience to changes in climatic conditions is hence an essential component of any strategy for poverty alleviation and the enhancement of economic opportunities in Bolivia.

Bolivia’s rich environment and natural resources play a very central role in both political and economic development in Bolivia. Economic growth in Bolivia is largely natural resources driven with mining, hydrocarbons and agroindustry/manufacturing being the key growth sectors. To regain political control over natural resources, such as water, gas and land, was a central demand of the social movements that brought the government of Evo Morales into power.

However, similar to many other natural resource rich countries, Bolivia has so far not been able to translate natural resource rents into a broad based development. Instead, resource extraction has been characterized by boom and bust cycles and rent-seeking behaviour, generating widespread inequality, social conflicts and environmental degradation.

The achievements in relation to MDG 7 Ensuring environmental sustainability are mixed. On the one hand, instead of *reversing the loss of environmental resources*, the trend is one of increasing pressure on environmental resources. For example the rate of deforestation is increasing and is one of the highest in the world, and water pollution is also getting worse. On the other hand, Bolivia has been successful in the MDG 7 sub goal on increasing access to water which will be reached. Increasing access to sanitation has proven more difficult and the sub goal will most likely not be reached by 2015.

In the international arena Bolivia has positioned itself as a strong advocate for environmental protection and climate justice. In national politics the need to balance the utilization of natural resources for development purposes with the needs for environmental conservation is recognized in the official national development plan, in the new political constitution as well as in the new law of “Mother Earth”. The central role of the state in natural resources management is one of the biggest changes compared to earlier administrations. The government plans to continue the process of nationalization of key industries so that all natural resources and strategic services are nationalized and managed by the state by 2025.

In contrast to the general rhetoric about respect for Mother Earth, there is increasing evidence that the rapid industrial development in mining, gas, oil and agriculture experienced in Bolivia during the last years is associated with very high environmental costs in terms of pollution, deforestation and land degradation. Particularly worrying are the signs that the environmental assessment system in Bolivia has been weakened during the present administration and that government related investment projects enjoy especially relaxed procedures for environmental permitting and monitoring. There is also a more general weakening of the capacity for environmental management, mainly due to the rapid changes in legal framework and administrative structures and the large replacement of experienced staff from earlier administrations.

Environmental problems caused by large polluters such as the oil and mineral sector may be solvable by strengthening the existing systems for environmental assessment, stepping up enforcement of existing environmental laws and investing in modern technology. However, most of Bolivia's environmental problems are intrinsically linked to poverty and inequality and cannot be solved by environmental policy alone. The land reform process stands out as crucial for reduced inequality and poverty reduction, but involves a high risk for accelerating the already high rate of deforestation unless combined with efforts to develop the agricultural systems towards higher sustainability. There is a strong need to strengthen the capacity of land reform authorities to integrate environmental considerations in the land reform process.

During recent years there has been an increase in the number of social conflicts related to environment and natural resources, including extractive industries, road developments, land, forest and water. It seems likely that the type of clashes between social movements and the government as the one around the road project in TIPNIS will continue to grow unless the gap between rhetoric and practice is narrowed. Reforms aiming at strengthening the legal system, dispute settling mechanisms and democracy at large are important also for addressing the pressing environmental problems facing Bolivia.

Issues to consider for Swedish development cooperation

Working with MDG 7 does not necessarily imply that Sweden must provide support through an environmental authority, but can be pursued through different means and channels. Several of the ongoing supported programmes have strong environment and climate change components. Key issues to consider in the new strategy period include:

- Seek opportunities for pursuing a dialogue with the government on selected strategic issues, such as the importance of halting deforestation and water pollution, possibly in collaboration with other development partners.
- Support the integration of environmental concerns in the land reform process, possibly through a Strategic Environmental Assessment.
- Strengthen the system for environmental assessment, monitoring and enforcement
- Systematize the lessons learned from the climate initiative and continue to support climate change adaptation and resilience
- Complement project oriented forest sector support with initiatives strengthening forest sector management
- Discuss how research supports can contribute to better informed decisions regarding critical environmental issues
- Seek twinning arrangements to systematically gather information on environmental issues and to make it publicly available.

1. Introduction

To regain political control over natural resources, such as water, gas and land, was a central demand of the social movements that brought the government of Evo Morales into power. Accordingly, natural resource management plays a central role in the Bolivian National Development Plan (NDP), in the new political constitution as well as in the new law of “Mother Earth” and other political reforms. In the international arena Bolivia has also positioned itself as a strong advocate for environmental protection and climate justice. However, there is increasing evidence that the rapid natural resources driven development experienced in Bolivia during the last years is associated with very high environmental costs in terms of pollution, deforestation and land degradation.

This Environment and Climate Change Policy Brief has been written as an input to the development of a new strategy for Swedish development cooperation with Bolivia¹. It aims at discussing key challenges and opportunities for achieving Millennium Development Goal 7 “Environmental sustainability” in Bolivia as well as the role of Swedish development cooperation.

The analysis was conducted as a desk-study in February 2013 and is based on available reports, research papers and statistics². Despite the obvious importance of natural resources and ecosystem services for the Bolivian economy and the health and livelihoods of the population, data on these resources is often lacking or contradicting and should hence be regarded with sound skepticism when reading this policy brief. An additional difficulty is the large gap between the official commitment to proactive environmental management in Bolivia and the actual implementation. While there are plenty of policy documents with commitments there are few good studies taking stock of actual implementation.

The document continues as follows. Chapter 2 discusses opportunities with green growth in Bolivia, describes key environmental problems and takes stock of the progress in achieving Millennium Goal 7 on environmental sustainability. Chapter 3 discusses the effects of environmental problems on poverty and health. Chapter 4 outlines key challenges linked to climate change mitigation and adaptation Chapter 5 discusses linkages between key economic sectors and different environmental problems. Chapter 6 outlines the policy and institutional framework for addressing the environmental challenges. Chapter 7 concludes and identifies issues to consider regarding the integration of environmental and natural resource aspects in Swedish development cooperation with Bolivia.

¹ Environment and climate change is one of the Swedish government’s three thematic priorities and the Swedish policy on environment and climate change in development cooperation requires that environmental impacts, effects of climate change and associated risks are assessed and integrated in analysis, planning, strategies, implementation and follow-up in Swedish development cooperation.

² Besides National development plans, a number of sector policies presented by the Bolivian government have been reviewed. Other key sources include the environmental profile made by the European Union in 2011 (Palerm and Ribera, 2011), the MDG Gap Task Force Report (ODI, 2010), analytical reports from Sida, the World Bank and other development organizations as well as Bolivian civil society organizations. Important inputs have been provided by Evelyn Taucer at Symbiosis in La Paz. Comments on an earlier draft of this document are gratefully acknowledged. Further comments can be directed to Daniel.Slunge@economics.gu.se.

2. Key Environmental Problems, Opportunities and the Millennium Development Goal nr 7

2.1. Opportunities for green growth

Bolivia is endowed with a huge diversity of different ecosystems and a wealth of renewable and non-renewable natural resources. It is also a culturally diverse country with 36 different ethnic groups which have their own languages, customs and traditions. Bolivia has significant natural gas deposits, maybe the third largest Latin America as well as rich mineral and forest resources.

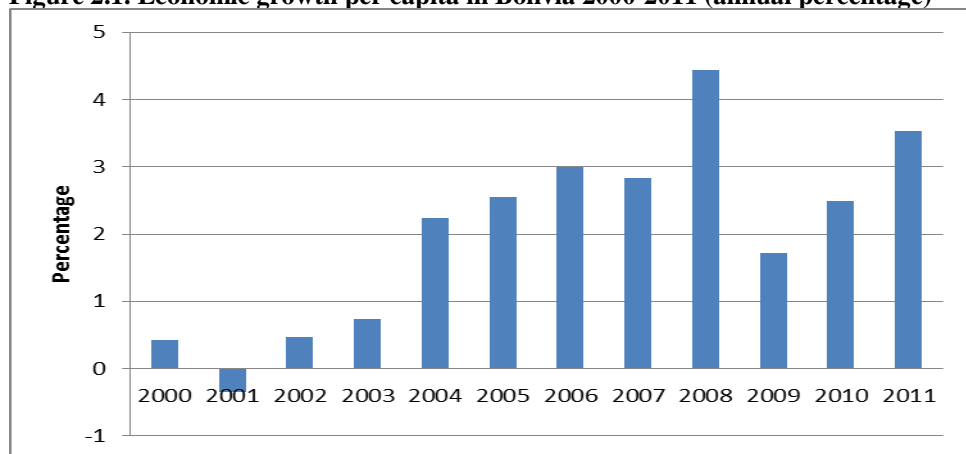
Box 1: Bolivia –natural resource rich and diverse

Bolivia is one of the 15 biologically most diversified countries in the world, with 12 different eco-regions – from the humid rainforests of the Amazonian flood plain to the alpine areas of the Andean mountains. It is also among the countries with the greatest diversity of birds, mammals, fresh water fish and amphibian species. Probably about 20-25% of the vascular plants (approximately 4.000-5.000 species) are endemic to the country³. This great diversity is mainly due to the range of very different ecological conditions arising from the Andean mountains (with the highest peak of over 6000 meters above sea level) located in the tropical zone. Temperatures and rainfall increase gradually from west to east, according to the topography. Humidity goes up from south to north, in the mountains as well on the eastern plains. The rainy season varies greatly in length; it is up to 11 months long in Chapare and less than one month in the southern part of the high plateau.

Source: Based on FAN, 2007, European Commission, 2005

Benefiting from high commodity prices, Bolivia has experienced a sustained period of relatively high economic growth per capita since 2004 (figure 2.1). Between 2003 and 2011 GDP per capita increased with more than 250 US\$ controlling for inflation (World Bank, 2013).

Figure 2.1. Economic growth per capita in Bolivia 2000-2011 (annual percentage)

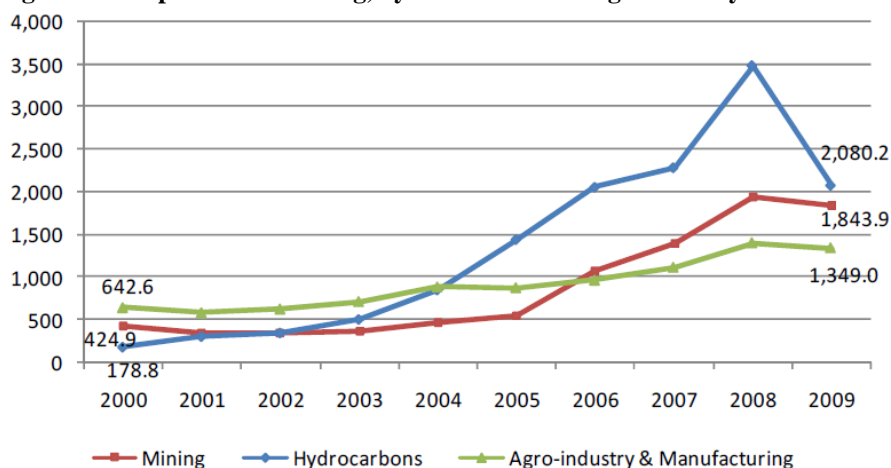


Source: World Development Indicators

Economic growth has been largely natural resources driven with mining, hydrocarbons and agroindustry/manufacturing being the three key growth sectors (figure 2.2.).

