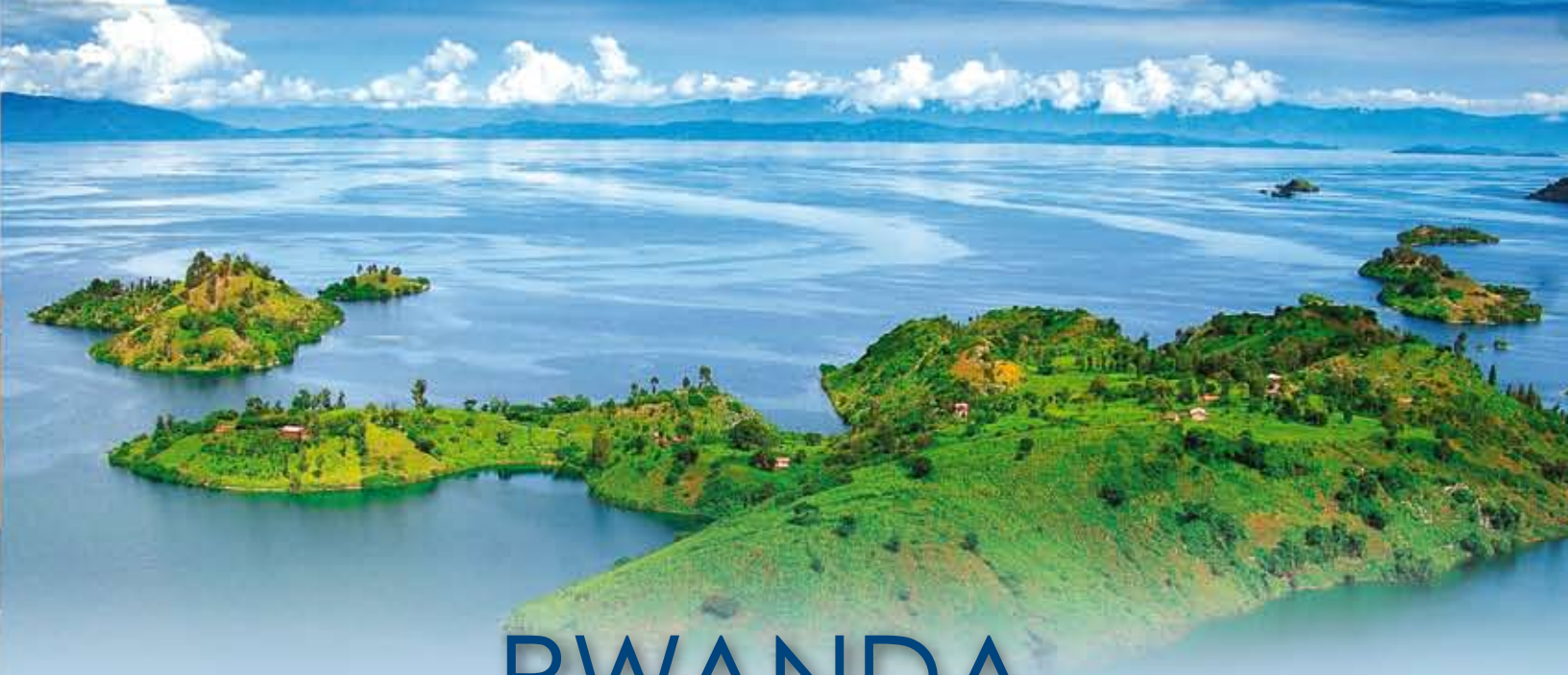


RWANDA STATE OF ENVIRONMENT AND OUTLOOK

Summary for Decision Makers









UNEP

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Foreword



Rwanda's economy and the livelihoods of her people are dependent on the environment and natural resources such as water, land, air, minerals, plants and animals. These natural resources are increasingly under pressure from unsustainable use resulting in environmental degradation as well as decline in ecosystem goods and services. The national environmental assets provide opportunities to achieve economic development and make good progress towards Vision 2020, EDPRS and the targets of the Millennium Development Goals. Rwanda's socioeconomic transformation cannot be realised without primarily addressing environmental challenges.

We cannot afford to lose our natural heritage through environmental degradation. Our very survival and that of future generations depends on the sustainable use of our environmental resources. Our challenge, as a country is to utilize natural resources to the benefit of sustainable development. To achieve this objective will require utilization of resources in ways that promote environment and natural resource conservation and improved management of all forms of pollutants, soil erosion, deforestation and general degradation of national resources.

The Government of Rwanda acknowledges these facts and has put in place measures to safeguard our environment while realizing economic growth. These measures include the adoption of a National Environmental Policy followed by the enactment of an organic law determining the modalities of protection, conservation and promotion of environment and the establishment of the Rwanda Environment Management Authority (REMA) in April, 2005. All these efforts are focused on overall support for sustainable national development.

This Rwanda's first comprehensive State of the Environment report provides a baseline environmental data and indicators. The report was adequately informed by national policies and strategies and will in turn support national environmental governance to the benefit of improved environmental management and envisaged contribution to national social and economic growth and overall human wellbeing. Additionally, the report draws inspiration from and will feed into other regional and global environmental reports such as the African Environmental Outlook (AEO) and the Global Environmental Outlook (GEO).

I am very pleased to present you this state of environment report, first of its kind, which provides information and knowledge on the state of the environment; serves as a guidance document for policy-makers and other stakeholders on how to improve environmental performance; and establishes the evidence base for monitoring the implementation of environmental priorities in national sustainable development. On behalf of the Government of Rwanda and on my own behalf, I would like to sincerely acknowledge African Development Bank and United Nations Environment Programme for their support in preparing this report. I would also like to commend REMA's team and all experts, national and regional and other partners whose dedication and contribution made this publication possible.

It is my hope that information provided by this report will inspire us in our road towards a wealthy state grounded in sustainability of our national development. I wish you a good reading.



Mr. Vincent Karega

Minister of State in Charge of Environment and Mines, Ministry of Natural Resources

Preface



Achievement of national sustainable development goals and effectively supporting poverty reduction initiatives will require Rwanda to integrate environment and natural resources management principles into the national planning for economic development. Environmental assessment and reporting is therefore a key contribution towards the role of environment in development by providing a reliable information base for environmental management and decision making.

This Rwanda's first comprehensive State of the Environment (SoE) report is produced in fulfillment of article 3 of law No 16/2006 (03/04/2006) that obligates REMA to take stock and conduct comprehensive supervision of the environmental management, in order to prepare a report on the state of environment and natural resources in Rwanda that shall be published every two years.

The development of this state of environment report was characterized by a highly participatory approach from the selection of the themes through drafting of the report and validation of the final product. The broad representation at various fora included participants at the District and Central levels of government, development partners and nongovernmental stakeholders all of whom were intended to guarantee ownership of the report by key national stakeholders.

This report was developed using an Integrated Environmental Assessment and reporting approach. The cause - effect linkages of human and natural actions and their impacts on the environment and human wellbeing in the country were assessed. More pertinently, the links between environmental state-and-trends with policy responses will likely guide decision making in support of sustainable development. In addition, the assessment "looked" into the future using various plausible scenarios to highlight how a range of interlinked actions may enhance or undermine Rwanda's natural wealth and thus economic growth. This report establishes an authoritative baseline for the realization of Rwanda's Vision 2020, EDPRS and MDGs. It highlights the role of natural resources in national economic growth. In this regards the report shows how the achievement of EDPRS and MDG may be jeopardized by environmental degradation, especially in water and energy resources, sanitation in the absence of informed decisions and actions.

REMA is extremely indebted to ADB and UNEP for their financial and technical support in the production of this report. Your support not only provided the resources but also contributed to the building of our national capacity in environmental reporting. I want to express my heartfelt gratitude to those who pioneered environment management in Rwanda. The support received from the Government of Rwanda leadership in general and the Ministry responsible for environment in particular, since the establishment of REMA has contributed to a great recognition of our country in environmental governance not only in our region but also worldwide.

