Mali Environmental and Climate Change Policy Brief-Final draft July 5th 2013

The Swedish Government has identified environment and climate change as one of three thematic priorities for development cooperation. This is reinforced in the Swedish policy on environment and climate change in development cooperation, which concludes that these aspects are a central point of departure for all development cooperation. An Environmental and Climate Change Policy Brief is a tool to address these issues in the context of an upcoming result strategy process for Swedish development cooperation in Mali.

This brief has been written in May-June 2013 by Olof Drakenberg and Emelie Cesar at Sida Helpdesk for Environment and Climate Change at the request of Mamby Fofana and Lisa Andersson, Embassy of Sweden in Bamako, Mali. This desk study policy brief aims to provide an overview of development-poverty and environment and climate change linkages and stimulate discussions at the Embassy. The brief will be complemented by a consultant report undertaken in Mali in July 2013.

Table of contents

Executive summary 2
1. Introduction to a development perspective on resilience 3
2. Key environmental problems, their causes and opportunities 4
3. What are the effects of the environmental problems? 5
3.1 Impacts on poverty 5
3.2 Impacts on economic development 8
3.3 Impacts on Public Health and Education 11
3.4 Impacts on security and conflict 13
4. Policy framework for managing environmental challenges 13
4.1 Legislative frameworks and key plans 13
4.2 Institutional capacity 15
4.3 Other actors 16
5.Risks and opportunities 17
6. Issues for Sida to consider 17
6.1 Addressing resilience 17
6.2 Operationalizing MDG 7 18
6.3 Links to other thematic priorities 19
References 21
Annex 1 Water flow on the Niger and flooding of the inner Niger Delta 26
Annex II Environmental indicators for Mali 27
Annex III Calculating Adjusted Net Savings 28
Annex IV Governance indicators 30

Executive summary

Mali is a landlocked country with an economy highly dependent on renewable (agriculture, fisheries, forestry, livestock) and non-renewable (minerals) natural resources. Mali has extremely diverse climatic zones ranging from deserts in the north to fertile land with high annual rainfall around 1400 mm in the south. Most people live in the southern parts of the country and the economy in mainly based on rain fed small scale agriculture. Prior to the coup in 2012 poverty levels had gradually been reduced to about 42% of the population but Mali remains one of the world's poorest countries, highly vulnerable to both economic and environmental shocks such as droughts and irregular rainfall.

Degradation of soils, forests and water ecosystems are the key environmental constraints for reducing poverty in Mali and where climate change further aggravates existing stresses. The degradation of soils is caused by natural processes like wind and water erosion but is also due to unsuitable agricultural practices, overgrazing or cultivation of marginal lands due to extremely rapid population growth, insecure tenure, lack of alternative livelihoods and weak governance. The annual cost of environmental degradation in Mali has been estimated to be equivalent to 6,5% of GDP. The main explanatory factors are lower agricultural and forest productivity due to land and forest degradation and health costs associated with polluted water and to a lesser extent air pollution. These costs are mostly borne by vulnerable groups that rely on rain fed agriculture and lack access to clean water and sanitation. More and more land is brought under cultivation which lead to deforestation and increase conflicts e.g. between farmers and pastoralists. Increased competition for scarce natural resources in Northern Mali is one of several factors that fueled the conflict leading to the current political situation. Insecurity and rapid migration contributes to further degrade the natural asset base and increase competition for resources. Urban environmental problems are mainly related to access to water, sanitation and management or waste.

Prior to the coup Mali had strengthened its capacity to manage its natural resource base, improved the legislative and institutional frameworks and mainstreamed environment and climate in the national development plan. However, budget allocation to target environmental priorities set out in the plan have been insufficient and implementation capacity remains weak, not least at decentralized levels. After the coup aid was suspended and the government's budget was drastically cut. Mali's economy and institutions has shown signs of resilience during the past year although the strong agricultural growth was largely due to good rainfall. Further strengthening the resilience of Mali and in particular vulnerable groups calls for multiple approaches. The government has adopted a transition road map to install national security, hold democratic elections, ensure food security and provision of basic services etc.

The most recent planning document is the Plan pour la relance durable du Mali (PRED). The plan includes programmes for infrastructural investments in energy and roads to facilitate agro industrial investments; investments to improve administrative services not least in the context of the decentralization process; improved food security through increased productivity and market development; access to basic services such as health, water and in particular education. Improved and integrated management of land and water resources is critical for food security and successful implementation of the plan. The PRED provides both risks and opportunities. Mali has large opportunities to increase productivity through greater use of irrigation, better agro-forestry -livestock practices including soil and water conservation measures, value addition, better provision of information and diversification of the economy. Social safety nets can also strengthen the resilience of vulnerable groups by protecting their

productive assets and allowing investments in human capital and diversification of livelihoods over time.

Even in times of transition much is won if government has sufficient capacity to assess that key investments programs properly assess any tradeoffs between short and long term impacts on the productive assets, soil and water upon which the majority of the population depend. An integrated approach with collaboration across sectors is important. Sweden as the lead in the thematic group on environment is well places to keep this dialogue and efforts to liase strongly with the group on rural development and agriculture could be promoted further.

Sweden has provided support to democracy, human rights, general budget support, statistic, and has a large portfolio for water and sanitation, climate, forestry and is leading the thematic working group on environment. In the current political setting environment and climate change aspects might best be treated as enabling conditions for reaching objectives on food security, improving public health and increasing the benefits of education.

Resilience can be used as an overarching framework for the strategy under which separate result areas are formulated and where the resilience perspective is mainstreamed in the respective result areas.

1. Introduction to a development perspective on resilience[1]

Sida has chosen to adopt the following working definition of resilience: *The ability of an individual, a community, a country or a region to anticipate risks, respond and cope with shocks and stresses, while addressing the underlying root causes of risks, recover, and continue to develop*.

A pragmatic attempt to translate the thinking into actions from a Sida perspective means:

- Resilience can be considered a 'merger' between other 'agendas' including disaster risk reduction (DRR), climate change adaptation (CCA), food security, environmental management and restoration (maintenance of ecosystem services), social protection etc. It serves as a unifying concept, and is useful because people experience their lives holistically: people live in complex, interconnected systems. Note that Sida's definition includes the vision of continuing to develop – and be ready for change.
- A resilience approach requires more "cross-sector" planning so several aspects of vulnerability are addressed in parallel (see characteristics below). Resilience is about ‘adaptive capacities’ – about managing change and eventually thrive. Uncertainty and change is accepted, and handled by becoming flexible and have multiple options when facing new challenges.
- Promoting resilience from a developmental/humanitarian perspective means to focus *mainly* on vulnerable peoples' ('individuals' and 'communities' in the definition above) ability to meet short- and long-term challenges to their livelihoods, safety and potential for development.
- However, the community level impact needs to be supported by higher level efforts to change the deep-rooted causes of vulnerability, including social, political and cultural inequalities etc. So policy dialogues, support to governance and political reforms as well as, for example, sector support to government agencies are important in establishing an 'enabling environment' for community resilience building.

[1] This text builds on ongoing work within Sida and should be considered work in progress.

- At least, do not undermine resilience: Guide any EIA processes to ascertain that no programming may risk eroding any groups' resilience (add to the risks/ challenges) – i.e. ensure proper analysis of potential side effects on vulnerable groups of any kind of infrastructure projects, and unintended effects in other sectors.
- The thinking is also applicable in post-disaster situations to bridge the relief and development gap: do not rebuild vulnerability.
- Identify if there are any opportunities to modify existing programmes in order to contribute to enhanced resilience – including 'adaptive capacity' – and strive for contributing to *several* of the following 'characteristics' of a resilient community[2], which:
    - …is *knowledgeable and healthy*. It has the ability to assess, manage and monitor its risks. It can learn new skills and build on past experiences
    - …is *organised*. It has the capacity to identify problems, establish priorities and act.
    - …is *connected*. It has relationships with external actors who provide a wider supportive environment, and supply goods and services when needed.
    - …has *infrastructure and services*. It has strong housing, transport, power, water and sanitation systems. It has the ability to maintain, repair and renovate them.
    - …has *economic opportunities*. It has a diverse range of employment opportunities, income and financial services. It is flexible, resourceful and has the capacity to accept uncertainty and respond (proactively) to change.
    - …can *manage its natural assets*. It recognises their value and has the ability to protect, enhance and maintain them.

2. Key environmental problems, their causes and opportunities

The key environmental constraints for reducing poverty in Mali are degradation of soils, forests and water ecosystems and where climate change further aggravates these existing stresses.[3] Other environmental challenges include biodiversity loss; waste and air pollution and siltation.[4]

The degradation of soils is caused by natural processes like wind and water erosion but also due to unsuitable agricultural practices, overexploitation such as overgrazing or cultivation of marginal lands etc. The underlying causes are rapid population growth, 3,6% per year[5], poverty and lack of alternative livelihoods, tenure insecurity, weak institutional capacity and other market failures[6].

