

**RWANDA**

**RURAL SECTOR SUPPORT PROJECT**

**PRELIMINARY ENVIRONMENTAL ANALYSIS**

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# 1. INTRODUCTION

1.1 In this Preliminary Environmental Analysis (EA), the potential environmental impacts of the Rwanda Rural Sector Support Project are analyzed and mitigation measures are proposed. The Rural Sector Support Project (RSSP) would assist the Government of Rwanda (GOR) to revitalize the rural economy and thereby increase rural incomes, reduce poverty and reinforce national stability. It would provide support to the rural sector over a 14 year period; the total (IDA) loan is envisaged to amount to US\$ 156 million.

1.2 The EA is written in accordance with World Bank Operational Policies 4.01 (Environmental Assessment), OP 4.04 (Natural Habitats), OP 7.50 (international waterways) and OP 4.09 (Pest Management). It is based on field observations and discussions with government officials, environmental experts, NGOs and villagers. This EA included three weeks of field work, divided between two missions, in order to conduct field assessments and public hearings among local stakeholders. An initial draft of the EA was completed following the first mission in September 2000<sup>1</sup>. Prior to the second mission in November, comments were received from the World Bank environmental review team, and have been included in the present version<sup>2</sup>. Finally, in addition to the environmental analysis, a socio-economic assessment was undertaken during project preparation<sup>3</sup>; the main positive and negative socio-economic impacts are briefly summarized in the EA.

1.3 The approach taken in the development of the present version of the preliminary EA was the following. The description of the environmental and institutional background was based on the previously prepared draft environmental analysis. Next, further screening of the potential environmental impacts of the RSSP was conducted on the basis of field visits and discussions with the major stakeholders involved (farmers, NGOs, and the Ministries of Agriculture, Environment and Natural Resources). The World Bank Environmental Assessment Sourcebook was used as a reference. In response to the significant potential impacts, a draft environmental mitigation and monitoring plan was prepared, discussed and fine-tuned with the three ministries relevant to the project and the World Bank appraisal team (during the field phase of the mission).

1.4 In response to the limited amount of environmental data presently available in Rwanda (particularly with respect to current land use, biodiversity, hydrology, etc.); absence of environmental policies and procedures in the country; relatively weak environmental institutions, and need for additional detail and site specificity associated with the RSSP components, the EA recommends that the programme be classified as an A project. If programme design could be modified providing for a phased approach placing greater emphasis on the development of much needed baseline information, greater project detail and site specificity, and institutional capacity, a B classification may be justified. In either case, three principal additional safeguards should be included in the programme's mitigation plan (as described in detail in chapter 6): (i) on-site regional and sub-project specific environmental assessments of all programme activities with a potential environmental impact; (ii) employment of an international environmental consultant for a total of 12 months during the first three years of the RSSP; and (iii) provision for an extensive environmental review following the completion of the programme's first phase for purposes of incorporating the results of several RAAP-supported environmental studies and the updating of the environmental mitigation plan for the 2<sup>nd</sup> and 3<sup>rd</sup> phases.

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<sup>1</sup> The first draft was prepared by Paul Mafabi, international consultant, assisted by Charles Gahire and Prof Jean Bosco Gashagaza, national consultants.

<sup>2</sup> The EA was revised by Lars Hein, FAO Investment Centre.

<sup>3</sup> L. Cremona (international consultant) and E. Kabega (national consultant): Rapport Sociologique (in French). June 2000.

## 2. PROJECT DESCRIPTION

2.1 The RSSP would be in the form of an Adaptable Program Loan. The overall program, as described in the Project Appraisal Document (PAD), will consist of three consecutive phases implemented over a period of 14 years with the first phase lasting 4 years and the second and third phase each lasting 5 years. After the first phase, an evaluation of the project achievements and the validity of the objectives and the components of the subsequent phases will be made, and the activities of the 2<sup>nd</sup> and 3<sup>rd</sup> phase will be defined in more detail. The main project components of the first phase are described below.