Information provided by this report is undoubtedly valuable. However, to the real value lies in the potential to take us as individuals and as a nation to actions poised to restore our environment. It is my sincere hope that as we read the report, we will be inspired to support concrete actions towards a Green, Clean, Healthy and Wealthy Rwanda.

Mukankomeje Rose

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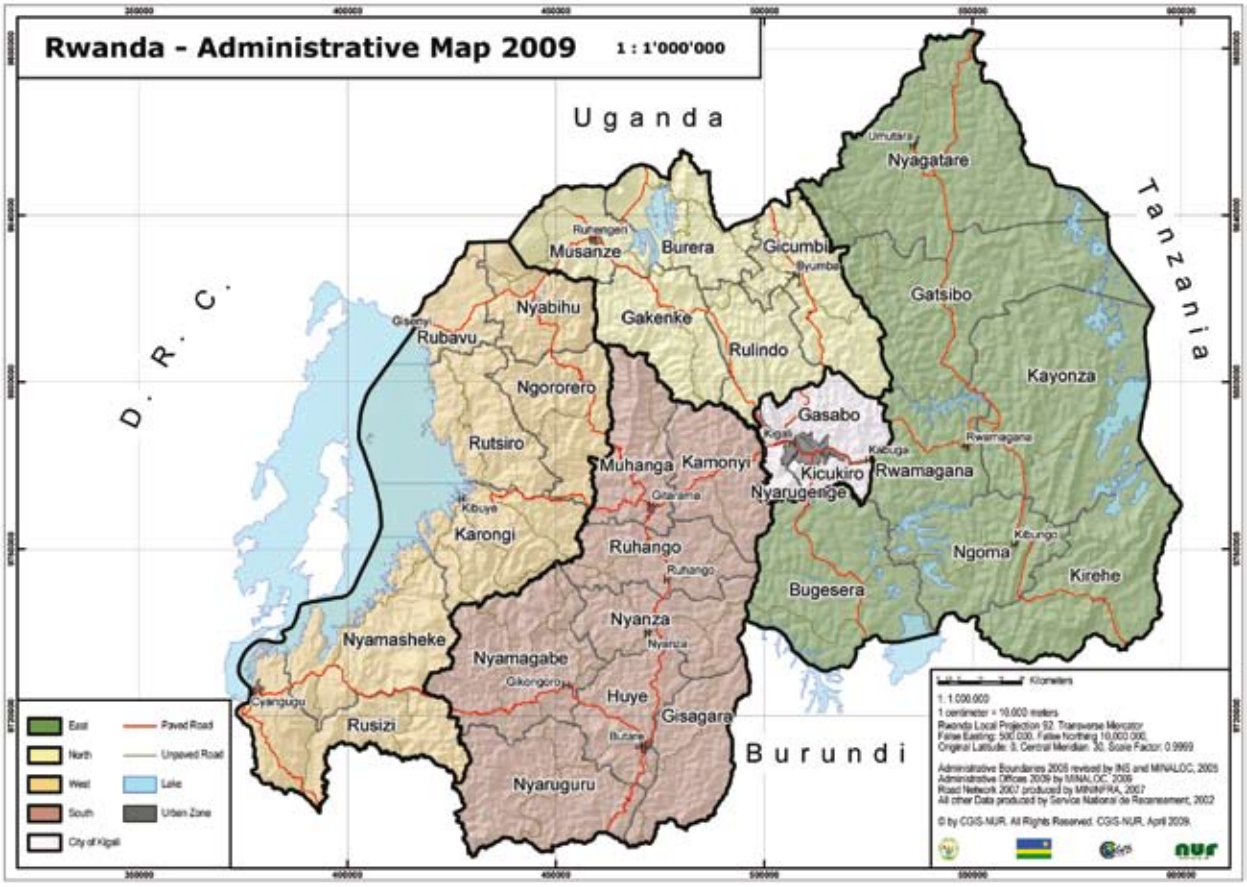
Summary for Decision Makers

Introduction

This is Rwanda's first comprehensive State of the Environment (SOE) report. It is produced in fulfillment of article 3 of law No 16/2006 (03/04/2006) that obligates the Rwanda Environment Management Authority (REMA) to ***take stock and conduct comprehensive supervision of the environment in order to prepare a report on the state of natural resources in Rwanda that shall be published every two years.*** The SOE provides a baseline for environmental data and indicators; and it can also feed into other regional and global environmental reports such as the African Environmental Outlook (AEO) and the Global Environmental Outlook (GEO). This report builds on the outcomes of the desk studies undertaken by the UNEP-Post Conflict Environmental Assessment.

The report comes at a time when Rwanda has made some commendable recovery from the aftermaths of the 1994 Tutsi genocide. There was a 3.5 per cent reduction in poverty between 2000 and 2006, although with a significant regional disparity. Eastern Province accounted for 68 per cent of the total reduction in poverty during that period (NISR. 2007). The administrative divisions in Rwanda are shown in Figure 1. The National Unity and Reconciliation Commission (NURC) have transferred reconciliation concepts and practices to communities and created innovative tools and institutions based on the integration of Rwandan cultural practices and modern tools (IJR 2005). Indeed, Rwanda is gradually making progress on the road to reconciliation as is reflected in the general high trust in government action and the good marks for newly decentralized political structures (NURC 2007), current governance, peaceful coexistence with neighbours and sharing of truth on genocide and forgiveness.

Figure 1: Administrative map of Rwanda



Environmental performance at national level

On environmental performance, progress has been rather slow but reassuring. The strong political will from the top leadership has enhanced efforts at protecting the environment and promoting sustainable use of the country's natural resources. At the policy and strategy level, protection of environment and sustainable natural resources management is one of the three cross-cutting areas in Vision 2020 (ROR 2000). In the Economic Development and Poverty Reduction Strategy, environment is both a pillar and a cross-cutting issue (ROR 2007). On the ground, considerable efforts continue: tree planting is being promoted and anti-erosion structures on steep slopes are being constructed and rehabilitated. There are also efforts in the conservation of biodiversity through strengthened protected area management.

Environmental performance at regional and global levels

At the regional and global level, environmental performance is expectedly weak. The country had to deal with the aftermaths of the genocide; with reconstruction and recovery as the short term priorities of government. Based on the Environment Performance Index (EPI), Rwanda's global ranking on environmental performance in 2008 stood at 131 in a performance league of 149 countries. The country's EPI score of 54.9 was below the average for its income group (61.3) and also below that of the geographic group (57.9). Uganda (61.6), Tanzania (63.9) and Kenya (69.0) performed relatively better than Rwanda (Esty *et.al.* 2008).

However, these geographic and income group averages mask Rwanda's commendable record on some of the environmental performance indicators. As can be seen in Table 1 below, the country's performance on sanitation drinking water and effective conservation were all above the averages for the regional group and the income group. Proximity to targets for drinking water and effective conservation is commendable.

A significant feature of the post-genocide politicaldispensation is the proclivity for participatory and evidence-based policy making. In the particular case of environment, decision makers are therefore grappling with a wide range of environmental problems and challenges in the face of incomplete or conflicting data, causal complexity, divergent values and preferences and a myriad of uncertainties. Each step of the environment policy and decision process becomes difficult in the absence of sufficient facts and careful analysis. Hopefully, the production of this SOE report is a significant contribution to building the badly needed evidence base for poverty-environment policy and decision making in Rwanda.

The Rwanda SOE methodology and process

The Drivers - Pressures - State - Impact - Response (DPSIR) methodology was applied during this integrated environmental assessment. Through the methodology, the cause-effect linkages of human and natural actions and their impacts on the environment as well as the resultant changes in the state of the environment and human wellbeing in the country were assessed. Where possible, indicators were used to demonstrate the nature of the changes, both positive and negative, in the various thematic areas. Baselines on the various themes were also established in order to determine the trend in environmental change. The reliability and credibility of the data and information used in the assessment were duly considered.