The trend is that land under cultivation increase rapidly with about 4,7 % per year.[7] In many parts of the country the soils are poor in organic matter and sensitive to overexploitation. Infertile land is abandoned.

[2] Arup, 2011
[3] République du Mali, 2011a,
[4] République du Mali, 2011b
[5] République du Mali, 2011c
[6] Externalities are unintended side effects of production or consumption. An example is soil erosion caused by unsustainable agricultural practices such as cultivation of steep slopes which cause siltation and reduced water storage capacity in downstream hydropower dam and increased exposure to landslides for downstream urban dwellers. The costs in these examples are not borne by those who cause the impact.
[7] République du Mali, 2011a

In combination with a large demand for fuel wood and charcoal, land conversion contributes to a reduction in vegetation cover of about 500 000 hectares per year[8] However the rate of deforestation was somewhat slower during the last decade than in the previous decade.[9] About 92 % of the population depends on either fuel wood, (74%), or charcoal, (18 %), for cooking.[10] Fuel wood is also used commercially, for example the bakeries in Bamako alone have been estimated to account for about 10% of the national consumption of reported quantities of fuel wood.[11]

Mali is rich in water resources but their distribution is highly uneven.[12] The availability and quality of water is problematic in many parts of the country. Low access to improved sanitation and lack of regulation of emissions from households, agriculture (agrochemicals from e.g. rice and cotton production), and mineral extraction are key causes for water pollution. The Niger River plays a critical role in for Mali's development providing water for agriculture, fisheries, energy, transportation etc. There are large seasonal variations in river flow which makes the inner Niger Delta highly productive. Annual variations in river flow depend on rainfall, particularly in the Upper regions of the Niger basin and are also influenced on rainfall during previous years. See Annex I for statistics on river flow and flooding. While expanding energy provision, further regulation of the river for hydropower purposes can have significant negative downstream effects on food production and livelihoods.[13] The competing demands for water between economic sectors, users and countries requires an integrated approach to water resources management and regional collaboration.

Specific urban environmental problems can be categorized in four groups. The first relate to access to water, sanitation and waste management; the second concerns pollution of water, air and soils; the third relates to vulnerability to natural disasters and flooding in particular and finally the fourth relates to the environmental footprint of urban consumption on adjacent ecosystems. The most important aspects are the provision of safe water and sanitation and management of waste.[14] Key underlying drivers include the rapid urbanisation process, insufficient planning and coordination, weak regulations, insecure tenure, low awareness and lack of investments.[15] More environmental indicators are found in Annex II.

3. What are the effects of the environmental problems?

3.1 Impacts on poverty

Poverty is both a cause to and consequence of environmental degradation. With a population growth rate of 3,6 % Mali has one of the fastest growing populations in the world.[16]. Rapid

[8] Republique du Mali, 2011c.
[9] World Bank, 2005 and 2013c Annual deforestation (% change) between 1990-2000 was 0.7 compared with 0.6 between 2000-2010. Investments in reforestation have increased considerably since 2010. As an example the number of planted trees quadroupled between 2009 and 2011. (MEA, 2012).
[10] Instat, 2011
[11] Komota et al, 2010 estimate that bakeries in Bamako use about 38 000 cubic meters of fuelwood , which is roughly 10 % of the fuel wood reported in the annual report of the National Directory for water and forests.
[12] Ministère de l'energie, des mines et de l'eau, 2007
[13] Zwarts et Frerotte, 2012
[14] World Bank, 2011a
[15] Ibid
[16] According to the CIA World Factbook 2012 only 2 countries had a growth rate higher than 3,6 %, the data is officially used in the Mali government's CSCRP 2012-2017.

population growth put significant pressure on natural capital which together with human capital typically represents the key assets for poor people. Due to lack of alternative income generating activities, poor men and women overexploit these resources, cultivate marginal lands, shorten fallow periods etc. thus further degrading the assets on which they depend.

About two-thirds of the population lives in rural areas but the share of urban population is growing rapidly by international standards with about 5% per year.[17] According to a recent World Bank study on safety nets, environmental shocks are the primary risk factor for vulnerable groups in Mali.[18] Environmental shocks dominate in areas like Kidal, Koulikoro, Kayes, Mopti and Sikasso whereas economic shocks dominate in Bamako. Examples of economic shocks include declining world prices for cotton or increased costs of food crops. Environmental shocks include drought, irregular rainfall, flooding. Table 1 lists the number of people affected by natural disaster during the last thirty years.

Table 1. Top 10 Natural Disasters in Mali for the period 1984 to 2013 sorted by numbers of total affected people

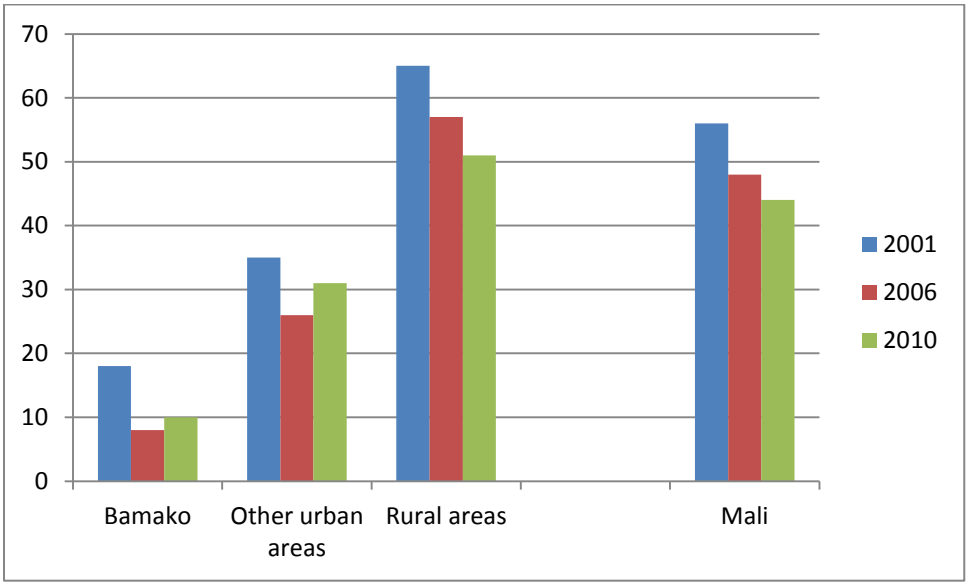
Disaster	Date	No Total Affected
Drought	2011	3 500 000
Drought	2005	1 000 000
Drought	06/2010	600 000
Drought	03/1991	302 000
Flood	4/07/2007	47 255
Flood	22/07/2007	41 603
Drought	08/2006	25 000
Flood	26/07/2002	22 519
Flood	05/2009	20 406
Flood	11/08/2010	16 000

Source: EM-DAT: The OFDA/CRED International Disaster Database

The drought in 2011 affected about a quarter of the population. The population is concentrated to the southern part of Mali and along Niger River. Poverty levels fell from about 55% in 2001 to 44 % in 2010. 91% of the poor live in rural areas and four out of five depend on agriculture which mainly is rain fed. At stated in the CSCRP rural agricultural development is key for the reduction of poverty in Mali and the degradation of natural resources constitute a major challenge for rural growth and livelihoods. Due to migration to cities urban poverty increased between 2006-2010. See figure 1.

[17] World Bank, 2011a
[18] World Bank, 2011b

Figure 1: Poverty levels 2001-2010, %



From CSCRP 2012-2017 Source : INSTAT (pour 2010, résultats provisoires ELIM)

Mali has showed an impressive improvement related to undernourishment, child mortality and child underweight between 1990 and 2012.[19]

The coup in 2012 and war in Northern Mali has affected 1,7 million people in the north reducing their access to land, water and other basic services, 480 000 have left their homes, aid and government budgets have been cut and the economy contracted with about 1 %.[20] The full impacts of the conflict on poverty are difficult to assess.

