EUROPEAN COMMISSION **REPUBLIC OF RWANDA**

ENVIRONMENTAL PROFILE OF RWANDA

This report is financed by the **European Commission** and is presented by **Dr. Fabien TWAGIRAMUNGU** for the **National Authorising Officer of FED** and the **European Commission**. It does not necessarily reflect the Government's or the European Commission's opinion .

Kigali, July 2006

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GLOSSARY

BAD	Banque Africaine de Développement
CDF	Community Development Fund
CE	Commission Européenne
CITES	Convention on International Trade of Endangered Species
COMESA	Common Market of Estern and Southern Africa
CRS	Catholic Relief Service
DEMP	Decentralization and Environment Management Project
DFID	Department for International Development
DPRPR	Decentralized Program for Rural Poverty Reduction
DSP	Development Strategic Paper
DSRP	Document Statégique de Réduction de la Pauvreté
EDPRS	Economic Development and Poverty Reduction Strategy
EES	Evaluation Environnementale Stratégique
FAE	Fossés Anti-Erosifs
FAO	Food and Agricuture Organization
FED	Fonds Européen de Développement
FMI	Fonds Monétaire International
FRSP	Fédération Rwandaise du Secteur Privé
GEC	Green Environment Conservation
IRST	Institut de Recherche Scientifique et Technologique
ISAE	Institut Supérieur d'Agriculture et d'Elevage
ISAR	Institut des Sciences Agronomiques du Rwanda
KIST	Kigali Institute of Science and Technology
MIGEPROFE	Ministère du Genre et de la Promotion Féminine
MINAFET	Ministère des Affaires Etrangères
MINAGRI	Ministère de l'Agriculture et des Ressources Animales
MINALOC	Ministère de l'Administration Locale et des Affaires Sociales
MINECOFIN	Ministère des Finances et de Planification Economique
MINEDUC	Ministère de l'Education
MININFRA	Ministère des Infrastructures
MININTER	Ministère de l'Intérieur
MINITERE	Ministère des Terres, de l'Environnement, des Forêts, de l'Eau et des Mines
MINECOM	Ministère du commerce, Tourisme et du Développement Coopératif
MTEF	Medium Term Expenditure Framework
NBI	Nil Bassin Initiative
NEPAD	New Partnership for Africa Development
ONGs	Organisations Non-Gouvernementales

ORTPN	Office Rwandais du Tourisme et des Parcs Nationaux
PADPR	Programme d'Appui au Développement des Populations Rurales
PAFOR	Projet d'Appui à l'Aménagement Forestier au Rwanda
PEP	Profil Environnemental du Pays
PIB	Produit Intérieur Brut
PNA	Parc National de l'Akagera
PNE	Politique Nationale de l'Environnement
PNUD	Programme des Nations Unies pour le Développement
PNUE	Programme des Nations Unies pour l'Environnement
PNV	Parc National des Volcans
POP	Polluants Organiques Persistants
PRSP1	Poverty Reduction Strategy Paper 1
RADA	Rwanda Agricultural Development Authority
RARDA	Rwanda Animal Ressources Development
REASON	Rwanda Environmental Awareness Services Organization Network
REMA	Rwanda Environment Management Authority
RITA	Rwanda Information Technology
RNE	Royal Netherlands Embassy
RTA	Rwanda Tourism Agency
RWA	Rwanda Wildlife Agency
SDAU	Schéma Directeur d'Aménagement et d'Urbanisme
TIG	Travaux d'Intérêt Général
UNR	Université Nationale du Rwanda

EXECUTIVE SUMMARY

The Government of Rwanda has started the preparation of the second poverty reduction strategy named « Economic Development and Poverty Reduction Strategy – EDPRS » that will cover 5 years and, compared to the PRSP1 created in 2002, will be an operational tool reinforced by realistic and feasible sectoral plans based on priorities, an adapted implementation framework and tangible results with significant impact on the improvement of living conditions of the population, especially the poorest one.

Given that the Country Environmental Profile is an important tool for the identification of the main environmental issues to be considered during the development of the national strategic paper, and for the political dialogue, the mission of the European Commission in Rwanda, through the FED Support to the National Ordonnateur, has financed the development of the Environmental Profile of Rwanda.

Apart from the first chapter consisting of introduction, this environmental profile is structured into four main chapters.

I. STATE OF ENVIRONMENT IN RWANDA

I.1. Physical Environment

1.1. **Relief and climate :** Rwanda has hilly and mountainous relief with an altitude ranging between 900 m and 4.507 m, and it has a tropical temperate climate due to its high altitude. The average annual temperature ranges between 16°C and 20°C, without significant variation. Rainfalls are abundant although they present some irregulararities.

1.2. **Arable land.** The average arable surface available is about 0.60 ha by household exploitation. This causes overexploitation of available land which is often accompanied by agricultural malpractices with desastrous consequences on land resources themselves and on environment in general.

1.3. **Soil degradation**: Rwandan soils are naturally fragile. They are generated by physico-chemical alteration of basic schistose, quartzite, gneissic, granite and volcanic rocks that make up the superficial geology of the country. The degradation of the natural milieu is particulary linked with hydrous erosion that affects the important portion of agricultural land. Generic impacts of erosion are numerous: i) loss of soil fertility by leaching arable lands; ii) increasing sedimentation on lands cultivated downhill from eroded plots; iii) Risks of destruction of crops and sand

banks which are particularly high in marshlands and valleys. iv) Local risks of landslides, collapses and mudslides and v) risks of irreversible leaching of soils.

1.4. Water resources: Rwanda possesses a relatively big quantity of water (surface and underground water): rivers, lakes and marshlands occupy a surface of 211000 ha, that is about 8% of the national territory (lakes: 128000 ha, rivers: 7260 ha and marshlands: 77000 ha). The outflow of the renewable underground resource is estimated at 66 m^3/s, out of which 9 m^3/s are produced by 22000 known sources. In general, too little information is available especially on underground resources.

1.5. Wet lands : Wetlands of Rwanda are composed of marshlands, lakes, rivers and streams and represent about 14,9% of the national territory of which 6,3% are marshlands and 8,6% are lakes, streams and water pools, permanent or seasonal.

I.2. Biodiversity and forests

The Rwandan territory is covered with diverse ecosystems: there are natural ecosystems (consisting of mountain rainforests, gallery forests, savannah forests, wetland and aquatic forests), woods and agro-ecosystems. All those ecosystems accommodate very rich flora and fauna.

2.1. Protected areas: Protected areas are made of national parks: *i) Volcanoes National Park* worldwide famous due to the presence of mountain gorillas and varied species of plants and animal species, ii) *Nyungwe National Park* hosting more than 1200 species of flora, 275 species of birds, iii) *Akagera National Park* covering a surface of about 108.500 ha and hosts more than 900 species of plants and 90 mammals. However, we should note that protected areas of Rwanda have lost around 50% of their original surface during the last 40 years due to different threats.

2.2. Relict forests and gallery forests comprising: *i) Gishwati forest* covering 600 ha; ii) *Mukura natural forest* covering 800 ha; iii) *relict forests and savannahs of the Eastern province* situated around Akagera Park and comprising a variety of endemic and rare species of plants whose majority is used in traditional medicine and iv) *gallery forests* hosting an important biodiversity with endemic and rare species.

2.3. Biodiversity of wetlands: The ecosystems of wet lands of Rwanda accomodate a biological diversity rich in plant and animal species except for the lakes of Kivu, Burera and Ruhondo that have some limnologic problems. Most lakes of the Akagera Park are rich in biodiversity. The Water hycinth is present and started covering big areas of lakes, representing a threat to their biological diversity. The lakes of the Akagera National Park are among the richest in fish species in the whole country,

mainly dominated by big populations of haplochromis and other fluvial species. Other lakes like Muhazi, Nasho, Rwampaga, lakes of Gisaka and Bugesera are also very rich in fauna and flora.

2.4. Biodiversity in agricultural systems: In Rwanda, human settlements, diversified agro-pastoral practices, consumption of forest products, bush fire and urbanization have caused the disappearance of the natural climatic formations of more than 90%. Those changes caused secondary formations consisting essentially of graminaceous plants, numerous seasonal or perennial species alternating with crops. The importance of each crop varies according to regions. Industrial crops are very few. They are limited to coffee, tea and pyrethrum. The agricultural production systems also host numerous wild species associated to them.

2.5. Pastoral lands: In Rwanda, animal breeding is mainly done at family and small scale level. Pastoral lands are subject to bush fire, trampling and sometimes overgrazing.

2.6. Wooded areas: Tree cultivation in Rwanda was limited to some plants around homes such as Ficus Thoningii, Euphorbia Tirucalli, etc. Cultivation of woody perennials for timber, energy generation or other services was not part of their customs. That resulted in a massive exploitation that quickly proved its limits.

I.3. Socio-economic environnement

3.1. Population and economy: Rwanda counted 8.128.553 inhabitants for a surface of 26.338 km^2 in August 2002 with an annual growth rate of 3%, i.e. a physical density of 321 inhabitants per km^2 and thus represents one of the highest densities of the continent. The gross domestic product (GDP) of Rwanda is dominated by the agriculture sector.

3.2. Human settlements: The rural habitat of Rwanda has been since long scatered and characterized by the traditional use of space, thus threatening environment by wasting lands and causing soil erosion. In urban areas, Rwanda does not yet have a global town planning. Towns have been developed spontaineously without taking into consideration the environmental aspect. The present policy of the Government of Rwanda encourages a system of grouped settlement which is commonly called imidugudu.

3.3. Energy and transport: In Rwanda, the biomass constitutes the main source of energy as it covers 94% of national needs. Woody fuels and vegetal wastes are the sources of energy used in households, industries and handcrfts. The transport sector is generally dominated by road transport that totals 14000 Km of roads and tracks.

3.4. Agriculture and animal husbandry: Agriculture is the most important sector of the Rwandan economy and contributes 43 % of the GDP. Coffee

and tea constitute the main export crops. Extensive agriculture practiced by the Rwandan population contributes to the degradation of environment. Farming remains mostly extensive and pastures consist essentially in family fallows and marginal lands considererd as unfit for agriculture.

3.5. Pollution: Pollution is caused by domestic and industrial wastes, agropastoral activities, anarchical exploitation of mines and quarries, and by invading weeds like water hycinth.

I.4. Natural disasters and hazards

4.1. N**atural disasters**: Natural disasters are those due to climatic or seismo-volcanic disturbances. They are a permanent threat to our country and consist mainly of drought, torrential rains, flooding, landslides, earthquakes, volcanic eruptions and bush fires not linked to human action.

4.2. Man-induced disaters: They consist of namely i) bush fires which are very frequent during the dry season mostly in the Eastern and Southern regions, ii) Conflicts and wars and iii) deforestation.

II. ENVIRONMENTAL POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

II.1. Vision 2020 and Environmental policy

1. **The Vision 2020:** protection and management of environment are among the pillars of the vision 2020. From now to the year 2020, the Government intends to build a nation where the pressure on natural resources, essentially land, water, biomass, biodiversity, is sensibly reduced and the process of pollution and degradation of environment is inverted.
2. **The National Environmental Policy** in Rwanda exists since November 2003 and has as the main objective to ensure durable protection and management of environment and natural resources of Rwanda.

II.2. Legal framework

1. **Constitution:** The Constitution of the Republic of Rwanda of 04 June 2003, as amended to date constitutes the basis of the legal framework for the protection and safeguarding of environment in Rwanda.
2. **Organic Law on the environment:** The legal framework for the management of environment was put in place by the Government of Rwanda by the organic law Nr 4/2005 of 8 April 2005 bearing the modalities to protect, safeguard and promote environment in Rwanda. That law governs environment in the broad sense of the term (land, agriculture, forests, water, biodiversity, etc.).

II.3. Institutional framework

In Rwanda, the institutional responsibility for the management of environment and natural resources is shared by several ministries (MINITERE, MINAGRI, and MINALOC), decentralized entities (Districts and Secteurs), public institutions (REMA), local and international non governmental organizations (NGOs), research and/or higher education institutions. With the new administrative reform, each district has a specialist in charge of environment.

III. COOPERATION OF RWANDA WITH THE EC AND OTHER PARTNERS REGARDING ENVIRONMENT

III.1. Cooperation with the European Community

1. **Rural Development Sector:** The initiatives financed by the EC in the rural development sector are: i) Support to the decentralization process through the Decentralization Programme for Poverty Reduction in the rural area (system of UBUDEHE); ii) Substantial financing for the development of the rural roads network especially in the Northern-West of Rwanda and iii) Implementation of other rural interventions such as water sanitation, land reform and environmental initiatives.
2. **Macro-economic support:** The funds of the European Community for macro-economic sector in Rwanda are used in the framework of attaining the objectives of the present Poverty Reduction Strategy.
3. **Other areas of intervention (non-focal):** The non focal intervention of the EC is mainly concentrated on support to the good governance and institutional support (statistics, justice, civil society, support to the electoral process through UNDP, co-financing of NGOs, etc.).

III.2. Cooperation with other donors

A good number of projects and programmes related to environment are financed by other different donors in addition to the European Community, including member countries of the EC. Those different donors are namely UNDP/UNEP, DFID, Belgian, Dutch and German cooperation, World Bank, African Development Bank, IMF, FAO, USAID, CARE, CRS, etc.

IV. CONCLUSIONS AND RECOMMENDATIONS

IV.1. Conclusions

The present environmental profile indicates that the main environmental problems of Rwanda consist notably of:

a) Degradation of soil due to the loss of vegetal cover, surexploitation and inappropriate agricultural systems, lack of anti-erosive measures, etc.
b) Reduction of biodiversity linked to the surexploitation and the diminution of sensitive natural spaces (marshland forests, etc.)
c) Deforestation mainly due to the demographic pressure, the uncontroled production of domestic energy (wood charcoal, firewood, etc.), the migration and resettlement of the population, etc.
d) Pressure on wet lands (clearing of natural marshes, hydro-agricultural development which are not associated with the protection of catchment basins), resulting in a reduced capacity of flood dabbing (risks of flooding and sedimentation of lakes).
e) Proliferation of aquatic weeds essentially along the Akagera and Nyabarongo rivers, etc.

IV.2. Recommendations

Given the present situation and trends of environment in Rwanda, a certain number of recommendations can be formulated:

1. Integrate the environment in the second Poverty Reduction Strategic Paper (PRSP2) and build the capacities of decentralized entities in the area of environment.
2. Plan a readjustment of performance indicators according to the environmental integration efforts of the PRSP2.
3. In order to address the problem of **soil degradation**, various techniques of soil preservation are recommended namely: i) radical terraces, ii) anti-erosion ditches, iii) reforestation in general and agroforestry in particular, maintenance of a permanent or a longer vegetal cover during the year, etc.
4. To address the problem of **deforestation**, it is necessary to initiate the following actions: i) increase the production of unproductive and degraded woods by reconversion and rehabilitation, ii) increase and diversify forest products, iii) support districts in developing and implementing District Forestry Plans, iv) intensify the agroforestry, v) promote incentive policies for the use of alternative energy sources, etc.
5. In order to fight the **destruction of natural ecosystems**, it will be necessary to put in place an efficient system of land management

including the protection of catchment and the rehabilitation of degraded crucial ecosystems (the basins of Nyabarongo and Congo, the marsh of Rugezi, etc).

6. We recommend to the European Commission to reinforce its intervention in the following areas:
    - Support the central administration (MINITERE, REMA) in environmental assessment of policies and programmes;
    - Support initiatives of the civil society aiming at protecting the environment;
    - Give assistance to decentralized entities in developing and implementing environment management plans;
    - Integrate environmental indicators in cooperation interventions of the European Community in Rwanda (increasing the wooded surface, reducing the rate of deforestation, increasing the surface of lands protected against erosion, the number of households using improved stoves and new and renewable sources of energy, the surface of protected areas, the number of endangered species (or in danger of extinction), the quality of water and air, the number of people trained in environment management, the number of districts with the environmental management plan, etc..).

I. INTRODUCTION

I.1. Background

The Government of Rwanda committed itself to the policy of poverty reduction, national unity and reconciliation, and has developed a vision for economic development and good governance. The second poverty reduction strategic paper (PRSP II) will be developed during 2006 in order to guide the implementation of that vision. In the mid term, the implementation of the PRSP continued through 2005 and considerable progress has been achieved particularly in health and education sectors.

The fight against poverty can be won with a sustained economic growth and it is convenient to identify potential contributions of environment in that growth. And we know that the exploitation of natural resources has an immediate impact on the quality of environment. The link between the degradation of environment and poverty reduction are clearly established. In fact the poor depend directly on natural resources and services for their subsistence and they are often more affected by environment degradation namely deforestation, reduction of soil fertility, erosion and water pollution. In addition, the poor are particularly vulnerable to natural hazards like flooding, drought in the Eastern and South-Eastern regions, volcanic eruptions, and conflicts related to the control of natural resources namely land, mines and forests.

Poverty reduction could not succeed without taking effective and real consideration of the environmental dimension. That is why environment is one of the priority areas identified by the Poverty Reduction Strategy in Rwanda and is among the first fundamental programmes retained by the PSTA (strategic programme for agricultural transformation) and the rural development programme.

Agricultural transformation and rural development must be accompanied by environment protection activities such as terracing, reforestation, water management, protection of catchment basins and rational use of wet lands. The Poverty Reduction Strategy also recommends actions in the sector of energy by encouraging in a particular way the rational use of wood and the promotion of alternative energy sources. It also supports water supply and actions of collecting and using rain water in clustered settlements and "imidugudu" villages.

I.2. Objectives

The main objective of the country's environmental profile is to identify and evaluate environmental issues to be considered during the preparation of the National Strategic Paper, which will influence directly or indirectly the cooperation activities of the European Commission (EC). The Country Environment Profile must provide to decision makers of the partner country and of the European Commission with clear information on major environmental issues, and on policies, strategies, and programmes concerning them (including those of the EC and other donors). The provided information will allow the cooperation strategy of the EC to take into account environmental aspects in choosing domains, objectives and approaches of cooperation. That information will also help to introduce norms of environmental observance within a set of cooperation activities in the country. The profile will identify essential links between environment and poverty reduction. It will also become a basis of information and will help to target political dialogue and cooperation with the country on essential issues like sustainable development or sensitization of political authorities on environmental issues.

I.3. Methodology

The methodology used in this work was especially dictated by the terms of reference and by available documentation on the situation of environment and related policy and laws.

The first step consisted of collecting available information on studies/reports on the status of environment in Rwanda and its integration in various developments (Agriculture, Animal breeding, Water, Energy, Tourism, etc.)