The following were the thematic areas of the assessment: Environment and Economic Development; Land Use and Agriculture; Forest and Protected Areas; Climate Change and Natural Disasters; Water Resources and Wetlands; Biodiversity and Genetic Resources; Population, Health and Human Settlements; Energy Resources; Industry and Mining; Environmental Policies, Legislation and Institutional Arrangements; and Environmental Trends and Scenarios.

Table 1: Rwanda's Environment Performance on Selected Indicators

Indicator	EPI score	Average for the region	Average for the income group	Raw score (%)	Target (%)
Sanitation	32.2	28.0	25.2	42.2	100
Drinking water	55.9	41.9	48.0	74.0	100
Effective conservation	69.7	53.2	69.2	7.0	10

Source: Based on Esty et.al. 2008

In developing the SOE report, consultations were made among national experts for the identified thematic areas, lead agencies and other major governmental and non-governmental stakeholders including the private sector. This participatory approach was central to the SOE process right from the selection of the themes through drafting of the report and validation of the final product. The SOE process in Rwanda was therefore led and owned by Rwandese.

This first SOE report serves three main needs: a) providing information and knowledge on the state of the environment; b) guiding policy-makers and other stakeholders on how to improve environmental management; and c) establishing the evidence base for monitoring the implementation of the Economic Development and Poverty Reduction Strategy (EDPRS) and for future policy decisions, particularly those related to integrating environment into policies, plans, programmes and budgets. In the subsequent sections, pertinent policy messages are conveyed in text boxes.

The Analysis

Environment and Economic Development

Rwanda's economy is linked to the environment in many important ways. The economy and the livelihoods of its people are inextricably linked to the country's natural resources, such as water, land, air, plants and animals. There is, however, scarcity of hard data demonstrating the connection between poverty and ecosystem services on the one hand and the benefits and costs of natural resources management on the other.

However, the preliminary analysis of the connection between poverty and ecosystem services in the country has indicated that in Butare (current Huye district) and Kibungo (current Ngoma district) all four of the ecosystem services are stressed and the four constituents of well being are threatened (UNEP and IISD 2005). These ecosystem services are maintenance of biodiversity, water supply, food production and energy resources. The four constituents of well being are adequate nourishment, clean water, energy for warmth and cooking and earning livelihoods. On the economic side, the 2006 economic analysis of natural resources management in Rwanda revealed that: a) the economic loss due to soil erosion was the equivalent of US $ 34,320,000, which represented 1.9 per cent of the Rwanda's GDP; b) there



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Harvesting of trees for charcoal and wooden board production may provide short-term economic gain, but result in long-term environmental degradation

was the unexpected additional daily expenditure of US $65,000 by ELECTROGAZ on diesel in order to generate supplementary power to meet the shortfall caused by reduced generating capacity of hydro-electric power stations fed by the degraded Regezi wetlands; and c) a 25 per cent drop in agricultural production due to soil erosion was caused by the degradation of Gishwati forest (ROR 2006a).

Given the heavy dependence of the economy on the natural resource base, it is imperative that the evidence base on the environment-development nexus is strengthened in order to inform policy actions that help to abate further degradation of the remaining natural resources and encourage additional investments that are needed to use the remaining stock of natural resources to promote growth and poverty reduction. The Poverty Environment Mapping (PEM) project made a beginning in this regard and also contributed to providing essential information to enable government and civil society to monitor environmental changes and how these changes affect the poor (ROR 2005). The Poverty Environment Initiative (PEI) also contributed to the evidence base that enabled the integration of environment in the EDPRS (ROR/UNEP/UNDP 2007, Opio-Odongo 2008).

Policy message 1: The periodic production of the SOE can assist in generating data and information on the status and changes in the poverty environment situation in Rwanda. Since the results of the economic analysis of the costs and benefits of natural resources are crucial for evidence-based decision making, it is wise to invest more in this type of analysis. Additional investments in the Poverty Environment Mapping and Poverty Environment Initiative would benefit the institutionalization of environment mainstreaming.

Available impressionistic evidence suggests that the level of public expenditure on environment does not seem to correspond to the growing awareness in the country of the links between environment and development. Between 2003 and 2007, the budget allocated to environment increased from 0.06 per cent to 1.15 per cent. Even for the EDPRS period, the share of environment, land and forestry will not exceed 1.8 per cent as per the 2008 Budget Framework Paper. The story is not much different for the Official Development Assistance (ODA) sources. In 2005, only 1 per cent of total ODA in Rwanda was dedicated to environment. This however may have been higher if environment were well mainstreamed in the health, energy, agriculture, and water and sanitation sectors.

Policy message 2: Conducting periodic environmental public expenditure review to track spending on environment, including cross sector spending on environmental priorities is important in deciding on the needed changes in the budget structure. It is therefore essential that adequate support is provided to REMA for conducting a comprehensive environmental public expenditure review and fiscal reform in the course of implementing the EDPRS.

Land use and Agriculture

In 2001, agriculture contributed 46 per cent of the GDP in real terms and accounted for 87 per cent of employment and 80 per cent of exports (Agricultural policy, 2004). In 2003, the contribution of agriculture to the GDP declined to 43 per cent of GDP as the service sector is growing. It declined further to 36.4 per cent in 2006. Despite this decline in the share of GDP, agriculture still employs about 86.3 per cent of the country's working population and is a major source of livelihoods for a majority of the population (NISR 2007).

Agriculture, therefore, will continue to be the mainstay of the Rwandan economy for the foreseeable future. Yet Rwanda's land resources are utilized in an inefficient and unsustainable manner. Landholdings in Rwanda are very small (50 per cent cultivating less than 0.5 ha, and more than 25 per cent cultivating less than 0.2 ha), scattered and crops are grown on steep slopes up to and above 55 per cent (ROR 2000). There has been a slight increase in the share of the population who own four or more plots of land since 2005. The proportion of households who do not own any land has remained more or less constant at 12 per cent (NURC 2007).

Changes in land use tend to be a problem in Rwanda. The absence of a land use master plans in cities and in the countryside allows land in Rwanda to be used haphazardly. Some wetlands are converted into farms, pastures and industrial estates. Some river banks are cultivated and forests are converted into farms. Perennial crops (bananas and coffee) are replaced by annuals (tubers such as cassava), making the land more susceptible to soil erosion. It has been estimated that soil erosion results in a loss of 1.4 million tons of soil per year. This represents a decline in the country's capacity to feed 40,000 people annually. Despite the growing awareness of the importance of soil conservation measures in the country, there is no corresponding implementation of anti-erosion measures. The inability of the small scale farmers to finance anti-erosion measures is part of the problem (ROR 2004a).

Although population pressure is not as high in the pastoral and agro-pastoral rangelands of the east, the shortage of water, drought and overstocking are a problem. The problem has tended to encourage the encroachment of the protected



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The use of soil conservation measures such as radical terraces reduce the amount of soil lost.

areas (Akagera National Park) for grazing livestock. In the drier Umutara region, overgrazing has been a big problem in the post genocide period.

The piecemeal implementation of the land policy and land law and the limited coverage of formal land registration and its focus on urban areas and rural commercial farms and church land partly account for the inability of land use to contribute to environmental sustainability. Land reform seems to be gaining favour among land users. According to the recent NURC survey, a growing number of the respondents favoured the reform and the modernization of agriculture. Although a majority of the respondents (62 per cent), agreed that ancestral land can no longer be transferred to one's children, a significant minority (between 35 per cent and 40 per cent) of the respondents remained opposed to the idea (NURC 2007).