³ Plant and animal endemism are concentrated in a few eco-regions related to the Andes (Yungas, Inter-Andean Dry Forests and the Sub-Andean mountain range)

Figure 2.2. Exports from mining, hydrocarbons and agroindustry/manufacturing (million USD)



Source: ODI, 2010

International debt reduction initiatives and policies that increased the royalty rate paid on hydrocarbon production have led to a sharp increase in government revenue. Economic growth and increased public spending⁴ on for example health, education and water and sanitation have contributed positively to poverty reduction and progress towards several of the millennium development goals (ODI, 2010; GoB, 2010).

Clearly Bolivia’s rich natural resources represent an opportunity for development and poverty reduction. However, similar to many other natural resource rich countries, Bolivia has so far not been able to translate natural resource rents into a broad based development. Instead, resource extraction has been characterized by boom and bust cycles and rent-seeking behaviour, generating widespread inequality, social conflicts and environmental degradation.

It is generally acknowledged that rich natural resource endowments do not necessarily need to be a “curse” for poor countries⁵. The challenge is creating the right mix of policies and instruments so that natural resources can be a source of wealth creation. Also the opportunities involved in creating a greener development path have lately received high level recognition in the Rio+20 conference as well as by international organisations such as OECD, the World Bank, UNEP and ILO in publications about Green Growth, Green Economy and Green Jobs⁶.

While the Bolivian government has officially been a fierce critic of the green economy concept, market based approaches to environmental management and the so called commodification of Mother Earth, in practice it has used a range of “green economy policy instruments” to increase fiscal revenue from natural resource extraction (e.g. royalties on natural gas) and invested in human capital (education). There have also been attempts to reduce fuel subsidies which however were refuted by social protests.

Besides this type of opportunities on a macro level, there are also many opportunities to make better use of environment and natural resources on the local and regional levels. In an extensive

⁴ For example through the program to eradicate extreme poverty, “Plan Vida” and various cash transfer programs such as “Renta Dignidad”, the “Juana Azurduy” and the “Juancito Pinto” bonuses.

⁵ Lederman & Maloney, 2007, *Natural Resources, Neither Curse nor Destiny*.

⁶ E.g. OECD, 2011; UNEP, 2011

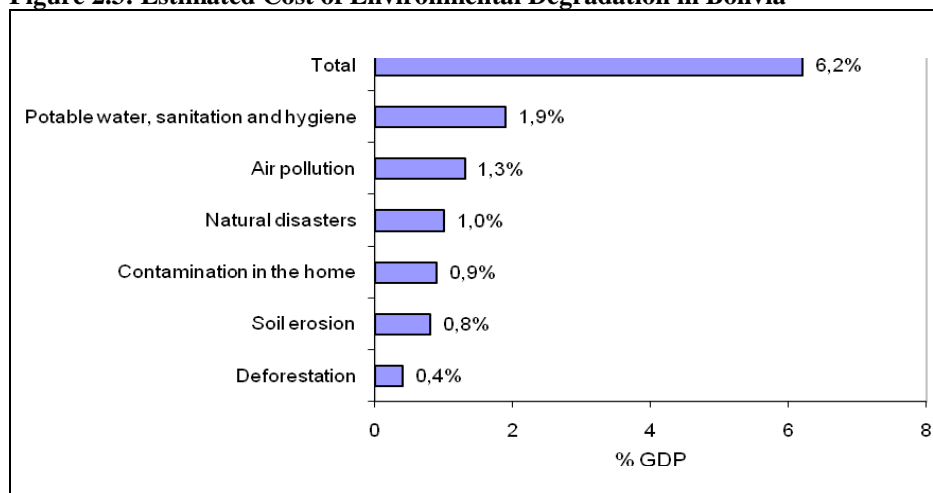
study UNDP in Bolivia point to the opportunities involved for improving livelihoods through for example organic farming, community forestry and eco-tourism⁷.

However, as the environmental problems outlined in the next section makes clear, Bolivia is currently largely failing to manage environment and natural resources in an economic, social and environmentally sustainable way. Indeed, despite the official importance of respecting Mother Earth, the trend is one of increasing environmental degradation.

2.2. Key Environmental Problems⁸

Economic growth in Bolivia is associated with high environmental costs. In 2006 the cost of environmental degradation in Bolivia was estimated to exceed six percent of GDP, which is well above countries like Peru and Colombia⁹ (figure 2.3). While this cost estimate is only a rough aggregation of many different types of localized environmental problems, it indicates that the real growth rate is significantly lower than the official when environmental costs are included.

Figure 2.3: Estimated Cost of Environmental Degradation in Bolivia



Source: World Bank, 2006. p.424. "Contamination in the home" refers to indoor air pollution.

Importantly, this cost estimate does not capture the wider picture of ongoing ecosystem change in Bolivia. There are clear indications that key ecosystem services, such as water purification and the regulation of climate, floods and disease, are being undermined by the current development trends. This has significant effects on poverty and economic development today and if negative trends are not reversed future impacts may be even more profound.

2.2.1. Water pollution and water management

Although Bolivia counts with abundant water resources, water scarcity is a growing problem in parts of the highlands, valleys and El Chaco. This is likely to be further aggravated by climate change. The serious conflicts around water management issues, notably in Cochabamba and El Alto, played an important role in the process which put the Morales government into power and water is still high on the agenda and interpreted in a rights based language.

However, the unsatisfactory quality of much of the water is an issue of serious concern as many

⁷ UNDP, 2008

⁸ See also selected environmental indicators in appendix A

⁹ World Bank, 2006

of Bolivia's water courses are severely polluted. Key sources of pollution are discharges from mining activities, agricultural sector and untreated waste water from industry and households. Mining is one of the major sources of water pollution and wastewater discharge can have high concentrations of dangerous heavy metals (e.g. arsenic, zinc, cadmium, chrome, copper, mercury and lead).¹⁰ One of the most obvious examples is the Pilcomayo river basin, where it has been estimated that the contamination of this river, mainly caused by mining, creates annual losses of millions of dollars to agriculture, cattle-breeding and fishery.¹¹ Another example is the mining megaproject San Cristobal, situated in the Nor Lipez region (one of the driest in the country), which is using 50.000 m³ of water per day. This is about the same amount that is used by the city El Alto with more than one million inhabitants. The project is moreover partly using fossil groundwater. Since there are no good estimates of the magnitude of Bolivia's groundwater resources, the sustainability of the growing use of this resource is difficult to assess. However, there is growing concern and calls for increased research and monitoring of this resource are put forward¹².

Due to uncontrolled use of pesticides, agricultural run offs often include organochlorinated compounds such as aldrin and endrin. Few industries comply with industrial discharge standards. In Santa Cruz, for example, out of the 600 largest industries, which include tanneries, battery factories, sugar refineries, and the production of vegetable oils, only a few pretreat their wastes. Rivers that cross the principal cities of the country suffer from high levels of organic contamination and receive domestic municipal waste and hazardous industrial or hospital wastes.

The rapid loss of glaciers due to climate change influences the availability of water downstream and further aggravates pollution when water flows are low.¹³

2.2.2. Air pollution

Overall, Bolivia has good air quality much of the year, except for three to four months of the dry season when fires are abundant especially in the lowlands of the Amazon and the East (Santa Cruz). For several decades, fires have increased in the country, as the agricultural frontier has expanded.¹⁴

Air pollution is however a serious problem in cities on altitudes above 2000 meters, (e.g. La Paz, El Alto and Cochabamba). The most significant sources of particles are motor vehicles, industry (particularly bricks production, metal foundries and oil refineries), burning of household- and agricultural waste. In some locations concentrations of particles smaller than 10 microns amount to 106 micrograms per cubic meter, which is 2.5 times higher than average for Latin America and the Caribbean, and similar to high polluted cities such as Santiago, Chile and Mexico City¹⁵.

Regarding indoor air pollution, almost 80 percent of the rural population uses firewood and other solid fuels for cooking and heating. This is a key cause of respiratory infections (see the section on Health below).

¹⁰ World Bank, 2006, and European Commission, 2005

¹¹ European Commission, 2005

¹² Laclette and Zúñiga, 2012

¹³ Palerm and Ribera 2011

¹⁴ Palerm and Ribera 2011

¹⁵ The principal air pollution problems are caused by particles with diameters less than 10 and 2.5 microns. World Bank, 2006, p.426.

2.2.3. Deforestation

Bolivia has more than 58 million hectares of forest (about 53,4% of the land)¹⁶, which constitutes 10% of South America's tropical forests. Given its relatively small population, Bolivia has the largest amount of forest per capita of any country¹⁷. This asset is being rapidly reduced, due to widespread deforestation. Deforestation increased from an estimated 168.000 hectares annually between 1990-2000 to around 330.000 hectares annually between 2001-2005¹⁸. We have not been able to find more recent estimates, but recent reviews indicate increasing deforestation¹⁹. The situation is particularly serious in Santa Cruz, north of La Paz and Cochabamba's tropic. It is estimated that deforestation accounts for 18-25% of the emissions of carbon dioxide globally, a fact that adds considerably to the already detrimental effects of deforestation such as biodiversity loss, soil degradation, erosion and damaged water recycling systems.

Identifying a key driver of deforestation is complicated since logging for timber is often followed by agricultural expansion and different studies define the prime driver differently. It is however clear that big scale agricultural expansion and logging (which is most of the time illegal) as well as forest fires which are mostly induced in order to clear land are the main drivers. Converting forests to agricultural land or livestock rearing for export can be very lucrative and forestry has problems competing with this. The government estimates that about 60% of the deforestation has been caused by expansion of large scale agro-industry and that settlements in forest areas only play a minor role²⁰. Most studies show that unless forests are already opened up by agro-industry or forest extraction, the small scale farmers will have difficulties to enter the forests for cultivation on a larger scale. Illegal logging has not been curbed and the forestry administration is very weak²¹.