Then followed the exploitation and analysis of various documents on national policies and sectoral strategies developed by different ministries in charge of management of natural resources, protection of environment, infrastructure, agriculture and livestock)

Field visits were also organized namely at the level of ministries (MINITERE, MINALOC, MINAGRI), provinces, some districts, public institutions (ORTPN, REMA), some local and international organizations (EC, UNDP, NBI,…).

During this work we have given priority to the analysis of all key documents such as the DSP, various evaluation reports, various documents availed by the European Community, studies on environmental impacts of projects financed by the EC, documents on environment, paper on the environmental

policy, the regulatory and legislative framework on environment and its implementation, international conventions as regards environment, performance contracts (IMIHIGO) signed between Districts and Kigali City mayors and the President of the Republic.

All that documentation was completed by information collected from different websites such as the following:
www.unep.net/profile,
www.earthrends.wri.org,
www.un.org/esa/agenda21/natlinfo/wssd/
etc…..

II. STATE OF ENVIRONMENT IN RWANDA

II.1. BIOPHYSICAL ENVIRONMENT

II. 1.1. Geophysical characteristics [19]

II.1.1.1. Location

Rwanda is geographically located in Central Africa between 1°04′ and 2°51′ latitude south and between 28°45′ and 31°15′ longitude East. Its surface area is 26.338 km^2 with an average density of 321 inhabitants by km^2 and 433 inhabitants by km^2 for the physiological density.

II.1.1.2. Relief

The Rwandan relief is hilly and mountainous with an altitude varying between 900 m and 4.507 m. The elements of that relief are:
Congo-Nil Ridge overhanging lake Kivu with an altitude ranging between 2500 m and 3000 m. It is dominated in the Northwest by the volcanoes range made of five volcanic massifs of which the highest is Karisimbi with 4507 m.
The central plateau presents a relief of hills with an altitude ranging between 1500 m and 2000 m.
The lowlands of the East are dominated by a depression characterized by hills with more or less round top and 1000 to 1500 m of altitude.
The lowlands of the South-West in Bugarama plain with an altitude of 900 m are part of the tectonic depression of the African Rift Valley.

II.1.1.3. Climate [21]

Rwanda enjoys a tropical temperate climate due to its high altitude. The average annual temperature ranges between 16°C and 20°C, without significant variations. Rainfalls are abundant although they present some irregulararities. Winds are generally around 1-3 m/s.

In the high regions of the Congo-Nil ridge, average temperatures ranges between 15 and 17°C and the rainfall is abundant. The volcanic region has much lower temperatures that can go below 0°C in some places.

In areas with intermediary altitude, average temperatures vary between 19 and 21°C and the average rainfall is around 1000 mm /year. Rainfalls are less regular, which sometimes causes periods of drought.

In the lowlands (East and Southeast), temperatures are higher and the extreme can go beyond 30°C in february and july- august. The absolute maximum of 32.8°C was recorded in the Southeast by Karama-Plateau station

on the 4th of September 1980. Thermic contrainsts are more considerable there than in the remaining part of the country. Rainfalls are less abundant in that region (700 to 970 mm/year).

Rwandan seasons are determined by the rhythm of rainfalls. Thus, the climate of the country is characterized by an alternation of four seasons of which two are rainy and the other two are dry.

However, one can notice that rainfalls are generally well distributed the whole year, despite some irregularities. Eastern and southestern regions (Umutara, Kibungo, Bugesera, Mayaga) are more affected by prolongued droughts while the northern and western regions (Ruhengeri, Gisenyi, Gikongoro and Byumba) experience specially abundant rainfalls that cause erosion, flooding, collapses and landslides.

As it is shown by the map of annual distribution of average rainfalls recorded during the period 1961-1990 (appendix VII.1), the quantity of total annual rainfalls varies between 800 mm in the Northeast of Rwanda (Estern Umutara) and 1600 mm in the natural forest of Nyungwe (Wisumo) and in the high lands of the Northwest (Kinigi). The decrease of rainfalls is observed in the region of Bugesera (900 mm) and in the Western part of Gisenyi Province (1200 mm). The increase of rainfalls is observed in some regions like Kibungo (Gahororo, 1200 mm); in the Southwest (Mibirizi, 1450 mm) and in the natural forest of Gishwati (1350 mm). The region that is characterized by the highest level of rainfalls (over the average isohyete of 1200 mm) is located in the western half of the country, from Byumba to Kibeho and from Kinigi to Mibirizi including the region bordering lake Kivu.

II. 1.2. Soils

II.1.2.1. Pedology [21, 31]

The Rwandan pedology is characterized by six types of soils namely:

- Soils derived from schistose, sandstones and quartzite formations (50%);
- Soils derived from granite and gneissic formations (20%);
- Soils derived from basic intrusive rocks (10%);
- Soils derived from recent volcanic materials (10%);
- Soils derived from old volcanic materials (4%);
- Alluvial and colluvial soils (6%).

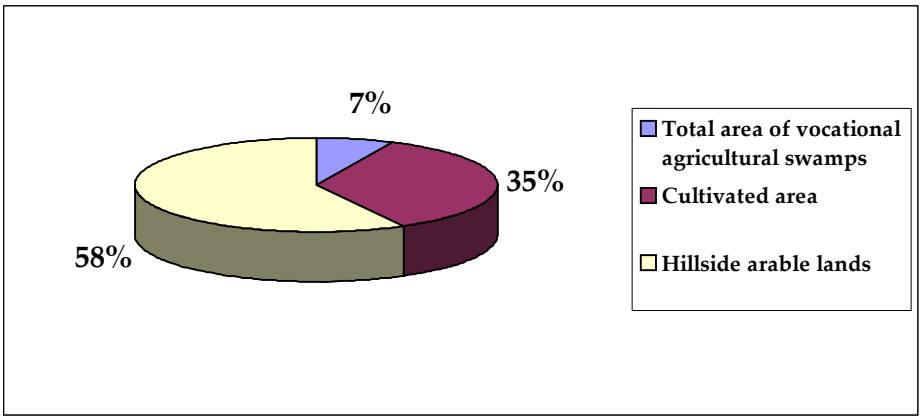
The Rwandan underground contains deposits of mines such as tin, wolfram, colombo-tentalite and gold. There are also a big number of quarries (clay, sand, building stones, limestones, peat, etc). From 1999 to 2001, the mining sector played an important role in the national economy. It contributed to

export revenues in following proportions: 5.9% in 1999; 12.58% in 2000; 42.64% in 2001.

II.1.2.2. Use of soils [7]

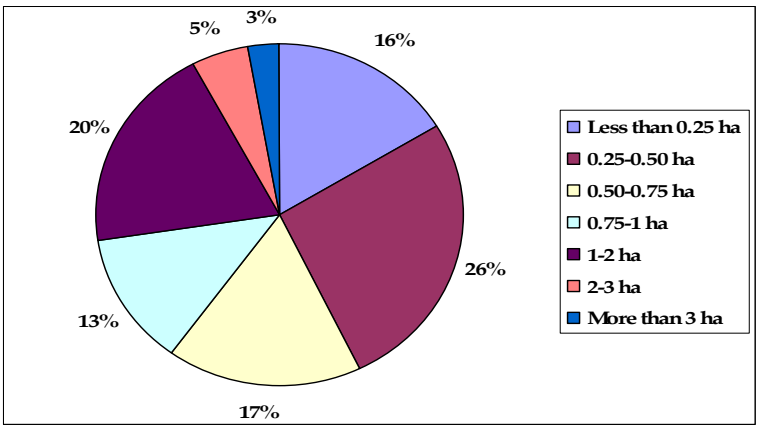
The exploitation of land employs 88% of the active population. The number of agricultural households is about 1.4 million with an average surface of 0.60 ha. Land resource is thus limited and coveted and that causes overexploitation and inappropriate use of lands with disastrous consequences on land resources themselves and on environment in general. Rwanda has also about 165 000 ha of marshes of which 66 000 ha can be developed into ricefields

Figure 1: Distribution of arable lands[1]



However, there are big differences as the surface of arable land varies from less than 0.25 ha to more than 3 ha by family exploitation (see chart 2) according to regions.

Figure 2: Distribution of the surface of arable lands[2]



II.1.2.3. Soil degradation

[1] Source : Communication Nationale Initiale sur les changements Climatiques, MINITERE 2005.
[2] Source : Enquête MINECOFIN 2002/ MINAGRI 2005

Rwandan soils are naturally fragile. They derive from physico-chemical alteration of schistose, quartzite, gneissic, granite and volcanic rocks that compose the superficial geology of the country.

The degradation of the natural milieu is particularly linked to hydrous erosion that affects a big portion of cultivated lands. We assume that the hydrous erosion reduce the capacity to feed 40 000 persons per year and causes annual losses of about 15 000 000 tones of soil, due to a bad conservation of soils, estimated at 945 200 tones of organic materials, 41 210 tones of nitrogen, 280 tones of phosphorus and 3 055 tones of potassium for the whole country.

The generic impacts of erosion are numerous:

- Loss of soils fertility due to leaching of arrable lands with its consequences on agricultural production;
- Increase of sedimentation on downhill cultivated lands from eroded plots.
- Risks of crops destruction and stilting-up particularly high in marshes and plains (areas that are more favourable to agriculture);
- Risks of local landslides, collapses and mudslides;
- Risks of irreversibble leaching of lands.

The hilly relief that characterizes an important part of the Rwandan topography is one of the main factors of soil vulnerability.

a. Highland soils [31]

The highland soils particularly prone to erosion and landslides comprise notably regions of the Congo-Nile ridge, valleys and lowlands (peat lands) as well as highland meadows. Soils of foothills of the Congo-Nile Ridge and of other transition regions between the central plateau and highlands are fertile but, due to deforestation and unappropriate agricultural practices, they are vulnerable to erosion.

b. Soils of the central plateau [31]

The central plateau covers the regions of South and Southeast (former provinces of Gitarama, Butare, a part of Kigali-Ngali and Kibungo). The types of their soils are hill ferrolsoils and valley histosoils. The slopes of hills are exposed to erosion notably for the case of clay-sandy or gravelly soils.

c. Soils of the lowlands [31]

They cover the Eastern and Southeastern regions and their types are ferrolsoils with savannah vegetation. Like the region of Bugesera, the region of the river-lake complex along Nyabarongo and Akanyaru rivers underwent

important leaching. In addition, the geological structure of soils in those regions allows rain waters to infiltrate deeply into soils, and that can partly explain the lack of runoff waters and shallow brooks.

d. Soils of valleys [31]

These are soils of histosoil and peatsoil types that constitute potential agricultural and energy wealth (case of intramountain basins of Kamiranzovu and Rugezi).

In the wide water surfaces of eastern regions like Umutara and Bugesera, as well as the Rusizi region (Bugarama), the valleys are of vertisoil and alluvial type and they are fertile. The slopes, however slight they may be, are threatened by strong erosion due to the weak permeability of soils.

The exploitation of any peat for fuel production purposes would require a preliminary development plan for swampy areas. In fact, any extraction of peat is associated with drainage and exondation, two factors likely to impact negatively on the crucial role of wet ecosystems and swamps in regulating the hydrology. Moreover, the exploitation of mines and quarries spoils the landscape and more often constitutes a source of soil erosion, water pollution and a danger to human health. A good number of querries are not rehabilitated and left as they are by their exploitants.

II.1.3. Water resources [10, 19, 21]

Rwanda has a relatively big quantity of water: rivers, lakes and marshes occupy a surface of 211000 ha or about 8% of the national territory (lakes: 128000 ha, rivers: 7260 ha and marshes: 77000 ha).

II.1.3.1. Surface water

Rwanda has got a dense hydrographic network of ± 2 km/km² (length of the superficial flow network by km² of surface). The country is divided into two hydrographic basins by a separating line called Congo-Nile Ridge, oriented from the North to the South and ± perpendicular to the volcanoes chain, making natural obstacles to exchange between the catchment basins of the Northern Kivu and the Southwest of Uganda and those of Rwanda.

In the West of that line there is the Congolese basin (33% of the surface of the national territory) that drains 10% of water resources of the country. It comprises rivers Sebeya, Koko, Rusizi, Rubyiro, as affluents of Lake Kivu (102800 ha on the Rwandan side, 473 m of maximum depth), Ruhwa and many other small rivers.

In the East of the Congo-Nile Ridge there is the Nile basin which covers 67% of the National Territory and drains 90% of Rwandan waters by two main rivers namely Nyabarongo and Akagera. The latter is the main affluent of Lake Victoria with an average outflow of 256 m^3/s at Rusumo station and thus is considered as the source of Nile. The basin of Nile in Rwanda comprises a lot of small lakes (Bulera, Ruhondo, Cyohoha South, Mugesera, Muhazi, Rwampanga, Mihindi, Mirayi and many others). Those lakes are not very deep (5 to 7 m of depth) except for Lake Bulera and Ruhondo which are 50 to 60 m deep.

II.1.3.2. Underground water

The outflow of the underground renewable water resource is estimated at 66 m^3/s. Out of this, the 22000 known sources contribute an output of 9 m^3/s. In general, little information is available on underground resources.

II.1.3.3. Quality of water [1, 16]

In Rwanda the quality of water is generally good with a pH comprised between 6 and 7.5. Surface waters are often carrying sediments and in mining and volcanic regions those waters can contain arsenic, lead, mercury, fluoride, iodide and other toxic metalloids and heavy metals. The physico-chemical pollution of water is not frequent due to the small level of industrialization and use of agricultural chemical inputs. The microbiological pollution is often observed and it comes from various domestic wastes and rubishes carried by rain water towards the natural milieu. The pollution of water courses and lakes by the water hyacinth and by other harmful aquatic plants is a phenomenon very recent and alarming in Rwanda.

II.1.3.4. Wetlands

The wetlands of Rwanda are composed of marshes, lakes, rivers and brooks representing around 14.9% of the national territory of which 6,3% consist of marshes and 8,6% of lakes, water courses and pools of permanent or seasonal fresh water.

In the highlands of the Northwest, there are lakes Bulera and Ruhondo as well as the marsh of Rugezi. In the Centre and the East of the country, wide marshes are those of Nyabarongo, Akanyaru and Akagera rivers. Many cuvette lakes communicate with those rivers and most of them are located in the Akagera National Park. From the Southeast to the Northwest, there are lakes Cyohoha South, Mugesera, Rweru, Sake, Cyambwe, Ihema, Milindi, Rwanyakizinga, Kivumba, etc.

Given the importance that the Government of Rwanda gives to wetlands, in 2003 it ratified the Ramsar Convention or convention on wetlands and has

already registered on the Ramsar list the site of Rugezi and identified other potential sites that will be registered in the future, like the complex of Mugesera-Rweru, Kamiranzuvu marsh and the wet zones of the Akagera National Park. In addition, a plan of action for the implementation of the Ramsar Convention was developed in June 2004.

The wetlands ensure several functions and provide numerous services to people. For instance they ensure control of floods and the recharge of underground waters. They play the role of alleviating the erosive force of water and thus facilitate the deposit of sediments in suspension that could block water courses downstream.

II.1.3.5. Degradation of water ressources [9]

The degradation of water ressources is characterized by:

- Frequent flooding and their effects on health, infrastructures, economy, land and aquatic ecosystems.
- The problems linked to water pollution (toxic products, water hyacinth …);
- Erosion of serving basins, sedimentation of water courses and silting up of lakes;
- overexploitation of lakes and water reserves;
- Periods of deficit in rainfalls and droughts leading to the decrease of river outflow and the disturbance of the hydrologic cycle as a whole.

II.1.4. Biodiversity and forests [6, 18, 20, 24]

Rwanda is covered by diversified ecosystems: natural ecosystems made of mountain ombrophile forests, gallery forests, savannahs, wet and aquatic zones, wood and agro-ecosystems. All those ecosystems host a rich flora and fauna.

II.1.4.1. Protected areas

The fauna and the flora can be better preserved and protected thanks to the establishment of a network made of protected areas like national parks and forest reserves to which the best management is applied.

However, through time and due to human activities, their surface has considerably decreased.

Table 1: Reduction of the surface of protected areas in Rwanda[3]

Names of parks	Surface in ha (at the time of its creation)	Surface today	Remarks
Akagera National Park	250 000	108 500	Created in 1934, it is the guarantee of the conservation of faune and flore of the Estern savannahs ecosystem
Volcanoes National Park	34 000	16 000	Created in 1925, it represents the last refuge of the natural flora of volcanic lands and the fauna which is specific to the volcanic ecosystems of the North.
Nyungwe National Park	-	103 000	Created in 2005, it comprises also a small forest of Cyamudongo at 10 km Southwest of Nyungwe. It guarants the survival of the mountain fauna and flora of the Southwest of Rwanda.

The geographical distribution of those parks on the national territory is a guarantee of the conservation of biological diversity representative of the fauna and flora of the country.

The Volcanoes National Park (VNP) is worldwide famous due to the presence of the mountain gorilla (*Gorilla beringei*). In addition to that spectacular animal, particular ecology (high altitude, plenty of rainfalls, fresh temperature,...) induces a varied biodiversity. The VNP host 245 species of plants of which 17 are predominant, including 13 orchid internationally protected, 115 species of mammals, 187 species of birds, 27 species of reptiles and amphibians and 33 species of arthropods. Some of those species are endemic and others are internationally protected.

The Nyungwe National Park is the widest mountain shade forest of Africa with a surface of 101.500 ha. It contains more than 1200 species of flora of which 140 species of orchids, 260 species of ligneous and herbaceous plants, 24 species of trees, 275 species of birds of which 26 endemic in the Rift Albertin and 3 are on the red list of the IUCN (Bradypterus graueri, Crypto spiza shelleyi and Apdis argentea), 13 species of primates representing 1/5 of primate species inventoried in Africa and the *Colobus angolensis ruwenzori* that appear in group of 300 to 400 individuals.

The Akagera National Parc covers a surface of about 108.500 ha and hosts more than 900 species of plants, 90 mammals, of which 47 species of big mammals,

[3] Stratégie Nationale et Plan d'action pour la conservation de la biodiversité au Rwanda, MINITERE, 2003.

530 species of birds, 9 species of amphibians and 23 species of reptiles. Four animal species are protected by the CITES (Convention on International Trade of Endangered Species) namely *Loxodonta Africana, Sincerus caffer, Panthera leo* and *Tragelaphus oryx.*

II.1.4.2. Relict forests and gallery forests

The Gishwati forest that covered 21.000 ha before 1981, consisted of only 600 ha in 2002.