Policy message 3: Since effective land-use policy and land-use planning are good for both agriculture and the environment, it may be wise for ongoing work on these issues to be expedited. The expansion of the IMIHIGO programme would most likely enable a wider adoption of soil conservation structures and improved agro-forestry practices, both of which can contribute to renewing and regenerating the soil.

The security of long-term tenure rights offered by both the land policy and land law promotes soil conservation practices and other on-farm investments, as well as providing an inheritable asset for future generations. Building on the law to make the system of land administration more efficient would permit easy access to and credible transactions in land, thereby fostering more sustainable land use and land management.

Policy message 4: Given the importance of land security in the country, it would be beneficial if appropriate procedures are instituted and fully implemented to extend land registration to villagers and small land owners in rural areas in order to ensure that these categories of people have legally enforceable land rights (DFID and MINITERE 2003). Strengthening the capacity of Community-Based Organizations (CBOs) to enable them provide adequate legal literacy to the poor on land rights in accordance with the land policy and land law in force is equally advantageous. The CBOs could also be encouraged to participate in the monitoring of and the implementation of both the land policy and land law.

Climate Change and Natural Disasters

Being dependent on rain-fed agriculture, Rwanda's economy and people's livelihoods are vulnerable to climate variability and climate change. Agriculture, biodiversity, water resources are more likely to be affected. The country's location in a tectonic region with the epicenter in Lake Kivu and the presence of volcanic chains in the north-west makes Rwanda susceptible to earthquakes. Two earthquakes of 6.1 and 5.0 magnitude with subsequent aftershocks occurred on 2nd and 14th February 2008. These earthquakes seriously affected Rusizi and Nyamasheke districts where 39 people died, 275 were wounded, 415 traumatized and 2,388 families left homeless. They caused a lot of damage to schools, hospitals, health centres and churches. More than 11,940 people were displaced in the two districts.

Rainfall in Rwanda is generally well distributed throughout the year, despite some spatial and temporal variability. The eastern and south-eastern regions are more affected by prolonged droughts while the northern and western regions experience abundant rainfall that usually causes erosion, flooding, and landslides. The eastern region, however, has been experiencing rainfall deficits for some decades. The Bugesera area in the eastern region, in particular, is often devastated by drought, which frequently translates into food insecurity in an area that was previously food secure.

Analysis of rainfall data shows that rainy seasons have tended to become shorter while the intensity of the rain tends to be higher. This tendency has been associated with declines in agricultural production and with events such as droughts in dry areas and floods and landslides in areas experiencing heavy rains.

Heavy rains have occurred especially in Northern and Western provinces. Coupled with deforestation and poor agricultural practices, those rains have often resulted in soil erosion, rock falls, landslides and floods which destroy crops, houses and other infrastructure (roads, bridges, schools) as well as human lives and property. On 28 September 2008, for example, the heavy rains and winds adversely affected 8 among the 12 sectors of Rubavu district: Gisenyi, Rubavu, Rugerero, Nyamyumba, Nyundo, Cyanzarwe, Nyakiriba and Kanama. More than 500 homes were submerged, about 2,000 hectares of crops destroyed and bridges, roads, pylons and schools washed away. Up to 1,982 houses, 72 primary schools, and 34 secondary schools were partially destroyed.



Floods in Gishwati have led to destruction of infrastructure such as roads

Being a party to the United Nations Framework Convention on Climate Change (UNFCCC) and to the Kyoto Protocol, Rwanda has identified the following six priorities areas for adaptation to climate change: i) Integrated Water Resource Management (IWRM); ii) setting up an information system for early warning of hydrological and agro-meteorological systems and rapid intervention mechanisms; iii) promotion of intensive agro-pastoral activities; iv) promotion of non-agricultural income generating activities; v) introduction of species resistant to extreme conditions; and vi) development of alternative sources of energy to firewood.

Regarding disasters, a Disaster Management Coordination Unit (DMCU), was established by the Cabinet Meeting of 27th October 2004. The Unit is under the national police, but reports to the Prime Minister's Office. Its mandates include: a) assessing and evaluating disasters frequently observed in districts or sectors; b) preparing disaster management programmes including disaster mitigation; c) assessing and evaluating the socio-economic costs of disaster; and d) reporting to the Prime Minister's Office.

In the case of volcanic activities, there is an ongoing monitoring work by a team of volcanologists from the Goma Volcano Observatory (DRC) and from the National University of Rwanda. However, this activity needs more human and financial resources if adequate observation of the Nyiragongo volcano is to be done and the results disseminated through early warning systems.

Policy message 5: Given the vulnerability of Rwanda to climate variability and climate change it is wise to document the sensitivity, likely impacts and current adaptive strategies in the health, agriculture, infrastructure, water and tourism sectors. More rigorous economic impact studies may have to follow. Meanwhile, despite limited knowledge on the likely impacts on these sensitive sectors, climate proofing may have to be encouraged for the on-stream investments in climate-sensitive sectors.

Policy message 6: Emerging lessons from the work of the Disaster Management Coordination Unit provides a basis for improving inter-ministerial coordination of disaster response and the crafting of the modalities for mainstreaming disaster risk reduction in the sectors that are more vulnerable to climate variability and climate change.

Biodiversity and genetic resources

Although Rwanda is a small country (26,338 km^2), it is rich in biodiversity, which is mainly conserved in protected areas (three national parks, natural forests, wetlands) covering almost 10 per cent of the national territory. The country's location at the heart of the Albertine Rift eco-region in the western arm of the Africa's Rift Valley, makes it home to 40 per cent of the continent's mammal species (402 species). There is a huge diversity of birds (1,061 species), reptiles and amphibians (293) species, and higher plants (5,793 species). Rwanda is also recognized as a biodiversity hotspot, hosting more endemic mammals, birds, butterflies, fish and amphibians than anywhere else in Africa.

There are 151 different types of mammalian species, 11 of which are currently threatened and none of which is endemic. Among these are the primates (14 to 16), with a half of the remaining world population of mountain gorillas *(Gorilla gorilla berengei)* – an attraction for tourists - found in the Volcanoes National Park. Others include the owl-faced monkey *(Cercopithecus hamlyni)*, the mountain monkey *(Cercopithecus hoesti)* in Nyungwe, the Chimpanzee (Pan troglodytes) in Nyungwe and Gishwati, and the Golden monkey *(Cercopithecus mitis kandti)* found in Volcanoes National Park. Rwanda also shelters 15 species of


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Gorilla families such as this in the Volcanoes National Park, are a big tourist attraction

antelopes, and has a wide diversity of wild species such as buffaloes, zebras, antelopes, warthogs, baboons, elephants, hippopotamuses, crocodiles, tortoises and rare species such as the giant pangolin. (Chemonics International Inc. 2003, MINITERE 2007).

However, having the highest population density in Africa and being dependent on agriculture, Rwanda faces major threats from the population pressure on its biodiversity and genetic resources. The other threat to biodiversity is the conversion of natural habitats due to human activities such as mining, agriculture and the introduction of alien species. The insecurity in the Great Lakes region and the reported plunder of natural resources has somewhat impacted on the biodiversity and genetic resources in Rwanda. The war, genocide, insecurity and displacement also contributed to the erosion of Rwanda's biodiversity.

Although it is acknowledged that a multitude of benefits accrue to Rwandese from the country's biodiversity and genetic resources, there is no hard assessment of the value of high value biodiversity and the costs and benefits of protecting it. Table 2 below depicts the possible categories of economic values attributed to environmental assets.

Anecdotal evidence, however, indicates that while Rwanda's earning from tourism to Virunga National Park grew from US $351,977 in 1974 to US $3,005,785 in 1989, there were no corresponding figures on the direct costs of managing the park and the opportunity costs of banning alternative land uses (ORTPN in ROR 2006a). The increase in revenue earnings from tourism from all the parks must have grown many times by now. Yet at the same time the conversion of land rich in biodiversity into alternative land use continues. By 1992, it was estimated that the conversion to cropland in Rwanda stood at 17 per cent compared to 20 per cent in Uganda, 28 per cent in Burkina Faso, and 21 per cent in Côte d'Ivoire (IUCN 1994).