Growing of coca-leaves is widespread in Bolivia. The preparation of land for coca cultivations contributes to deforestation of large areas, normally through burning and carbonization of biomass. Studies from coca-growing in Colombia indicate that in order to create one hectare of coca cultivations it is necessary to degrade four hectares of tropical forest. The cultivation process also requires the use of large amounts of pesticides and fertilizers.

During the last year there has been a conflict over the planned construction of a 182-mile road, 32 miles of which would cut through TIPNIS, a large protected area. The road would be an important addition to Bolivia's undeveloped highway system. The project would however cause widespread damage, contaminating the park's three main rivers and opening large areas of forest to illegal logging and settlement. If built, the TIPNIS road would likely be a major transport route for moving Brazilian soybeans to Pacific ports for shipment to China. This has prompted critics to charge that the TIPNIS road is designed primarily to benefit Brazilian industry rather than to provide economic and social advancement for the people of Bolivia.²²

2.2.4. Land degradation and soil erosion

Only 2-4 % of the land is suitable for intensive agriculture. The Bolivian soils, both in the highlands and the lowlands, have little depth and are fragile and easily eroded. Between 1954

¹⁶ UDAPE, 2010

¹⁷ USAID Bolivia 2008

¹⁸ UN REDD, 2013.

¹⁹ Castro Delgadillo, 2011; Fuentes y Selaya, 2011

²⁰ Ministerio de Planificación del Desarrollo, *Plan Nacional de Desarrollo*, 2006, p. 114. Notably production of soybeans for exportation but also cattle ranging are claimed to cause deforestation, NDP, p.129.

²¹ Castro Delgadillo, 2011

²² Yale environment 360, 2013 Yale School of Forestry and Environmental Studies

and 1996, the area of eroded soils increased by 86%, from about 24 to 43 million hectares²³. This widespread erosion, affecting 45% of total territory and up to 70-90% of land in the valleys, is a serious obstacle to increasing agricultural productivity²⁴.

The great inequities with regard to land ownership in Bolivia do not only generate social conflict but is also a key cause behind land degradation. In the highlands, where small and very small farms dominate (“minifundio”), the land keeps being divided into extremely small plots (“surcofundio”²⁵). The increasing land pressure forces the peasants to overexploit soil and vegetation, which in turn increases vulnerability to wind and water erosion. In the lowlands, agriculture is dominated by extensive cattle grazing and cultivation of export crops on large land estates (“latifundios”). The rapidly increasing monocultures of soybean are highlighted as the main factor of land degradation²⁶. The Program of the Government for 2010-2015 has as a goal to eliminate the latifundio and continue to distribute land to small owners.²⁷

Other causes of loss of agricultural land are the urbanization processes (e.g. Cochabamba) and the contamination of rivers with residual waters from mining activities (e.g. Pilcomayo). Soil erosion is also caused by coca growing on steep slopes²⁸.

2.2.5. Loss of Biodiversity

As noted above (Box 1) Bolivia is very rich in species, and is counted among the so-called “mega-diverse” countries. However, this rich diversity is under threat, resulting both in species loss, and (more importantly) loss of resilience to change, increased vulnerability of the natural ecosystems and degradation of ecosystem services. Data on the extent of biodiversity loss is however very weak²⁹.

Bolivia has made progress in establishing a protected area system that covers approximately 20% of the total land area, which is a much larger share than in other Latin American countries. The National System of Protected Areas consists of 22 important areas and covers around 15% of the country’s territory, while departmental and municipal protected areas cover an additional 7%³⁰. Most of these areas are inhabited by indigenous and peasant communities.

There are however severe problems of enforcing the protected areas system in practice. Illegal logging, settlements, hunting and bio-trade are frequent phenomena. The protected area system is understaffed and cannot manage their mandate in a proper way. Protected areas are also threatened by mega projects for hydropower, mining and infrastructure. These examples show that nature protection and biodiversity conservation efforts cannot be pursued in isolation but needs to be seen in a broader social and economic context.

South America is particularly important as the center of origin of many cultivated species, such as potato, quinoa, amaranth, tomato, peanut, cacao, and pineapple. Wild relatives of many of

²³ European Commission, 2005

²⁴ Ministerio de Planificación del Desarrollo, *Plan Nacional de Desarrollo*, 2006

²⁵ While “minifundio” means a very small or minimal agricultural unit (very often 0,5 – 1,0 ha or even less), “surcofundio” is a linguistic innovation made to explain what an extreme minifundio is.

²⁶ Ministerio de Planificación del Desarrollo, *Plan Nacional de Desarrollo*, 2006

²⁷ Government of Bolivia, 2010

²⁸ European Commission, 2005

²⁹ As in many other countries, most of the existing data deal primarily with trends in species and not other dimensions such as loss of agrobiodiversity, ecosystem functions etc.

³⁰ World Bank, 2006

these domesticated species are found in Bolivia. The genetic diversity of these wild relatives of crop plants is a resource that can help ensure the viability of these crops in the face of evolving crop pests and diseases and global climate change.³¹ The agricultural biodiversity of Bolivia is threatened by improved commercial varieties and/or the change in consumption and demand. The effect of climate change also poses serious risks to some varieties. The amount of varieties of potato, quinoa, peanuts, ajipa, papalisa, hualusa, yacon is decreasing and have reduced range and distribution.³²

2.3. The Millennium Development Goals

Environmental factors are closely linked to several of the Millennium Development Goals (MDGs). Besides MDG 7 *Ensure Environmental Sustainability*, improved environmental management will be particularly crucial for reaching the goals and targets related to MDG 1 *Eradicate extreme poverty and hunger* and MDG 4 *Reduce child mortality*. The MDG 7 is divided into four targets and 10 indicators (box 2.2).

Box 2.2. Millenium Development Goal 7 – Ensure Environmental Sustainability

Targets	Indicators
<u>Target 7.A:</u> Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	7.1 Proportion of land area covered by forest 7.2 CO2 emissions, total, per capita and per \$1 GDP (PPP) 7.3 Consumption of ozone-depleting substances
<u>Target 7.B:</u> Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.4 Proportion of fish stocks within safe biological limits 7.5 Proportion of total water resources used 7.6 Proportion of terrestrial and marine areas protected 7.7 Proportion of species threatened with extinction
<u>Target 7.C:</u> Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	7.8 Proportion of population using an improved drinking water source 7.9 Proportion of population using an improved sanitation facility
<u>Target 7.D:</u> By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums

Due to the inadequacy in the internationally developed indicator framework for measuring progress in relation to MDG 7 (particularly the indicators for measuring the loss of environmental resources (target 7A and B)) as well as the lack of good data it is difficult to do a careful assessment of MDG7.

As made clear in section 2.2, the loss of environmental resources has not been reversed in Bolivia. On the contrary the tendency is one of increasing loss of environmental resources. Deforestation and fragmentation of ecosystems due to an expanding agricultural sector as well as water and soil pollution due to poorly managed extractive industries with their associated infrastructure are key areas where environmental degradation is increasing.

Bolivia has however made significant progress in expanding the coverage of access to safe drinking water (figure 2.4). Increasing access to basic sanitation has proven more difficult (figure 2.5.), although notable improvements have been made through programmes such as PASAP³³ and PASAR³⁴.

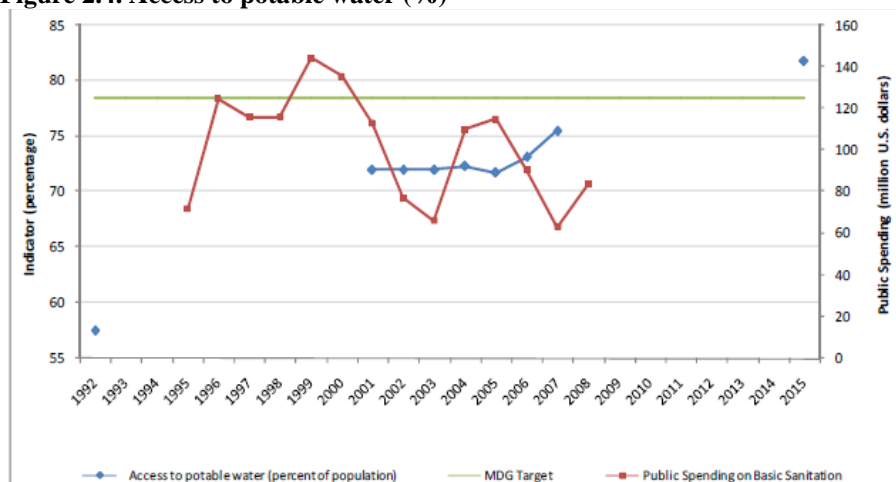
³¹ USAID 2008

³² Palerm and Ribera, 2011

³³ Programa Sectorial para Agua y Saneamiento en Zonas Periurbanas

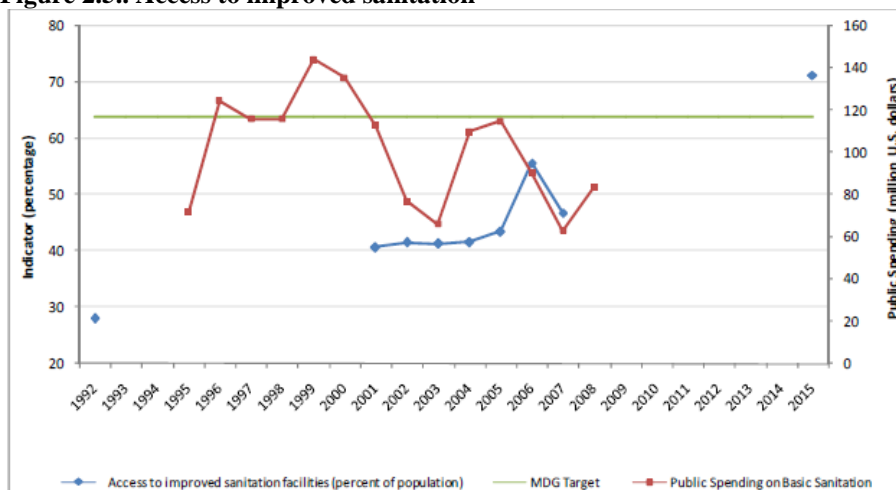
³⁴ Programa Sectorial para Agua y Saneamiento en Zonas Rurales

Figure 2.4. Access to potable water (%)



Source: UDAPE, 2010

Figure 2.5.. Access to improved sanitation



Source: UDAPE, 2010

Bolivia’s progress in relation to MDG7 is thus mixed. On the one hand, the loss of environmental resources shows an increasing trend and it is unlikely that the target on improved access to sanitation will be met. On the other hand, significant progress has been made in terms of access to water and it is likely that this target will be achieved.