The natural forest of Mukura that spreads on 3.000 ha in 1960 covered only 800 ha in 2002. It is similar to that of Gishwati regarding tree species and altitude (2000~3000 m).

Relict forests and savannahs of the East located around the Akagera Park hosts a variety of endemic and rare species whose majority is used in traditional medicine.

Gallery forests accommodate an important biodiversity with endemic and rare species. That is for instance the case of the *Blighia unijugata, Grewia forbese, Rhus vulgaris, Pterygota mildbraedii* and *Ficus sp*.

In general, on a period of about 40 years, the surface of the natural forests of Rwanda underwent a decrease of about 65% between 1960 and 2002. The search of arable lands, extensive farming, abusive use of forests for firewood, production of wood charcoal and house building in urban areas, as well as a bad management have sensibly contributed to the reduction of the surface of forests.

II.1.4.3. Biodiversity of wetlands [5, 18, 20]

The ecosystems of the Rwandan wetlands host a biological diversity rich in vegetal and animal species (more than 104 flower species are registered there), except for Lake Kivu, Bulera and Ruhondo that know some liminologic problems.

The Lake Kivu contains a very poor aquatic flora and the density of the phytoplancton is relatively low due to the lack of mixture of layers (the nutrients are caught at the bottom of the lake). The aquatic fauna is also poor due to the physical isolation of the lake.

Most lakes of the Akagera National Park are very rich in biodiversity: phytoplancton, fish species and ornithologic fauna. The flora is dominated by the Cyperus, Phragmithes, Phoenix, etc. The Water Hyacinth (Eichornia crassipes) is present and starting to cover more important surfaces of lakes, thus constituting a threat to their biological diversity. Some lakes like Cyambwe, Rwampanga and Rweru are particularly rich in hyppopotamuses and crocodiles.

One can also find many other lakes there such as Nasho, lakes of Gisaka and lakes of Bugesera that contains a phytoplancton which is very rich in biodiversity and a flora that is mainly dominated by papyraie with Cyperus papyrus mixed with Miscandium violaceum and Nymphea nouchallii. All those lakes are associated with gally forests onshore or on small islands.

Concerning the Northern lakes (Bulera and Ruhondo), the aquatic flora and fauna are poor due to the physico-chemical situation unfavourable to their development and the isolation of the two lakes. The concentration of the plankton is less important in Lake Bulera than in Ruhondo. They count 48 species grouped in 4 families (chlorophyceous, Cyanophyceous, pyraphytes and bacillariophyceous).

Lake Muhazi is locked, isolated, and its ichthyologic fauna is very limited. One can find there three endemic species and other nine introduced from outside. The lake is very rich in phytoplancton.

The macroflore of the marsh is mosly made of wide spaces of papyraie with some zones of Miscanthidium. The low layer is covered with Cyclosorus stratus. The fauna of big rivers and associated marshes comprises ungulates, carnivorous, primates, rodents, lagomorphous, insectivorous and birds.

II.1.4.3. Agro-ecosystems [18]

II.1.4.3.1. Biodiversity in agricultural systems

The natural ecosystems that covered the country before the colonial period have been modified by the demographic pressure on more than 90% of the national territory. Human settlement, diversified agro-pastoral practices, consumption of forest products, bush fires and urbanization have caused the disappearance of that climatic formation. Those changes caused secondary formations consisting essentially of graminaceous plants, numerous seasonal or perennial species alternating with crops.

Agricultural lands presently cover around 52% of the total surface of the country and are permanently cultivated. The time between two growing seasons is the only period of respite. Those lands carry various crops that play an essential role in the national economy. Those crops are usually grouped in two categories: food producing crops and industrial crops.

Among the food produing crops, we can mention sorghum, beans (Phaseolus vulgaris), eleusine (Eleusine corocana), Colocases (Colocasia antignorum), maize (Zea mays), rice (Oryza sativa), wheat (Triticum sp), barley (Hordeum

vulgare), peas (Pisum sativum), soja bean (Soja hispada), peanut (Arachis hypogea), sweet potato (Ipomea durcis), potato, cassava (manihot esculanta) and banana (Musa).

The importance of each crop varies according to regions. Some crops, like bananas, potatoes, different varieties of wheat, sorghums and beans are subject to a very big scale trade. Potatoes, beans, cassava and bananas are present everywhere in the daily diet of the population.

The industrial crops are very few. They are limited to coffee, tea and pyrethrum. The agriculture production systems are also associated to a lot of wild species.

II.1.4.3.2. Pastoral zones [20]

In Rwanda, the essential part of animal breeding is limited to the family scale and to a small number of animals by household. As agriculture occupies the biggest portion of lands, the cattle graze in fallows, on road borders, and in some parts of marginal lands. This obliges farmers to adopt the semi-permanent stabling and to grow fodder crops such as Tripsacum laxum, Setaria spp, Desmodeum spp, Pennisetum purpureum, Mucuna pruriensis, Cajanus cajan, Calliandra calothyrsis, Leucaena diverifolia, Sesbania sesban, etc. However, we can notice the development of ranching in Umutara and Gishwati. Other pastoral spaces are very limited and are disseminated all over the country.

Those spaces are prone to bush fires, trampling and sometimes overgrazing. The latter is the main cause of reduction of the biological diversity as it exterminates the most precious species along with pyrophyle species with small bromatologic value such as Eragrostis spp, Sporobulus spp and Digitqria spp.

II.1.4.3.3. Forestry and tree cultivation [20]

Tree cultivation in Rwanda was limited to some plants around households such as Ficus Thoningii, Euphorbia Tirucalli, Erythrina abyssinica, Vernonia amygdalena, Dracaena afromontana, etc., but the cultivation of woody perennials for timber, energy generation or other services was not part of the customs. That resulted in a massive exploitation that quickly proved its limits.

The first wood plantations were created in 1920 and 1948 and only consisted of Eucalyptus. Later on, other species were introduced. These were namely Pinus spp, Callistris spp, Grevillea robusta, Cedrella spp, Cupressus. The Arboretum of Ruhande (ISAR Station) has 206 species among which 146 feuillus, 56 resinous and a species of bamboo. Thoses species proved to be

dangerous for the biological patrimony because they used to drain and acidify places that are already acid, what caused the reduction or even the extermination of the undergrowth. Thus planting those species would lead to erosion. The covered surface was estimated at 256,300 hectares in 1998. Despite efforts of diversifying tree species, we estimate that 99% of woods consiste of Eucalyptus.

A replacement of those woods by agro-forestry species such as Grevillea, Cedrella, Maesopsis, Calliandra, Leucena proves to be urgente. That is why agro-forestry practices have to be developed even in agricultural zones.

II.1.4.3.4. Deforestation

The deforestation phenomenon is mostly intensified by the production of fire wood and wood charcoal, and it constitutes a high threat to vulnerable groups and to the whole population since the main source of energy in Rwanda is wood.

The demographic pression associated to high demand of wood products and to other human activities thus constitutes the main cause of intensive deforestation, and it immediately results in reduction of the vegetal and forest cover. Then soil erosion and degradation become frequent as soon as intense rainfalls occur.

II.3. SOCIO-ECONOMIC ENVIRONMENT

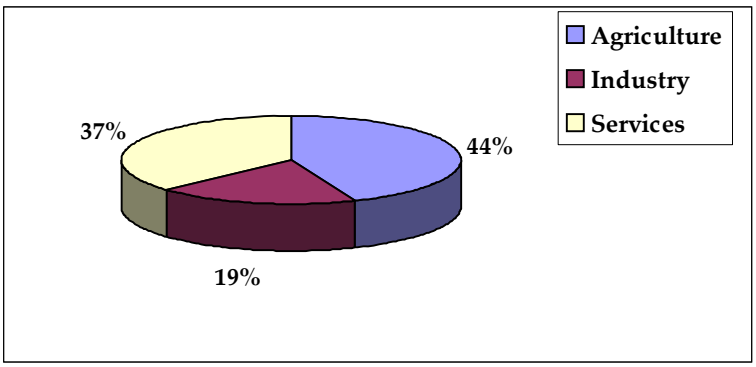
I.3.1. Socio-demographic data [28]

In August 2002, Rwanda counted 8.128.553 inhabitants for a surface of 26.338 km^2, i.e. a physical density of 321 inhabitants/km^2. Given that the effectively useful land is only of 18.740 km^2, the physiologic density in 2002 was 378 inhabitants by km^2. Rwanda is classified among the poorest country of the world. About 50% of the population is below 16 years of age and 90% live in rural areas.

In 2002, the GDP per inhabitant in constant price was 77.870 FRW. The real growth of the GDP for the year 2002 was 9,4% compared to the year 2001, mostly due to a good food production during the big agricultural seasons of 2002.

The Gross Domestic Product of Rwanda is dominated by the agriculture sector. In 2002, the portion of agriculture in the GDP was more than 43%, that of industry was 19% and that of services was 37%.

Figure 3: Composition of the GDP in 2002



Source : MINECOFIN, Edition n°5 August 2002 : Indicators of economic developement

II.3.2. Human settlements [15, 16, 17]

The Rwandan habitat has been since long scattered and it remains so. It has for long been characterized by the traditional use of space associated with the ancestral lifestyle but which does not correspond any more to present environmental and economic constraints. It is in that perspective that the present policy of the Government of Rwanda in matters of habitat consists of encouraging a clustered habitat commonly called «IMIDUGUDU».

In urban areas, Rwanda has not yet a global city development plan. There are only plans of different towns of which some have expired and need updating. Urban centres developed spontaneously without taking environmental aspects into consideration.

Sanitary facilities are insufficient and sometimes inadequate in city centers. In peri-urban zones qualified as spontaneous quarters, solide wastes are piled in disorder, drinking water is rare, and rain water draining gutters are insufficient. Thus diseases are frequent in those places, the degradation of environment is more pronounced and living conditions very poor.

City development should normally be based on urban planning documents like the "Schéma Directeur d'Aménagement et d'Urbanisme (SDAU)". Nowadays, only 2 centers have got that kind of document and the SDAU of Kigali and Rwamagana are under developemnt. The policy of city development which is under finalization is aimed at supporting districts in their efforts to quickly get urban planning documents integrating environmental aspects.

II.3.3. Energy and transport [16, 21]

In Rwanda, the biomas constitutes the main source of energy as it covers 94% of national needs. Woody fuels and vegetal wastes are the sources of energy used in households, industries and handcrafts.
However, the country has also other sources of alternative energy which are not yet exploited namely peat estimated at 155 millions of tones, methane gas of the Lake Kivu representing 57 billions m^3 and solar energy.

Combined with anthropic factors (agriculture, drainage of marshes, deforestation and overexpoitation of river basins), the hydrous deficit is considered to be the main factor of vulnerability of the hydro-electricity sub-sector of the energy sector. It is evident that the pluviometric deficit leads to the reduction of offer in water resource and, consequently, in hydro-electricity. That was the case for the power plants of Ntaruka and Mukungwa on lakes Bulera and Ruhondo, two main interior sources of electric energy of Rwanda.
Globally, the energy sector is essentially of the traditional type as only wood (15% wood charcoal, 71 % fire wood and 8% harvest wastes) covers about 94% of the total energy needs of the country, against only 5 % for the contribution of petrol products and 1% for electric energy.

Moreover, the hydroelectricity infrastracture is still weak and the present production does not exceed 27 MW while the demand is more than 40 MW; However, the electricity from diesel thermic sources was recently produced at Jabana and Gatsata, and the mobilization of funds and investors is underway for other hydro-electric projects:

- 28 MW on Nyabarongo river in Bulinga;
- 60 MW (three countries)on Akagera at Rusumo;
- Rusizi II; Mukungwa III; Rukarara and various other microplants.

The transport sector is generally dominated by road transport that totals 14000 Km of roads and tracks. In the sub-sector of air transport, the country has two international airports (Kigali and Kamembe) and aerodromes (Huye, Rubavu and Ruhengeri, etc) used in internal transport. Lake transport is used mainly on Lake Kivu for connecting districts of the Western Province. But the construction of certain roads was done without studying the environmental impact, which caused landslides, collapses, gullies and sandbanks in depressions (example: Road Gitarama- Ngororero-Mukamira).

II.3.4. Industry and Mining [32]

The industrial tissue of Rwanda is modest and recent: 78% of industrial companies were created between 1964 and 1987. In 2002, the contribution of

the industry sector to the GDP was of 19% of which the major part was from the agro-industry and the rest from small and medium size companies which produce consumption goods in replacement of importation by using simple technologies.
One of the major problems is related to the location of industrial units as some of them are installed near residence houses, others in valleys (wet lands). Those installations are sometimes sources of pollution because of their wastes, liquid (waste waters) or gaseous (dust, smoke, smell), and their noises.

In the mining sector, the rehabilitation of quarries was never a preoccupation of those responsible. Many abandonned quarries are not rehabilitated. The exploitation of mines and quarries is often a source of water pollution due to contamination linked with the absense of waste water purification, classic practices of exploitation and soil erosion.

II.3.5. Agriculture

Agriculture is the most important sector of the Rwandan economy with a contribution of 47% to the GDP (12% for livestock) and contributes 71% of export revenus. Coffee and tea are the main export crops, with about 62 millions US$ of export revenu in 2005, of which 38 millions US$ for coffee and 24 millions US$ [4] for tea.

The agriculture production system is based on small family exploitations whose production is consumed by the owners at more than 80 %. The systems of crops are complex, based on the diversification of productions and the association of crops. Seven main crops, namley banana, bean, sweet potato, cassava, sorghum and potato, of which the first five are present in 90 % of production units and constitute the common basis for all the regions of Rwanda.

The little use of chemical fertilizers (see appendix 1.12) and pesticides, the low level of equipment and the very limited use of research based technologies result in small yields which are also very vulnerable to climatic changes.

Research and popularizaton should normally contribute to growth by the promotion of modern inputs and appropriate technologies, but it was noticed that during the PRSP1, there was no clear strategy concerning research and popularization. That is the reason why the MINAGRI has put in place RADA, RARDA and restructured ISAR.

The extensive agriculture practiced by the Rwandan population contributes to

[4] Source : MINECOFIN Export data 2006 using OCIR Thé/ OCIR Café Volume Figures

the degradation of environment. The agricultural intensification at the level of projects was often realized without taking into account environmental drawbacks of used inputs (mineral fertilizers, pesticides, herbicides and used techniques).

II.3.6. Animal husbandry [25]

Animal husbandry, essentially made of cattle, is mainly extensive. Average milk production is 1 litre / cow/ day for 180 days of lactation (MINAGRI, 2001).

The pastures consist mainly of family fallows and marginal lands considered as unappropriate to agriculture such as the undergrowth. The demographic pressure progressively leads to the semi-intensification or intensification of fodder resources used to feed animals.

Data from MINAGRI (2006) show that the number of cattle increased by 60% between 2000 and 2005 (see appendix 1.13): the number of cows increased by 43%, goats 67%, sheep 195%, porcs 93%, poultry 44% and rabbits 67%.

The limited subsisting pastoral surfaces are badly used because farmers do not master the rotative management of pastures. That is showed by the overgrazing and overexploitation causing trampling, degradation and disappearance of vegetal cover. The permanent stabulation, the semi-stabulation and extensive farming constitute the three main types of animal husbandry.

One should note that today there is in MINAGRI through RARDA, a programme called « *One Cow to Every Poor Family in Rwanda* » that will cover all the districts of the contry in order to contribute to poverty reduction and food security.

II.3.7. Various pollutions [21, 29]

Pollution comes from domestic and industrial wastes, agro-pastoral activities, anarchical exploitation of mines and quarries, and from invading plants like water Hyacinth.

Waste water and solid wastes coming namly from septic tanks and pit latrines, animal wastes and refuse infest water, air and soil. Although Rwandan factories are still few, they are mostly installed inside or near wet zones and reject all their wastes and sub-products in water courses and marshes without prior treatment. Factories also release smokes in the atmosphere and cause air pollution.

Agro-pastoral activities implicate the use of fertilizers, pesticides and herbicides often harmful to water, air and soil. As for the water hyacinth, the Pistia and other aquatic weeds, they have invaded a big part of aquatic ecosystems of Rwanda where they are responsible for the degradation of water quality.

Finally, the preparation of mines, which consumes a lot of water, constitutes also a major pollutant of water courses in Rwanda. The exploitation of mines and quarries produces massive quantities of refuse that appear in nature in the form of enormous hip of earth and rocks that are carried by rain water towards valleys, where water courses are chocked and covered by masses of sterile mineral materials, harmfull to any kind of vegetation.

II.4. CATASTROPHES AND NATURAL RISKS

We can distinguish two types of catastrophes affecting environment: natural and anthropic.

II.4.1. Natural catastrophes [13, 18]

The natural catastrophes are those due to climatic and seismo-volcanic disturbances. They constitute a permanent threat for our country and consist notably of droughts, torrential rains, floodings, landslides, earthquakes, volcanic eruptions and bush fires not linked to anthropic action.

II.4.1.1. Droughts and floodings

Like other Central and Estern African regions, Rwanda faces sometimes long periods of drought, sometimes serious floodings. Drought is responsible of certain diseases, food insecurity, migrations of the population, reduction or loss of vegetal and animal species. For example, we can mention the case of death of hyppopotamouses in the central valley of Umutara in 2000, the decrease of water resources and the drainage of marshes in the region of Bugesera in 2000 (drying of Lake Cyohoha in 2000).

Torrential rains are responsible for soil erosion, collapses and floodings that destroy crops, houses and development infrastructures (roads, bridges, schools, etc.), and also cause losses of human and animal lives. Thus the flooding of September-December 2001 and those of May 2002 caused the death of 108 people in the Northern and the Western regions of Rwanda.

II.4.1.2. Earthquakes and volcanic eruptions

Rwanda is located in the region of the occidental Rift valley, subject to risks of earthquakes and volcanic eruptions which cause death of populations

affected by lava flows and volcanic dust, and also can release gases that are toxic to the surrounding population. Those earthquakes and volcanic eruptions also cause massive migrations of the population, responsible for the destruction of environment. The volcaninc eruption of Nyiragongo in the Democratic Republic of Congo (DRC) on the 17/01/2002 caused the displacement of 300.000 persons in the region of Goma towards Gisenyi town in Rwanda.

II.4.2. Anthropic catastrophes [13, 20]

II.4.2.1. Bush fires

Bush fires are very frequent in Rwanda during the dry season especially in the Eastern and Southeastern regions (former province of Umutara, Kibungo and Bugesera).