Key to changing government and popular perceptions about biological resources is needed to show that the protection and sustainable use of biodiversity has positive economic value and that this economic value might be higher than the value of alternative resource uses which threaten biodiversity (IUCN 1994).

Table 2: Categories of economic values attributed to environmental assets

	Use values	**Total economic value**	**Non-use values**	
Direct use	*Indirect use*	*Option values*	*Bequest values*	*Existence values*
Outputs directly consumable	Functional benefits	Future direct and indirect values	Use and Non-use value of environmental legacy	Value from knowledge of continued existence
Food, Biomass, Recreation, Health	Flood control, Storm protection, Nutrient cycles	Biodiversity. Conserved habitats	Habitats, prevention of irreversible change	Habitats, Species, Genetic, Ecosystem

Source: IUCN 1994

Policy message 7: Since knowing what is available, its value and the costs and benefits of protecting it is fundamental to promoting the conservation of biological diversity and genetic resources, it is worth while building national capacity for biodiversity profiling and economic valuation. This requires strengthening institutional capacity for taxonomy, ethno-biology, ecology and environmental economics.

Policy message 8: In the absence of effective policy and law, it may prove difficult to enforce conservation and sustainable use of biodiversity, including those outside protected areas. The policy and law should also protect biodiversity outside protected areas, the Rwandese who are repositories of indigenous knowledge associated with biodiversity and restrain the gene hunters from illegal prospecting. Sufficient incentives also have to be provided to communities surrounding protected areas in order for them to commit to protecting and sustainable use of the biodiversity and genetic resources therein.

Forests and protected areas

A recent mapping inventory of forests with a surface of 0.5 hectares or higher and with coverage of more than 20 per cent indicated that Rwanda has an estimated 240,746 ha of forests in 2007. This is approximately 10 per cent of the 23,835 km2 of national dry lands (MINITERE and CGIS-NUR 2007). Rwanda forests and woodlands fall into four categories: the natural forests of the Congo Nile Ridge comprised with Nyungwe National Park (NNP) Gishwati, and Mukura ; the natural forests of the Volcanoes National Park (VNP); the natural forests in savannah and gallery-forest of the Akagera National Park (ANP) and remnants of gallery-forests and savannahs of Bugesera, Gisaka and Umutara; and forest plantations dominated by exotic species including *Eucalyptus* spp., *Pinus* spp. and *Grevillea robusta* and trees scattered on farmlands (agroforestry) and along anti-erosion ditches.

Forests provide ecosystem services and products such as protection of water catchments, regulation of water flow, influencing climate, protection against soil erosion, water purification, food, wood for fuel and construction, tourism, non timber forest products including medicine plants, honey and handcrafts. The role of forests in preserving ecological balance is particularly important in Rwanda. They contribute greatly to watershed protection against erosion, thus making agriculture viable and covering the daily basic needs for wood for more than 96 per cent of the country's population. Presently, the contribution of the forestry sector to the national economy is not well known, although it is conservatively estimated to have stood at 1.3 per cent of total GDP between 2001 and 2006 (ROR 2007). It is nonetheless acknowledged that forests generate direct monetary incomes, thereby contributing to poverty reduction (ROR 2004b).



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People accessing firewood in the Akagera National Park

Although in 1993 forests covered 26 per cent of Rwanda's land area, by 2004 it covered only 19 per cent. The main threat to forests is the rapid increase in population, which is leading to forest encroachment and deforestation for settlement, agriculture and grazing land. The other threats include illegal logging, charcoal production, and bushfires. Indeed, during the 2007 national forest inventory, it was established that the threats included illegal tree cutting (78.3 per cent), charcoal making (4.9 per cent), livestock grazing (2.5 per cent), farming activities (1.9 per cent), bushfires (1.9 per cent), stem debarking (0.6 per cent), mining (0.5 per cent) and beekeeping (0.4 per cent) (MINITERE-ISAR 2007).

Again, as was the case with biodiversity, the nagging issue is changing governance and popular perceptions about forest resources by empirically demonstrating that sustainable use of forests has positive economic value and that this economic value will be higher than the value of alternative resource uses which threaten forests.

Policy message 9: Policy makers and environment stakeholder will continue to be up against the negative perceptions on protection and sustainable use of forests and protected areas. Dealing effectively with these perceptions requires careful empirical documentation on and innovative publicizing of the contributions of forests and protected areas to economic growth, poverty reduction and people's livelihoods. Helping communities and local governments to appreciate the opportunities in using forest lands to earn carbon funds and payments for ecosystem services, which may outcompete the alternative uses they may wish to subject forests to is equally useful.

Water resources and wetlands

Water resources

Water directly influences people's quality of life, their health and productivity. Access to clean and safe water is vital for good health. Water is also essential to animal production, agriculture, industrial development, hydro-power generation and transport; all of which contribute to socio-economic development and poverty reduction. In Rwanda, the water resource consists of fresh water systems of the country's lakes, rivers, marshlands and ground water, all supplied by rainfall.

The lakes in Rwanda cover more area than the rivers. The hydrological system is divided into two river basins, the Congo and Nile river basins; the latter contributing approximately 90 per cent of the total national surface water stock (MINITERE 2005). The major perennial and voluminous rivers include Nyabarongo, Mukungwa, Muvumba, Akanyaru, Akagera, Ruvubu, and Base, all of which are in the Nile Basin. Some of these offer potential sites for hydro-electric power development. The Rusumo falls on the Akagera River is site for the upcoming largest hydro-electric power station.

Although Rwanda possesses abundant water resources, the distribution of drinkable water is still inadequate and the rate of access in the country is estimated at 54 per cent, but does not exceed 44 per cent in rural areas (ROR 2004c). The 2010 target is 80 per cent (ROR 2007). Some of the water sources have been subjected to heavy and unchecked pollution as a result of untreated wastes (both domestic and industrial) being dumped into water courses. In urban areas, non-treated effluents are also dumped into rivers and marshlands. In urban and peri-urban areas, where sewerage pits are constructed in areas with high water table, especially those close to the marshlands or streams, water contamination is usually high (ROR 2004c).



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Fresh water sources like the Musanze-Mpege river are a source of clean water

Most of the industries in the country lack waste treatment facilities and therefore pour their effluents directly into the water courses near them. This is particularly the case in the Gikondo, Nyabugogo and Nyabarongo marshlands near Kigali City. Inappropriate application of fertilizers and pesticides also contributes to the contamination of water sources. Tests conducted by the National University of Rwanda in 2002 to establish water quality, revealed that some rivers contained high levels of the elements under investigation, well beyond those recommendation by the World Health Organisation for drinking water.

The conversion of wetlands, especially through unsuitable agricultural practices and deforestation, results in increased risk of soil erosion, subsequent sediment deposition and siltation of the lakes and rivers, and diminished water flow into streams and rivers. The extensive deforestation of Gishwati, for instance, has been blamed for the reduced ground water recharge in the area and the drying up of streams and fresh water sources further downstream (ROR 2006b).

Over time the country's demand for water has increased due to growing agricultural and industrial production. Indeed, water scarcity is becoming a major constraint to rain-fed agriculture, especially for cropping systems that use large quantities of water. The other competing demands for water

are from domestic and hydro-power generation uses. The increasing population has raised pressure on water resources even further, resulting in reduced per capita availability of water per year (ROR 2004c).

Policy message 10: Unless effective measures are taken to control water pollution by industries, agricultural enterprises and domestic wastes, there is the risk that Rwanda will have difficulties achieving the EDPRS and MDG targets on access to clean and safe water. Among the measures is the effective translation of the polluter pays principle that is enshrined in both the National Environment Policy and the Sector Policy on Water and Sanitation into legally enforceable instruments.