Gender inequality contributes negatively to agricultural growth.[21] Mali is ranked at the very end, 86 out of 86 countries in the 2012 Social Institutions and Gender Index that measures discriminatory social institutions.[22] Women have the same legal right as men to vote and to participate in public life in Mali. Women and men also have the same access to land and the government has launched revised legislation and several publicly funded agricultural development projects that, theoretically, allow women to access land on the same basis as men. However, in reality many obstacles prevent women from exercising their rights, including lack of access to credit to purchase equipment to work the land, meaning that they have to rely on the goodwill of other family members who may or may not allow them to use equipment. In some regions, customary law dictates that women are only entitled to poor quality land, or have no rights to property at all, or are only able to obtain a life interest in the land that they work, through their husbands. The percentage of women having access to land

[19] UNDP, 2013 Mali improved the score from 28 to 16.
[20] République du Mali, 2013c
[21] World Bank. 2008,
[22] The following text in this section is an excerpt from the Mali gender profile at the social institutions index webpage. The Social Institutions and Gender Index (SIGI) was launched by the OECD Development Centre in 2009 to measure the underlying drivers of gender inequality for over 100 countries. The SIGI captures discriminatory social institutions, such as early marriage, discriminatory inheritance practices, violence against women, son preference, restricted access to public space and restricted access to land and credit

has increased in Mali from 18.7 percent in 2007 to 20 percent in 2008-2009. This positive trend can be partially attributed to implementation of the Agricultural Framework Law (Loi d'Orientation Agricole) favouring women. Data shows that only 16 percent of creditors in Mali are women. The rate of illiteracy is still high among girls and women, thus affecting women's capacities, jeopardizing their productivity and limiting their access to development opportunities. According to tradition, women are entitled to the less fertile land and often obtain use rights and not ownership.

3.2 Impacts on economic development

Mali's renewable natural resources and non-renewable natural resources play a crucial role for development as agriculture, fisheries and livestock employ about 80% of the population[23]. The annual cost of environmental degradation in Mali has been estimated to be equivalent to 6,5% of GDP annually. The main explanatory factors are lower agricultural and forest productivity due to land and forest degradation and health costs associated with polluted water and to a lesser extent air pollution.[24] These costs are mostly borne by vulnerable groups that rely on rain fed agriculture and lack access to clean water and sanitation. Rural agricultural growth is recognized as critical for poverty reduction and food security. In the medium turn, land degradation and loss of vegetation cover is a major barrier for Mali ambition's to become an agro industrial power.[25] In 2012 Mali had a negative savings rate, even without counting degradation of water, forest and soil, see Annex III.

The growing environmental problems in urban areas, primarily related to water, sanitation and waste management have significant impacts on economic development mostly due to health impacts causing absence from work etc. These impacts are likely to increase due to expected increased frequency of extreme weather events.[26]

Access to finance is by far the most important obstacle identified by private firms but access to electricity and access to land are also among the top five obstacles for private firms.[27] Power and water outages occur frequently and value lost due to power outages are about 4% of sales which is significantly lower than the average in sub Saharan African countries.[28] About one quarter of the population have access to electricity and Mali's demand for electricity is increasing more rapidly than GDP growth. The adoption of proper electricity tariffs that ensure cost recovery is key for the much needed development of the electricity sector.[29]Due to the crisis and severe budget constraints, government has reduced costly subsidies for petrol and butane.[30] From the perspective of promoting a greener economy this is a sound development. Although many poor men and women face rising costs for

[23] République du Mali, 2013c
[24] République du Mali, 2009, Evaluation économique de la gestion environnementale au Mali couts et bénéfices, UNEP, UNDP, SBA The evaluation includes several methods to calculate the costs of environmental degradation and resource inefficiences. By combining different methods they find that the equivalent of one fifth of Mali's GDP is lost every year due to environmental degradation and resource inefficiencies. This figure is included in the CSCRP 2012-2017. The figure 6,5 % of GDP mentioned here is chosen as the methodology is have been used in in a series of other analysis undertaken by the World Bank. Whichever number is used this signals that poor management of natural resources is very costly and that measures to reverse the trends need to be considered.
[25] République du Mali, 2013c
[26] World Bank, 2011a,
[27] IFC, 2010
[28] Ibid
[29] IMF, 2013
[30] L'Essor, April 29 2013

transportation and cooking these subsidies generally mostly benefit richer parts of society.[31] The elimination of fuel subsidies can create fiscal space for targeted pro-poor spending.

The economy has been growing at around 5 % between 1996 and 2011[32]. It is first and foremost due to growth in the primary sector, food crops other than rice, rice and to a lesser extent livestock that have been the engines of the Mali economy in recent years. In 2012 due to the extra ordinary political situation one the one hand and good harvests and high incomes from gold mines on the other hand, the economy contracted with about 1%. However the economy is expected to return towards a growth rate around 5 % already in 2013 but the uncertain political situation and economic crisis constitutes a significant risk for economic and social development.[33]

In 2012 agriculture (including forestry, fisheries, cropping and livestock) was estimated to account for around 37% of GDP, with industry and services contributing to 23% and 40% respectively. With 2012 being an exception, the long term trend is a decline in agricultural share of the economy due to rise in gold production, demographic shift toward urban areas and the normal structural transformation of the economy towards manufacturing and services. The correlation between agricultural production and rainfall and economic development is very strong[34] although increased investments in irrigation has somewhat reduced the vulnerability to rainfall changes.

Mali has significant potential for growth in agricultural, forestry and livestock systems. Rural land is estimated to be around 47 million hectares including 12 million ha of arable land, 30 million ha of grazing land, 3,3 million ha of wildlife reserves and 1,1 million ha of forestry reserves. 2,2 million ha are suitable for irrigation and the county has substantial water resources[35] where only 12 per cent of the country's large irrigation capacity has been developed.[36]

The table below show increases in yields per hectare for major food crops. It can be noted that the increase in yields per hectare in sorghum and millet remain very low. The average annual growth rate of yield per hectare of major food crops is 2,5 % which can be compared with a population growth of 3,6% per year. It should also be noted that this table masks the large differences between high potential and low potential farming areas and differences in yields for different farm sizes. As an example, cereal production per capita is often three times higher for those with the larger farms compared with those with small size farms.[37] Cotton accounts for about 1 % of GDP and 15 % of export incomes. Cotton yields per hectare failed to improve between 2001/2 and 2008/9.[38]

[31] Sterner, T, 2011, Fuel taxes and the poor – the distributional effects of gasoline taxation and their implications for climate policy
[32] Staatz, J., et al, 2011
[33] World Bank, 2013b
[34] IMF, 2006
[35] Djiré, M, et al, 2013
[36] IFAD, 2011
[37] Staatz, J., et al, 2011
[38] Ibid

Table 2. Trends in yield of major food crops 1990 to 2009

Crop	Mean Yield (kg/ha) 1990/1 - 92/3	Mean Yield (kg/ha) 2006/7 - 08/9	% change in 3-yr averages (1990/1-92/3 vs. 2006/7-08/9)	% annual Growth
Millet	662	797	20.6%	1.3%
Sorghum	797	901	13.0%	0.9%
Maize	1,181	1,790	51.5%	2.3%
Rice	1,641	2,902	76.9%	3.4%
Fonio	617	766	24.2%	1.3%
Total cereals	840	1,208	43.8%	2.5%
Groundnuts*	856	919	7.3%	0.1%

*Source: Staatz et al, 2011*Data available only through 2007/08*

Projected changes in temperature and rainfall are likely to have significant negative impacts on crop yields in both drier and wetter areas. Food production in wetter areas will mainly be impacted by the rising temperatures whereas changes in rainfall have larger impact in arid areas.[39] An extensive literature review finds that the median decline in crop yields in the Sahel due to climate change is -18 % although projections include large differences.[40] A study on Mali finds that without adaptation the percentage of people found to be at risk of hunger rises from 34 to 64-72% and the economic losses are estimated to be in the order of 1% of GDP.[41] Nevertheless, the same study also reveal that 2/3 of the costs of climate change could be recovered if the government undertake a mix of policies such as promotion of better crop varieties, improved soil management, free trade and expanding cropland. Major non-agricultural impacts of climate change include reduced hydropower generation, increased burden of disease due to malnourishment and diarrhoeal diseases etc. thus impacting both business environment, education and employability.[42]

Investments in Office du Niger have been substantial which has led to significantly higher yields per hectare. A sharp increase of land and water disputes has also emerged in the Office du Niger.[43] Between 2004-2009 close to 900 000 hectares were allocated to private investment projects and the pace of investments has increased since. The investments have taken place in context of an unclear land tenure system creating large governance challenges and where legislation to manage social and environmental impacts have faced significant implementation challenges.[44] A study evaluating the environmental and social impacts of Initiative Riz is underway where findings will be relevant for better understanding of tradeoffs between productivity gains, the interests of vulnerable groups and the resilience of ecosystems.