Parks and protected areas are the most threatened for pastoral reasons, poaching, mine exploitation, preparation of charcoal, etc. That phenomenon is responsible for land degradation, deforestation, loss of biodiversity, etc.

II.4.2.2. Conflicts and Wars

Since 1959 Rwanda experienced social conflicts and crises that provoked losses of humane lives. The most recent and most blattant case is the war that plunged Rwanda into mourning since 1990, followed by the genocide and massacres of 1994 which had the following consequences on environment:

- degradation of environnement in general;
- massive migrations of the population that caused degradation and modification of ecosystems;
- loss of human resources in the area of environment;
- Decrease of formerly protected areas.

II.4.2.3. Other catastrophes

a. Diseases and pests

Some elements of the biodiversity are targetted by various diseases and pests. In normal times, damages are not very important. But sometimes epidemics occur and cause massive destructions as was the case of the destruction of Cypress afforestation by Cinnera cupressis at the end of the 80s, the destruction of crops and other plants by the legionnaire worms in the Eastern half of the country and Mayaga in 1998, and the destruction of Pinus afforestation in the Congo-Nil Ridge in 1998. Food-producing and industrial crops are regularly invaded by diseases, insects and different pests. For example the cassava mosaic does not allow any harvest, the banana fusariosis is the main factor of collapse in banana production.

b. Risks of explosion, accident and fire

Some chemical products have the nature of exploding under the effect of high temperature when they are badly kept or have expired. That is the case of Mancozeb that took fire in Gikondo warehouses. We should also mention the misuse of toxic products, fires due to various causes, namely those concerning petrol stations, garages, industries and factories; road accidents and bad electric installations, etc.

III. ENVIRONMENTAL POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

III.1. ENVIRONMENTAL POLICY

III.1.1. Vision 2020 [17]

Environment protection and management rank among the main pillars of vision 2020. By 2020, the Government intends to have built a nation where pressure on natural resources mainly lands, water, biomass, biodiversity will have sensitively decreased and the pollution process and environmental degradation reversed. The management and protection of these resources and environment are more rational and strictly under control in order to preserve and leave to future generations a basic heritage which is likely to ensure sustainable development.

Therefore, with regard to natural resources and environment protection and management, the Government of the Republic of Rwanda has set an objective of decreasing the percentage of households involved in direct exploitation of primary agriculture from 90% to 50%; setting up efficient and updated regulations which are appropriate for sustainable protection and management of natural resources and environment; decreasing within the national energetic assessment rates of diseases related to environmental degradation and firewood from 60% and 94% to 50% respectively.

To achieve these objectives, Rwanda will ensure: 1) that the environment issue is integrated into all education, sensitisation, and development policies and programmes as well as in all decision-making processes, 2) the promotion of grassroot communities participation with more involvement of women and the youth in environment protection and management; 3) that the precaution principle is set up to alleviate negative effects of socio-economic activities to our environment; 4) a diversification of energy sources that will be made available to the population to decrease pressure on biomass; 5) that the " polluter-pays" principle as well as preventive and penal measures are set up

to safeguard the environment; 6) that a study on environmental impact be conducted for any development project and programme; 7) the planning of industrial sites establishment and control of their effects on environment and the population; 8) the promotion of more environment friendly transport, stocking and industrial products and waste elimination technologies; 9) regulations relating to mine exploitation and mine discharge treatment are applied; 10) rehabilitation of former quarry sites; 11) that the Standards Bureau for local and imported products is strengthened; 12) a statistic database on natural resources and environment and a quick alert system to prevent/ anticipate natural disasters are set up and that a scheme for victims of a natural calamity is created; 13) that Rwanda Environment Management Authority (REMA) is set up and supported, (14) the cooperation with other countries and international institutions in the area of environment protection and management.

Public institutions should interest and urge the private sector, civil society, donors and grassroot communities to efficiently contribute to natural resources management and environment protection. The implementation of laws and regulations, adoption and disseminination of environment friendly technologies will constitute a big priority for both central and local Governments. Finally, regional and international cooperation will be promoted and strengthened to efficiently contribute to environment protection and management. Public institutions in charge of environment protection and management will be strengthened and the role of the private sector and civil society will be clearly defined and enhanced for a more coordinated and harmonised environmental action.

III.1.2. National Policy on Environment [33]

With reference to the National Policy on Environment (NPE) in Rwanda, as of November 2003, to ensure a sustainable environment protection and management, the following principles mention among others that:

1. It is every person's right to live in a safe and stable environment, but on the other hand, they must keep it salubrious,
2. The national economic growth must be based on rational use of resources and take into acount environmental dimensions,
3. Active and effective participation of the whole population for environment protection and management,
4. A special emphasis must be laid on environmental education and sensitisation programme at all levels with more involvement of women and the youth,

5. Environmental impact is to be analysed while conducting studies of development projects.

In addition, some political options and strategic actions have been envisaged. With regard to population and land development, the NPE proposes the elaboration or updating of master plans and special plannings in urban areas.

As regards natural resources management (lands and water), the NPE proposes among others:

- to ensure the preservation and protection of soils against any form of degradation,
- to ensure that a prior study of environmental impact which underlines costs and benefits from slopes and underlying ecosystems protection is conducted for any development projects,
- to encourage programmes of rainwater collection, stocking and use.

Regarding wetlands management, forests and other reserves and biodiversity, the NPE proposes among others:

- to set up protection measures for slopes to avoid degradation of swamps,
- to promote the rehabilitation of ecosystems under degradation and restoring endangered species;

As regards environmental education, information and research, the NPE proposes among others to reinforce the human and institutional capacity building with regard to environment and to sensitise the population to protect environment.

With regard to health and sanitation, the NPE proposes among others:

- to set up a system of waste collection, transport, disposal and elimination,
- to establish norms of zone protection between dumps, human buildings and water sources,
- to set up an appropriate canal and evacuation system for waste waters and rainwater in towns and resettlement sites “imidugudu”.

As regards the environment decentralised management, the Central Government will be concerned with conservation and protection policies while tourism and environmental management will be transferred to government decentralised services at the District and Kigali City levels. At this level, the implementation capacity of this environmental policy is very low.

The strategy and the national action plan on biodiversity were approved in June 2000, and objectives and priorities for sustainable biodiversity conservation and management were defined. Biodiversity includes slopes and wetlands but also the government strategy on protected areas.

According to strategies in the area of environment, environmental concerns rank as follows:
i) political and legal frameworks relating to environment unknown by the population and/or decentralised entities; ii) low level of awareness among people with regard to environment; iii) inadequate exploitation of forests; iv) erosion ; v) exploiting quarry sites without restoring exploited parts; vi) insufficient knowledge on environment status; vii) weakness of decentralised structures in environment management ; viii) absence of appropriate environment-friendly technologies.

In general, the national environmental policy is in direct relation with other policies in the area, especially policy on agriculture, land, water and sanitation, forests, energy, industry, gender, etc.

III .2. LEGISLATIVE AND INSTITUTIONAL FRAMEWORK ON ENVIRONMENT MANAGEMENT

III.2.1. LEGISLATIVE FRAMEWORK

III.2.1.1. Constitution of the Republic of Rwanda [3]

The Constitution of the Republic of Rwanda of 04/06/2003, as amended to date, provides that:

- Every citizen has the right to live in a safe and satisfactory environment,
- Every person is obliged to protect, safeguard and ensure environment promotion,
- The State ensures environment protection,
- Every person has the right to have a private, individual or collective property (art.29 al.1);
- Private, individual or collective property is inviolable and it shall not be interfered with except in public interest, in cases and manner established by the law, and after payment of a fair and prior compensation. (art. 29 al. 2-3);
- Soil ownership and other real rights governing the soil are granted by the State.

III.2.1.2. Organic law on environment [12]

The legislative framework of environment management was set up by the Government of Rwanda by organic law No 4/2005 of April 8, 2005 establishing modes of protecting, safeguarding, and promoting environment in Rwanda. This law governs environment in the broadest sense of the term (lands, agriculture, forests, water, biodiversity, etc.). It focuses on the following principles:

(i) The whole population must contribute to the protection and efficient management of environment in all its components,

(ii) A particular emphasis must be put on education and sensitisation on environment preservation at all levels, especially among women and the youth,

(iii) Prevention rather than rehabilitation must be seen as a priority,

(iv) Impact studies must be efficiently conducted before any activity regarding swamps development or slopes ,

(v) The principle of fair sharing of benefits from efficient environment conservation and resources sharing must be respected and explained to all people concerned,

(vi) Advantages of local, national, regional and international interdependence drawn from efficient environment management must also be explained and made understood to all the people countrywide.

Moreover, the country adheres to several international agreements, treaties and conventions, though management legal tools are not yet well developed. Among other conventions ratified by the Republic of Rwanda, the most important ones which have influenced or influence the national policy with regard to environment are:

- Convention on Biological Diversity of June 10, 1992 ratified on March 18, 1995.
- United Nations Convention Framework on Climatic Changes of June 10, 1992 ratified on August 18, 1998.
- United Nations Convention on Desertification Control of June 17, 1991 and ratified on October 22, 1998.
- Vienna Convention on Ozone layer Protection of September 22, 1987 and Montreal Protocol on substances impoverishing Ozone layer of September 16, 1987, ratified on December 6, 2000.
- Stockholm Convention on Persistant Organic Pollutants (POP) adopted and ratified by the Presidential Order No 78/01 of July 8, 2002.
- Basle Convention on Dangerous Wastes, adopted on March 22, 1989

in Basle and by the Presidential Order No 29 /01 of August 24, 2003 establishing Rwanda adhesion.

- RAMSAR Convention on February 2, 1971 on wetlands
- Kyoto Protocol to the Convention Framework on Climatic Changes of March 16, 1998.

There are also decrees, statutory instruments and ministerial orders which constitute important legal tools in Rwanda; and they concern mainly the prohibition of the use of plastic bags, cutting and selling trees, organisation of forest regulations, underground waters, lakes and streams and their usage, pollution and contamination of springs, lakes, streams, public hygiene and safety, city and country planning, soil conservation and usage, etc.

III. 2.1.3 Analysis and Comments

Though the policy exists and necessary laws are provided for in the national administration, there is a long way to go before they can be implemented because:

- Some laws (for instance the law on forests, Code on mines, etc.) have to be updated and made public at all levels.
- Recent laws on lands and organic law must be supplemented by appropriate orders for their implementation.
- It is necessary to set up norms regarding the disposal of solid, liquid and gaseous wastes in Rwanda.
- Planning activities of some swamps, road construction, and /or other infrastructures likely to have negative impact on environment are undertaken without prior studies on social and environmental impact.
- Implementation of various international conventions ratified by Rwanda is still weak, especially at the decentralised level.

Therefore, there is a need of

- updating a number of old policies and laws so as to become operational, especially with regard to the promotion of more sustainable environment and more productive agriculture in time,
- speeding up implementation methods of new laws (organic law, law on lands, etc.)
- enabling districts to develop community plans for lands use and natural resources management both at the levels of districts and resettlement sites "*imidugudu*"

III.2.2. Institutional framework on Environment management

In Rwanda, institutional responsibility as regards environment and natural resources management falls under several ministries, decentralised entities (districts and sectors), local and International Non-Government Organisations (NGOs), research institutions and/or higher learning institutes.

III.2.2.1. Districts

With the recent administrative reforms, districts have been entrusted with new powers in terms of environment management, and this will certainly have a positive impact on environment and natural resources management in Rwanda. Therefore, the new organic framework within districts provides a post of a professional in charge of environment and natural resources at each level with the following duties [34]:

- To follow up the implementation process of plans and master plan of spaces in terms of their usage (agriculture, livestock, housing, natural reserves, etc) with regard to environment protection and natural resources conservation;
- To develop a sensitisation programme on environment protection for the benefit of the population;
- To develop sensitisation programmes for private entrepreneurs so that they invest in activities aimed at environment protection;
- To set up pollution control mechanisms;
- To control mine exploitation;
- To promote new energy renewable sources;
- To promote rational use of energy and water,
- To receive and analyse bids on mine and carry extraction;
- To check up whether laws and regulations relating to activities of mine and quarry exploitation are respected;
- To set up development programmes for swamps and conservation;
- To warn competent authorities in case of breach of environment related regulations and disasters that constitute a threat to environment quality,
- To check up whether recommendations from studies on environmental impact are respected during the execution.

III.2.2.2. Ministry of Lands, Environment, Forests, Water and Mines (MINITERE)

MINITERE is responsible for land use development policies (including research, land classification, agrarian laws, and land regime), development of environmental policies and procedures (including impact evaluation); natural

resources protection (water, land, flora and fauna), environmental legislation, biodiversity and other environmental aspects.
This ministry is headed by a minister and two Secretaries of State- one in charge of lands and environment, and the other in charge of water and mines.

III.2.2.3. Rwanda Environment Management Authority (REMA)

As regards biophysical environment management throughout the whole

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To follow up the implementation process of plans and master plan of spaces in terms of their usage (agriculture, livestock, housing, natural reserves, etc) with regard to environment protection and natural resources conservation;

To develop a sensitisation programme on environment protection for the benefit of the population;

To develop sensitisation programmes for private entrepreneurs so that they invest in activities aimed at environment protection;

To set up pollution control mechanisms;

To control mine exploitation;

To promote new energy renewable sources;

To promote rational use of energy and water,

To receive and analyse bids on mine and carry extraction;

To check up whether laws and regulations relating to activities of mine and quarry exploitation are respected;

To set up development programmes for swamps and conservation;

To warn competent authorities in case of breach of environment related regulations and disasters that constitute a threat to environment quality,

To check up whether recommendations from studies on environmental impact are respected during the execution.

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III.2.2.3. Rwanda Environment Management Authority (REMA)

As regards biophysical environment management throughout the whole

country, the entire responsibility is entrusted to REMA whose main mission is the implementation of the national policy on environment. This institution has among other duties:

- To coordinate various environment protection activities which are carried out by environment promotion organs, and promote integration of environment issues into various development policies, projects, plans and programmes in a bid to ensure appropriate management and rational use of environmental resources basing on sustainable production to improve the welfare in Rwanda.
- To coordinate the implementation of government policies and decisions taken by the Board of Directors, and ensure an efficient integration of environment issues into the national planning, services and institutions within the government.
- To advise the government on legislation and other measures relating to environment management or implementation of conventions, treaties, and relevant international agreements in the environment domain wherever necessary.
- To make proposals relating to environmental policies and strategies to the Government.

III.2.2.4. Ministry of Agriculture and Animal Ressources (MINAGRI)

MINAGRI is mainly mandated to develop, transform and modernise the Rwandan agriculture in general (including fishing and livestock). It includes 3 units namely the planning unit, finance and internal resources management unit and ICT unit. In addition, this ministry supervises 3 new agencies namely RADA (Rwanda Agricultural Development Authority), RARDA (Rwanda Animal Resources Development Authority) and the Rwanda Horticulture Development Authority**)**

III.2.2.5. Ministry of Infrastructures (MININFRA)

MININFRA is in charge of public infrastructures (buildings, roads, etc.), energy, transport and communication. This ministry is also in charge of housing and town planning. MININFRA mainly gets involved in environment management through urban planning.

III.2.2.6. Rwanda Office of Tourism and National Parks (ORTPN)

Rwanda Office of Tourism and National Parks (ORTPN) was established by the decree of 18/6/1973 which was confirmed and modified by Decree-law of 26/04/1974. The overall mission of ORTPN is to preserve the valuable biodiversity and values of protected areas, and ensure the long run promotion

of tourism in collaboration with all parties involved in the benefit of bordering communities and the Rwandan population in general.

ORTPN comprises two agencies, one in charge of Conservation (Rwanda Wildlife Agency -RWA) and the other in charge of Tourism (Rwanda Tourism Agency -RTA). Each agency has specific mission but both work for the accomplishment of the ORTPN overall mission [24].

> RWA is responsible for preserving the Rwandan precious biodiversity to ensure the national sustainable development, and as an international heritage, by applying efficient ecological principles and the promotion of strategic partnerships with local communities and other partners.
> RTA is responsible for making tourism more profitable to all Rwandans through the development of a unique tourist product including natural and cultural attractions and by facilitating the creation, marketing and promotion of high quality educational experiences for the targeted tourist customers, and by ensuring sustainable development through efficient environment conservation.

III.2.2.7. Institute of Scientific and Technological Research (IRST)

This institute was created within the framework of restructuring research in Rwanda by law n°06/1989 of March 15, 1989 and published in official gazette of May 1, 1989. Its mission includes:

- Fundamental and applied research directed to real and priority national needs mainly in the area of energy, pharmacopoeia, and knowledge of Rwandan society;
- Contribution to enhancing research results;
- Promotion of technologies adapted to the national development;
- Contribution to the training of scientific and technological research personnel;
- Publishing and disseminating research results.

III.2.2.8. NGO's, higher learning and research institutions

The involvement of various NGOs, higher learning and research institutions in environment management in Rwanda is important. The table below gives examples and area of intervention.

Table 2: **Involvement of NGOs, higher learning and research institutions in Environment management in Rwanda**

Name of NGO or Institution	Area of intervention
Rwanda Environmental Awareness Services Organization Network (REASON)	Promotion of environmental awareness
Green Environment Conservation (GEC)	Using improved stoves
Care international	Agroforestry, protected area management
Agro-Action Allemande	Agroforestry, swamp management
National University of Rwanda (NUR)	Faculty of sciences, Faculty of Agronomy and Faculty of Applied Sciences (Master's degree in water management, natural resources and environment)
Institute of Agricultural Sciences in Rwanda (ISAR)	Agronomy, soil fertility, forestry and agroforestry, zootechnics.
Kigali Institute of Science and Technology (KIST)	Alternative energy sources, rainwater collection technology
Higher Institute of Agriculture and Animal Husbandry (ISAE)	Agronomy, soil fertility, forestry and agroforestry and animal husbandry

Other institutions which also intervene in the environment domain are non government, regional and international organisations and cooperation organisations such as European Community, bilateral cooperations with Netherlands, Belgium and Germany, UNDP, FAO, World Bank, NEPAD, ADB, COMESA, UNEP, etc.