Policy message 11: The demand for water for various end uses is likely to grow in the medium term as Rwanda's economic transformation accelerates. It is thus advisable that both water demand, and integrated water resources management (that are enshrined in the Sector Policy on Water and Sanitation) are effectively implemented. This will ensure rational use of water that also takes sufficient account of the water needs of the poor and the environment.

Wetlands

The wetlands in Rwanda cover a total area of 165,000 hectares, which is about 7 per cent of the total surface area. They provide an important function of water treatment and purification and serve as sources of water for the lakes and connecting rivers in the country. Many rivers flow throughout the year because wetlands, just like the rain forests, gradually release their stored water. Wetlands are, therefore, important in maintaining perennial rivers and streams. They also enable the movement of large volumes of water into the underground aquifers, thereby recharging the water table.

Wetlands prevent surface run-off by limiting water flow and overflowing of riverbanks downstream, preventing erosive flood conditions. They also remove sediments, nutrients, toxic substances and other pollutants in surface run-off. This improves water quality and prevents siltation of downstream watercourses.

Because of their ability to purify and retain large volumes of water, wetlands provide clean and reliable sources of water for human consumption, agriculture and industry. Some wetlands are also a source of important agricultural resources, such as the wild variety of rice. Others offer sites for recreation and tourism given the spectacular concentration of different species of animals and plants in such wetlands. Bird-watching, game viewing and sport fishing usually occur at such sites.

The marshlands of Akagera and associated lakes, Akanyaru-Nyabarongo and associated lakes, Kamiranzovu (part of Nyungwe forest) and Rugezi marshland still host large biodiversity. The high altitude marshlands, due to their specific ecological conditions, size and protected status, host a greater number of vegetation species compared to other marshlands: 51 species in Rugezi, 44 species in Kamiranzovu. Outside of the national parks, the lakeside and marshy Rweru-Mugesera complex hosts the most diverse mammals species among which are crocodiles, varans (sand crocodiles) and snakes. The marshy lakeside Akanyaru complex of Nyabarongo and Akagera National Park are especially rich habitats for ornithological fauna. Indeed, Rwanda hosts migratory birds, species protected by CITES (observed in Murago, Gishoma, Rweru-Mugesera complex, on the lakeshore of Ihema Lake). Species on the IUCN list and the endangered ones have also been seen in Kamiranzovu, Murago, Rweru-Mugesera and on the shores of Ihema Lake. Some of the wetlands in Rwanda are important fish habitat, supporting large populations of fish, upon which many local communities depend for their livelihood.

However, the wetlands are threatened by human activities such as agricultural production; already out of the total 165,000 hectares of wetlands, 92,000 hectares are used for agriculture. While most of the marshlands in the country are under traditional cropping, some have been developed through extensive drainage or irrigation. Others have been reclaimed for the production of rice and sugar cane. These human activities have contributed to the disappearance of permanent springs, lower volumes of water outflow from some wetlands, lower ground water yields and disruption of the ecological services provided by wetlands.

Wetland degradation in Rwanda has resulted in adverse economic and livelihood impacts. A case in point in the degradation of the Regezi wetlands, which reduced the water levels of the two lakes that receive water from it to supply Ntaruka and Mukura hydro-power stations. The upshot of this was the need for ELECTROGAZ to incur a daily expenditure of US $ 65,000 for diesel generation in order to meet the shortfall from hydro-power generation (ROR 2006a). Sub-optimal production of industries, due to frequent

load shedding, also reduced revenues accruing to both the industries and the Rwanda Revenue Authority.

Policy message 12: Unless rational and sustainable use of wetlands are adhered to, the vital ecosystem services and products provided by wetlands will diminish with adverse consequences for the economy and people's livelihoods as has been documented for the degraded Rugezi wetlands. Leadership from the ministries responsible for water, agriculture and the environment in harmonizing and rationalizing functions, mandates and policies on the wetland ecosystem can be of great help in averting the situation.

Energy resources

Rwanda has variety of potential energy resources from biomass, hydro, solar, petroleum, methane gas, wind and geothermal. Biomass is the principal source of energy in rural areas where access to electricity is less than 1 per cent. Rwanda meets 94 per cent of national energy needs from biomass and the balance of 6 per cent is met by other options such as kerosene, diesel, dry cells, grid and non-grid electricity, biogas, solar, wind and other renewable energies. Due to increasing energy demand of the modern sector, the search is underway for other sources of energy. In addition to the option of expanding the capacity for hydro-electricity and solar energy, the government is supporting the development of methane gas of Lake Kivu. There is also an estimated 155 million tonnes of peat reserve. The feasibility studies on its extraction have, however, shown that the environmental impacts could be serious and that there would be need for more efficient and sustainable extraction technologies (ROR 2004d).

Rwanda's potential for renewable energy, micro-hydro, geothermal, wind, solar and peat, is huge. However, developing this potential would depend on enhanced indigenous capacity in design, manufacturing, installation maintenance and marketing of renewable energy technology. There would also be need to establish the scientific data on different sources of renewable energy in the country in terms of type, location, quantity and technologies applied to explore them.

In Rwanda, there is an intricate link between energy consumption and the sustainability of environmental and natural resources. Firewood and charcoal consumption is likely to grow in the short and medium term and this is likely to fuel deforestation. Use of agricultural residues as fuel in rural areas is also to have an upward trend, resulting in increased loss of soil nutrients and diminished agricultural productivity.



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Energy saving cook stoves like these being made can reduce the amount of fuel wood that is used for cooking purposes

Crucially, energy is linked to many of the EDPRS and MDG targets. Energy inputs such as electricity and fuels are essential to generate jobs, industrial activities, commerce and agricultural production. To attract teachers in rural areas, electricity is needed for home and schools. Time spent by women and the girl child in collecting firewood is time diverted from productive activities and schooling. Availability of electricity in clinics enables refrigeration of vaccines and timely immunization of children. Electricity to power radios and televisions enhances public health education and general community empowerment (UN Energy 2005).

Policy message 13: Without improved access to modern energy services, it may prove difficult for Rwanda to effectively progress towards the EDPRS and the MDGs energy targets. Making rural energy and electrification an integral part of Rwanda's rural transformation and poverty strategy would improve access to modern energy services and yield the expected environmental and human development benefits.

Industry and Mining

Industry

Despite some progress in the last five years, Rwanda's industrial base remains generally weak and uncompetitive. There has been an increase in the establishment of a wide variety of small-scale commercial and industrial operations, particularly garages and artisanal mining operations. The large scale establishments are primarily engaged in production and/or processing of wood, beer, soft drinks, tobacco, cement, textiles, paper and methane gas. Between 2001 and 2006, manufacturing contributed 6.8 per cent of the total GDP and posted an annual average growth rate of 8.1 per cent (ROR 2007).

The majority of the industrial processing operations use fuel wood as a source of energy, thereby accelerating deforestation. This poses the threat of land degradation through accelerated soil erosion with adverse consequences for the environment and agriculture. In the Kigali City area, a significant number of factories are located in a low lying area – the Gikondo wetland. These factories have no proper wastewater disposal systems, and consequently pollute soils, ground and surface water. Generally, it is rare to find industrial enterprises that have efficient systems of liquid or effluent wastewater processing and elimination. In most cases the wastewater is directed to the reception environment without any preliminary processing (ROR 2006b).

Unplanned location of industries, petroleum depots and garages contribute to environmental pollution. Almost all industries, garages and workshops are located in valleys or marshes that are bordered by heavily populated areas. Chemical discharges from the industries pollute the water, making it toxic to humans and animals. In some instances the discharges also pollute soils. In the case of the Gikondo-Nyabugogo wetland system, the industrial effluents and other pollutants emanating from there pose transboundary environmental challenges. Polluted waters from industrial park in the Gikondo-Nyabugogo wetland system are discharged into the Nyabarongo River and its tributaries and these, in turn, feed the polluted waters into the Akagera River that flows into Lake Victoria.