Job creation through labor intensive public works could become an important tool for reversing environmental degradation and increasing investments in agriculture through irrigation works, plantation of forests, soil and water conservation.[45]

[39] World Bank, 2013e The World Bank study refers to Burke et al (2009) and a study that suggests that Mali as early as 2050 could have a climate for which there is no presedent and to where it might be impossible transfer suitable seeds from other parts of the world.
[40] Roudier et al, 2011
[41] Butt et al, 2006
[42] Republique du Mali, 2006.
[43] Ibid
[44] Djiré, M., et al, 2013
[45] Bourdet, Y, 2011

The mining sector is dominated by gold production which has grown from six tonnes in 1993 to almost 50 tonnes in 2012. It represents about a quarter of GDP, three quarters of export earnings and significant share of government incomes. This mining sector has had limited impact on the local economy[46] but the sector attracts the largest share of foreign direct investments.[47] Many have mining as a safety net in cases of crop failure or drought. Contrary to most countries artisanal mining is legal in Mali. Mining, both small scale and large scale, has the potential to contribute more to poverty reduction in Mali if resources are used responsibly.[48] The main opportunity is through efficient use of government revenues from the sector. This means that mineral wealth is transformed to other forms of wealth such as human capital, financial or manufactured capital resulting in more sustainable livelihood opportunities and pro poor economic growth. Empowering civil society to be aware of their rights and the legal requirements of mining companies is a powerful opportunity to ensure that local communities sustainably can benefit from the country's mineral wealth.[49] Recently a new mining code was adopted giving greater attention to private Mali firms to buy stakes in mining companies, promoting capacity development, community benefits and social and environmental safeguards etc.[50]

Generally mining is not an extensive form of land use and environmental impacts are largely local. But impacts may also be widespread and large. Main impacts are air, water and land pollution, energy and water consumption and landscape alteration.[51] Small scale mining impacts include siltation of rivers, exploitation of bush meat, deforestation, mercury and cyanide pollution and the destruction of land.[52] As a consequence public health is affected, agricultural productivity is reduced and the provision of ecosystem services is lowered. In Ghana it has been found that agricultural production has declined by 40% close to gold mining operations. Furthermore, poverty, child malnutrition and respiratory infections had increased near the mining sites.[53]

3.3 Impacts on Public Health and Education

Lack of access to safe drinking water, sanitation, and health services negatively affects people's health. There are strong links between environment and health concerns in Mali, particularly related to malnutrition, indoor air pollution and water-related diseases. In Mali about 81% of the children have some sort of anemia and 38 percent of children under 5 years old show significant levels of stunting and wasting.[54] Nevertheless, the proportion of undernourished in the population was reduced from 27 % in 1990-92 to 12 % in 2006-08.[55]

Access to improved water has increased from 55% in 2005 to 64 % in 2012. While 87 % of urban residents have access to improved water only half of the rural population is served by improved water. Progress towards improved sanitation has been very slow, moving from 20% in 2005 to 22% in 2012 with large differences between rural and urban areas.[56] Only 14%

[46] http://www.africaneconomicoutlook.org/en/countries/west-africa/mali/
[47] UNCTAD, 2011
[48] One of the EITI principles speaks of prudent use of natural resources.
[49] Drakenberg, O ,2010
[50] http://www.africaneconomicoutlook.org/en/countries/west-africa/mali/
[51] OECD, 2008
[52] OECD, 2008, Keita, 2001
[53] Aragon, F., et al, 2013
[54] World Bank, 2011b
[55] IFPRI, 2012
[56] World Development Indicators

have access to improved sanitation in rural areas and 35% in urban areas respectively.[57] Furthermore, the hundreds of thousands of people who have been forced to leave home due to political instability and recent conflict are in often forced to drink from unprotected water sources and lack sufficient hygienic conditions.[58]

WHO estimate environmental burden of disease to over 71 000 deaths every year. More than 22 000 people die every year due to lack of access to safe drinking water and sanitation.[59] Climate change may impact both quantity and quality of water resources, and may thus worsen the situation if no adaptation measures are introduced. Deaths due to diarrhoea are higher in Mali compared to other countries in the region (See table below). The table shows figures for Mali, Burkina Faso and Ghana for comparison.

Biomass fuel such as wood, charcoal, dung and crop residues remains the principal energy source of the country. Rural poor households often use open fires for cooking, causing indoor air pollution resulting in respiratory diseases. Over 15 000 people die every year due to indoor air pollution. Especially women, children and elderly are exposed to indoor air pollution. Reducing indoor air pollution will yield benefits for the poor, and help achieving the MDG 4 (reducing child mortality), and 5 (improve maternal health).

Table 3.Estimated deaths and DALYs[60] attributable to selected environmental risk factors

WHO estimates	**Water Sanitation & Hygiene**		**Indoor air pollution**		**Outdoor air pollution**	
Country	**Diarrhoea - Deaths/year**	**Diarrhoea - DALYs/1000 capita/year**	**Deaths/year**	**DALYs/1000 capita/year**	**Deaths/year**	**DALYs/1000 capita/year**
Mali	**22 600**	**66**	**15 300**	**45**	**1000**	**1.3**
Burkina Faso	23 900	58	16 500	41	1200	1.3
Ghana	20 300	18	6 500	8	700	0.3

Source: WHO (2009)[61]

Malnutrition is a serious problem, indicating that socio-economic human rights are not fulfilled. Political instability in Mali has exacerbated the widespread food insecurity and nutrition crisis affecting the country since 2011. Approximately 4.6 million people are predicted to be facing food insecurity.[62] Undernourishment has large consequences for health, productivity and education. For example, it is estimated that the political crisis together with food insecurity and natural disasters will affect access to education for over 670 000 children during 2013.[63] Malnutrition has a negative impact on children's educational achievement as it is difficult to focus on studies when hungry and fatigued.

[57] World Bank, 2012
[58] UNICEF, 2013
[59] WHO, 2009
[60] Disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.
[61] The latest data presented by WHO
[62] UNICEF, 2013
[63] UNOCHA, 2012

3.4 Impacts on security and conflict

In rural Mali land tenure and water rights are a source of conflict and this is expected to increase with population growth, climate change and domestic and foreign interest in irrigated agriculture.[64] The extent to which the quality and availability of natural resources such as land and water can fuel violent conflicts in general is debated among academics. Environmental changes may under certain conditions increase the risk of violent conflict but not necessarily in a systematic way and unconditionally. The outcome is dependent on economic and political factors. [65] Many have found that environmentally induced migration can lead to competition over resources thus triggering conflict and instability.

In the case of conflict in Northern Mali and the military coup in 2012 competition for increasingly scarce natural resources is frequently mentioned as one of the underlying causes together with a failed decentralization process etc.[66] Desertification, mining exploration, population growth and agricultural expansion have further increased competition for resources such as grazing lands and water thereby reshaping living conditions in an area where poverty and malnutrition are very high. The consequences include migration, decimated livestock herds, floods and food insecurity. Other important factors to the conflict are Tuareg dissatisfaction with social conditions and government policies, proliferation of weapons and trained soldiers, weak and corrupt state institutions, ethnic tensions and international terrorism.[67]

A study of social conflicts in Africa finds a strong correlation with extreme deviations in rainfall (drought and floods) and demonstrations, riots and anti-government violence.[68] A statistical analysis of climate variability and environmental conditions in the Mopti region finds that there is a weak connection between climate variables and the number of land-disputes in the Court of Appeal. This finding is seen as indicative evidence that conflicts over land are determined by political and economic contexts rather than climate variability.[69] Contextual factors includes for instances policies favoring farming at the expense of pastoralism and the level of confidence in the judicial system.

In summary natural resource scarcity and the continued degradation of these resources is a contributing factor to malnutrition, economic hardship, migration and violent conflict in Northern Mali. At the same time conflict and insecurity generally fuels unsustainable management of natural resources.

4. Policy framework for managing environmental challenges

4.1 Legislative frameworks and key plans

Mali has a relatively well developed environmental legislation and have made progress in establishing a political and institutional framework that is creates opportunities for consideration of environment and climate change aspects[70] The constitution from 1992 stipulates that everyone has the right to a healthy environment. In 2010 the National Agency for Environmental and Sustainable development was established. Its mission includes to ensure the implementation of the environmental policy, overseeing the integration of

[64] Staatz et al, 2011
[65] Bernauer et al, 2012
[66] Boukhars, A., 2013; Abdalla, M., 2009; Nickels, B., 2013
[67] Boukhars, A., 2013
[68] Hendrix et al, 2012,
[69] Benjaminsen et al, 2012
[70] Groupe Thematique Environnement, 2012

environmental aspects across sectors. Key documents include the national policy for environmental protection, national environmental action plans. Mali has ratified thirty international treaties and conventions relating to environment including the Rio conventions.[71] Environmental considerations are often absent or weak in policies with large environmental impacts such as energy, mining, industry and transportation.[72] As a response government have created legal provisions for and made efforts to institutionalize the use of strategic environmental assessments for policies and the increased use of findings from environmental impact assessments.[73]

Mali has also prepared a strategy for green economy and climate change with a focus on climate aspects. A special fund is being established to facilitate funding of the strategy from multiple sources including international climate funding. In 2011 World Bank improved the score for Mali's environmental policy and institutions.[74] A multi stakeholder group including civil society groups has criticized government for the implementation gap and weak administrative capacity in combination with over reliance on regulation versus other forms of incentives for environmental management.[75]

Greening of the CSCRP

The government made a broad attempt to green the CSCRP *(Cadre stratégique pour la croissance et la réduction de la pauvreté,)* for 2012-2017 which included capacity development and the inclusion of environmental considerations in all policy areas during the preparation process. The outcome document was a significant step forward from previous key planning documents. It defines three strategic areas: promoting accelerated and sustainable growth that benefits the poor and creates jobs and revenue; reinforcing the long-term bases of development and equitable access to good-quality social services; and strengthening institutions and governance.