2.2 **Component 1. Rehabilitation of Farmed Marshland and Hill-Side Areas.** This component would provide the financial and technical opportunities to farmers to improve the efficiency of the cultivation of marshlands and hill-sides. The component would only support agricultural activities in wetlands that are currently being exploited for agricultural purposes. It is foreseen that about 6,000 ha of wetlands would be included in the first phase of the project (see Annex B). Rehabilitation of hillsides includes mainly the construction of progressive and radical terraces on cultivated land; it is envisaged to construct terraces on a total of about 60,000 ha of hillsides. The large majority would be in the form of progressive terraces; radical terraces, which require much higher labor inputs, would only be supported on a limited scale. The component would follow a catchment approach (i.e., applying a catchment planning framework which would guide programme-supported field rehabilitation activities interventions in both wetlands and hillsides). An overview of the envisaged development models is presented in table 1. The farmers are expected to formulate subproject proposals themselves (with technical assistance of extension officers trained under the project), and they would be paid for their labor contribution.

**Table 1: Proposed development models<sup>1</sup>**

| Development model     | Main features  | Indicative costs* (US\$/ha) | Proposed crops   |
|-----------------------|--|-----------------------------|--|
| <b>Wetlands</b>       |  |                             |  |
| Rehabilitation        | Repair of drainage and irrigation works, leveling.   | highly variable             | Maize, legumes (peas and beans), vegetables (cabbage, tomatoes, eggplant, etc.)                    |
| Modernization, type 1 | Improvement of draining conditions, leveling, irrigation with treadle pumps.   | 400 to 800                  | Maize, legumes (peas and beans), vegetables (cabbage, tomatoes, eggplant, etc.)                    |
| Modernization, type 2 | As type 1 with a simple water storage basin and either motor pumps or gravity irrigation; recommended for wetlands of 30 to 100 ha.  | 1,600 to 1,800              | Maize, legumes (peas and beans), vegetables (cabbage, tomatoes, eggplant, etc.)                    |
| Modernization, type 3 | As type 2 with a irrigation reservoir and gravity irrigation only. This would generally involve constructing a dam in the river bed in order to create the water reservoir. It would be the recommended modernization type of wetlands above 100 ha. | 2,000 to 2,500              | Rice, maize, legumes (peas and beans), vegetables (cabbage, tomatoes, eggplant, etc.)              |
| <b>Hillsides</b>      |  |                             |  |
| Progressive terracing | Planting of living hedges on contour lines in order to gradually create terraces   | 150-200                     | Mix of plantain, beans, manioc, coffee, Irish and sweet potatoes, maize, sorghum, vegetables, etc. |
| Radical terracing     | Counterslope terraces constructed through earth works  | 1000-2000                   | Mix of plantain, beans, manioc, coffee, Irish and sweet potatoes, maize, sorghum, vegetables, etc. |

\*: labor costs included at 1 US\$/day.

<sup>1</sup> Based on A. Dachraoui: RSSP, Rappports Techniques (in French), mission 1, June 2000; and mission 2, November 2000.

2.3 **Component 2. Integrated Management of Critical Ecosystems.** The Program's objective under this component would be to strengthen the capacity of local communities to effectively manage critical ecosystems. This component would be funded by the Global Environmental Facility (GEF). Envisaged activities include: (i) development of an enabling environment for sustainable resource use. This would include the development of National Wetlands Policy and a National Strategy and Action Plan for the Conservation and Sustainable Use of Wetlands; (ii) assessment of the biodiversity of critical wetlands and the identification of wetlands of global significance and priority areas/hotspots for intervention; development and implementation of community-based integrated management plans; (iii) capacity building and institution strengthening in decentralized integrated natural resources management; and (iv) development of an Environmental Information System (EIS). Activities (i) and (ii) would be closely coordinated with the formulation of the Master Plan for wetland management, to be funded by the African Development Bank (ADB).