Policy message 14: In the event that industrial location continues to be inadequately guided by land use policy and plans and the industries continue to neglect adherence to the legal requirement that they must design and implement adequate environmental management plans, valuable natural resources such as the wetlands will continue to be degraded and water quality standards will drop with adverse health consequences for the population. Documenting and publicising the mutual benefits of cleaner production programmes to industry, the economy and the environment would help in facilitating industrialization that is pro-poor, pro-jobs and pro-environment.

Mining

Although Rwanda is a small country, it is relatively rich in minerals. In 2005, for instance, Rwanda's mineral industry produced gold ores and concentrates of columbium (niobium), tantalum, tin, and tungsten, most of which was designated for export. The country also produced cement, sapphire and small quantities of natural gas, and was known to have deposits of beryllium, kaolin and peat (Yager 2007). Table 3 below depicts the various mineral commodities produced by Rwanda between 2001 and 2005. Indeed, between 2001 and 2006, mining and quarrying contributed 0.6 per cent of total GDP and posted an average annual growth rate of 41.3 per cent (ROR 2007).



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Mining activity close to water bodies can lead to siltation as is shown in this picture of the Ngororero-Nyabarongo river

Table 3: Mineral Commodities produced by Rwanda

Commodity[2]		2001	2002	2003	2004[e]	2005[e]
Cement		91,204	100,568	104,613	104,205[3]	100,000
Columbite-tantalite, ore and concentrate						
Gross weight	kilograms	241,000	96,000	128,000	200,000	250,000
Nb content	do.	76,000	30,000	40,000	63,000	80,000
Ta content	do.	53,000	20,000	26,000	40,000	50,000
Gold, mine output, Au content	do.	10[e]	10[e]	2	--	--
Natural gas, gross	thousand cubic metres	828	103	314	320	320
Tin:						
Mine output, Sn content		169	197	192	547[r]	700
Refined[e]		-- [3]	40[r]	200[r]	200[r]	200
Tungsten, mine output, W content		142	153	78	120	200

[e] *Estimated: estimated data are rounded to no more than three significant digits.* [r] *Revised.* -- *Zero.*

[1] *Table includes data available through October 25, 2006.*

[2] *In addition to the commoditiies listed, sapphire and pozzolanic materials are also known to the produced, but information is inadequate to make reliable estimates of output.*

[3] *Reported figure.*

Source: Yager 2007

Although mining occupies a small area of the land, it can have significant, and often irreversible, environmental impacts. Sand harvesting and quarrying, if done inappropriately, can result in some significant environmental impacts. Mining also leads to the displacement of people, land use changes, dust and noise pollution. The preparation of mineral ores which use a lot of water constitutes a major pollutant of streams in Rwanda. A specific case in point is the water draining the mining sectors of Rutongo and Gatumba, which pollute the rivers of Nyabarongo and Nyabugogo with sediments of clay and sand. The main problem presented by mining in Rwanda is the non-respect of environmental management policy and security of labour by owners of the quarries (ROR n.d.).

In the Great Lakes region, there has been considerable politicking in the last decade or so on the sources of minerals that countries in the region have been exporting. In the interest of demystifying the long contested availability of mineral resources in Rwanda, the Rwanda Geology and Mines Authority (OGMR) together with the German Institute of Geo-science and Natural Resources (BGR) have recently launched a joint project for certifying Rwanda's minerals. The project is intended to foster transparency, ethics and professionalism in the mineral sector (Gahigi 2009).

Policy message 15: If left unregulated the private sector may not have sufficient interest in protecting people and the environment from the adverse effects of mining and quarrying. Notwithstanding Rwanda's commitment to a free market economy, it would be prudent to bring into full force the provision of the Mine and Geology Policy that REMA studies the impacts of mining and quarrying on the environment in order to take necessary actions in mitigating the adverse effects of mining on people and the environment. That is desirable and legitimate intervention.

Population, health and human settlement

Rwanda has a young but fast growing population. The population was 9.2 million in 2006 and is expected to reach 16 million by 2020 unless family planning, education and outreach strategies are intensified. With a population density of 397 inhabitants per square kilometer, Rwanda is the most densely populated country in continental Africa.

The link between population pressure and land use in Rwanda's agrarian economy where traditional technology still predominates is a complicated one. Over the years, growing population pressure has contributed to the dwindling of farm size in response to demographically-induced changes in the structure of landholding. Those pressures have fueled land fragmentation and the distances between the various parcels of land owned by a farmer have increased. Over time, there

has been an increase in the number of land-scarce farmers, which has compelled those in need of land for cultivation to colonize marginal, less productive land that was previously intended for grazing, wildlife or forests. Land renting by those who have land to spare is now a common feature of the land tenure system. The fallow periods in most places have either shortened or disappeared (Clay 1996, ROR 2004a, NISR 2007).

Like other developing countries, Rwanda is experiencing increasing rural-urban migration. Perceived availability of and convenient access to services, infrastructure, amenities and employment encourages this form of migration. Although the government has been trying to address population access to basic services in the urban areas, there is still a significant lack of adequate water, electricity supply, sanitation and garbage collection systems.

Housing is in short supply and hence the persistence of slum dwellings. The public transport network is inadequate. Human settlements are not adequately planned and this complicates the delivery of basic social services, including education, water and sanitation. The inability of fixed-income urban employees to use modern energy services compels them to rely heavily on biomass fuels, with negative environmental and health implications.

On the side of environmental health, waste management remains poor. The drainage in the city is generally inappropriate and causes water contamination with refuse. The situation is not any better in the rural areas. Although it is estimated that 86 per cent of the Rwandan rural population have latrines, very few of these meet the standards for safe hygiene and sanitation. Urban air pollution, resulting from dust particles and vehicular emissions, is also growing.

Policy message 16: In the absence of an effective rural growth centre strategy aimed at increasing the opportunities for self employment and jobs outside existing urban centres, no amount of admonition by government can curb rural-urban migration. Even the difficult living conditions in the peri-urban areas will not serve as a sufficient push factor for reverse migration to the rural areas. Those conditions are unlikely to effectively counteract the push factor of land scarcity in rural areas that makes hacking a living there nearly impossible, without resort to alternative livelihood strategies that damage the environment and natural resources.

Environmental policies, legislation and institutional arrangements

Rwanda has made a remarkable progress in the development and implementation of environmental policies, legislation and institutions. A number of new policies and laws were promulgated in 2004. Many of these policies in the other sectors such as energy and industry show reasonable degree of sensitivity to, and make provisions for not undermining environmental sustainability. The country's institutional architecture for promoting environmental sustainability has also improved. The establishment of REMA in 2006 provided the country with the institutional machinery for supporting the implementation of the environmental policy and law.

Rwanda's post genocide political dispensation, especially the principles associated with decentralization and democratization, has helped to ensure the engagement of the population in the development of environmental policies and laws. Globally, poor people who are largely dependent on natural resources continue to have precarious livelihoods. Thus the question of their participation in polices that determine the security of their livelihoods and the state of livelihood resources is important (IIED and IDS 2004).

There is growing consciousness in the country on the need to always examine the inter-linkages of policies and laws, especially when developing new and reviewing old policies and laws. The development of the Forest Policy attests to this. However, the capacity for policy implementation is weak at both the central and local government levels. Efforts at domesticating the international environmental policies and laws that Rwanda has ratified remain weak. Although action plans for the implementation of these policies and laws have been developed, the tendency of not mainstreaming their key interventions into national and sector plans and programmes has often resulted in the plans having little or no funds for implementation.

Policy message 17: The incapacity to implement existing environment policy and law can become a serious disincentive to resource users and those affected by the unabated abuse of environmental policy and law to the extent that government pleas for their sustained engagement in policy development and review may be construed as a mockery of environmental governance.