Environment and climate change aspects are relatively well analysed in introductory sections in relation to how they can constrain economic development, they are mainstreamed in separate chapters for all policy areas and described in a separate chapter. According to the donor coordination group on environment, all the efforts made to green the CSCRP III risk being lost unless the government increase efforts to mobilize sufficient resources for its implementation.[76]

In addition to the CSCRP there are three fundamental documents that set the main parameters for agricultural development policy in Mali and thus have substantial impact on the environment. They are i) the *Loi d'Orientation Agricole*, or LOA, which establishes a long-term vision for the agricultural sector based on the promotion of a sustainable, modern and competitive agricultural sector based primarily on family farms; ii) the *Stratégie Nationale de Sécurité Alimentaire,* and the *Plan National d'Investissement du Secteur Agricole,* or PNISA, Mali's CAADP investment plan, which focuses on strategic investments in five value chains: rice, maize, millet and sorghum, inland fisheries, and livestock products (both meat and dairy).

Key policies during the transition phase

[71] AEDD, http://www.environnement.gov.ml/index.php?page=base-de-donnees-environnemental
[72] Republique du Mali, 2013
[73] PTF Groupe Thematique, 2012, Dialogue politique
[74] World Bank country policy and institutional assessment score for environmental policies improved from 3 to 3,5.
[75] Green Economy Coalition, 2011
[76] PTF Groupe Thematique Environnement, 2012a

The crisis initiated by the coup in 2012 has affected society and government capacity in a number of ways. The suspension of aid led to a decrease of 90 % of external capital spending[77] and government spending was reduced by about 35% in 2012 impacting on almost all areas of government spending. Budget allocation to the environmental department of the Ministry of Environment and Sanitation has been reduced by 90% in 2012 thus severely constraining its operations.[78] The national assembly adopted a road map for the transition period which aims to reestablish territorial integrity and enable transparent and credible general elections before July 31 2013. The most recent planning document is the Plan pour la relance durable du Mali (PRED). The plan includes programmes for infrastructural investments in energy and roads to facilitate agro industrial investments; investments to improve administrative services not least in the context of the decentralization process; improved food security through increased productivity and market development; access to basic services such as health, water and in particular education. These immediate priorities highlighted in the PRED are complemented by no less than 12 thematic priorities such as improving the rule of law, gender and integration of environment in policies and strategies. The government wants to allocate most of the budget to the priority area boost the private sector, agricultural growth, energy and road infrastructure and employment of the young. Environment and climate aspects are included under a special heading and include specific investments in sustainable land management, renewable energy and sanitation. The extent to which the overall ambition, to ensure environmental aspects are considered in policies and strategies will be realized is highly uncertain. No clear direction on how this will be achieved is given, only that the current situation is unsatisfactory and that environmental pressures will increase. The plan provides both risks and opportunities, the big investments promoted in the Office du Niger and in road and energy infrastructure entails risks and must be properly assessed from social and environmental perspective. Improved governance, rule of law, education, public works, microfinance, gender and promotion of value addition are examples of areas that can have significant positive environmental impact by reducing pressure on scarce resources.

4.2 Institutional capacity

The administrative capacity of the Mali government is very low.[79] In the years up to the coup the country had shown progress in relation to public financial management[80], and regulatory quality while there had been negative trend regarding the rule of law, control of corruption and government effectiveness between 2006 and 2011[81], see also Annex IV. Low respect for environmental legislation and unclear legislation contribute to weaken trust in environmental regulation.[82] The decentralization process requires strengthening of all capacities, including environmental capacity. The low ranking of the Transparency International corruption perception index (CPI)[83] indicates that incidence of corruption is high (Mali is ranked 105 of

[77] African economic outlook, http://www.africaneconomicoutlook.org/en/countries/west-africa/mali/
[78] PTF Groupe Thematique Environnement, 2012b
[79] Lafourcade et al, 2013
[80] African economic outlook, http://www.africaneconomicoutlook.org/en/countries/west-africa/mali/
[81] World Bank, 2013c
[82] World Bank, 2011a
[83] The Transparency International Corruption Perception Index (CPI) measures the degree of perceived corruption in a country. Corruption is relevant for natural resources, as for example illegal logging and extraction of minerals (diamonds, gold, coal etc.) and associated illegal trade are almost always intertwined with corruption. Corruption then results in a loss of government revenue that could be invested in sustainable natural resource management or general economic development. Corruption levels are also relevant for concessions and for (poor people's) access to land. CPI score and rank 176 countries and is updated annually and easily accessible.

176 countries)[84] and anticorruption measures are constrained due to the lack of counter powers. The capacity to collect and analyse environmental data is weak. Data is typically outdated, collected at irregular intervals and is constrained by weak financial and human resources.[85] The current crisis and budget cuts further reduce government capacity in particular in areas outside of the government's main focus during the transition.

Mali's environmental authorities have week capacity and their reliance on international funding, including projects, diverts attention from core functions such as monitoring control and coordination. Strengthening important human rights principles such as the rule of law, transparency and public participation may be equally or more important than specific environmental policies or projects in order to improve environmental outcomes. Prospects for improving environmental outcomes is thus not only dependent on legal frameworks and strengthened capacities of the environmental authorities and sector ministries, but also largely on external factors that provide the 'enabling environment.[86]

Civil society, media and opposition parties are very weak. Although civil society is present at national and local level on all important policy areas, (including environment and land rights), their participation and influence on policy making is limited.[87] However a number of civil society organisations and non-governmental organsiations have capacity for service delivery.

4.3 Other actors

A large share of the government's budget is provided from multilateral and bilateral donors. Donor dependency is particularly high related to spending targeting environmental management organizations.

The following countries/organsiations are represented in the thematic coordination group on environment which is led by Sweden; the Netherlands, Denmark, Norway, Canada, Switzerland, Germany, France, EU, WFP, USAID, UNEP. UNFPA, FAO, UNDP, UNEP, World Bank, African Development Bank.

The UNDP-UNEP Poverty Environment Initative works with the Ministry of Environment and Sanitation and the Ministry of Economy and Finance to build government capacity to better include poverty environment linkages in national development planning processes and budgets. The programme is partly Sida financed.

The private sector has a key role for economic development. About 1 in 10 has formal employment in the private sector and 4 out 5 are active in the informal sector. The economy is highly concentrated to agriculture, trade including car repairing, household work and manufacturing. Formal employment is generally only associated to manufacturing whereas the rest are mainly part of the informal sector.[88] Cooperatives, farmers and trader organisations play a key role in many of agricultural value chains in Mali. Value chains like dairy, horticulture and irrigated agriculture have high potential for employment and growth could benefit from stronger cooperatives and collective action.[89]

[84] Transparency International, 2013
[85] Republique du Mali, 2009b
[86] Ölund Wingqvist et al, 2012
[87] PTF, 2012, Retraite Extraordinaire des PTF, Axe stratégique 1 : gouvernance démocratique et economique
[88] Bourdet, Y, 2007
[89] Staatz et al, 2011

5.Risks and opportunities

As a result of the political instability, food crisis and security crisis in Mali poverty rate increased from 41.7% in 2011 to 42.7% in 2012. A serious humanitarian crisis began in 2012, with 480 000 having left home since early 2012, 292 000 internally displaced persons and 177 000 abroad.[90] However, the halted economy is expected to increase with projected growth rated at 5.4% in 2013 and 5.5% in 2014. This said, the political instability, economic crisis and war in the north pose a risk towards increased economic development and Mali's strive towards reducing poverty and achieving the MDGs.[91]

Climate change pose a risk for poverty reduction and achievement of the MDGs as it adds to existing stresses and is expected to negatively impact on agricultural productivity; public health and risk create macro-economic shocks due to more frequent natural disasters. Already vulnerable groups in rural areas are expected to be most affected by climate change. Climate funding represents an opportunity as new source of investments in Mali. Mali's climate fund is created as a vehicle to fund the implementation of Mali's strategy for green economy and climate resilience.