3. Poverty, Health and the Environment

The links between environmental degradation and poverty are complex and location specific. The poor, and particularly women and children, are disproportionately affected by environmental degradation since they have least capacity to cope with health problems, food insecurity or economic shocks following natural disasters. In rural areas, especially in the highlands and valleys where land plots are small, the degradation of land and water catchments constitutes important constraints to agricultural productivity. The high prevalence of water carried diseases, closely linked to the very low access to improved water and sanitation, cause income losses and further aggravates poverty.

Deep and widespread rural poverty has resulted in a rapid process of rural-urban migration. While this may have partly alleviated some of the environmental pressure in rural areas, it has also resulted in mounting environmental problems in urban areas. The cumulative effect of poor

sanitation, water and air pollution and inadequate waste management are detrimental for the increasing number of people living in urban slums.

Since environmental degradation tends to affect poor people more than the better off it is likely that environmental degradation further aggravates the already deep inequalities in the Bolivian society. The Gini coefficient was estimated to 0,66 in 2011, a slight deterioration from 0,61 in year 2000.³⁵ From a pro-poor perspective, reforms and investments that reverse the land degradation and improve agricultural productivity, especially among small farmers, are of crucial importance. Approximately 40% of the economically active population is estimated to be engaged in the agricultural and livestock sector. In rural areas the corresponding figure is as high as 80%³⁶.

There has been a significant improvement in access to safe drinking water during the last years (see section 2.3), but problems with water carried diseases still prevail especially in rural areas. With an infant mortality rate of 51 per 1000 Bolivia ranks next to last in the region in terms of health indicators³⁷. Environmental conditions are at the root of this problem. The health effects of poor sanitation, polluted water and air are probably still the most serious environmental health link. Child diarrhea is the principal reason of mortality, especially in rural areas

Tuberculosis is a key environment-related health problem and 20% of children under the age of 5 have respiratory infections³⁸. In rural as well as urban areas, the burning of firewood and other solid fuels for cooking results in high concentrations of polluted indoor air. This affects mainly women and children and is a major cause of respiratory infections. About 80% of the rural population use firewood and other solid fuels for cooking and heating. Measures to reduce indoor pollution include improved stoves, substitution of solid and liquid fuels by gas, and improved home ventilation practices. Urban air pollution also contributes to respiratory infections.

One third of children below the age of three living in rural areas are chronically under-nourished³⁹. This is closely linked to the high levels of child diarrhea but also to land degradation, hampering agricultural productivity and food security.

The health sector will be affected in several ways by climate change. The changes in precipitation patterns and rising temperatures are increasing the risk of diseases, especially, malaria and dengue fever. During 2000-2002 there were more than 62.000 cases of malaria. However, targeted efforts can counteract the effect of a warmer climate. The incidence of malaria was dramatically reduced from 24 per 1000 people in 1998 to 4.2 per 1000 people in 2008 (the MDG targeted incidence is 2 per 1000). Bolivia is now on track in terms of achieving the target of reducing the prevalence of malaria.⁴⁰

Given these strong environmental health linkages, reforms and investments that address water and air pollution are likely to have large positive effects on poverty reduction.

³⁵ World Bank, 2011. The Gini-coefficient is a common measure of inequality and ranges from 0 to 1 where 0 signify perfect equality and 1 maximum inequality in incomes.

³⁶ Ministerio de Planificación del Desarrollo, *Plan Nacional de Desarrollo*, 2006

³⁷ <http://data.worldbank.org/indicator/SP.DYN.IMRT.IN/countries?display=map>

³⁸ World Bank, 2012, *The Little Green Data Book*

³⁹ Ministerio de Planificación del Desarrollo, *Plan Nacional de Desarrollo*, p.37

⁴⁰ Bolivia Case Study for the MDG Gap Task Force Report ODI 2010

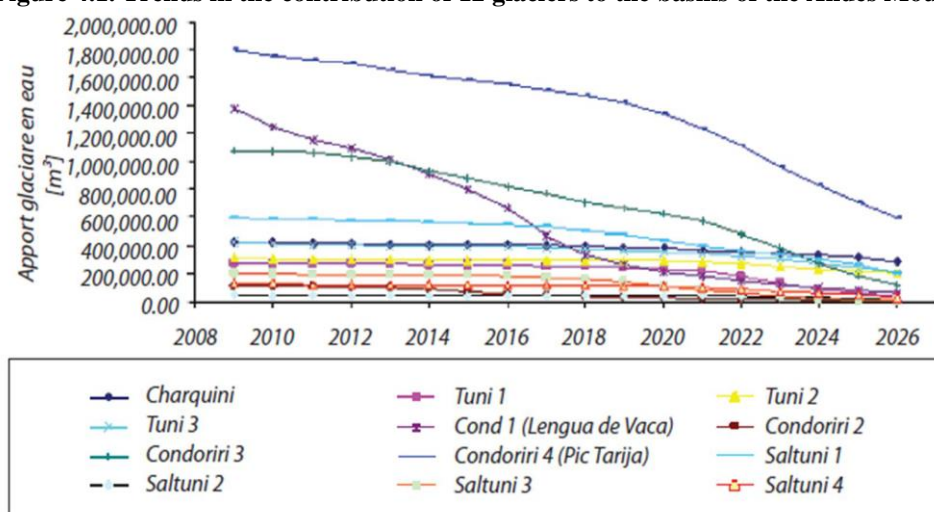
4. Climate change, vulnerability and adaptation

4.1. Climate change

The geographical location of Bolivia in the Andean region, combined with high levels of poverty, make it an extremely vulnerable country to climate change. Evidence of climate change is compelling in Bolivia and the country is subject to several climate-related risks. The most significant disaster risks are floods in the flat eastern regions and droughts in the western mountainous and semiarid part of the country. Other risks include hail, frost, landslides, extreme temperatures, and uncontrolled forest fires. Climate change projections based on scientific models are consistent with the increase in natural disasters that has been observed during the past decade in Bolivia. These extreme events are key obstacles to economic development and poverty reduction.

Glaciers are retracting at an alarming rate (figure 4.1.). The glacier areas in Bolivia are major providers of fresh water in the country. The national program on climate change (PNCC) estimates that 35 percent of the water supply for La Paz will disappear in 20-30 years due to the melting of the nearby glaciers. Since glaciers effectively buffer stream discharge seasonally, continued glacier melting is likely to result in more variable stream flows and less dry-season runoff. This will reduce water quality, as concentration of pollutants increases when rivers carry less water. Changes in the hydrological cycle are also likely to have a range of other substantial negative impacts on natural environments, urban water supply systems and agricultural production.

Figure 4.1. Trends in the contribution of 12 glaciers to the basins of the Andes Mountain Range ⁴¹



Source: Climate Investment Fund 2011

Studies have shown that the temperature in the tropical Andes Mountains has been rising approximately 0.10°C per decade since 1939, with the warming level over the past two decades increasing to 0.33°C per decade⁴².

Rising temperatures are expanding the spatial range of diseases and affecting the growing season of agricultural activities as well as their sensitivity to pests. Higher temperature may also have

⁴¹ Climate Investment Fund 2011

⁴² Climate Investment Funds 2011

effects on crops and livestock and thereby food security. Studies indicate that higher nightly temperatures may impair the proper development of grain in certain crops.⁴³

Fire events have increased more than ten times in the last ten years in Bolivia. Santa Cruz and Beni are the departments showing the largest number of hot spots. The fires are detrimental to the vegetation cover and the bare soils are prone to erosion. The fires are also followed by severe smog and air contamination. This situation is calling the attention of authorities and changes in Bolivian Forest law are being discussed.⁴⁴

4.2. Vulnerability, adaptation and resilience

A large portion of Bolivia's population is extremely vulnerable to the effects of climate change as these people rely on agricultural production for subsistence. Increasing the resilience of communities to natural disasters, changes in climatic conditions or other effects of climate change is hence an essential component of any strategy for poverty alleviation in Bolivia⁴⁵.

Resilience can be described as the ability of an individual, a community, a country or a region to anticipate risks as well as to respond and cope with shocks and stresses. Strengthening resilience also implies addressing the underlying root causes of risks in order to recover from shocks and stresses in order to continue to develop.

There are several government and donor funded programs for strengthening resilience and climate change adaptation in Bolivia. The major adaptation projects and programs are:

- *Andean Regional Climate Change Adaptation (PRAA)* implemented by the National Climate Change Program (PNCC), from 2006 to 2013, with funding from the World Bank and the Andean Community of Nations (CAN). It is focused on the retreat of glaciers in the basin of Tuni Condoriri in La Paz, climate scenarios and management of water resources and risk by local communities.
- *Pilot Program for Climate Resilience (PPCR)* implemented by the PNCC with funding from the World Bank. It aims to support the integration of climate risks into development policies and planning in Bolivia, focusing on territorial and multisectoral aspects. This program began in 2011 and lasts for five years.
- *The United Nations Program for Development (UNDP)* has been working since 2008 with a project for capacity building in systematizing, and disseminating information on climate change. It will continue in a second phase until 2017.

There is also a spontaneous adaptation going on to the changing climatic conditions and natural disasters. Both women and men face an increased workload as a result of climate change and natural disasters, but the reasons for this are different. A field study shows that men see a dramatic increase in their workload during natural disasters while women more often see increases because of incremental, slow-onset climate changes, in addition to natural disasters⁴⁶. Climate change impact domestic water supplies and, as a result, add an additional burden to women's provision of water for their families. Migration is a predominantly male strategy for reducing risk from climate impacts. Women then increasingly participate in community decision-making but as a "replacement" for the man of the household and gives an increased work burden for women. Gender roles are rapidly changing but this mainly takes the form of women assuming male responsibilities.⁴⁷

⁴³ Ibid

⁴⁴ Fuentes and Selaya, 2011

⁴⁵ World Bank, 2010

⁴⁶ Ashwill et al 2011

⁴⁷ Ibid

5. Environmental Challenges related to National Development Plans and Key Economic Sectors

The Bolivian government has launched a set of ambitious reforms to develop Bolivian society. Natural resources and the relation with Mother Earth play a central role in these reforms. Section 5.1. analyses how environmental considerations have been integrated in the National Development Plan (NDP) presented in June 2006⁴⁸, the subsequent Government Plan for 2011-2015 (MAS IPSP)⁴⁹ and the Agenda Patriótica 2025⁵⁰. To increase readability we will refer to these documents as the “National Plans”. In section 5.2, we analyze how environmental concerns have been integrated in key economic sectors.

5.1. Integration of Environment in the Bolivian National Development Plan

The National Plans outline the strategic priorities for the Bolivian government. It is a broad and general framework, describing the central components of the “cultural and democratic revolution” of the government. While some goals are included in the plans, the documents lack the set of structured medium term goals and indicators which is usually found in Poverty Reduction Strategies.