2.4 **Component 3. Promotion of Export Agriculture.** This component would seek to strengthen the capacities of export crop farmers and exporters to manage their commercial and technical activities and thereby raise the productivity and competitiveness in Rwanda's export sectors. It would focus on coffee and tea (traditional Rwandan export crops), flowers and various fruit species.

2.5 **Component 4. Support to Agricultural Services Delivery Systems.** The Program's objective under this component is to strengthen the capacities of lead public institutions, farmer associations, and SLOs to participate in the delivery of research and extension services. In order to mitigate the risk of increased use of pesticides (in particular on vegetables, rice and potatoes), the RSSP would include an integrated pest management sub-component as part of the component support to agricultural services delivery systems. A comprehensive IPM program has been developed, involving the organization of training workshops and study tours, curriculum development, training of trainers, and the organization of farmer field schools. The component was formulated by an international IPM specialist. In total, the project would organize 120 farmer field schools (FFS) in the first phase of the project. This would involve the training of some 2000 to 2500 farmers in IPM, leading to a considerable reduction in pesticide use and improved crop yields. The total budget of the IPM sub-component was estimated to be about US\$ 360,000.

2.6 **Component 5. Small-scale Infrastructure Development.** This component's objective is to strengthen the capacities of local communities and private sector operators to construct and maintain transport and post-harvest equipment and infrastructure. The RSSP would support the construction of feeder roads, bridges, etc. As the project would be demand driven and precise activities would be defined during implementation, it is not yet known where these rural infrastructure works would be constructed.

2.7 **Component 6. Promotion of Off-farm Productive Activities in Rural Areas.** The activities under this component should lead to higher levels of off-farm employment and incomes in the program areas. This may include the support for rehabilitation or construction of agro-processing units.

2.8 **Component 7. Program Monitoring and Evaluation.** In order to ensure effective monitoring and evaluation of program activities, a monitoring unit would be set up in the Program support and Coordination Unit (PSCU).

2.9 **Program Support and Coordination.** It is envisaged to install a Project Support and Coordination Unit at the central level in order to coordinate the implementation of all project activities, monitor project achievements, etc. The unit would ensure effective coordination

between and support to the various implementing agencies and beneficiaries groups at the prefecture and commune level.

2.10 Based on the results of the first phase, the subsequent phases of the Program would extend and deepen the institutional and technical support and raise the investment activities in order to accelerate the pace of intensification and commercialization of agricultural production. Specific activities envisioned to be supported in subsequent phases include: (i) further improvement of effective and sustainable agricultural services delivery systems; and (ii) further development of infrastructure improvements and maintenance arrangements. These two sets of activities would build the core of the program to which targeted sub-sector specific interventions would be added.

2.11 The budget of the RSSP is shown in table 2.

**Table 2. Project costs**

| <b>Component</b>   | <b>Indicative Costs – total<br/>(US\$ million)</b> | <b>Indicative Costs – first phase<br/>(US\$ million)</b> |
|--|--|--|
| 1. Rehabilitation and Development of Marshlands and Hill-sides | 79.0   | 15.0   |
| 2. Integrated Management of Critical Ecosystems                | 15.0   | 5.0  |
| 3. Promotion of Agricultural Exports                           | 13.0   | 8.0  |
| 4. Support to Agricultural Services Delivery Systems           | 13.0   | 8.0  |
| 5. Small Scale Rural Infrastructure                            | 22.0   | 9.0  |
| 6. Promotion of off-farm productive activities in rural areas  | 10.0   | 4.0  |
| 7. Program Monitoring and Evaluation                           | 1.5  | 0.55   |
| 8. Program Support and Coordination                            | 2.5  | 1.45   |
| <b>Total costs</b>   | <b>156.0</b>                                       | <b>51.0</b>  |

### 3. THE EXISTING ENVIRONMENT

#### The Physical Environment

3.1 **Topography.** Rwanda is a small, mountainous and landlocked country covering 26,330 Km<sup>2</sup>; a map of Rwanda is included in Annex A. The country has been described as the country of 'thousand hills' (*mille collines*) because of the numerous highly dissected hills, often with flat peaks and convex slopes, separated by relatively narrow valleys covered with alluvium matter. Towards the southeast, the relief is dominated by plateaus, whereas the west of the country is dominated by the roughly north west oriented Nile – Congo river rift. The average altitude is 1,250 meter above sea level.