Remittances from migrants account for around 4.4% of GDP in Mali. Many households in Mali save remittances for unexpected events, thus it serves as insurance for entire households. World Bank estimates that remittances to Africa are projected to continue to increase, but at a slower pace than in the beginning of the second halve of the 2000s. So far migrants have sustained volumes of transfer but any further global economic downturn and policy tightening towards migrants' risks the outlook of increasing remittances.[92]

6. Issues for Sida to consider

Prior to the coup in 2012 Swedish development cooperation in Mali targeted i) sustainable development based on poverty reduction (general budget support); ii) democratic governance and social development; and iii) sustainable use of natural resources. Mali has also been part of the climate change initiative. Due to the crisis bilateral cooperation with government was suspended in 2012. Support to multilateral organisations e.g. Unicef and civil society has increased and opportunities to reallocate funds for disaster risk reduction, resilience and food and water security are ongoing.[93]

In this chapter we elaborate some initial discussions and ideas on the implications of the environment and climate change challenges Mali is facing, the government's plans and opportunities for Sida during the coming years.

6.1 Addressing resilience

As explained in the introductory section Sida has decided to define resilience as *The ability of an individual, a community, a country or a region to anticipate risks, respond and cope with shocks and stresses, while addressing the underlying root causes of risks, recover, and continue to develop*.

For a country like Mali with unstable political situation and high exposure to weather related shocks and highly vulnerable population, e.g. HDI rank of 182 out of 187 in 2012, a focus on resilience is particularly relevant.

[90] République du Mali, 2013c
[91] http://www.africaneconomicoutlook.org/en/countries/west-africa/mali/
[92] http://www.africaneconomicoutlook.org/en/outlook/financial_flows/remittances/
[93] Embassy of Sweden, Bamako, 2012

The Plan pour la relance durable is the government's proposed vehicle for responding to the shock while addressing the underlying causes. Striking the right balance between responding to immediate needs such as national security, humanitarian assistance and addressing underlying causes like unsuccessful decentralisation, poverty, low return on investments, overuse of natural resources due to population growth combined with insecure tenure, weak democratic governance, corruption etc.is a tall order. A resilience perspective requires that all aspects of what constitutes a resilient country or community are addressed. Sweden can seek to ensure that all aspects are covered but it goes without saying that Sweden can only focus its support on a fraction of all the elements that combined build resilience in Mali. It has been beyond the scope of this assignment to point to specific areas or programmes. However at a more general level it can be said that the Swedish focus on democratic governance, sustainable use of natural resources and humanitarian support remain relevant.

This is not to say that nothing should change, it encourages reflection on issues like reaching environmental objectives through Safety net programs or agro value addition programmes involving the strengthening of cooperatives and farmers organisations. It also points to promoting better food security through better governance of land and water where these resources are managed in an integrated way involving all relevant actors.

There is no one way as to how resilience can be used in the context of a strategy.

A) The use of resilience as an overarching framework for the strategy under which separate result areas are formulated and where the resilience perspective is mainstreamed in the respective result areas

B) Resilience is a separate result area that includes a broad array of programmes from various sectors of particular relevance for resilience

C) Resilience is a separate result area focusing on some specific elements and where the resilience perspective is mainstreamed in other result areas

We think that the first alternative can be a useful and operational approach. It also implies that all activities consider opportunities to increase their contribution to resilience in Mali.

6.2 Operationalizing MDG 7

National security, food security and democratic elections are key concerns for the transition period. It is understandable and reasonable with a shorter time perspective than usual. In generally a shorter time perspective does not favor sufficient attention to sustainable use of countries' natural resources or investments in natural capital. However, given that broad based agricultural growth is a top priority, productive and sustainable use of water and soils, including grazing areas and forests becomes critical parts of the equation. Secure, efficient and equitable allocation between different users and sectors can bring both medium and long term environmental benefits and short term benefits for food security and political stability and is therefore a good way to operationalize MDG 7. Lessons from ongoing work on integrated water resources management and support of civil society work on conflict prevention around natural resources could be built upon. Increased collaboration between PartenairesTechniques et Financiers Groupe Tematique Environnement and GroupeTematique Economie agricole et rurale, as promoted by the Groupe Tematique Environnement appears to be a key priority. Care must also be given to ensure the targeting of vulnerable groups, not just increasing rural agricultural production in general as this may not be sufficient for reducing poverty.

Except for internally displaced people and in the northern regions, the government appears to give lower priority to improve access to water and sanitation, two specific MDG7 targets.

From the perspective of the right to a healthy environment and given the economic and social costs associated with bad health, it can be argued that continued efforts are needed for improving access to water and sanitation more broadly. Investments in improved management of natural resources, water and sanitation etc. are thus enabling factors for reaching objectives of food security, public health and for increasing the benefits of education in targeted areas.

Even in times of transition much is won if government has sufficient capacity to assess that key investments programs properly assess any tradeoffs between short and long term impacts on the productive assets, soil and water upon which the majority of the population depend. This includes capacity to undertake and act on strategic social and environmental assessments and other forms of analysis e.g. cost benefit analysis linked to major decision making processes and investments. This includes the significant upscaled investments envisaged for irrigated agriculture, energy and road infrastructure and the promotion of agricultural value chains. As the donor lead on Environment Sweden could promote this. Perhaps collaboration with the UNDP-UNEP Poverty Environment Initiative on this issue could be considered. It is worth noting that non environmental programs might have significant environmental benefits. These include safety net programs, including regular cash transfers or food for work programs have been shown to promote use of sustainable agricultural practices and may allow investments in human or natural capital.[94]

Efforts on operationalizing MDG 7 can thus have multiple entry points ranging from existing MDG targets to supporting general extension services that also promote soil and water conservation techniques, to combining public works with investments in natural capital including rehabilitation of degraded lands, or local capacity for cross sector management of water and land to balance competing uses for food, energy, grazing lands etc.

6.3 Links to other thematic priorities

There are stong links between environment and climate change and the thematic priorities democracy and human rights and gender equality and womens' role in development. As shown in chapter 3.1 women are in practice often deprived of access to productive resources such as land and their participation in economic activities is often constrained. Women are also more affected by lack of access to clean water, sanitation and modern energy due to traditional roles for collecting water and fuelwood.[95] However there are large differences on the role that women play in rural households, some are mainly involved in livestock keeping and others are not involved in agriculture.[96] Women's knowledge in natural resources management including adaptation to climate change is often neglected. Nevertheless Mali's strategy for a green economy and climate resilience specifically mentions the importance of womens's participation in the further development of an investments plan for green economy.[97]

A green and inclusive economy in the context of Mali includes i) investing in natural capital to make more out of its natural resources without undermining the asset base; ii) transforming mineral capital other forms of capital; iii) diversifying the economy; iv) making use of green technologies and market nishes such as eco tourism; v) attracting climate finance to strengthen the resilience. Furthermore the constitutional right to a healthy environment

[94] See experiences from Ethiopia. Teklewold, H., Kassie, M., Shiferaw, B., Köhlin, G., 2013
A 2013 World Bank emergency safety program in Mali claims that, regular transfers over an extended period may also help the household acquire productive and agricultural assets.
[95] Rosander, 2004
[96] Assalene et al, 2010
[97] République du Mali, 2011a

requires access to clean water and sanitation, modern energy and efficient management of waste. Sound policies are needed for the greening of the economy. It includes proper pricing of natural resources and energy and pollution. It requires secure tenure and provision of good information to all actors on environment and climate change risks and opportunities. Even a greener economy will for Mali be accompanied by an increased environmental footprint. Accountable policy makers need capacity to make transparent and well informed decisions where tradeoffs between environment and other development priorities are made.[98]

Human rights based approaches are useful to promote greater environmental sustainability. While the public sector has a key role in the formulation and implementation of governance mechanisms, such as policies and regulations, the active participation of many other actors, free flow of information, accountability and integrity are crucial aspects for improved environmental outcomes[99]. The important governance role of communities and other actors in between the state and the market are increasingly recognised. Many countries have decentralised natural resource management for enhanced community level participation, transparency and strengthened accountability. However, with decentralised responsibilities must follow sufficient resources - for instance information, training and financing -needed to carry out the new functions.

[98] République du Mali, 2011a
[99] Ölund, G et al, 2012 The text is an excerpt from this publication.