Natural resources are assigned central importance, both as a growth engine and as a generator of employment. In the so called National Productive Matrix the relevance of the *strategic sectors* (Hydrocarbons, Mining, Electricity and Environmental Resources⁵¹), is emphasized. The revenues generated by these strategic sectors should be reinvested in the development of *employment generating sectors* (industry, tourism, agriculture, commerce and services). Land and Employment are considered the axes for redistribution of income. The Plans thus highlights the importance of a more equitable redistribution of land among the population, with a special emphasis on indigenous communities. The central role assigned to the state in the management of natural resources is one of the most central changes in comparison with policies of earlier administrations. The Agenda Patriótica states that in 2025 all natural resources and strategic services should have been nationalized and managed by the state.

On a general level, the need to balance the utilization of natural resources for development purposes with the needs for environmental conservation is recognized. This is particularly emphasized for the renewable natural resources. Notably, very little attention is paid to issues related to pollution and how to ensure environmental quality.

The National Development Plan outlines ambitious goals for public investments in large scale projects. These include big investments in refineries, a distribution network for natural gas, “thermoelectric projects” (that will generate an additional 260MW capacity for electricity generation from natural gas) and transport infrastructure.

If not managed properly, these planned investments can potentially have big negative environmental impacts. The same holds true for many of the ambitious reform processes initiated

⁴⁸ Ministerio de Planificación del Desarrollo, 2006. *Plan Nacional de Desarrollo*,

⁴⁹ Government of Bolivia, 2010. Although this document does not have the same “official status” as the National Development Plan it is included in the review since it communicates the intentions of the ruling party in Bolivia.

⁵⁰ Government of Bolivia, 2013

⁵¹ “Environmental resources” in the NDP includes biodiversity, forests, greenhouse gases (carbon sequestration) and water.

by the Bolivian government. In this context it is worrying that Bolivia does not have a well working system for environmental impact assessments (EIA) of projects and strategic environmental assessment (SEA) of plans, programmes and policies. In fact, there are clear signs that the environmental assessment system has been weakened during the present administration⁵².

5.2. Environmental challenges for key growth sectors and reform processes

In basically all key economic sectors there are important links between management of the environment and natural resources, sustained growth and poverty reduction. Environmental challenges that merit special attention are discussed in this section.

5.2.1. Land reform and agriculture:

From an environmental perspective the government's initiatives regarding land reform is especially interesting, since changes in property rights tend to have large impacts on how resources are managed. Land distribution in Bolivia is still very unequal. With a large share of the population engaged in agricultural activities, a more equal land distribution is expected to have positive effects on poverty reduction⁵³.

The revitalization and strengthening of the land reform process in Bolivia plays an important role in the Plans and an accompanying sector policy has been presented⁵⁴. Land reforms can have both positive and negative impacts on key environmental concerns such as deforestation and land degradation. On the one hand, since unequal land ownership has led to cultivation of marginal lands as well as to unplanned colonization of tropical forest land, contributing to deforestation and soil degradation, a more equal land distribution and well planned new settlements could potentially decrease this pressure.

On the other hand, there are several reasons why the land reform process also can lead to increased deforestation and degradation of land. In order to avoid confiscation of idle land, a common way for large land owners to prove that they fulfill the requirement of using their land for economic and social purposes has been cut down forest. Overlapping tenure rights for different natural resources is another area of concern.

The NDP 2006 aimed at redistributing 12 million hectares of land to indigenous groups and small farmers until 2010.⁵⁵ However, the MAS IPSP claims that as much as 26 million hectares were titled between 2006 and 2009. The definitions of redistribution, titling, indigenous lands etc are varying and difficult to pin down. It is however clear that the land reform has a strong momentum. The effects of this on land use are still unclear. The NDP also contains minor programs for addressing land degradation in the highlands and in the valleys. Given the magnitude of the problems caused by soil erosion for agricultural productivity the proposed programs seem to be insufficient. Improving agricultural practices also has a direct influence on climate change since less greenhouse gases will be released if soil erosion is curbed and permanent or repeatedly planted new vegetation is kept. There is thus a strong link between improving agricultural and forestry practices and adaptation and mitigation to climate change. Support to small scale farmers for improving agricultural practices is scarce and there is no

⁵² Palerm and Ribera, 2011

⁵³ Ministerio de Planificación del Desarrollo, 2006, *Plan Nacional de Desarrollo*, p.128- 140

⁵⁴ Ministerio de Desarrollo Rural, Agropecuario y Medio Ambiente, 2007,

⁵⁵ Ministerio de Planificación del Desarrollo, 2006, *Plan Nacional de Desarrollo*

national policy regulating the use of fertilizers and agrochemicals. Agricultural land and aquifers are increasingly contaminated. This is a severe threat to the health of small farmers, to those who work in the agroindustry as well as to consumers.

Against this background there is a strong need to strengthen the integration of environmental considerations in the sector policies guiding the land reform process. Redistribution of land and land titling is one tool for reaching sustainability but far from enough. In solitude it might even have negative effects. To make it more effective it has to be paired with among others support to improved agricultural practices, capacity building on rights and responsibilities in relation to land owning and a supporting framework for governance.

Food sovereignty is a priority for the government, and there is a strong political pressure to increase farmland for the purpose of growing crops such as coca leaves, corn and rice. This could lead to even more deforestation and loss of land, as well as a decline in the agricultural biodiversity by introducing more commercial varieties of crops. The forest is not considered to be as valuable as the agricultural land.

5.2.2. Forestry sector reform:

As stated in the previous section, the status of Bolivia's forests is highly dependent on the developments related to the land reform process, agricultural development and the expansion of the mining and hydrocarbon sector. The policies and practices of the forestry sector itself are of course also important from an environmental perspective.

Bolivia's vast forest resources constitute a major wealth asset. The export of forest products has decreased in recent years probably due to increased control of illegal logging and insecurities in tenure. The forests in Bolivia are however probably much more important as a resource for the rural subsistence economy and for the provision of ecosystems services than for export. Bolivia's forests also carry a great potential for tourism. Calculations on the value of forests are often based on only the value of the logs and the amount per hectare do not turn out very high. If other values such as carbon sequestration (to mitigate and adapt to climate change, production of ecosystems services, tourism and not least the value for the subsistence economy were included, the value would increase substantially. If forests (timber) were used productively in a sustainable way and for the benefits of local people the value would increase further. If all these values were realized then clearing of forests for other uses might decrease.

For Bolivia's many indigenous groups living in or close to forests non timber forest products, such as medicines, firewood, building material, fruits, nuts and honey provide valuable resources. Forests will further have an increasing role in mitigation against climate change and adaptation strategies. 40% of Bolivia's population is estimated to include forest resources in their livelihoods. Forestry income constitute on average 20% of total income for families living adjacent to forests, according to a broad meta study conducted by the World Bank.

Bolivia is exploring ways for decreasing its deforestation rates and is now a member of UN-REDD (United Nations program on Reduction of Deforestation and Degradation of forests) which invests in forest governance. REDD is a mechanism in making under the UNFCCC. Details of the mechanism are not yet fully negotiated but several programs promoting REDD has already started. The aim of the mechanism is that developing countries will be paid (through a market mechanism or funds) for reducing greenhouse gas emissions from forest. The mechanism could potentially have great influence on forests in Bolivia. In the UN negotiations Bolivia has as the only country in the world declared that they want to include text on the rights of Mother

Earth in the legal framework. Bolivia has also declared that they do not accept a market mechanism for payments. A high level mission from the UN-REDD program concluded in October 2012 that Bolivia cannot be eligible for UN-REDD funding under the conditions that Bolivia is putting forward.⁵⁶ The Climate Convention deals with decreasing greenhouse gas emissions while Bolivia would like to see a more holistic approach touching on all the pieces of sustainability. The UN-REDD organization is of the opinion that it does not have such a wide mandate and cannot support actions that do not directly or indirectly have to do with carbon sequestration.

Forest management is the responsibility of the Viceministerio de Medio Ambiente, Biodiversidad, Cambios Climáticos y de Gestión y Desarrollo Forestal (VMA). The basic policy document for the sector is the Plan Nacional de Manejo Integral del Bosque (2008), which aims to improve the livelihoods of forest users, especially the poorest, to improve contribution of forests to equitable development, to ensure the provision of environmental goods and services with a perspective of reducing the growing risks from climate change.⁵⁷

La Autoridad de Fiscalización y Control Social de Bosques y Tierra (ABT) has as their mission to promote, regulate and control the Management of Forests and Lands, involving all sectors of society. Its powers include, among other, the issue of licenses and permits, forestry actions prevention, control and investigation of misuse of forest resources and to develop control programs, monitoring and prevention.⁵⁸

The National Plans do not mention forestry as a separate sector but it is included in proposed support to small scale manufacturing and also as an asset for tourism. Indirectly it is included in the plans for legalization of tenure and redistribution of land. The small scale manufacturing is part of the aim to move from the heavy dependency on exports of primary products and create more value added to exported products.

5.2.3. Water sector reform

Water has been given high priority by the current administration which considers water as a human right and as a public resource that should be owned and controlled by the state. A new Ministry of Water has been created with three Vice Ministries (Irrigation, Watersheds and Water Resources and Basic Services). The National Development Plan outlined a new policy framework⁵⁹, where public service providers are preferred over private ones and the state is an active player protecting the most vulnerable groups in society. Furthermore, tariffs should be reasonable and permit cost recovery and participation of local communities in the management of water resources is encouraged.⁶⁰ The government recognizes the possible negative effects of climate change on the water sector and states that the sector has to adapt and take a holistic view for the water supply⁶¹.

Bolivia has made a great achievement in increasing access to water (see section 2.3.) In 2013 the water coverage in the country is expected to reach 87%⁶², which can be compared to the millennium development goal of 78% by 2015. This is mainly the effect of the implementation

⁵⁶ UNREDD/PB9/2012/iii/2

⁵⁷ Palerm and Ribera 2011

⁵⁸ Palerm and Ribera 2011

⁵⁹ El Plan Nacional de Saneamiento Basico

⁶⁰ Ministerio de Planificación del Desarrollo, *Plan Nacional de Desarrollo*, p. 74-76.

⁶¹ PASAP Programa de Agua y Saneamiento para Areas Periurbanas 2010

⁶² Government of Bolivia, 2010

of internationally supported programs working in rural and peri-urban areas of the big cities. For example the program Mi Agua works with local government, communities, schools, and other stakeholders to reach high levels of water and sanitation coverage.