III.2.3. Coordination

Environment management coordination in Rwanda is carried out at two levels:

a) **Interministerial Coordination**:
This coordination is ensured by the office of the Prime Minister through interministerial coordination committees (ICC) which consist of either ministers concerned or Secretary Generals from ministries concerned under the chairmanship of the PM's Office.

b) Coordination of various actors involved in the domain of environment:
This coordination is ensured at the national level by the Ministry in charge of environment (MINITERE) by developing environmental policies and procedures (including impact evaluation), natural resources protection (water, land, flora and fauna), environmental legislation, biodiversity and other environmental aspects. Furthermore, Rwanda Environment Management Authority (REMA), which is a technical organ from MINITERE, is mainly responsible for implementing the national environment policy and is in charge of coordinating various environment protection activities carried

out by environment promotion organs and promoting integration of environment issues into development policies, projects, plans and programmes.

c) At the decentralised level:
The coordination of districts is ensured by the four provinces and Kigali City. In addition, at each district and sector level, the organic law provides that environment conservation committees should be set up.

III.3. INTEGRATION OF ENVIRONMENTAL ISSUES INTO MAJOR SECTORS

Environmental issues are integrated into several sectors in Rwanda. These sectors are described in table 3 below.

Table 3: Integration of environment into major government and institutions[1] programmes

Sector	Key Institutions	Integration level
Agriculture	MINAGRI ISAR MINALOC MINEDUC PAFOR NGO	-Agricultural strategic policy of MINAGRI integrates environmental aspects. In collaboration with ISAR, a list of farming species appropriate for different national regions has been published - Introduction of new species requires preliminary studies -Soil conservation and fight against erosion is one of the priorities for provinces and districts (Performance contracts/*Imihigo*) -Agricultural exploitation of swamps must consider environmental aspects.
Infrastructures	MININFRA FRSP KIST IRST EC	-Policy on energy envisages promotion of new energy sources, especially renewable energy and exploitation of methane gas from lake Kivu - Strategic policy in the sector of construction considers the environmental impact in the construction of new infrastructures -The housing policy provides for urban planning and creation of resettlement sites (imidugudu).
Education	MINEDUC ORINFOR MINALOC RITA	- Environmental education and training plan, - School infrastructures, - Education policy that also puts emphasis on environment protection

[1] Source : MINECOFIN, Poverty reduction strategy, Annual progress report, 2005.

Sector	Key Institutions	Integration level
Strategic Planning and poverty reduction	MINECOFIN UNDP Embassy of Netherlands DEMP CDF	-Efficient elaboration of MTEF - It is planned that the second strategic plan on poverty reduction will integrate environmental aspects more seriously; - Integration of environmental aspects into the district development plans.
Private Sector	MINICOM RIEPA FRSP	-The national investment strategy and sectoral strategies from MINICOM specify that all investment plans must integrate environmental aspects ; - Privatisation of forest domains (e.g Nshili-Kivu forest, Nyaruguru district).
Regional and international Cooperation	MINAFET Secretariat of Conventions UNEP Embassies Sub -regional, regional and international organisations	- Cooperation framework well defined and memoranda of partnerships signed; - Implementation of various conventions ; - Participation into regional and international forums.
Gender and Environment	MIGEPROFE PRO-FEMMES Réseau des Femmes, A-habitat	- The gender policy integrates environmental aspects; -Women are very involved in natural resources and environment management.
Activities of public interest	MINIJUST MINALOC Provinces Districts MININTER Gacaca Jurisdictions	- Activities related to environment protection are envisaged in policies and laws on activities for general interest as alternative penalty to imprisonment (TIG)
Decentralisation and good governance	MINALOC CDF Districts	- Decentralization policy and the law on the functioning of districts and cities gives the responsibility of environment protection and management to those decentralised entities , - Policy and laws on community activities "*umuganda*" envisage activities related to environment protection.

III. 4. Environment management and poverty reduction

It is through sustained economic growth that fighting poverty can be successfully achieved and identification of possible effects of environment to such growth becomes of paramount importance to this end. Yet, natural resources exploitation directly affects the environment quality. Links between environmental degradation and poverty reduction are clearly established. In fact, poor people directly depend on natural resources and natural services for their survival and they are very often affected by environment degradation, especially by deforestation, low soil fertility, erosion and water and air pollution. Moreover, the poor are particularly easily hurt by natural disasters such as floods, drought, volcanic eruption and other conflicts related to natural resources control, especially land resources.

Poverty reduction cannot, however, be achieved if environmental dimension is not seriously and efficiently taken into consideration. Therefore, environment is part of the first priority area identified in Poverty Reduction Strategy in Rwanda and ranks as the first among fundamental programmes of agricultural transformation and rural development.

Agricultural transformation and rural development must go hand in hand with environment protection activities such as excavation work, tree planting, water management and rational use of wetlands. Poverty Reduction Strategy also advocates for actions in the sector of energy by encouraging a very special and rational use of wood and the promotion of alternative energy sources. It also backs water supply activities and any other actions which are likely to encourage rainwater collection and use within resettlement sites and villages "*imidugudu*".

IV. COOPERATION BETWEEN THE EUROPEAN COMMUNITY AND OTHER DONORS WITH RWANDA IN ENVIRONMENT

IV.1. European Community cooperation

For the 2002-2007 period (9th EDF), the total assistance to Rwanda by the European Community would amount to 124 million euros as for allocation A and to 52 million euros as for allocation B. Focus sectors have been chosen on the basis of the Government strategic priorities and other donors' strategies. About 50% of part A was allocated to rural development, including the

important section of infrastructures, with a particular emphasis on strengthening local and decentralised structures and recapitalisation of rural area (boosting the production, infrastructure rehabilitation and creation). Besides, about 40 % of the same allocation would be used as a continuous support to economic reform programme. Finally, the remaining 10% was allocated to institutional support, to capacity building for civil society organisations and to enhancement of Rwandan efforts towards regional integration and stability.

IV.1.1. Rural development sector (75 million euros)

The following initiatives are funded within the sector of rural development:

- Support to the decentralisation process through Decentralisation Programme for Rural Poverty Reduction (DPRPR): the main objective of this programme is to provide communities with direct support in such a way that the latter can initiate and implement their own community development plan. This sector comprises a section (20 million euros) known as « ***ubudehe mu kurwanya ubukene*** ». This approach is based on a traditional concept of community activities which involve direct contribution of each cell and some individual poor households in order to implement a project which was identified and analysed by themselves.

1. Substantial funding for the creation of a rural road network, especially in the north-west part of Rwanda (priority to be given to the rehabilitation of the main road Ruhengeri-Gisenyi). Funds have also been provided to support road maintenance funds for the construction and renovation of public buildings.
2. The remaining amount is used to implement other rural programmes including water and sanitation, agrarian reforms, environmental initiatives and development of agricultural information systems.

IV.1.2. Macro-economic support

The European Community funds to support the macro-economic sector in Rwanda are used in the perspectives of the current poverty reduction strategic programme objectives (multi-annual support programme to poverty reduction) subdivided into the following six sub-sectors:

1. Rural development and agricultural transformation (agricultural modernisation, access to loans) ;
2. Human development (strengthening health and education programmes);

3. Economic infrastructures (roads, energy and other infrastructures both in urban and rural areas);
4. Governance (support to decentralisation, constitutional reform, reconciliation, criminal justice, transparency, etc.);
5. Development of private sector (investment promotion in the private sector, increasing export capacity, etc);
6. Reinforcement of institutional capacities.

IV.1.3. Other intervention areas (non-focal)

The EC non-focal support is mainly directed towards assistance to good governance and institutional support (statistics, justice, civil society, support to electoral process through UNDP, joint funding by NGOs, etc.).

Within the framework of the 10th EDF already in pipeline, the EC envisages granting 223 million euros (at least) to Rwanda and priority areas are infrastructures and rural development.

IV.2. Cooperation with other donors

Many environment- related programmes and projects are funded by donors other than the EC including European Community countries. Among these donors, one can mention UNDP, UNEP, DFID, Belgian, Dutch and French Cooperations, World Bank, ADB, IMF, FAO, USAID, CARE International, CRS, etc.

- Belgian cooperation intervenes in the national sensitisation system (MINAGRI), water conveyance (former Butare province), in tree planting (MINITERE), in integrated fight against diseases and pests), etc.
- GTZ (German technical cooperation) intervenes in the sector of food security and social stability in the Southern province, especially by providing support to food production and fostering social cohesion, health and rehabilitation of infrastructures through a participatory approach at cell level (*UBUDEHE*).
- KFW (German Financial Cooperation) intervenes in water conveyance programmes in eight villages surrounding Kigali.
- RNE (Royal Netherlands Embassy) intervenes in several domains mainly : support to DEMP project (MINITERE) operating in districts of the Eastern province; support to the drawing of the national forest map and to the inventory of forest resources (national forest plan, MINITERE); support to the management plan of Rugezi valley, HIMO programme in Ruhengeri, Cyangugu and Gitarama; support to

agricultural transformation programme and rehabilitation of regional centres (Karama and Ruhengeri); support to statistics service within MINAGRI, etc.

- French cooperation intervenes in the Support Programme to the Development of Rural Populations (PADPR).

However, for these various interventions to be more efficient in the area of environment there should be one single agency to ensure coordination with a special goal of avoiding any unnecessary duplication of activities. There is also a need to strengthen inter-institutional coordination in the sector of environment in Rwanda.

V. CONCLUSIONS AND RECOMMENDATIONS

V.1. Conclusions

Natural resources in Rwanda are under serious pressure and the harmonisation of laws and various sectoral policies is necessary for their efficient conservation.

Major environmental problems in Rwanda include among others:

- Soil degradation which is due to lack of vegetal cover, overexploitation and inappropriate farming systems, absence of anti-erosive measures, etc. ;
- Deforestation which is mainly due to demographic pressure (need for new lands), uncontrolled production of domestic energy (wood charcoal, firewood, etc.), migration, and population resettlement, etc.
- Pressure on wetlands (the clearing of natural swamps, hydro-agricultural development not associated with basin protection); and this results in reduced capacity of flood dabbing (risks of floods and silting up of lakes)
- Water contamination which is due to lack or insufficiency of clean drinking water supply systems, lack or absence of sanitation systems and waste water treatment, etc.
- Proliferation of dangerous aquatic weeds, especially all along Akagera and Nyabarongo rivers due to dissolved nutriments from pollution by industrial, household discharged wastes, also from inappropriate agricultural practices and lack of water treatment practices.

V.2. Recommendations

With reference to the current situation and tendencies of environment in Rwanda, as well as the political, legislative and institutional framework with regard to environment management, the following recommendations can be made:

1. In general, the following actions are to be taken:
    - Integrating environment into the second Poverty Reduction Strategic Paper (PRSP2);
    - Conducting a strategic environmental evaluation (SEE) on policies, programmes and plans in various sectors so as to contribute to sustainable development, poverty reduction and good governance;
    - Providing Districts with technical assistance when they prepare development programmes, plans and projects which optimally integrate environmental dimension;
    - Speeding up the implementation process of orders aimed to enforce organic law No 4/2005 of April 8, 2005 establishing modes of protecting, safeguarding and promoting environment;
    - Setting up environmental norms and building capacity for institutions in charge of monitoring and controlling environment status in Rwanda;
    - Preparing plans to implement environment related international conventions at district levels;
    - Conducting SEE on rural development,
    - Reviewing the need for capacity reinforcement in decentralised structures (districts and sectors),
    - Considering a revision of performance indicators on the basis of environmental integration efforts of the PRSP2.

2. Strategies for soil degradation eradication still constitute a challenge for everybody in Rwanda. In order to deal with this problem, several soil conservation techniques are recommended, notably:

    - radical terraces,
    - digging anti-erosive ditches and planting fixative grass/trees to stabilize slopes,
    - planting hedges on contours of hills,
    - tree planting in general and agroforestry in particular,
    - efficient management of grazing lands,
    - fight against bush fires,
    - Various modern farming methods: mulching, maintaining vegetal cover and intensification of agriculture, etc.

3. To deal with the problem of **deforestation** , it is necessary to undertake the following actions:
   - Increasing unproductive and degraded afforestation through reconversion/rehabilitation;
   - Increasing and diversifying forest products by increasing afforestation areas through forest reconversion, reforestation on communication axes (national roads, districts, sectors and cells) and on empty areas meant for afforestation;
   - Supporting Districts while elaborating and implementing District Forest Plans;
   - Further sensitisation of the population on conformity with the law on forests and effective regulations regarding forest management and exploitation;
   - Making the population to directly participate in new tree planting, even in the choice of local species to ensure their better management/sustainability;
   - Creating income generating activities for people surrounding forests (natural or artificial) to decrease pressure on these resources;
   - Building capacity for local institutions in terms of qualified forest staff and logistic means;
   - Intensifying agroforestry by:
     - Increasing arborisation rates within agricultural exploitations, especially fruit trees (sources of revenues and additional to agricultural production);
     - Improving the animal stabling system;
     - Restoring organic matter by the use of organic manure, agricultural residues;
     - Adopting appropriate farming methods;
   - Disseminating economical energy techniques (improved stoves) ;
   - Exploiting other alternative energy sources.

4. **Destruction of natural ecosystems** leads ipso facto to the loss of biological diversity and hydric resources alteration. To tackle the problem of wetlands degradation, loss of diversity and water resources degradation, the following actions are recommended:
   - Urgently setting up an efficient land management system which includes among others, slopes protection (tree planting, FAE, radical and progressive excavation with fixative and fodder grass on slopes,…), planning for underexploited swamps, promotion of clustered resettlements and animal stabling system and protecting marginalised zones from grazing.

- Rehabilitating critically degraded ecosystems such as Nyabarongo basin, Congo basin, Rugezi swamp, Giswayi forest, etc.
- Undertaking integrated activities for a rational conservation and use of natural resources including: I) setting up land management system in which grazing lands will be clearly fixed and separated from farming zones, ii) development of modern cattle keeping; iii) development of rainwater collection and stocking; iv) extension and rehabilitation of water conveyance networks; v) rehabilitation and protection of wetlands (lakes and swamps) invaded by water hyacinth.

We recommend that the European Community strengthens its intervention in the following domains:

a) Support to the central administration (MINITERE, REMA) during policy and programme environmental evaluation;
b) Support to initiatives by the civil society aiming at the environment protection, incorporating environmental indicators into the cooperation between the European Community and Rwanda such as:
   Increasing offorested areas,
   Deforestation rates,
   Area of lands protected against erosion,
   Number of households with improved stoves and other newly initiated and renewable sources of energy,
   Protected areas and number of endangered species,
   Water and air quality,
   Number of trained staff in terms of environment management,
   Number of districts with environment management plan, etc.
c) Providing decentralised entities with assistance while they elaborate and implement environment management plans.

APPENDICES

VI. SUMMARY TO BE ATTACHED TO THE DSP

CONTEXT

The Government of Rwanda has started the preparation of the second poverty reduction strategy named « Economic Development and Poverty Reduction Strategy – EDPRS » that will cover 5 years and, compared to the PRSP1 created in 2002, will be an operational tool supported by realistic and feasible

sectoral plans based on priorities, an adapted implementation framework and tangible results with significant impact on the improvement of the living conditions of the population, especially the poorest one.

Given that the Country Environmental Profile (CEP) is an important tool for the identification of the main environmental issues to be considered during the development of the country strategic paper (CSP), and for the political dialogue, the mission of the European Commission in Rwanda, through the FED Support to the National Public Payer, has financed the development of the Environmental Profile of Rwanda.

I. SITUATION OF ENVIRONMENT IN RWANDA (see executive summary, section I)

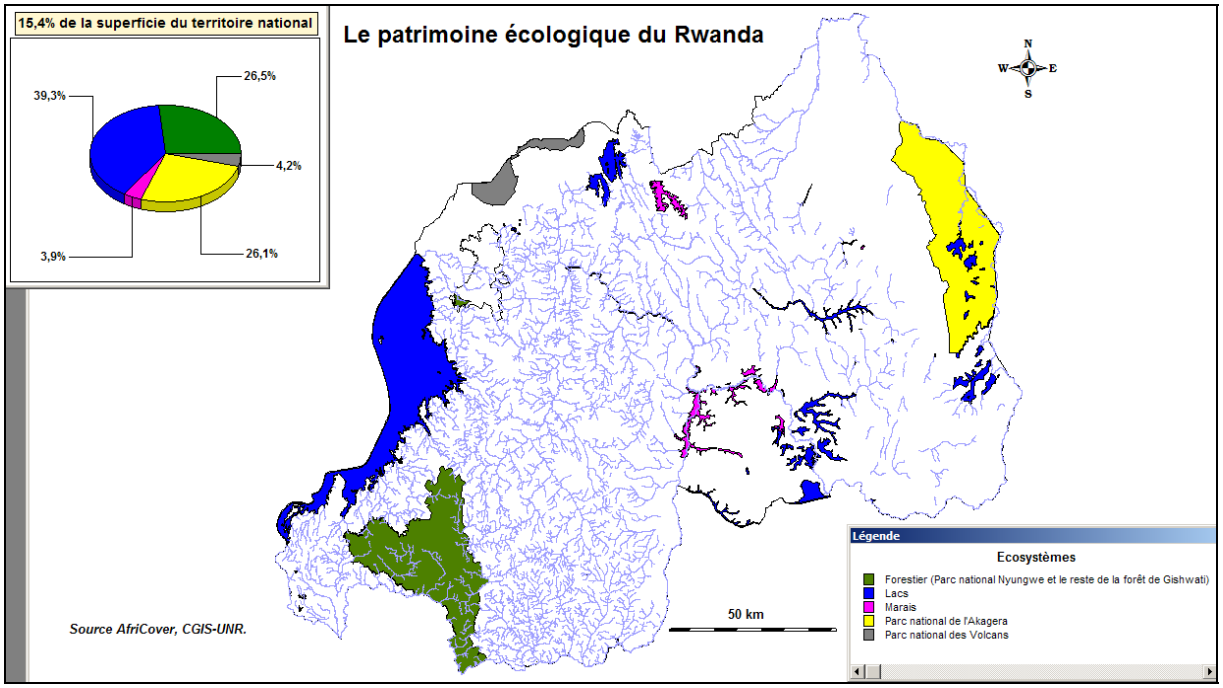
III. ENVIRONMENTAL POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK (see executive summary, section II)