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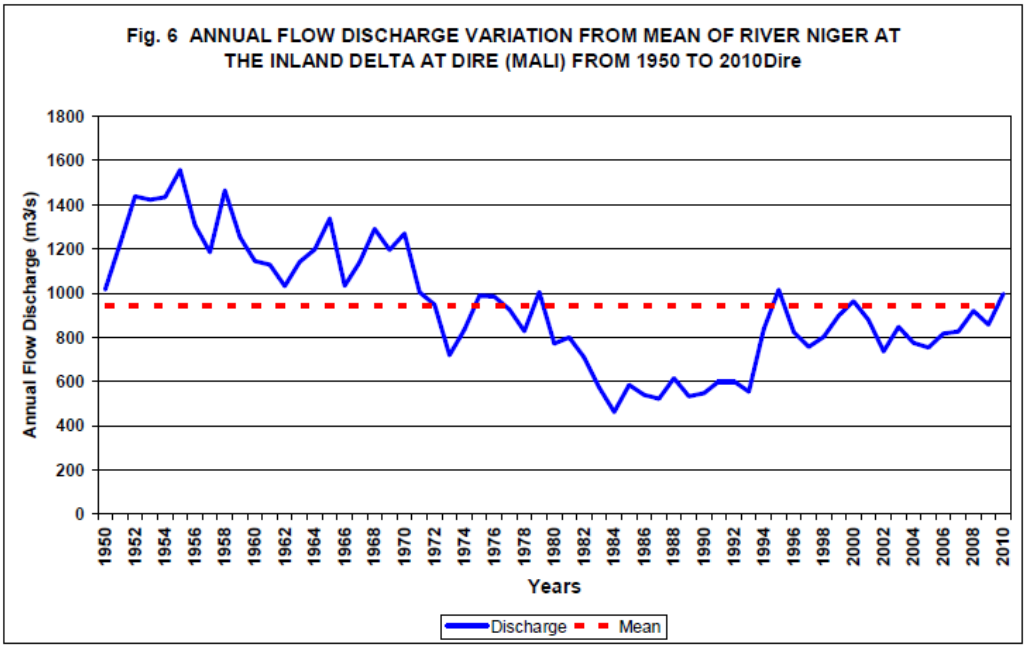
Annex 1 Water flow on the Niger and flooding of the inner Niger Delta



Source: Olomoda, 2012

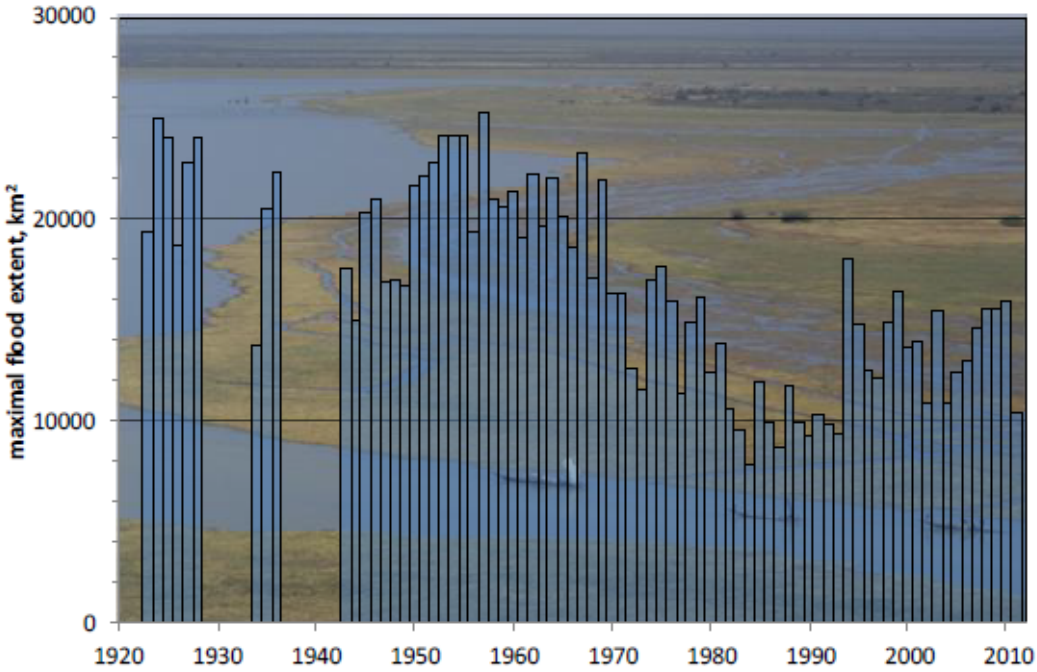


Fig 4 The inundation of the Inner Niger Delta during the peak flood varies from year to year. 20 000 to 25 000 km2 was inundated in the wet 1950s and 1960s. the 60% decline in flooding between the 1960s and 1980s was due mainly to a decrease of the river discharge of the Bani (down 80%) and the Niger (down 50%). The flood extent is larger again since the mid-1990s, but small compared to the past. The flood extent in 2011 was nearly as low as during the disaster years in the 1980s.

Source: Zwarts, 2012

Annex II Environmental indicators for Mali

Mali

Population (millions) **15.8** Land area (1,000 sq. km) **1,220** GDP ($ billions) **10.8**

	Country data	Sub-Saharan Africa group	Low-income group
GNI per capita, *World Bank Atlas* method ($)	610	1,258	571
Adjusted net national income per capita ($)	532	1,022	521
Urban population (% of total)	34.9	36.5	28.0
Urban population growth (avg. annual %, 1990–2011)	4.8	3.8	3.5
Agriculture			
Agricultural land (% land area)	34	44	39
Agricultural irrigated land (% of total agricultural land)	..	..	..
Agricultural productivity, value added per worker (2000 $)	*511*	334	308
Cereal yield (kg per hectare)	996	1,361	2,034
Forests and biodiversity			
Forest area (% land area)	10.2	27.8	25.7
Deforestation (avg. annual %, 2000–2010)	0.6	0.5	0.6
Terrestrial protected areas (% of total land area)	2.4	11.7	10.0
Threatened species, mammals	12		
Threatened species, birds	13		
Threatened species, fish	2		
Threatened species, higher plants	7		
Oceans			
Total fisheries production (thousand metric tons)	110	6,383	11,563
Capture fisheries growth (avg. annual %, 1990–2011)	2.1	1.8	4.0
Aquaculture growth (avg. annual %, 1990–2011)	27.3	16.0	4.9
Marine protected areas (% of territorial waters)	..	5.8	..
Coral reef area (sq. km)	..	17,980	15,120
Mangroves area (sq. km)	..	27,808	25,818
Energy and emissions			
Energy use per capita (kg oil equivalent)	..	683	363
Energy from biomass products and waste (% of total)	..	58.2	66.2
Electric power consumption per capita (kWh)	..	553	242
Electricity generated using fossil fuel (% of total)	..	65.2	32.0
Electricity generated by hydropower (% of total)	..	18.7	45.3
CO_2 emissions per capita (metric tons)	0.0	0.9	0.3
Water and sanitation			
Internal freshwater resources per capita (cu. m)	3,788	4,455	5,125
Total freshwater withdrawal (% of internal resources)	10.9	3.2	4.5
Agriculture (% of total freshwater withdrawal)	90	84	90
Access to improved water source (% of total population)	64	61	65
Rural (% of rural population)	51	48	57
Urban (% of urban population)	87	83	86
Access to improved sanitation (% of total population)	22	31	37
Rural (% of rural population)	14	23	32
Urban (% of urban population)	35	42	47
Environment and health			
Particulate matter (urban-pop.-weighted avg., µg/cu. m)	111	41	54
Acute resp. infection prevalence (% of children under five)	6	..	..
Diarrhea prevalence (% of children under five)	13	..	..
Under-five mortality rate (per 1,000 live births)	176	109	95
National accounting aggregates—savings, depletion and degradation			
Gross savings (% of GNI)	*8.9*	*18.4*	25.2
Consumption of fixed capital (% of GNI)	8.5	10.9	7.7
Education expenditure (% of GNI)	3.9	3.7	3.0
Energy depletion (% of GNI)	0.0	10.4	1.4
Mineral depletion (% of GNI)	9.8	2.2	2.0
Net forest depletion (% of GNI)	0.0	0.5	1.2
CO_2 damage (% of GNI)	0.1	0.5	0.3
Particulate emissions damage (% of GNI)	1.3	0.4	0.5
Adjusted net savings (% of GNI)	-5.2	-1.2	15.2

Source: World Bank, 2013, Little Green Data Book

Annex III Calculating Adjusted Net Savings

Underinvestment in natural resources and ecosystems

Mali is highly dependent on natural resources sectors (agriculture and livestock, fish, mining, forestry) in terms of subsistence, employment, exports and economic growth. Insufficient investment in natural resources, ecosystems and institutions risk undermine poverty reduction and economic growth. Current trends point at low agricultural yields per hectare for non-irrigated crops, deforestation and increased climate risks.