3.2 **Climate.** Despite the proximity to the equator, the climate is mild, being moderated by altitude. The high peaks in the west have a cool and very rainy climate, whereas the high plateau is temperate. The eastern third of the country is tropical. Mean annual rainfall in the mountainous zone is around 2400 mm a year, declining to 1200mm/yr in the central districts and to as little as 700 mm/year near the Tanzanian border. Most of the country has two rainy seasons per year, separated by one short and one long dry season. The rainy seasons are roughly from September to January and February to May.

3.3 **Hydrology.** Rwanda's hydrology is characterized by a dense hydrographic network with lakes, rivers and wetlands. The country is divided into two major drainage basins, the Nile to the east and the Congo to the west. The Congo River basin covers 33% of Rwanda and receives 10% of the total national rainfall. The Nile River Basin covers an area of 67% of the territory and

receives 90% of the national rainfall. The waters of the Nile River basin flow out through the Akagera river system, which contributes between 8 and 10% to the Nile drainage system. Rivers and lakes cover some 135,000 ha, or 5% of the national territory.

3.4 **Wetlands.** Wetlands cover a total area of 164,000 ha or about 6% of the territory. The wetlands (in French: *marais*) include a variety of ecosystems, ranging from large, permanently flooded swampy peat-lands to smaller, seasonally flooded wetlands with a more mineral soil. The main swamps are Akanyaru (30,000 ha) on the border with Burundi, Mugesera-Rugwero in the southeast, Kagera swamps along the Tanzania border in the east, Nyabarongo (10,000 ha) and the Rugezi wetlands (5,000 ha) in the north. The wetlands act as sinks for sediment particles and play an important role in the national water balances by acting as a buffer, thus reducing the maximal flow rates during the rainy season and maintaining a relatively high flow rate during the dry season. Currently, an estimated 94,000 ha have been brought under agriculture, the large majority of this being spontaneous agriculture with maize, sweet potatoes and beans. In addition, the wetlands are used for a variety of traditional activities including the collection of leaves to make handicrafts, extensive grazing and the making of bricks. Wetlands also provide a spawning habitat for fish, and are of great importance for biodiversity conservation (see also paragraph 3.9).

### The Biological Environment

3.5 **Vegetation.** Rwanda contains a wide variety of different habitats and species, due to its varied geomorphology and its diverse climatic conditions. Vegetation can best be characterized as a regional mosaic, including sections of Guineo-Congolian and Sudanian vegetation. The Nile-Congo ridge contains mountainous tropical forest whereas the natural vegetation in the middle and low altitude parts of the country is basically east African bushland. Secondary forest mosaics produced by human activity have replaced natural vegetation almost everywhere outside the national parks.

3.6 **Savanna.** Savannas occur mainly in the eastern part of Rwanda and can be divided into shrub savanna with trees under 4 meters high and acacia wooded savanna with trees over 4 meters high. In the open savannas of the first category, *Themeda*, *Hyparrhenia* and *Cymbopogon* predominate. Dominant species in the wooded savanna are *Acacia senegal*, *Acacia siberiana*, *Albizia petersiana* and *Lannea*.

3.7 **Forests and protected area system.** There are presently two national parks in Rwanda: Volcanoes National Park and Akagera National Park. These areas are exclusively reserved for the protection of flora and fauna, and of geological formations of scientific and aesthetic value. The Volcanoes National Park is particularly important for biodiversity conservation. In combination with adjacent forests in Uganda and Congo, it contains approximately one-half of the world's remaining population of mountain gorillas. In addition, there are a number of forest reserves, including Nyungwe and Giswati forest reserves. Actions have been initiated to make the Nyungwe forest reserve a national park, but its status has to date not been officially changed.