III. COOPERATION OF RWANDA WITH THE EC AND OTHER DONORS IN ENVIRONMENTAL AREA (see executive summary, section III)

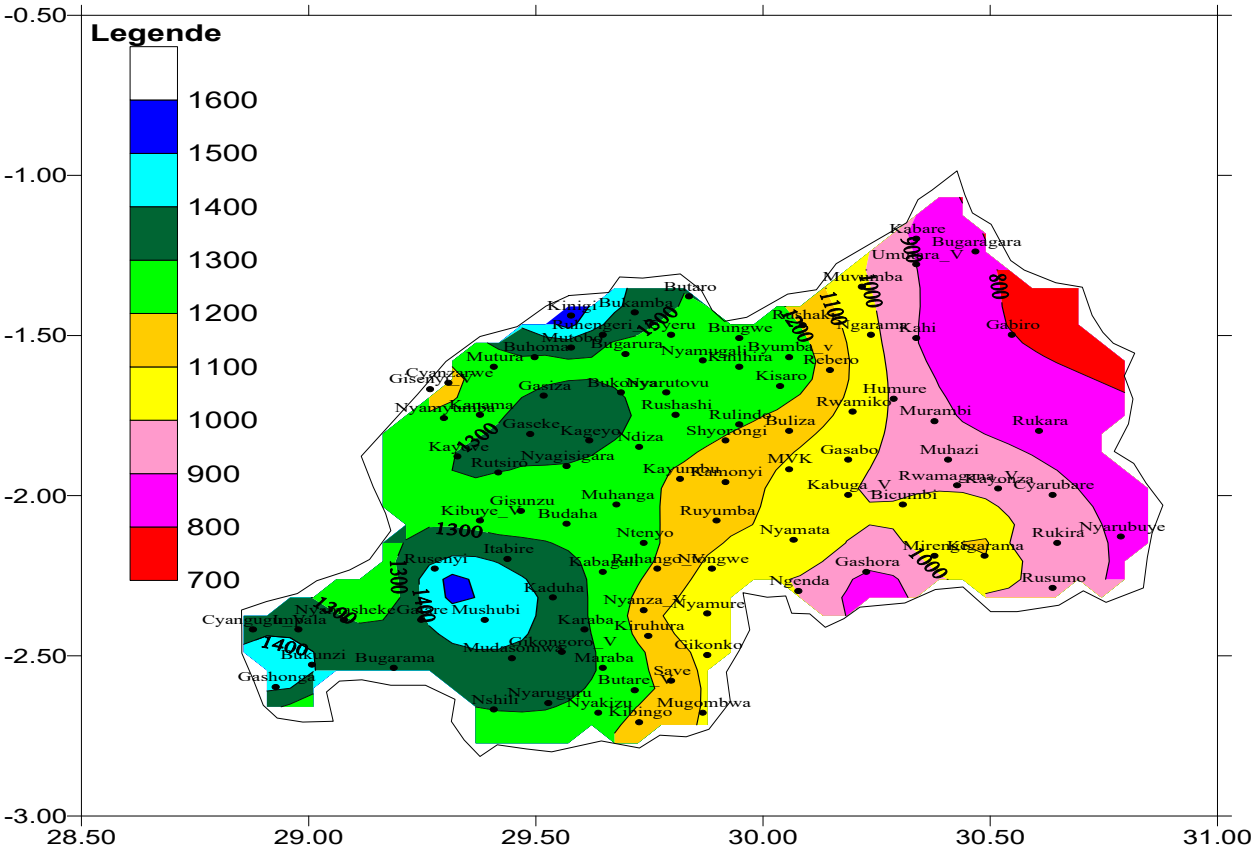
IV. CONCLUSION AND RECOMMENDATIONS (see executive summary, section IV)

VII. TECHNICAL APPENDICES
Appendix VII.1: Maps, photos, Tables and Figures

1.1. Map showing the ecologic heritage of Rwanda

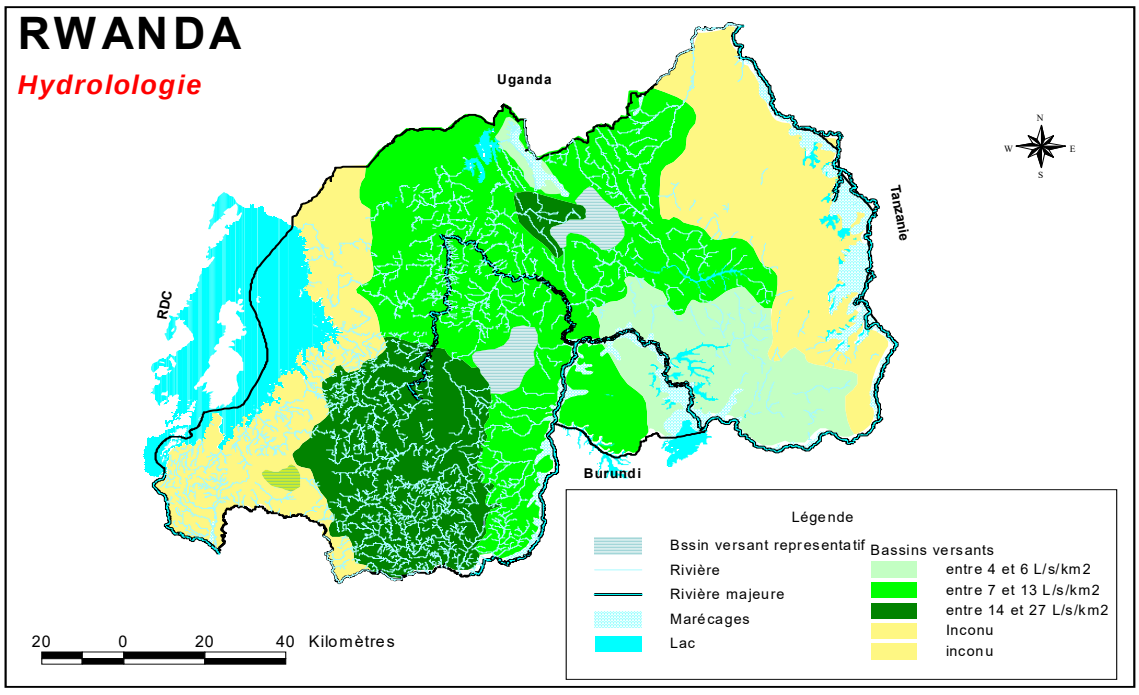


1.2. Map showing the annual average distribution of rainfalls in Rwanda (1961-1990).

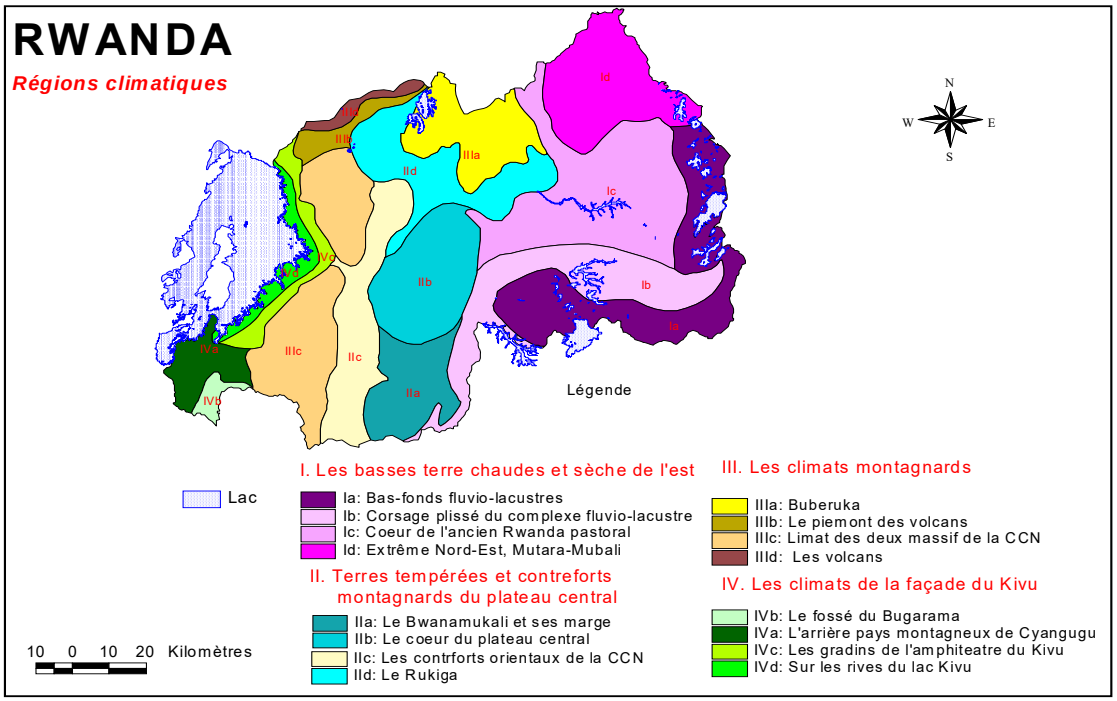


1.3. Photo showing a degraded pasture in RUKARA (District of Kayonza)

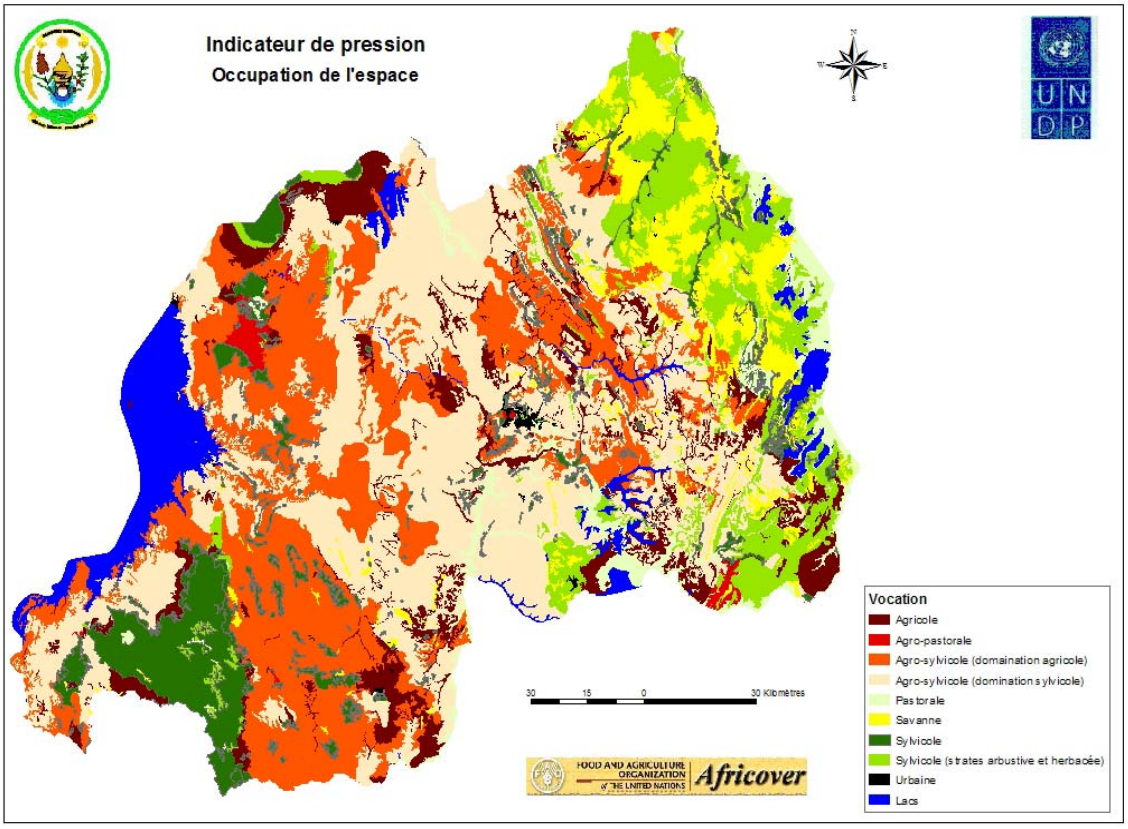
1.4. Hydrological map of Rwanda



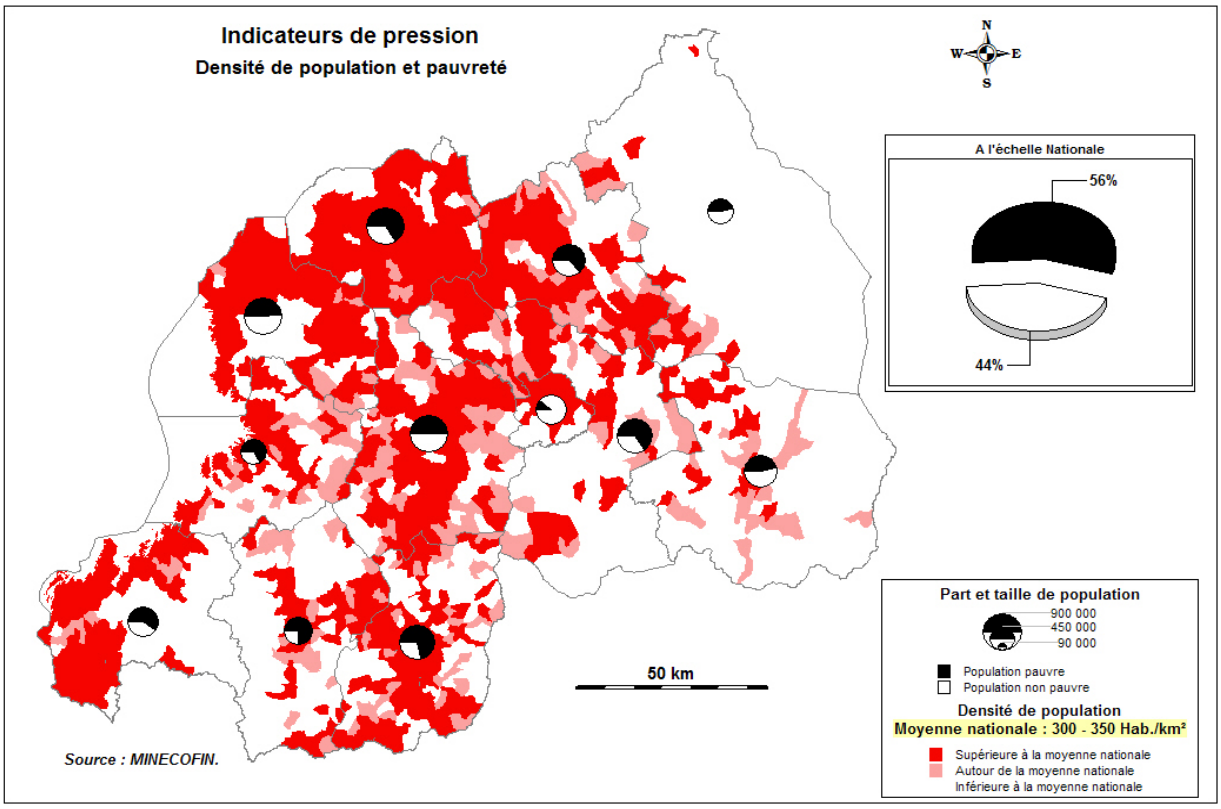
1.5. Map of climatic regions of Rwanda



1.6. Map showing space occupation: indicator of pressure

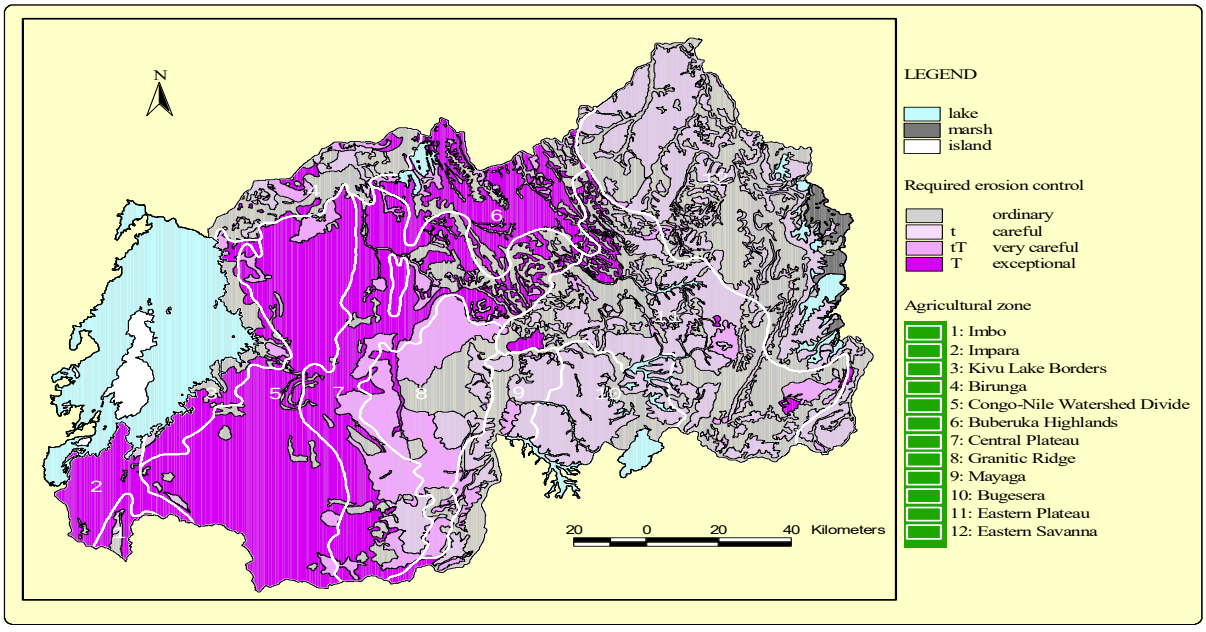


1.7. Map of pressure indicators: density of the population and poverty



1.8. Classification of soils according to the risk of being be eroded due to the slope

Risk class	Very high	High	Average	Low	Very low
Surface (ha)	357.529	436.563	763.005	340.376	136.625
% of soils	17.6	21.5	37.5	16.7	6.7