One way of illustrating a country's savings and assessing if the country is following a sustainable economic path is to estimate adjusted net savings. It depicts a "truer" level of savings after accounting for depreciation of produced capital, investments in human capital and depletion of natural capital. A high savings rate signals increased resilience of society. Even without considering all forms of natural capital (water , soils, fisheries), calculations of Adjusted Net Savings indicate that Mali has an alarming negative savings rate, -5,2% of Gross National Income which is lower than the LDS average (15%). However, this is mainly due to the dramatic fall in the gross savings rate due to the political crisis. If estimates for degraded soils are included, the saving rate fall to close to -10% which is highly unsustainable.. Experienced and expected impacts of climate change are adding to many existing stresses to the population of Mali and economic growth prospects.

	1990	**2000**	**2006**	**2011**	**2012**
Gross savings (% of GNI)	15,16	16,18	12,00	18,6	8,9
Consumption of fixed capital (% of GNI)	4,06	7,87	8,70	8,4	8,5
Education expenditure (% of GNI)	2,33	2,72	2,70	3.9	3,9
Energy depletion (% of GNI)	n.a	n.a	n.a	n.a	n.a
Mineral depleation (% of GNI)	n.a	n.a	*2,50*	9,8	9,8
Net forest depletion (% of GNI)	n.a	n.a	n.a	n.a	*0.19*
CO2 damage (% of GNI)	0,08	0,13	0,10	0,1	0,1
Particulate emission damage (% of GNI)	0,50	0,61	1,10	1,7	1,3
Adjusted net savings (% of GNI)	12,85	10,29	2,3	7,4	-5,2
Cost of land degradation*					*4,39**
Adjusted net savings (% of GNI) incl land degradation					-9,59

*See explanation land degradation

Source: World Development Indicators and authors adjustements in italics

Mineral depletion

Due to lack of information about the costs of production in Mali no figure for mineral depletion is provided by the World Bank. Mineral depletion is equal to the product on unit resource rent and the physical quantities of minerals extracted. Gold mining is very important for Mali and annual extraction rates are in the area of 50 tonnes per year.[100] It is therefore a serious underestimate. Using a standard value for unit rent for gold (845$ per kilo in 2000)) the mineral depletion is in the area of 42 MUSD per year or 2,5 % GNI. The figure is included in the table for year 2006. Data for 2011 and 2012 are available from the World Bank.

Net forest depletion

[100] CSLP II . AccordingUSGS Minerals Yearbook 2005, Volume III – Mali, Mauritania, and Niger Malian gold production was primarily from the Kalana, the Morila, the Sadiola Hill, and the Yatela Mines. These five mines produced a total of 44,230 kg of gold in 2005..

Due to lack of information from the forest sector in Mali no figure for net forest depletion is provided by the World Bank. The rent is estimated from the product of unit resource rent and the excess of round wood harvest over natural growth. Round wood harvest includes both fuel wood and timber. The extent of forest land has been reduced by 5% between 1990 and 2005 and is currently reported to be about 29 000 000 hectares. About 600 000 hectares are deforested per year while the regeneration capacity is assessed to 500 000 hectares. This results in an annual net loss of forests of 100 000 hectares per year. (AEDD, 2010 p 34). The 2009 study undertaken by the Poverty Environment Inititative, Evalution economique de la gestion environnementale couts et benefices calculated deforestation to 0,19% of GDP. The extent of forest land is not a sufficient indicator of sustainability as it doesn't account for the logging for fuel wood and timber. Rising demand for fuel wood due population growth is expected to surpass production by 2010. Although the lack of data does not allow for calculations it is clear that the net forest depletion is larger than zero. Climate change could provide an incentive to avoid deforestation and increase afforestation if significant carbon credits are generated and an institutional framework can be established. It is unclear to what extent the poor will be able to participate and benefit of such systems. The figure 0,19 is added to the table for year 2012.

Land degradation

The World Bank does not include figures for nutrient depletion of soils or land degradation in Adjusted Net Savings due to difficulties in calculating the impacts. Yet, for Mali where land is a key asset for the rural poor the state of soils is of critical importance. As much as 7-15% of agricultural lands have been abandoned because of land degradation.[101] Land is a key asset for the rural poor in Mali. Farm yields in part depend of the nutrient balance of soils. Farmers use low levels of fertilizers which erodes the productivity of land. Research have estimated annual economic losses due to soil erosion to 0,5 % of GDP.[102]. The 2009 study undertaken by the Poverty Environment Inititative, Evalution economique de la gestion environnementale couts et benefices calculated overxploitation of soils, soil erosion, desertification, salinization and pollution of soils to 4,39 of GDP. This figure is high in an international comparison where the cost of land degradation as a share of agricultural GDP often is in the order of 2-3 %. More erratic rainfall due to climate change is likely to aggravate the problem. The data 4,39 has been added to the figure for 2012 but it should be interpreted as an upper bounds.

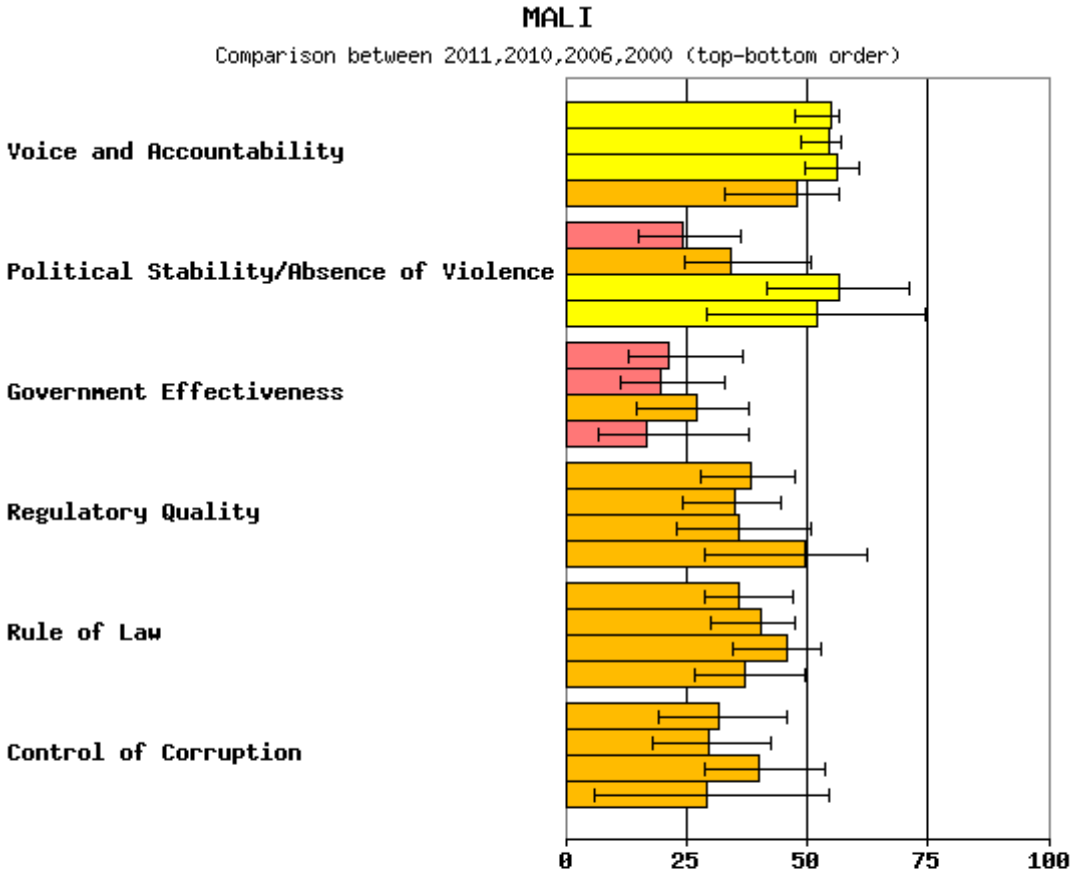
Water pollution damage

Most densely populated areas of Mali are relatively richly endowed with water resources mainly through the Senegal and Niger rivers. The value of water depends on the quality that decides possible uses for drinking water, irrigation or commercial use. Main pollution sources are households (access to improved sanitation is 22%, , industry (about 800 000m3 used water are released into the Niger), mining and agriculture.

For Mali, economic impacts of water pollution are primarily through diarrhoeal diseases caused by poor sanitation that affect mortality, morbidity, employability and educational results. Under 5 mortality is extremely high for Mali, 218 deaths per 1000, compared with 114 for the Low Income Group of countries. No figure is added to the table for year 2006.

[101] PNUD, 2006, p 42
[102] Bishop and Allen, 1989

Annex IV Governance indicators



Source: Kaufmann D., A. Kraay, and M. Mastruzzi (2010), The Worldwide Governance Indicators: Methodology and Analytical Issues

Note: The Worldwide Governance Indicators (WGI) are a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries.
These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms.
The WGI do not reflect the official views of the World Bank, its Executive Directors, or the countries they represent. The WGI are not used by the World Bank Group to allocate resources.