The government's ambition is to achieve 100% access to drinking water and sanitation by 2025⁶³. However, increasing access to water and sanitation involves several challenges. The weak capacity and coordination of the many public entities involved in the provision of water and sanitation services as well as within communities and user groups is one of these challenges.⁶⁴ Another challenge concerns maintenance of investments made and the difficulties service providers may face in recovering costs through charging water consumers for their consumption. Currently, tariffs only cover direct operations and some maintenance costs and service providers apply a solidarity tariff for the first 10 cubic metres of water. The financial sustainability of this solidarity tariff is however questionable as costs for capital expenditure, capital maintenance, and direct and indirect support also must be covered⁶⁵.

The coverage of safe drinking water is still low in some rural areas and there is need for stepped up efforts at departmental and municipal levels. Parallel with new investments in physical resources there is a need also for considerable investments in the capacities of water user groups both in maintenance and in economic and social issues connected with the use of water.

In September 2012 IDB announced a new loan of 78 million USD for Bolivia's sanitation and water resources sectors. The project will contribute to the reform of the sectors and help develop a policy and institutional framework for the management and sustainability of the services. It also aims at reducing the effects of flooding on productive areas. Bolivia will also implement a national water efficiency program⁶⁶.

5.2.4. Mining

Mining has become Bolivia's second-biggest foreign currency earner after natural gas (2012) and is identified as one of the strategic revenue generating sectors in the National Plans. The state has taken an increasingly active role in the sector and expectations are high on extraction of new minerals such as lithium. The mining sector, however, also causes significant environmental problems. Mining is a key source of pollution of especially water, but also of air and soil. Cooperative and small-scale mining, in which more than 70,000 families work, is particularly polluting⁶⁷. Of particular concern in Western Bolivia is that most mines produce acid water with a very high content of heavy metals. The severe contamination of the Pilcomayo River as well as the Poopó and Uru Uru lakes are examples where mining activities have resulted in health problems⁶⁸. Mining is traditionally associated with the highlands, but the lowlands also possess significant mineral deposits. The NDP notes that deposits of tin, wolfram and gold are found in the Beni-department, and mining operations are frequent in Santa Cruz and other departments. Repeated conflicts between indigenous communities and mineral companies have been reported and mining concessions are sometimes operating within indigenous territories⁶⁹.

⁶³ Government of Bolivia, 2013, *Agenda Patriótica – 13 pilares de la Bolivia Digna y Soberana*

⁶⁴ Ibid.

⁶⁵ International Water and Sanitation Centre 2012

⁶⁶ Inter American Development Bank, 2012

⁶⁷ World Bank, 2006

⁶⁸ World Bank, 2006 and World Bank 1998

⁶⁹ See <http://www.ceadesc.org/> for a number of reports on mining in indigenous territories. See also <http://cedla.org/obie/>, Observatorio Boliviano de Industrias Extractivas.

In order to decrease pollution from mining, there is a need for stricter enforcement of the environmental law as well as environmental provisions in the mining law. Despite the magnitude of the environmental problems caused by the mining sector, the National Plans do not include any commitment to abating pollution from the mining industry. International mining companies that form coalitions with the Government of Bolivia seem not to be forced to prioritize environmental issues.

5.2.5. Oil and gas:

Bolivia has the third largest gas reserves in Latin America as well as significant potential petroleum reserves. The NDP identifies hydrocarbons as the motor of economic development, generating rents that can be reinvested. During 2000-2005 the sector accounted for 4-6% of GDP and during the last years the value of exports has increased significantly following favorable world market prices.

In many poor countries experiencing similar resource booms, rent-seeking behavior and corruption have been key obstacles to sound management of the increasing revenues. Despite the stated intentions of the Bolivian government to use the resources for pro-poor development, Bolivia's trajectory of corruption and poor management of public resources may prove difficult to overcome⁷⁰. In order to stimulate good governance, Bolivia could join initiatives encouraging transparency and accountability in the sector. The Extractive Industries Transparency Initiative (EITI) is such an initiative that supports improved governance in resource-rich countries through the verification and full publication of company payments and government revenues from oil, gas, and mining⁷¹. Increasing tax revenues from the hydrocarbon sector does not only have implications for the state budget. Large shares of the additional tax revenues from the sector have been allocated to departments and municipalities. Clearly, transparency and accountability are also critical issues at these administrative levels.⁷²

The downside of the oil and gas boom is that it has had vast negative environmental and social impacts for many local communities in Bolivia. Key environmental impacts include deforestation due to road and pipeline construction, opening up of remote areas making it easier for slash and burn farmers to enter, pollution of water basins and drinking water, chemical waste and loss of biodiversity⁷³. The activities also have an impact on climate change since large areas are directly deforested through the activities of the sector and indirectly since new areas are opened up for slash and burn agriculture or for agroindustry. Activities within the sector have also caused some of the worst environmental disasters in Bolivia⁷⁴.

The National Plans do not elaborate on the environmental problems the expansion of the sector has caused and this is alarming. It only points out that the oil and gas sector has been nationalized and that 73% of the revenues from the sector after the nationalization goes to the state while before the nationalization the figure was 27%.

Emission of greenhouse gases which contribute to climate change is another negative external effect from oil and gas production. Bolivia is however not a large emitter of greenhouse gases

⁷⁰ Bolivia receives a score of 34 out of 100 in Transparency International's corruption Perception Index 2012. See http://www.transparency.org/policy_research/surveys_indices/cpi/2006.

⁷¹ The previous Bolivian government showed interest in joining the initiative. The position of the Government concerning transparency and the EITI is not defined. See <http://www.eitransparency.org/>.

⁷² World Bank, 2006c.

⁷³ APG- Itika Guasu, Asamblea del Pueblo Guaraní, 2005.

⁷⁴ European Union, 2005

and the average CO₂ emissions of 1,3 ton per capita places Bolivia well below the Latin American average of 2,8 ton per capita⁷⁵. Though if CO₂-emissions from deforestation were included, the emission rate would likely increase significantly (see 2.1.3 above). Given the increased international attention to climate change, there may be a significant economic potential for carbon sequestration from forestry in Bolivia. However, the government does not accept the commodification of forests and rejects the sale of carbon credits.

5.2.6. Energy

The NDP underlines the high potential for energy generation from hydropower and hydrocarbons in Bolivia. In the National Plans there is no special focus on hydropower. Instead the focus is on mining, hydrocarbon and cement. After 2006 electricity production has been nationalized. The latest nationalization was in early 2013. The environmental considerations seem not to increase when the government has greater influence on the sector. On the contrary it seems, like in other sectors, that when government is involved the economic growth potential in the short run is the sole focus.

Despite the potential of hydropower, Bolivia is heavily dependent on imported diesel to cover the energy demand from industry and other sectors. The MAS IPSP contains a project of Gas to Liquid in order to decrease the dependency on diesel imports. The government policy to directly regulate domestic prices below border prices has resulted in substantial fiscal costs. Low prices have also led to substantial smuggling to neighboring countries facing higher domestic prices. Sectors such as transports, agriculture and manufacturing, are forced to resort to more costly imported diesel.

Fuel price subsidies generally have adverse consequences for both government finances and the efficient use of energy and often result in shortages. Fuel subsidies are not a cost-effective way to protect the real incomes of poor households, since they involve substantial leakage of benefits to higher-income groups. Despite this, fuel subsidies are often popular as experienced by both the present and former governments whose attempts to reduce fuel subsidies have been stopped by social protests.

6. The Policy and Institutional framework for environmental management

6.1. Policy framework for environmental management

Following the Rio Conference on Environment and Development in 1992, Bolivia made significant progress in developing an institutional framework for natural resources management and environmental protection. Bolivia's early initiative to create a Ministry for Sustainable Development in 1992 received international recognition. The general environmental law from 1992 was later complemented by more specific rules for environmental protection and sector specific environmental regulations for key sectors such as hydrocarbons, mining and manufacturing. Provisions for sustainable use of natural resources were also included in laws governing land reform, forestry and water. During the 1990ies Bolivia signed and ratified the major multilateral environmental agreements, including the eight environmental conventions that

⁷⁵ World Bank 2012

Sweden has identified as crucial for poverty alleviation⁷⁶. The success in implementing this policy framework is generally considered as mixed. While considerable progress was made in terms of forestry management (especially concerning certified forestry and biodiversity conservation), progress in other areas was bleak.

The current administration has made several important changes in relation to the policy framework for environmental management developed in the 1990ies. Besides the National Development Plan described above the key parts of this framework consist of the new political constitution⁷⁷, the law of Mother Earth and the autonomy and decentralization law.

The *new constitution* establishes the right to live in a clean environment as a fundamental right and contains several strong provisions for sustainable environment and natural resources management as well as the right of the population to information and to participate in processes that can affect environmental quality. Importantly the new constitution frames basic services such as water, sanitation, health and education as human rights which the Bolivian state has the obligation to fulfill.

The recently approved *law of Mother Earth* aims to replace the old framework law for environmental management from 1992, but the old law, including related regulations, are still in force. The law defines Mother Earth as "a collective subject of public interest," and declares both Mother Earth and life-systems (which combine human communities and ecosystems) as titleholders of inherent rights specified in the law (for example the right to clean air and water). Among other things the law also spells out duties of the state and individuals and proclaims the creation of the Defensoría de la Madre Tierra, a counterpart to the human rights ombudsman office (the Defensoría del Pueblo).

Also the *law for autonomy and decentralization* is important for environmental management. Four administrative, or autonomy, levels are established: departmental, municipal, Regional and "Indígena Originaria Campesina". The specific role of each of these levels in the management of environment and natural resources differs for different types of resources, making the system complex to grasp⁷⁸.

Another important development is the recently established agro-environmental tribunal which mandate overlaps with existing environmental laws and institutions. There are also ongoing discussions on a new water law and a new mining law.

The government has also undertaken large *administrative changes* and created new governmental entities in charge of implementing the new policy framework. In 2009 the Ministry of Environment and Water was created and a number of existing as well as new vice ministries and authorities was placed under its mandate (box 6.1).

⁷⁶ Ministry of Foreign Affairs, Ministry of the Environment and Sida, 2004, Using Environmental Conventions in Development Cooperation, Eight Conventions.