1.9. Photos showing the state of salubrity in a slum of Kigali city (Cyahafi)

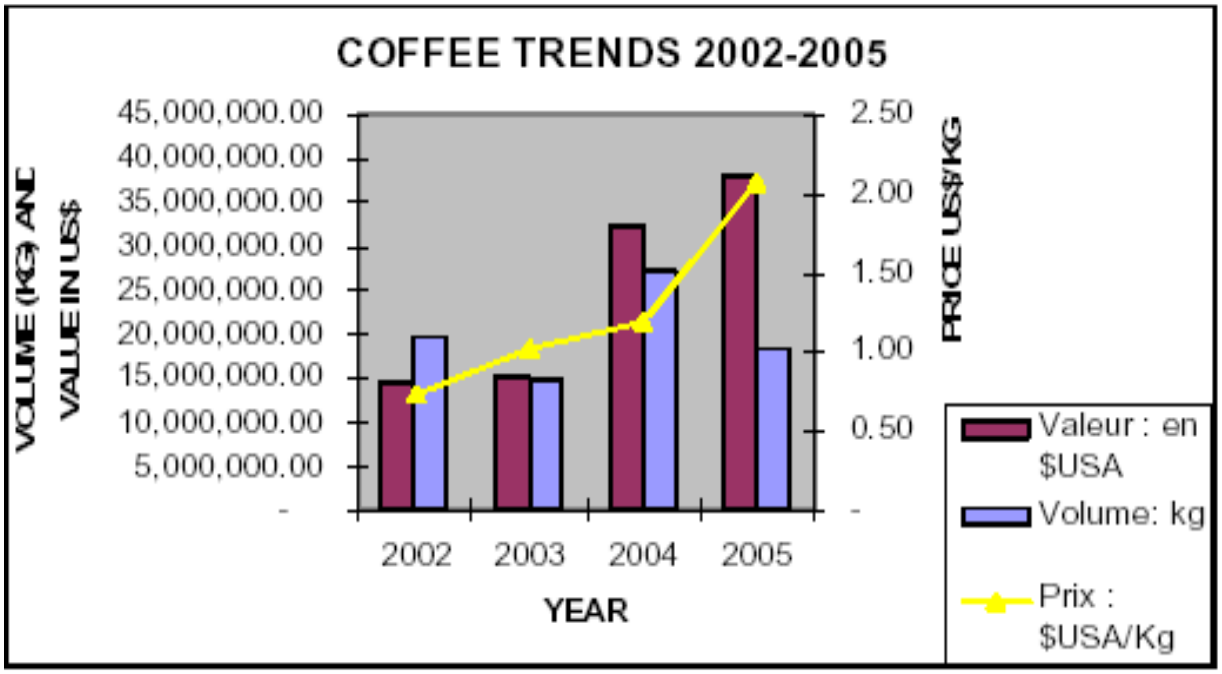
1.10. Photos showing savage landfill in Kigali City

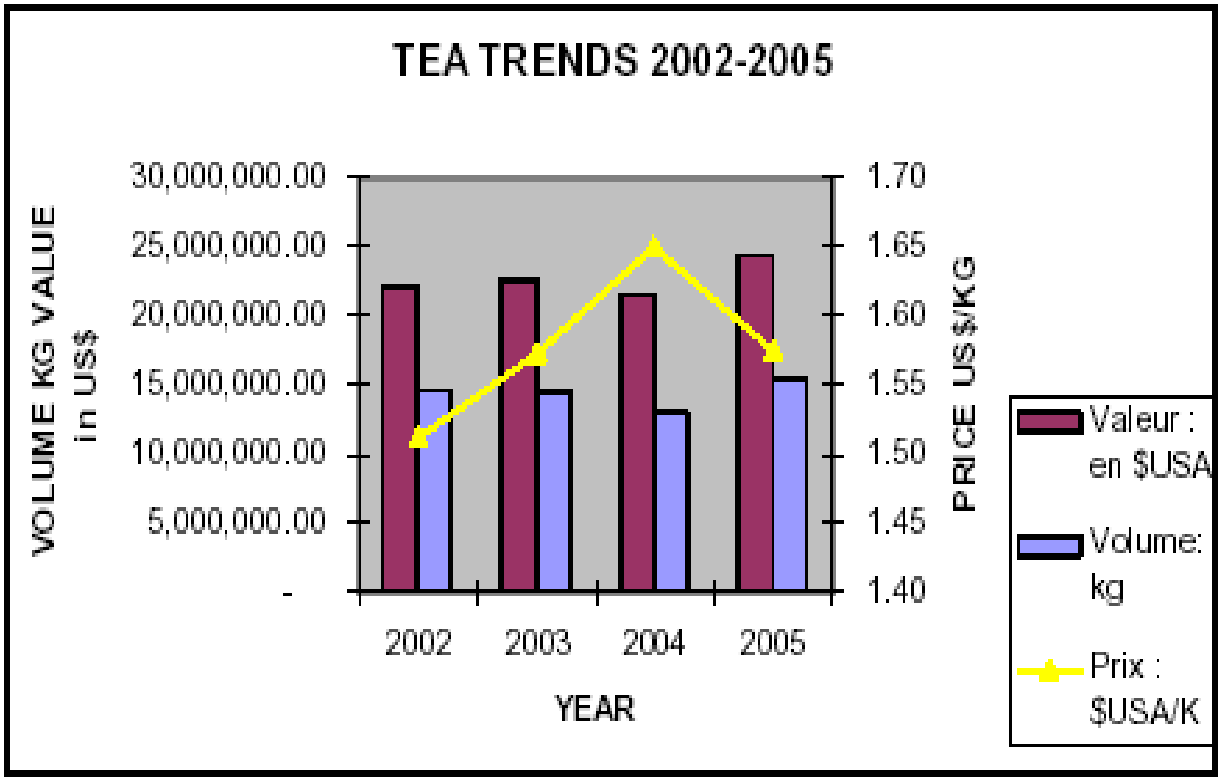
1.11. Table 4: Use of fertilizers according to crops in Rwanda

Crop	2001	2002	2003	2004	2005
Rice	351	474	433	555	
Coffee	125	128	50	100	844
Tea	2,500	3,400	4,000		
Irish Potato	2,285	1,549	2,343	1,934	
Total	5,261	5,551	6,826		
Total Import	8,686	6,439	7,080		8,602
Use in Other crops	3425	888	254		

Source: MINAGRI/ World Bank Fertiliser Study May 2004

1.12. Volume of coffee and tea exports between 2002 and 2005.





Source: MINECOFIN Export Data 2006 using OCIR Thé Volume Figures

1.13. Table 5: Growth ot the number of cattle between 2000 and 2005

LIVESTOCK	2000	2001	% change 2000-01	2002	% change 2001-02	2003	% change 2002-03	2004	% change 2003-04	2005	% change 2000-2005
Cattle	755,123	814,124	8%	960,450	18%	991,697	3%	1,006,572	1%	1,079,206	43%
Goats	756,502	916,753	21%	919,785	0%	1,270,903	38%	1,263,962	-1%	1,263,962	67%
Sheep	232,724	266,539	15%	300,600	13%	371,766	24%	686,837	85%	686,837	195%
Pigs	177,220	197,081	11%	207,783	5%	211,918	2%	326,652	54%	342,027	93%
Poultry	2,043,077	1,277,705	-37%	1,055,644	-17%	2,432,449	130%	2,482,124	2%	2,943,703	44%
Rabbit	338,616	495,290	46%	488,629	-1%	498,401	2%	520,057	4%	565,696	67%
TOTAL	4,303,262	3,967,493	-8%	3,932,891	-1%	5,777,134	47%	6,286,204	9%	6,881,431	60%

Appendix VII.2: List of consulted documents of policies and action plans related to the environmental profile of Rwanda.

1. Politique nationale de l'environnement, 2003.
2. Politique forestière, 2004.
3. Politique foncière, 2003.
4. Politique des mines et géologie, 2005.
5. Politique Nationale Sectorielle de l'eau et assainissement,2005.
6. Politique Agricole, 2004.
7. Politique de la décentralisation et de la bonne gouvernance, 2000.
8. Plan Stratégique de conservation de la Biodiversité, MINITERE ,2003
9. Plan Stratégique du MINAGRI (2000-2010),
10. Plan Stratégique de l'ORTPN (2004-2008).
11. Stratégie Nationale de Réduction de la pauvreté, 2002.
12. Recensement Général de la Population, 2002.
13. Constitution de la République du Rwanda, 2003.
14. Loi organique n° 04/2005 du 8/04/2005 portant modalités de protéger, sauvegarder et promouvoir l'environnement au Rwanda.
15. Loi organique n° 08/2005 du 14/07/2005 portant régime foncier au Rwanda.
16. Contrats de performance (Imihigo) des Districts et de la Ville de Kigali
17. Le nouveau cadre organique des districts, MINALOC 2006.

VIII. ADMINISTRATIVE APPENDICES

VIII.1. List of persons contacted

N°	Institution	Names	Function
1	MINITERE	RWABUTOGO Joseph	Professionnel environnement
2	MINITERE	UWIZEYE Fidèle	Professionnel Mine et Géologie
3	REMA	MASHINGA Theobald	Directeur EIA ; Compliance and Enfoncement
4	MINECOFIN	USENGAMUREMYI Maximillien	Point Focal Environnement ; Unité Planification du Développement
5	District de Nyamagabe	Gahamanyi Jean Bosco	chargé de l'Agriculture et de l'environnement
6	District de Huye	Gasana Ildephonse	Vice Maire chargé des affaires économiques
7	District de Huye	Harelimana Pierre	Professionnel chargé de l'Environnement
8	Province de l'EST	Makombe J.M.V	Chargé de la bonne gouvernance
9	District de Kayonza	Ruremesha Fidèle	Professionnel chargé de l'Environnement
10	District de Ngoma	Mukwiye Martin	Professionnel chargé de l'Environnement
11	NBI	Dr. Gaspard Bikwemu	Deputy Assistant Manager NELSAP
12	ORTPN	Emmanuel Hakizimana	Chargé de la planification
13	MIG	Vincent Ngarambe	Directeur Général
14	Delegation of European commission in Rwanda	Arnaud DEMOOR	Programme Manager
15	UNDP-Rwanda	Jonathan Duwyn	Rural Energy and GEF Associate, Sustainable Livelihoods Unit

VIII.2. REFERENCES

1. Atelier technique sur la politique sectorielle de l'eau et de l'assainissement ; MINIRENA. Septembre 1997; Kigali.
2. CGIS-UNR: Environnement et Pauvreté, Etude Pilote pour une cartographie des relations entre Environnement et Pauvreté, UNDP-Kigali, Avril 2003.
3. Constitution de la République du Rwanda, 2003.
4. Contrats de performance (Imihigo) des Districts et de la Ville de Kigali, 2006.
5. Etude du Plan Directeur d'Aménagement et de Mise en Valeur des Vallées de la Nyabarongo et de l'Akanyaru : Phase 1 : Etude de base, Rapport Définitif MINAGRI –SOGREAH, Septembre 1988.
6. FAO, Etude sur les Ressources Forestières Naturelles et les Plantations Forestières du Rwanda, Septembre 1999.
7. FSRP/DSA, 2000. Statistiques agricoles: Production agricole, élevage, superficies et utilisation des terres. Année agricole 2000. MINAGRI. Kigali.
8. GAPUSI, R.J. (1999). Identification et analyse des options stratégiques pour la conservation de la biodiversité dans le Parc National de Nyungwe.
9. Generation and application of climate information, products and services for disaster preparedness and sustainable development in Rwanda; MININFRA, Department of Meteorology; Kigali, June 2004.
10. Initiative du Bassin du Nil, mai 2001, « Analyse Environnementale Transfrontières »
11. Loi organique n° 04/2005 du 8/04/2005 portant modalités de protéger, sauvegarder et promouvoir l'environnement au Rwanda.
12. Loi organique n° 08/2005 du 14/07/2005 portant régime foncier au Rwanda.
13. MINALOC, 2003. Projet de politique nationale de gestion des risques et des catastrophes au Rwanda. Kigali
14. MINANI Faustin/PNRP : La Revue de littérature sur les causes des disettes et Famines au Rwanda ainsi que les mesures prises pour pallier à ces fléaux, Kigali, août 2001
15. MINECOFIN: Un Profil de la Pauvreté au Rwanda, Un rapport basé sur les résultats de l'Enquête Intégrale sur les Conditions de Vie des Ménages 1999-2001, Kigali, février 2002.
16. Ministère de l'Enegie, de l'Eau et des Ressources Naturelles, Inventaire National de l'Alimentation en Eau potable au Rwanda, Edition 2001.
17. Ministère des Finances et de la Planification Economique, Novembre 2002 ; Vision 2020.

18. MINITERE (2003). Stratégie Nationale et Plan d'action pour la conservation de la biodiversité au Rwanda.
19. MINITERE, Communication nationale initiale relative à la convention-cadre des nations unies sur les changements climatiques, juin 2005.
20. MINITERE, National Strategy and Action Plan For The Conservation of Biodiversity In Rwanda, Kigali, March 2004.
21. MINITERE, Revue de la littérature sur les études de vulnérabilité et mesures d'adaptation aux changements climatiques au Rwanda
22. MINITERE: Document des Stratégies Sectorielles du MINITERE (2005-2010) Gestion des Ressources Naturelles et Protection de l'Environnement, Version finale, juillet 2004.
23. Nshimiyimana E., L'assainissement et mise en valeur des petits marais au Rwanda. Mémoire. Inédit, Faculté d'Agronomie, UNR, Butare, 1985.
24. Plan Stratégique de l'ORTPN (2004-2008).
25. Plan Stratégique du MINAGRI (2000-2010),
26. Politique Nationale de Gestion des Ressources en Eau : MINAGRI, Juillet 1998.
27. Pré-Etude de la Qualité des Eaux du Rwanda : MINITRAPE – UNICEF, Décembre, 1995.
28. Recensement Général de la Population, 2002.
29. Relations entre Environnement et Pauvreté, UNDP- Kigali, avril 2003.
30. Stratégie Nationale de Réduction de la pauvreté, 2002.
31. UNR : Atlas du Rwanda, 1981.
32. MINECOFIN, Edition no 5, Août 2002: Indicateurs de développement économique.
33. MINITERE, Politique Nationale de l'Environnement (PNE) au Rwanda, Novembre 2003.
34. Le nouveau cadre organique des districts, MINALOC 2006.

VIII.3. CURRICULUM VITAE OF CONSULTANTS

1. CURRICULUM VITAE de Dr. Fabien Twagiramungu

- **Nom et Prénom** : Twagiramungu Fabien, Ph.D
- **Profession :** Professeur et Consultant indépendant dans le domaine de l'environnement et d'assainissement
- **Date de naissance :** 27-juillet-1966 à Runyanzovu/ Rwanda
- **Email :** fabynetbe@yahoo.fr

A. EXPERIENCE PROFESSIONNELLE

- Depuis Avril 2004 : Professeur au Kigali Institute of Education (KIE)
- Auteur de plusieurs études dans le domaine de l'Environnement et assainissement.
- Formateur des journalistes Rwandais sur les concepts environnementaux pendant le séminaire tenu à Kigali du 20 Septembre au 2 Octobre 2004 en collaboration avec l'UNR-Ecole de journalisme et de communication à travers le projet de « Environmental journalism and communication »
- Chercheur sur le « "Contrôle chimique de l'infestation des lacs et des cours d'eau du Rwanda par la Jacinthe d'eau (Eichhornia Crassipes)» : en cours.

B. FORMATION

1998-2003: Ph. D. en Sciences : chimie de l'Université de Gand (Belgique) avec cinq ans de recherche dans le domaine de chimie analytique appliquée en sciences de l'environnement et en assainissement avec les cours spécifiques ci-dessous en rapport avec le principal sujet de recherche de thèse de doctorat :

- Substances humiques et gestion de la qualité des eaux naturelles
- Systèmes naturels pour le traitement des eaux usées
- Chimie de l'environnement.

Pour compléter ma formation dans les domaines ci-hauts cités, j'ai bénéficié des visites guidées dans des entreprises et des unités industrielles de traitement des eaux usées et de recyclage de déchets solides dans différents pays européens:

BELGIQUE: -AppliTek NV, Département de Technologie Environnementale
-Active Respect for Environment and Nature (ARENA);
ESPAGNE: -Enviromed-Spaincomp
-Agua y Medio Ambiente SL (AYMA)
FRANCE: -BioBasic Environnement, etc.

2. CURRICULUM VITAE de Vital Nyilimanzi

Nom:	NYILIMANZI
Prénom:	Vital
Date de naissance:	28 Avril 1963
Lieu de naissance:	District Nyaruguru- Province du Sud
Nationalité:	Rwandaise
Etat civil:	Marié (Père de 3 enfants)
Adresses :	Tel : 00 250 08536469
	E-mail : nyiv@yahoo.fr ou adenviron@yahoo.fr

1. Etudes faites

1984-1990	:	Université Nationale du Rwanda/Campus de Butare Diplôme obtenu: Licence en biologie
1978-1982	:	Humanités Scientifiques au Collège des Humanités Modernes de Nyanza Diplôme obtenu: Humanités Générales
1978-1975	:	Tronc Commun à l'Ecole Normale Inférieure de Save
1969-1975	:	Ecole Primaire à Runyinya

2. Autres formations

Formation sur les procédures d'utilisation des sciences et expertise (Etudes d'impact environnemental) pour la prise de décision sur le permis environnemental, Kigali, Janvier 2006.

Formation en analyse comparative entre les sexes, Kibuye, du 9 au 14 0ctobre 2005. Formation organisée et financée par la Coopération Canadienne au Rwanda.

Stage de formation sur la protection de l'environnement, République Populaire de Chine, du 8 octobre au 22 Novembre 2003. Formation qui s'est concentrée sur la conservation des ressources en eau, l'évalaution d'impact environnemental, les pollutions physiques, les normes environnementales, etc.

Formation relative à l'élaboration des plans stratégiques pour la conservation des espèces d'oiseaux en danger (Uganda, Kampala, Septembre 2001). La formation a préconisé la conservation des espèces et de leur habitat et l'élaboration des plans et stratégies nationaux pour la conservation des espèces d'oiseaux en danger.

Formation en planification stratégique (RIAM-Murambi- Gitarama , 2001)

Formation en informatique des logiciels :MS DOS, MS Word, MS Excel, Internet et Power Point (Kigali, Mai 2000), MS Publisher (2004)

Atelier sur le renforcement des capacités d'intégration de l'évaluation du milieu et des rapports sur l'état de l'environnement (Nairobi, Kenya, Mars 2000)

Stage de formation en gestion des Projets et des Programmes d'Investissement Public (PIP) à Murambi, Gitarama,1997

Formation en Méthode Accélérée de Recherche Participative (MARP), 1998

3. Expériences professionnelles

Du 1er avril 2005 à nos jours :	Expert chargé de l'Environnement dans le Programme d'Alimentation en Eau Potable et d'Assainissement dans le milieu Rural

VIII.4. Terms of Reference for a CEP

ToR for the preparation of the Country Environmental Profile of Rwanda

1. Background

The Government of Rwanda remains committed to poverty reduction, national unity and reconciliation, and has developed a vision of economic modernisation and redesigned governance. An Economic Development for Poverty Reduction Strategy (EDPRS) will be developed during 2006 to guide the implementation of this vision. In the meantime, implementation of the PRSP continued in 2005, and progress was made against key indicators, particularly in health and education.