3.8 Preliminary estimates indicate that all of the protected areas and forest reserves in Rwanda were seriously damaged as a result of the 1994 civil disturbances. From an estimated pre-1994 total surface area of 417,000 ha, it is thought that they have been reduced to approximately 226,000 ha. Specifically, the Akagera National Park was reduced to less than one-third of its original size when the Umutara prefecture was created in 1996 for resettlement of returning refugees. The Gishwati Forest has all but disappeared (from a pre-war estimate of 37,000 ha, only about 2,000 ha remain). Due to the high population density and the limited efficiency of the use of agricultural land, there is an ongoing encroachment into remaining forests and protected areas and their existence remains under threat.

3.9 **Other Critical Habitats.** Currently, none of the country's wetlands has a protected status (except the wetlands in Akagera national park). Nevertheless, five wetlands have been described as crucial for the protection of birdlife<sup>1</sup>. These are Mugesera, Kagera, Nyabarongo, Rugezi Swamp, and the Akanyaru wetlands. These wetlands support a number of globally threatened species and restricted range species, such as water turtles, crocodiles, monitors, snakes, otters and a large variety of water birds including herons, egrets, ducks, warblers and weavers. Some 180 bird species have been identified in the wetland habitats of Rwanda, including 6 European migrants<sup>1</sup>.

### **The Socio-Economic Environment**

3.10 **Population.** Rwanda has an estimated population of 8.2 million people with an annual growth rate of about 3% and an average population density of about 400 people per km<sup>2</sup>, one of the highest in Africa. More than 90 % of the population depends on agriculture for their livelihoods, and the per capita income of US\$250 is one of the lowest in the world. The majority of the people live below the poverty line and is not capable of meeting their basic human needs<sup>2</sup>.

3.11 **Agriculture.** Agriculture is the mainstay of Rwanda's economy. Approximately ninety-one percent of the population depends on the sector, which is estimated to contribute about 40% to the GDP. According to the census of MINAGRI, agricultural arable land covers an area of about 1,385,000 ha or about fifty-two percent of the total area of the country. Per capita land holdings are very small with an average area of 0,6 ha per family. The main food crops are bananas, beans, sorghum, sweet potatoes, Irish potatoes, cassava, maize and rice, which was introduced in the country relatively recently.

3.12 **Social structure and organization.** A modest proportion of the country's farmers is organized in Farmers Associations or co-operatives, which co-ordinate farming activities in the communities. Membership in these associations includes both men and women. However, as a result of the genocide of 1994, many of these associations have been affected. In some of the communities, a substantial part of the male community has either died or is serving prison sentences. In recent years, the GOR has been implementing a program of resettlement of returnees (primarily through the *Midugudu* program). This involves establishing settlements with basic infrastructure such as roads and healthcare units. However, in many cases people that initially occupied the land used for resettlement were not fully compensated, and discontent with the resettlement policy is increasing.

3.13 **Health issues.** Health centres are present in a large part of the communes. However, the supply of medicines at the local level is very limited, and except for minor diseases and diagnosis, people have to go to the prefecture level hospitals. Currently, the government is implementing a cost sharing scheme in which the patients make a contribution towards the cost of the medical services offered at health centers.

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<sup>1</sup> Kanyamibwa, 1995: Important Bird Areas for Africa. Rwanda, World Conservation Monitoring Centre, 1995.

<sup>2</sup> UNDP Human Development Report Rwanda 1999 and Ministry of Finance and Economic Planning, Directorate of Statistics (Rwanda July 1999).

## 4. INSTITUTIONAL, LEGAL AND POLICY FRAMEWORK

### The Institutional framework

4.1 In Rwanda, the institutional responsibility for environment and natural resource management is shared between several ministries: (i) the Ministry of Land, Human Resettlement and Environment Protection (MINITERE); (ii) the Ministry of Agriculture, Livestock and Forestry (MINAGRI); (iii) the Ministry of Energy, Water and Natural Resources (MINIRENA); (iv) the Ministry of Public Works, Transport and Communication (MINITRACO) and (v) the Ministry of Commerce, Industry and Tourism (MINICOM). Several NGOs and universities also deal with various aspects of the environment, see table 3.