⁷⁷ La Nueva Constitución Política del Estado

⁷⁸ Palerm and Ribera, 2011

Box 6.1. Key ministries and authorities with an environmental mandate

Ministerio de Medio Ambiente y Agua (MMAyA) Viceministerio de Agua Potable y Saneamiento Básico (VAPSB) Dirección General de Agua Potable y Alcantarillado Sanitario Dirección General de Gestión Integral de Residuos Sólidos Viceministerio de Medio Ambiente, Biodiversidad, Cambios Climáticos , y Gestión y Desarrollo Forestal (VMA) Dirección General de Medio Ambiente y Cambios Climáticos Dirección General de Biodiversidad y Áreas Protegidas Dirección General de Gestión y Desarrollo Integral Viceministerio de Recursos Hídricos y Riego (VRHR) Dirección General de Cuencas y Recursos Hídricos Dirección General de Riego
Servicio Nacional de Áreas Protegidas (SERNAP) Unidad Central Dirección de Planificación Dirección de Monitoreo Ambiental Direcciones de Áreas Protegidas (22) Dirección Administrativa Dirección Jurídica
Autoridad de Fiscalización y Control Social de Bosques y Tierras (ABT)

Source: Modified of Palerm and Ribera, 2011

There are also administrative structures at Departmental and Municipal levels with an environmental mandate, for examples Departmental secretaries for natural resources⁷⁹.

Social movements have played a very important role for the recent legal developments in Bolivia. The World People's Conference on Climate Change and the Rights of Mother Earth that was hosted by the government of Bolivia outside Cochabamba in April 2010 was an important stepping stone for the Constituent Assembly and the law of Mother Earth. The Pact of Unity (*Pacto de Unidad*) is one example of a national alliance of Bolivian grassroots organizations in support of indigenous and agrarian rights and land reform which have been a driving force behind the Constituent Assembly and the rewriting of the constitution. The Pact of Unity has been a close ally of the Bolivian government and a key building block in the pro-government alliance the National Coordination for change⁸⁰. However, there are also diverging opinions in the indigenous movements. In December 2011, the indigenous organizations CIDOB and CONAMAQ formally withdrew from the Pact of Unity arguing that the Pact had deviated from its original purpose and was now only saying yes to government proposals⁸¹.

There are also several NGOs in Bolivia working on environment and climate change related issues. Many of these receive donor support and several are members of the network organization LIDEMA (which receives support from Sweden)⁸².

Despite the decreasing share of development aid in the government budget, development agencies continue to play an important role for environmental management in Bolivia. Besides the UN, the Inter-American Development Bank, the World Bank and the European Commission there are several bilateral donors involved in environment and climate change related support.

⁷⁹ Palerm and Ribera, 2011

⁸⁰ Coordinadora Nacional por el Cambio - CONALCAM

⁸¹ Rojas M., 2011

⁸² Liga de Defensa de Medio Ambiente

There is a donor coordination group on environment and climate change with two subgroups: i) Watersheds, vulnerability and climate change adaptation and ii) Forests, protected areas, biodiversity and climate change mitigation.

6.2. Implementation challenges

While the new policy framework is replete with ambitious formulations on proactive environmental and natural resources management, there are several important hurdles to the effective implementation of this framework in practice.

Paradoxically the new policy framework has been criticized for being both not sufficiently comprehensive (not covering all regulations that the previous framework did) and for being too large and complicated (with overlapping and uncoordinated laws and administrative mandates). The parallel development of the new laws has created a situation of legal uncertainty.

The central role assigned to the state in the management of natural resources is one of the most important features in the National development plan. The increasing involvement of the state in industries with vast environmental impacts has made the situation where one state entity is supposed to monitor and enforce legislation on another state entity more common. A serious problem is the power asymmetry between powerful implementing agencies responsible for natural resource extraction and the much weaker environmental authorities. The capacity for environmental management has been weakened by the large replacement of experienced staff from earlier administrations, the rapid changes in administrative structures, the predominance of personnel on short term contracts and the reduction in public sector salaries. This weakening of public administrative capacity has been particularly serious regarding environmental management⁸³. To improve systems for environmental monitoring and disclosure as well as strengthening the enforcement of existing laws and regulations are key capacity needs.

The complicated decentralization process also highlights the need for clarifying responsibilities between different levels of authorities. There is also a huge need for capacity development at lower administrative levels.

Another challenge is to allocate adequate resources for environmental management. Environmental management continues to be largely financed by development aid. Even though revenues from natural resources extraction have improved the fiscal situation, finding sustainable financing for environmental management continues to be a challenge.

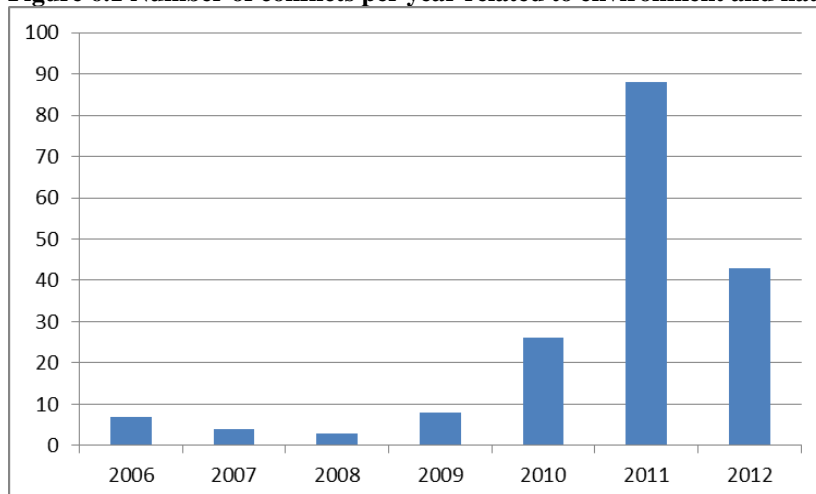
Finally, but not least important, a key explanation behind the lack of progress in implementing laws and reforms for sustainable and equitable natural resources management is clearly the conflicting interests in Bolivian society. Conflicts around ownership and access to environment and natural resources have been at the centre of the political turmoil in Bolivia during the last years. During the 1990ies, the social movements that brought the Morales government into power started to gain momentum. The social movements were largely fuelled by privatization processes which led to the perception that Bolivia's natural riches were sold out to foreign companies in a process that benefited the already rich and deepened the poverty of the broad

⁸³ Embajada Real de los Países Bajos and Embajada de Dinamarca, 2006

population. The lack of progress in implementing the land reform was another key issue for mobilizing social movements.⁸⁴

During recent years there has been an increase in the number of conflicts related to environment and natural resources, including extractive industries, road developments, land, forest and water (figure 6.1)⁸⁵.

Figure 6.1 Number of conflicts per year related to environment and natural resources



Source: UNIR 2013

There is an increasing gap between, on the one hand, the radical but often very vague provisions for communitarian and proactive environmental management in the new Constitution and the Law of Mother Earth, and, on the other hand, the heavy investments made by the Bolivian state in natural resource extraction and infrastructure development at very high environmental costs. It seems likely that the type of clashes between social movements and the government as the one around TIPNIS will continue to grow unless this gap is narrowed.

⁸⁴ The National Development Plan states that social movements were empowered in the process of nationalization of water and hydrocarbons. The new “state of participation and integration” will be based on this democratic movement (Ministerio de Planificación del Desarrollo, Plan Nacional de Desarrollo, 2006, p. 83)

⁸⁵ UNIR 2012

7. Conclusions and issues to consider

7.1. Conclusions

Bolivia is endowed with a huge diversity of different ecosystems and a wealth of renewable and non-renewable natural resources. However, similar to many other natural resource rich countries, Bolivia has so far not been able to translate natural resource rents into a broad based development. Instead, resource extraction has been characterized by boom and bust cycles and corruption, generating widespread inequality, social conflicts and environmental degradation.

Poverty in Bolivia is aggravated by a number of serious environmental problems such as water pollution, air pollution, soil erosion, deforestation and natural disasters. The poor, and particularly women and children, are disproportionately affected by environmental degradation since they have least capacity to cope with health problems related to poor water and air quality, food insecurity or economic shocks following natural disasters.

Evidence of climate change is compelling in Bolivia and the country is subject to several climate-related risks. The most significant disaster risks are floods in the flat eastern regions and droughts in the western mountainous and semiarid part of the country. Changes in temperature and precipitation also affect water flows and agricultural conditions making a large portion of Bolivia's population extremely vulnerable to the effects of climate change. Increasing the resilience to changes in climatic conditions is hence an essential component of any strategy for poverty alleviation and the enhancement of economic opportunities in Bolivia.

The achievements in relation to MDG 7 Ensuring environmental sustainability are mixed. On the one hand, instead of *reversing the loss of environmental resources* (sub goal 7a), the trend is one of increasing pressure on environmental resources. For example the rate of deforestation is increasing and is one of the highest in the world, and water pollution is also getting worse. On the other hand, Bolivia has been successful in the MDG 7 sub goal on increasing access to water which will be reached. Through among others the project Mi Agua, big investments have been done during the latest 3 years and in urban areas the situation has improved significantly. Increasing access to sanitation has proven more difficult and poor sanitation continues to be an important cause of mortality among children. The MDG 7 sub goal on sanitation will most likely not be reached by 2015.

Environment and natural resources play a very central role in both political and economic development in Bolivia. Economic growth in Bolivia is largely natural resources driven with mining, hydrocarbons and agroindustry/manufacturing being the key growth sectors. To regain political control over natural resources, such as water, gas and land, was a central demand of the social movements that brought the government of Evo Morales into power. The government's plan is to continue the process of nationalization of key industries and that all natural resources and strategic services should have been nationalized and managed by the state by 2025.

On a general level, the need to balance the utilization of natural resources for development purposes with the needs for environmental conservation is recognized in the Bolivian National Development Plan (NDP), in the new political constitution as well as in the new law of "Mother Earth" and other political reforms. In the international arena Bolivia has also positioned itself as a strong advocate for environmental protection and climate justice.

However, there is increasing evidence that the rapid industrial development in mining, gas, oil and agriculture experienced in Bolivia during the last years is associated with very high environmental costs in terms of pollution, deforestation and land degradation. There is a growing gap between the general rhetoric about Mother Earth and the lack of environmental considerations in much of the large scale developments. Particularly worrying are the signs that the environmental assessment system in Bolivia has been weakened during the present administration and that government related investment projects enjoy especially relaxed procedures for environmental permitting and monitoring. There is also a more general weakening of the capacity for environmental management, mainly due to the rapid changes in legal framework and administrative structures, the large replacement of experienced staff from earlier administrations and the predominance of personnel on short term contracts.

Environmental problems caused by large polluters such as the oil and mineral sector are solvable by strengthening the existing systems for environmental assessment, stepping up enforcement of existing environmental laws and investing in modern technology. However, most of Bolivia's environmental problems are intrinsically linked to poverty and inequality and cannot be solved by environmental policy alone. The land reform process stands out as crucial for reduced inequality and poverty reduction, but involves a high risk for accelerating the already high rate of deforestation unless combined with efforts to develop the agricultural systems towards higher sustainability. There is a strong need to strengthen the capacity of land reform authorities to integrate environmental considerations in the land reform process.