On a domestic level, further consolidation of the constitutional and judicial reforms introduced in 2003-4. Reform of public administration continued, including through a reform of local government structures.
Regionally, the political and security situation is stable. Internationally, Rwanda's profile is heightened by the release of several films about the Genocide, the visit of a number of international figures, and the election of Rwandans to key positions in international organisations.

Macroeconomic performance is increasing, GDP growth accelerated and inflation slowed, but export performance declined due to cyclical factors in 2005. The Integrated Framework process highlighted Rwanda's challenges as regards trade, particularly as relates to transport costs, energy and credit. Rwanda's involvement in regional integration deepened, as it took the lead of the COMESA grouping. There is increasing evidence that progress is being made towards poverty reduction in the social sectors, as a result of policy reforms, sector strategies, and increased resources from Government. Poverty, particularly in rural areas, remains widespread in Rwanda, and the majority of the population remains dependent on subsistence agriculture.

The environmental issues to be addressed in the rural development are the lack of land, erosion, low fertility, heavy dependence on natural resources, deforestation, water pollution, conflicts and catastrophes. Whereas, regarding the decentralisation program, the problems are the capacity to integrate environmental issues, environmental impact on projects, how to integrate environment in the Districts Development Plans, to integrate environment in the national policies and strategies, and how to finance that.

The EC-Rwanda cooperation, following preparations made in 2003-4. Disbursements from the European Development Funds (EDFs) reached

record levels in 2005. Under the 9th EDF allocation went under Rural Development, infrastructures, Economics, Good Governance and Budget support.

The link between the cooperation and the Country Strategy Paper concerning environmental issues, its mostly about the rural development (decentralisation, sustainable agriculture development, prioritisation of environment maters, environmental impact of Ruhengeri – Gisenyi road, and road maintenance.), macro-economic support (food security, exportation, use of fertilizers and pesticides, irrigation, privatisation of land, pressure on natural resources, tourism and industrial and mining activities.

The Country Strategy Paper states that environmental degradation is known to cause poverty, the need for intuitional support to address environmental issues is needed; however, nothing or very little was done on decentralisation, rural transport, agriculture innovation, and others macro-economics reforms,…regarding environmental matter.

The EC-cooperation contributes to solve the matter with its environmental impact assessment of the road, the fight against soil erosion, the pyrethrum sun drying method and the education for a sustainable agriculture namely under Stabex Programs, Ubudehe and support to the Decentralisation.

The last CEP (CSP 2002-2007) stated that the main environmental concerns in Rwanda had always been about soils erosion due to overgrazing and pasture extension, deforestation, wetland occupation, crises, people settlements and its impact.

Now days, environment issues are still addressed on land overexploitation, which causes low fertility of soil, malnutrition, rural exodus, internals conflicts,… The overexploitation of the forest and its destruction due to civil war, population resettlement and energy supply. Pressure on moist zones by marshlands being drained and covered for irrigated agriculture, lakes pollutions and hydroelectric barrage. Scattered settlement, reduction of the National Park of Akagera contribute to threatened the biodiversity. A continuous increase of population in urban area, which goes with the increase of waste, though a effort for public hygiene has been carried out. Breakout of water waste diseases, malaria and lambs disease. The group settlements of population with its unknown impacts on environment. Volcanic, seismic risks and flood risks are to be considered.

The government sets out overall and specific objectives to improve management of the environment, at the central and local levels, in accordance

with the current policy of decentralisation and good governance in the country. MINITERRE, ORTPN and MININFRA are all involved. The environmental law was integrated in the DPRS 1. The Rwandan Environmental Management Authority (REMA) was established by the government to implement environmental policy in the country. The organic law n°04/2005 on environment was established, though there is still a need to harmonise laws and policies, to built capacities at the decentralised structures (districts) and to take in consideration environmental issues in the territorial reforms.

Regarding the cooperation contributions, as stated earlier the EC-cooperation contributes in the fight again erosion and environmental impact assessment of the road Kigali – Ruhengeri -Gisenyi; PNUD –PNUE has contributed in the elaboration of the EDPRS 2 and other initiatives from NGOs and other intuitions (not well organised).

Integration of environmental issues in the EDPRS 2 and a Strategic Environmental Assessment of sectorial policies (not yet established) has been planned.

The CEP is a tool to integrate environmental issue during programming phase concerning the overall co-operation process. The CEP is used in the preparation of the CSP/NIP, for policy dialogue and reference. A summary of the CEP must be annexed to the CSP.

2. Objective

The main objective of the Country Environmental Profile is to identify and assess environmental issues to be considered during the preparation of a Country Strategy Paper, which will directly or indirectly influence EC co-operation activities. The Country Environmental Profile will provide decision-makers in the partner country and in the European Commission with clear information on the key environmental challenges, the current policy, legislative and institutional framework and the strategies and programmes (including those of the EC and other donors) designed to address them. This information will ensure that the EC co-operation strategies systematically integrate environmental considerations into the selection of focal sectors and co-operation objectives/strategies, and also establish the necessary environment safeguards for all co-operation activities undertaken in the Country. The Profile will establish the key linkages between the environment and poverty reduction. It will constitute an important source of baseline information and contribute to focusing political dialogue and co-operation with the Country on key areas of concern including sustainable development as well as raising awareness among policy-makers.

3. Results

The profile will deliver the following results:

An assessment of the state of the environment and key environmental factors and trends influencing the Country's development and stability.

An assessment of national environmental policy and legislation, institutional structures and capacity, and the involvement of civil society in environmental issues.

An assessment of the integration of environmental concerns in development policy and sectors with key linkages with environmental issues.

An overview of past and ongoing international (including EC) co-operation in the environment sector.

Recommendations and, as far as possible, guidelines or criteria for mainstreaming environmental concerns in co-operation areas. These recommendations should support the preparation of the Country Strategy Paper/National Indicative Programme and include guidelines or criteria to be used for environmental mainstreaming in subsequent phases of the cycle of operations.

4. Issues to be assessed

The following issues should be assessed:

(*the sub-heading below are the same as the recommended profile format*)

4.1. The state of the environment

This Chapter identifies the state and trends of key environmental resources or components in the country but are not limited to:

Themes	**Aspects**
Mineral resources and geology	Mineral resources Geological risks (seismic, volcanic and related risks)
Land	Soil erosion and degradation Soil exhaustion, deforestation Land use, arable land, losses due to urbanisation or infrastructure building
Water	Water contamination, water weed infestation Ground water Water quality
Air and climate	Air quality Potential climate changes and vulnerability
Forest, vegetation,	Forest cover and volume

ecosystems	Pastureland State of particular ecosystems (savannahs, mangroves, coral reefs…)
Biodiversity, wildlife	Local status of globally threatened species/habitats Alien invasive species Fish stocks Species with special value
Landscape	Aesthetic and cultural value of landscape
Living conditions in human settlements	Air and water quality Sanitation Slums Health Vulnerability to disasters

Pressures explaining the main negative trends should be identified, as well as pressures contributing to global environmental problems, using the following Table as a guiding checklist.

Themes	**Possible aspects to consider**
Mining, extraction of hydrocarbons	Extraction, treatment and transport of minerals and hydrocarbons
Water use and management	Water extraction (surface- and ground-water) Waste water discharges Water use
Land management	Land use planning
Forest exploitation, hunting, fisheries, biodiversity	Forest extraction Forest and fisheries management practices Hunting and fishing activities, poaching Use of NTFP (non-timber forest products) Fires Introduction of alien species
Livestock raising	Overgrazing Rangeland management, use of fire, water management
Agriculture	Extension of agricultural land Shifting cultivation Intensification Irrigation and water use Pest control Agricultural practices
Energy production and use	Sources of energy Energy consumption Energy efficiency

Urbanisation, infrastructure and industry	Urban growth and sprawl, urban planning, dams, roads, major infrastructure, polluting industries, tourism
Waste disposal and management	Waste production Waste management Public behaviour and practices, existing systems, hazardous waste management
Atmospheric emissions	Emissions of greenhouse gases and ozone-depleting substances Air pollutants affecting local or regional air quality (point-source and non-point source emissions)

As far as possible the driving forces influencing these pressures should be identified, such as economic incentives, demographic pressure, access rights to natural resources and land tenure systems.

Environmental trends should be assessed with regard to their social and economic impact, including:

- Declines in economic production or productivity (e.g. agriculture, forestry, fisheries);
- Threats to human health;
- Human exposure to environmental disasters (e.g. floods, drought);
- Conflicts and security;
- Impact on poverty and on vulnerable groups (including women, children and indigenous peoples);
- Sustainability of resource use;
- Cultural values.

This Chapter should lead to the identification of problems, described in terms of situations or trends that are undesirable due to their current socioeconomic consequences (e.g. falling productivity, health problems, natural risks, social crises, conflicts), their future consequences (e.g. decline in natural resources, cumulative pollution) or their contribution to global environmental problems.

If appropriate the consultant could refer to appropriate environmental indicators in order to establish a consistent basis both for comparisons among countries and for monitoring changes in the studied country. Attention should be paid to the MDG 7[1] indicators, and specific indicators related to the particular environmental issues of the country.

[1] See http://www.undp.org/mdg/

If appropriate, the information could be organised according to eco-geographical subdivisions with the scale (regional, national, local) of the issues indicated.

4.2. Environmental policy, legislation and institutions

A brief description and review should be provided of the strengths and weaknesses of the following aspects, with their associated evaluation criteria given for guidance:

Aspect	**Evaluation criteria**
Policies	Existence of national policies, strategies and action plans for the environment; including possible National Strategy for Sustainable Development (NSSD) and National Environmental Action Plans (NEAP). Policy response to global issues, sustainability issues (depletion of natural resources), and specific environmental issues identified above. Consistency between policies. Environmental integration in sectoral and macro-economic policies and existence of SEA of policies or strategies (especially the PRSP if relevant). Important measures taken by the Government to solve environmental concerns. Effectiveness in achieving targets.
Regulatory framework, including EIA and SEA legislation	Ratification status and implementation of MEAs (Multilateral Environment Agreements) such as those concerning climate change, biodiversity and desertification. Adequacy of (current and in preparation) environmental legislation (including land tenure and land reform, access rights to natural resources, management of natural resources, requirements for environmental assessment such as for EIA and SEA, pollution control, development control). Provision and procedures for public participation in environmental issues. Effectiveness of legislation enforcement. Use of other (non legislative) instruments, e.g. "green budgeting" (or Environmental Fiscal Reform) and market-based mechanisms, voluntary

	schemes (environmental management systems, environmental labelling, industry-government agreements). Potential impact of non-environmental legislation.
Institutions with environmental responsibilities	Identity, number and quality of institutions (involved in policy making, legislation, planning, environmental protection, monitoring and enforcement). Level of co-ordination and decentralisation. Strength and capacity of individual institutions. Influence on other institutions. Good governance practices. Capabilities, means, functioning of environmental services. Major NGOs, institutes or other organisations involved in environmental management or policy.
Public participation	Transparency and access to environmental information. Role of NGOs and civil society in environmental decision-making. Effective participation. Access to justice in environmental matters.
Environmental services and infrastructures	Protected Areas: number, areas, relevance, and effectiveness. Sanitation and waste treatment infrastructure. Disaster prevention systems. Emergency response mechanisms.
Environmental monitoring system	Relevance of selected indicators (with reference to MDG7). Measurement of the indicators: periodicity, liability. Integration in the general development indicators.

The analysis should both identify potential institutional/policy/regulatory causes of environmental pressures and the response by the government to solve the environmental problems.

4.3. Integration of environmental concerns into the main policies and sectors

The assessment should examine the integration of environmental concerns in the overall development policy and in sectors/areas that have key linkages with environmental issues and which might be identified for EC support,

taking into account the focal areas of the current CSP. This section should examine whether there is a Strategic Environmental Assessment (or similar assessment) for the national development strategy or the Poverty Reduction Strategy and for the sectors. If an SEA exists, it should provide a brief description of it, including its main recommendations. The main legislation and institutional arrangements and measures of the sector which address environmental issues, especially those identified in section 4.1 should be examined.

4.4. EU co-operation with the Country from an environmental perspective

This section should review the past and current experience relating to development co-operation interventions with specific environmental objectives as well as the integration of environment into other co-operation areas, including the application of environmental integration procedures (preparation of SEA or EIA in EC funded programmes/projects). Where information is available the environmental impacts or potential risks of EU co-operation should be identified for the benefit of future programmes. The results of existing evaluations/reviews should be incorporated and lessons drawn for the future. The implications for the environment of budgetary support or sector wide approaches should be reviewed if these have been applied. The review should cover both geographical and thematic programmes.

4.5. Co-operation funded by other donors from an environmental perspective
This section should review the past and current involvement of other donors and their experience in the Country, and include a list of recent and planned projects/programmes with an environmental focus or anticipated impact. Co-ordination mechanisms between donors and the EC with respect to the environment should be assessed.

5. Conclusions and recommendations

The key aspects of the state and trends of the environment in the Country, including policy/regulatory and institutional constraints and challenges, should be clearly stated. These may be presented in a matrix, crossing environmental concerns and the main sectors or policies.

Based on a comprehensive assessment of the available information and on consultations with stakeholders, recommendations should be made on how the Commission and the Government can better mainstream the environment into the next Country Strategy Paper, taking into account current CSP and any pre-identified options for the next one, including the anticipated focal sectors.

Recommendations should address (but not necessarily be limited to) the following:

(1) Recommendations concerning the selection of the focal sectors and response strategies, based on environmental considerations. These recommendations should show how best to address the main environmental challenges identified by the CEP. This might be done by selecting environment as a focal area and/or, more frequently, through environmental safeguards in other areas. These may include, for example, proposals for institutional strengthening and capacity building (including the enhancement of the regulatory framework and enforcement capacities) or recommendations for initiating an appropriate Strategic Environmental Assessment (SEA) process.

(2) Recommendations on the use of EC horizontal budget lines (such as Environment and Forests) and facilities (EU Water Facility - EUWF and the EU Energy Facility - EUEF).

(3) Opportunities for co-ordination on environmental issues with other donors, seeking to achieve complementarities and synergies in order to more effectively deliver development objectives.

(4) Proposals for environmentally-relevant indicators to be used in the NIP (National Indicative Programme) or to be considered during the formulation of a GBS or SPSP (if relevant).

Individual recommendations should be clearly articulated and linked to the problems to be solved and grouped according to the sector concerned or institutional stakeholder. The relative priority of the recommendations and an indication of the challenges to their implementation should be given.

Any constraints to preparing the profile resulting from limited information should be described.

6. Work plan

The work plan should include but not necessarily be limited to the following activities:

- Consultations with EC country desk officers and other relevant officials, EC Delegation, the national environmental authority and a selection of national and local authorities, key international donors, plus key national and international civil society actors operating in the environmental field.

Review of key documents and reports, including the DPRS I, previous Country Environmental Profiles (EC and others); the current EC Country Strategy Papers 2002-2007; evaluation reports, existing Strategic Environmental Assessments (particularly those concerning potential focal sectors), EIA of EC funded projects; environmental literature, environmental policy and regulatory framework, legislation, regulations (REMA) and enforcement relating to environmental issues, information on monitoring and environmental performance indicators,…

Field visits to sites of key environmental concern and (if possible) the organisation of a national workshop that national authorities, donors, experts and representatives of civil society should be invited to participate with the aim of clarifying and validating key environmental concerns.

On the basis of the outline work plan and time schedule given in these Terms of Reference, a detailed work plan should be proposed.

7. Expertise required

The proposed mission shall be conducted by a team of (two) experts who should have the following profile:

Expert level I or level II with at least 10 years wide experience in environmental issues, including institutional aspects; international environmental policies and management; environmental assessment techniques and experience in rapidly assessing information and developing recommendations. He/she would be the team leader.

Expert level II with 10 years experience and with an environment background complementary to the team leader.

In addition:

Previous working experience in the Country or the region is requested for at least one team member;

Experts should have an understanding of the EU environment and development policies;

Experience in undertaking environmental analyses and preparation of development programmes would be an asset;

Familiarity with Commission guidance on programming, country strategies, PCM, policy mix and integration of environmental issues into other policy areas is desirable;

Experience of participatory planning processes would be an advantage.

The experts should have excellent skills in computer literacy and knowledge in other sciences, economics, socials, infrastructures,… would be an asset.

Both French and English will be the working languages and the final report must be presented in the two languages.

8. Reporting

The results of the study should be presented in the Country Environmental Profile in the format given in section 10 of these ToR. The draft profile, in 2 hard copies and electronic version (Microsoft Word), should be presented to the Support Unit to the National Authorising Officer of FED 10 days after the signature of the contracts. Within *1* week, comments on the draft report will be received from the EC. The consultants will take account of these comments in preparing the final report (maximum 40 pages excluding appendices). The final report in French and English and *10* copies is to be submitted.

9. Time schedule (*example*)

	Experts
Desk analysis, including briefing to the team leader in (*place*)	*1*
Field phase including travel and possible workshop	*7*
Report finalisation	*2*
Debriefing in (*place*)-not later than (*date*)	*1*
Final report end (date)	*4*
Total days	*15*

10. Report format for a Country Environmental Profile

Standard Report Format for a Country Environmental Profile

Maximum length (excluding appendices): 40 pages.

The following text appears on the inside front cover of the report:

This report is financed by the European Commission and is presented by [*name of consultant*] for the National Authorising Officer of FED and the European Commission. It does not necessarily reflect the opinion of the Government or the European Commission.

1. Summary

The summary should succinctly and clearly present the key issues described in the profile following the order of headings 2 to 5 given below. The Summary should not exceed 6 pages.

2. State of the environment

3. Environmental policy, legislative and institutional framework
3.1. Environmental policy and legislation
3.2. Environmental legislation and institutional framework
3.3. Integration of environmental concerns into the main sectors

4. EU and other donor co-operation with the Country from an environmental perspective

5. Conclusions and recommendations

6. Country Strategy Paper Environmental Annex Summary
Comprising the main issues presented in sections 2 to 4 above (excluding section 5) in not more than 4 pages.

7. Technical appendices

I. Environmental maps of the Country
II. Reference list of environmental policy documents, statements and action plans, and other relevant technical information.

8. Administrative appendices
I. Study methodology/work plan (1–2 pages)
II. Consultants' Itinerary (1–2 pages)
III. List of persons/organisations consulted with their affiliation and contact details (1–2 pages)
IV. List of documentation consulted (1–2 pages)
V. *Curricula vitae* of the consultants (1 page per person)
VI. Terms of Reference for the Country Environmental Profile