Policy options for action

Environment and economic development

- Institutionalize the integration of environment into policies, plans and programmes as provided for in the Environment Management Policy. To this end, appraise top executives of the various ministries and parastatals on the merits and challenges of environment mainstreaming; strengthen the capacity of sector and district planners and environmentalists for environmental assessment, poverty-environment mapping, policy analysis, economic analysis of various aspects of environmental degradation and environmental public expenditure review; and ensure the adequacy of environmental data, including its capture in future household surveys.
- Apart from providing the skills mentioned above, draw upon the good practices and lessons learned from the Decentralized Environment Management Project (DEMP) and similar initiatives in the East African region to develop a strategy for effective mainstreaming of environment at the decentralized level. Supplement this with well-packaged education and information material on why environment matters and what actions the various stakeholders at the district and lower levels could take to promote environmental sustainability.
- Market failures and market distortions partly account for the ineffectiveness of environmental policies and laws despite increased efforts in applying the command and control approach in enforcement. Invest, therefore, in strengthening the capacity to assess the costs of environmental degradation (preferably via satellite account, for example tourism) and how the various taxes and subsidies affect the achievement of environmental sustainability, with the view to developing suitable economic instruments.

Land use and agriculture

- Given the issues of affordability of land registration and titling in rural areas, effectively implement the suggestion by DFID and MINITERE (2003) that a programme be instituted in the short-to-medium term to develop appropriate procedures for extending land registration to villagers and small land owners in rural areas. This will ensure that these categories of people have legally enforceable land rights.
- Strengthen the capacity of community-based organizations in providing legal literacy to the poor regarding land rights in accordance with the current land policy and land law. That capacity enhancement should also enable the organizations to monitor the implementation of both the land policy and law.
- In deepening decentralization, provide sufficient capacity development support and funds to the environment and other relevant committees at district and lower levels so that they can effectively execute their mandates on land and agriculture and also meet the environmental sustainability objective.



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Soil conservation efforts and implementation of good agriculture practices will allow to increase agricultural productivity without degrading the environment.

Climate change and natural disaster

- Document the nature and impacts of climate change, especially in the sensitive sectors of agriculture, infrastructure, water and health.
- Understand, document and strengthen existing livelihood coping strategies rather than imposing new, high-tech solutions.
- Coordinate efforts within and between governments, private sector and civil society in promoting adaptation to climate change and sustainable development through sharing ideas. This will encourage innovation and maximize the efficiency with which limited resources are used.
- Integrate climate change adaptation into the development agenda across all sectors at all levels of government.
- Strengthen national capacity for effective engagement in the regional and global negotiations and collective actions to mitigate and adapt to climate change.

Biodiversity and genetic resources

- Develop and promulgate a biodiversity policy and law taking account of the existing biodiversity strategy and action plan developed under the Global Environment Facility (GEF). The policy and law should adequately

cover wildlife and other important genetic resources outside protected areas. They should also regulate research on biological resources, bio-prospecting and the patent rights of those who are repository of indigenous knowledge and technology.

- Once the new policy and law on biodiversity is in force, harmonize other existing policies and laws that relate to the protection of biodiversity and genetic resources with the new policy and law. Build capacity for effective enforcement of these policies and laws, including the development and application of appropriate economic instruments.
- Since adequate biodiversity profiling is central to effective management, national capacity for taxonomy, ethno-biology, ecology and environmental economics will need to be strengthened.

Forests and protected areas

- Strengthen further the National Forest Authority to ensure improved governance and stewardship of the forest resources.
- Strengthen the human resource capacity of the forest sector to ensure effective provision of technical and extension services.
- Promote agro-forestry that is well adapted to the land availability situation in Rwanda, taking special account of the needs of the land holders.
- Invest in the quantification of the contribution of forests to economic growth and poverty reduction.
- Sensitize the local communities and local governments on the opportunities for earning incomes through payment for environmental services and the earning of carbon funds. Build the capacities of relevant government agencies and local NGOs to support the communities and local governments in seizing these opportunities.


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Akagera National Park represents an exceptional conservation area and offers great opportunities for safari game viewing


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Lake Kivu and its islands, a great opportunity for recreation and tourism but also rich in biodiversity need to be protected.

Water resources and wetlands

- Ensure that the integrated water resources management regime is in force and scaled up.
- Expand the cleaner production programme to cover more industries, while producing an empirical documentation of the benefits of the programme to the environment, industry and the economy.
- Intensify water quality monitoring and where practical, train and engage the environment committees at the district level to support this effort.
- Encourage the water utilities and other relevant government agencies to explore the feasibility and viability of water demand management, taking sufficient account of the rights of both the environment and the poor to water for sustaining ecological functions and human livelihoods, respectively.
- Finalize the classification and inventorying of wetlands in order to institute adequate wetlands management regimes.
- The ministries responsible for agriculture, environment and industry should harmonize and rationalize their policies, mandates and functions in order not to compromise adequate availability of wetland ecosystem services and products.

Energy resources

- Expeditiously develop the Lake Kivu methane and bring on-line additional hydro-power stations.
- Foster collaboration between the ministries responsible for agriculture, environment and energy to ensure that the development of wetlands does not interrupt the availability of water from the wetlands that feed hydro-power stations.
- Implement a wood and charcoal efficiency and a substitution strategy that can help curb deforestation.
- Make rural energy and electrification an integral part of the country's rural transformation and poverty reduction strategy with the view to achieving the Vision 2020 targets on percentage of the population with access to electricity.
- Enforce the Strategic Environmental Assessment (SEA) and Environment Impact Assessment (EIA) requirement in the development of new energy supply systems.

Industry and mining

- REMA should effect the provision of the Mine and Geology Policy on its statutory obligation to study the impacts of mining and quarries on the environment with the view to ensuring that the existing laws and regulations on mining are complied with.
- The Cleaner Production programme should be expanded in order to ensure that expanded industrial production brings benefits to industry, the economy and the environment.
- In deepening decentralization, REMA should work closely with the ministries responsible for industry, mining, environment and local government to develop the capacity of district environment committees to enable them contribute to the monitoring and enforcement of the laws and regulations governing industrial and mining operations.

Population, health and human settlement

- Evolve a rural growth centre strategy for purposes of increasing the opportunities for self employment and the employment in services, both of which can contribute to reducing rural-urban migration.
- Intensify the family planning programme and ensure that the family development message is powerful enough to counter the traditional, cultural and religious messages that tend to run counter to the objectives of family planning.
- Make sufficient investment in the imidugudu in order to improve on human settlement, taking advantage of it to promote the uptake of energy-saving cook stoves, the replanting of degraded hill tops in the neighbourhood and better provision of education, water, sanitation and health services.
- Encourage the districts that will be developing new District Development Plans (DDPs) to include targets on promoting environmental health in addition to the targets on environment protection.
- Seek to build and strengthen synergy between the programmes of the Ministry of Natural Resources on water and sanitation and those of the National Water and Sanitation Authority for purposes of enabling the country to meet its EDPRS and MDG targets on water and sanitation.

Environmental policies, legislation and institutional arrangements

- Increase the knowledge and awareness of the general public on environment laws and policies in order to facilitate public participation in the EIA public hearings in particular, and in public decision making, in general.
- Strengthen the human resource capacity of environmental and related institutions at national and district levels for environment assessment, policy analysis, monitoring and enforcement.
- Invest adequately in the training of advocates in environment law.
- Fill the critical gaps in environment policies and laws, ensuring that the inter-linkages approach is adhered to in the development of new policies and laws.
- Determine the actual institutional deficits and areas of overlaps and conflicts in order to strengthen the implementation capacities of the various agencies with mandates on natural resources and environment. Correct the deficits through a combination of staff training, adequate funding and governmental reform.

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