During recent years there has been an increase in the number of social conflicts related to environment and natural resources, including extractive industries, road developments, land, forest and water. It seems likely that the type of clashes between social movements and the government as the one around road project in TIPNIS will continue to grow unless the gap between rhetoric and practice is narrowed. Reforms aiming at strengthening the legal system, dispute settling mechanisms and democracy at large are important also for addressing the pressing environmental problems facing Bolivia.

7.2. Issues to consider for Swedish development cooperation

Swedish development cooperation with Bolivia has a long history. In the current strategy period (2008-2013) bilateral cooperation is undertaken within the fields: (i) democracy and human rights, (ii) education, (iii) environment and human rights; and (iv) research. While there are linkages to environment and climate change issues in all Swedish supported interventions, the linkages are particularly strong in the supports to the Program for water and sanitation in peri-urban areas (PASAP), the community forestry program Baba Carapa and the climate adaptation programme Pro Agro. Several of these supports form part of the special climate initiative financed by the Swedish government.

Sweden is about to develop a new strategy for development cooperation with Bolivia. This section discusses key issues to consider when integrating environment and climate change issues in this strategy and how to operationalize a possible focus on the millennium development goal 7 Ensuring Environmental Sustainability.

Working with MDG 7 does not necessarily imply that Sweden must provide support through an environmental authority but can be pursued through different means and channels depending on the opportunities and constraints in a given context.

A natural starting point is to consider lessons learned from current development cooperation with Bolivia. Why has it for example been so difficult to make advances in support to forestry policy reform and implementation, while it has been easier to make progress in relation to water and sanitation? This example underlines the need to understand the political linkages related to environment and natural resources management. The government's (and different interest groups') priority to agricultural expansion rather than forest management clearly made progress on forest policy difficult. In order to change priorities make trade-offs more informed there is probably a need to increase the awareness of the value of forests not only for logs but also for carbon sequestration, provision of ecosystems services, subsistence economy and tourism. Also experiences from integrating environmental concerns in development cooperation in the education sector should be considered. Why do environment and gender play a more peripheral role than before in the new curriculum developed by the Ministry of Education?

Dialogue on a strategic level: Swedish budget and sector support has been replaced by support to different programmes and projects. In combination with the somewhat skeptical attitude of the new government towards development agencies, the focus on programmes and projects risk diverting Swedish support away from issues of strategic importance. This is unfortunate since the government is trying to push several complex and challenging reform processes where Sida and other development agencies could act as dialogue partners and give advice on international good practice. If bilateral dialogue at high levels is difficult to undertake, then maybe joint donor-government dialogues can be undertaken around selected issues. Also support to civil society organizations or specific studies can be viable options. How to seek opportunities for a dialogue with the government on strategic environmental issues should be continuously considered.

Strategic Environmental Assessment in support of the Land Reform Process: The land reform process may be the most critical reform for poverty reduction and environmental sustainability in Bolivia. There is big need for improved integration of environmental considerations, including the links to agricultural production and sustainable forest management, and capacity building in the policies and institutions leading the reform efforts. Terms of references for conducting a Strategic Environmental Assessment of the land reform process have recently been developed with support from The Netherlands⁸⁶. Since the Netherlands are phasing out development cooperation with Bolivia, the possibility for Sweden, in collaboration with other development agencies, to support the government in implementing the Strategic Environmental Assessment and the ensuing recommendations should be considered⁸⁷. This could be an initiative of very high strategic relevance

Consider continued forest related support: While the Baba Carapa community forestry programme reportedly has contributed to important outcomes (despite the problems faced), it seems pertinent to consider how to proceed from this micro-macro paradox ("an island of success in a sea of deforestation"). Can project oriented support be complemented with dialogue initiatives? During the last years tenure rights to many million hectares of land has been handed over to individuals and community groups. Communalization of land started already more than a decade ago in Bolivia and has gained increased momentum under the new government. It is well

⁸⁶ Netherlands Commission for Environmental Assessment, 2012

⁸⁷ Strategic Environmental Assessments (SEA) are increasingly being used to integrate environment in sector strategies and other strategic level decision-making. In the Paris Declaration development agencies and partner countries jointly committed to "...develop and apply common approaches for "strategic environmental assessment" at the sector and national levels. OECD DAC has recently published Guidance on how to apply SEA in development cooperation (www.seataskteam.net).

known that in order to reach sustainable management of forests it is far from enough to only decentralize tenure. There are probably vast needs for training and capacitation of user groups and community groups in various aspects of the use of their new assets. The issue of reaching sustainability in use of forests is important not only for the direct users but also for the maintenance of the flow of many important environmental services.

Strengthen the Bolivian system for environmental assessment and monitoring: Bolivia does not have a well working system for environmental impact assessments of projects or strategic environmental assessments of plans and programs. Also monitoring and enforcement of environmental legislation is highly inadequate. There is an urgent need to strengthen these systems in order to address the pollution and environmental degradation associated with the many large development projects in Bolivia. Such support can have a technical component such as training of staff. Training may be particularly important in relation to strategic environmental assessment which is a relatively new concept in Bolivia. Opportunities to link up with the Sida funded International Training Programme on strategic environmental assessment⁸⁸ could be explored for this purpose. However, there are also important political and administrative aspects related to environmental assessment, monitoring and enforcement. Without constituencies supporting the recommendations put forward in environmental assessments they can be of little value. To address this political dimension support could for example be given to civil society organizations for monitoring the application and enforcement of the environmental assessment regulations in Bolivia. Also specific studies on the functioning of the environmental assessment system in Bolivia could be considered. A related issue could be to support a review of the emerging environmental policy landscape in order to point out overlaps and gaps, including how the issues of assessment, monitoring and enforcement will be conducted in practice. Also the relationship between environmental law and the agro-environmental tribunal could be included in such a review.

Continue supporting climate change adaptation and resilience: The Swedish financed climate change initiative has contributed to several important projects in Bolivia⁸⁹. Some of the supported activities may not have names that refer directly to climate change but are aimed at promoting resilience to climate change in relation to water and sanitation, agriculture, forestry and health. An evaluation of these experiences seems relevant. Also the possibility to continue some of these supports beyond the climate initiative could be considered. Many other development agencies have also supported work on climate adaptation in Bolivia (see for example the Pilot Programme for Climate Resilience⁹⁰). Nevertheless, the work on improving climate adaptation and resilience faces crucial challenges. Following the new law on Mother Earth a Plurinational Entity on Climate Justice will be created and will develop new mechanisms for adaptation, mitigation and a joint mechanism for adaptation and mitigation to climate change for forests. It seems crucial to assure that the capacity that has been created within the National Climate Change Program (PNCC) is not lost during the transition to this new administrative entity. It is important for Sida to stay informed on the development and carefully consider if there are any fields where additional support is needed despite the “crowding” of other donors. For all programmes and projects receiving Swedish support it should be considered how they can contribute to climate change adaptation and resilience.

⁸⁸ <http://www.niras.com/Business-Areas/Development-Consulting/International-Training-Programmes/Strategic-Environmental-Assessment-2013.aspx>

⁸⁹ Sida, 2012, “Klimatsatsningen årsrapport 2011 - bilaterala och regionala insatser”

⁹⁰ Climate Investment Fund, 2011

A good understanding of natural resources related issues and the importance of sustaining ecosystem services: Given the central role natural resources play in Bolivian politics, a good understanding of the issues at stake is necessary for sound planning of Swedish development cooperation with Bolivia. Further studies, seminars and stakeholder dialogues around environment, natural resources, ecosystem services, and related issues should be considered as part of the process of developing and implementing a new strategy.

Ensure sustainability of investments in water and sanitation: Support to extended water and sanitation coverage is prioritized by the government and several development actors. Important achievements have been made during the latest years and the coverage of the services has increased especially in urban areas. Besides new investments in improved water and sanitation, there is a need for a strategic dialogue on how to make the provision of water and sanitation services sustainable. User groups, community groups and other types of associations for maintenance and management have been created where investments in water and sanitation infrastructure has been made. Important here would probably be to follow up the investments with actions that secures the sustainability. Tariff constructions (mainly in urban areas) and capacitation for maintenance (mainly in rural areas) could be considered. Also how to upscale the use of unconventional technologies for water and sanitation could be considered.

Linking research to policy: How the environment related research supported by Sida can contribute to better informed decisions regarding critical environmental issues should be a continuous dialogue issue with partner organizations. Research that systematically increases the cumulative knowledge about the state of environmental resources in Bolivia should be encouraged. Possibly twinning arrangements could also be arranged between statistical offices in order to systematically gather information on environmental issues and to make it publicly available.

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Appendix: Selected Environmental Indicators	Bolivia (2006)	Bolivia (2012)	Honduras (2012)	Guatemala (2012)	Latin America & Caribbean (2012)
Source: World Bank, 2006 and 2012					
Population (millions)	9.0	9.9	7,6	14.4	582.6
GNI per capita (\$) (World Bank Atlas Method used)		1810	1870	2740	7733
Agriculture					
Agricultural land (%) of land area	34	34	29	41	36
Agricultural productivity, value added per worker (\$2000)		716	2041	2803	3663
Food production index (2004-2006=100)		113	103	122	131
Forest and biodiversity					
Forest area (%) of land area	54.2	52.8	46.4	34.1	47
Annual deforestation (% change, 1990-2010)	0.4	0.5	2.2	1.3	0.5
Nationally protected terrestrial areas (% of land area)	13.4	18.5	18.2	30.6	20.2
Threatened species, higher plants		72	107	72	-
Threatened species, mammals	26	20	7	16	-
Treatened species, birds	30	34	9	10	-
GEF benefits index for biodiversity (0-100 median is 1.5)	13.8	12.5	7.2	8	-
Emissions and pollution					
Energy use per capita (kg oil equivalent)	504	638	592	701	1245
CO ₂ emissions per capita (metric tons)	1.2	1.3	1.2	0.9	2.8
Electric power consumption per capita (kWh)	422	558	678	548	1892
Water and Sanitation					
Access to improved water source (%) of total population	85	88	87	92	94
Rural access to water (%) of rural population	68	71	79	87	81
Urban access to water (%) of urban population	95	96	95	98	98
Access to improved sanitation (%) of total population	45	27	77	78	79
Rural access to sanitation (%) of rural population	23	10	69	70	59
Urban access to sanitation (%) of urban population	58	35	85	87	84
Environment and Health					
Diarrhea prevalence (%) of children under age 5	24.8	26	16	-	-
Under-five mortality rate (per 1000 live births)	69	54	24	32	23