4.2 **Ministry of Lands, Human Resettlement and Environmental Protection (MINITERE).** This is a new Ministry following the government restructuring in February 1999. MINITERE has five Directorates: Lands; Environmental Protection; Planning; Legal Affairs; and General Services. It is responsible for developing land utilization policies (including surveying, land classification, land laws and land tenure); the development of environmental policies and procedures (including impact assessments), protection of natural resources (water, land, flora, fauna), environmental legislation, biodiversity, and other environmental aspects. The Directorate of Environmental Protection (DEP) has three Divisions: Environmental Policy and Advocacy; Environmental Assessment; and Environmental Monitoring and Inspection. DEP is also responsible for environmental monitoring. In general, MINITERE is understaffed, and this is particularly the case for the DEP that has currently only some 12 professional staff at the central level. Although formally responsible for environmental assessment, there is no legal framework yet regarding environmental assessment (see below), and MINITERE's activities in this field are limited.

4.3 **Ministry of Agriculture, Livestock and Forestry (MINAGRI).** In the February 1999 restructuring, the Directorate for Environmental Protection was transferred to the Ministry of Lands (now MINITERE, above) and responsibility for water resources management to the Ministry of Energy, Water and Natural Resources. MINAGRI's primary mandate is the development, transformation and modernization of Rwandan agriculture in its broadest sense (including forestry, fisheries and livestock). The Directorate of Rural Engineering (Genie Rural) and Soil Conservation (DGRCS) advises the Government on land management and is the technical agency responsible for the exploitation and management of the wetlands for agriculture. The Department of Forestry is responsible for management of the forest reserves and plantations.

4.4 **Ministry of Energy, Water and Natural Resources (MINIRENA).** Another newly recreated ministry after the government restructuring in February 1999, MINIRENA has been mandated to handle most of the water-related matters which had previously been under the purview of the Ministry of Agriculture, Livestock, Environment and Rural Development. Through its Directorate of Water and Sanitation (DWS), MINIRENA is responsible for water resource management. Its main objective is to ensure protection and conservation of water resources, and ensure supply of water and sanitation systems to the Rwandan population. DWS is comprised of four divisions: Division of Urban Water, Division of Rural Water, Sanitation Division, and Hydrology and Water Resources Management Division. The Hydrology and Water Resources Management Division is responsible for the preparation of hydrological surveys, assessment of potential underground water resources, maintenance of a database on national water resources, water quality control, and monitoring water levels in lakes and river systems.

4.5 **Ministry of Public Works, Transport and Communication (MINITRACO)** plays an important role in water resources management through its Division of Meteorology, which is located in the Directorate of Transport. The Division of Meteorology is comprised of six sections: Meteorology, Agrometeorology, Climatology, Meteorological Centre, Data Analysis and Computers, and Hydrometeorology. It co-ordinates all aspects of meteorology and provides data and information to all interested users.

4.6 **Ministry of Commerce, Industry and Tourism (MINICOM)** is responsible for tourism and the management of protected areas. It houses the Rwandan Office for Tourism and the Protected Areas (ORTPN) that handles the day-to-day management of the protected area system.

**Table 3. NGOs and Universities involved in Environment Management in Rwanda**

| Name of institution   | Relevant focus areas  |
|---|---|
| <b>NGOs</b>   |   |
| Rwanda Environment Awareness Services Organization Network (REASON) | Awareness raising   |
| Green Environment Conservation (GEC)                                | Improved cook stoves  |
| CARE  | Agroforestry; protected area management                       |
| German Agro-Action  | Agroforestry; marshland rehabilitation                        |
| CRS   | Marshland rehabilitation                                      |
| <b>Academic and Research Institutions</b>                           |   |
| National University of Rwanda, Butare                               | Agronomy; soil fertility; forestry; agroforestry; fisheries   |
| Kigali Institute of Science and Technology KIST                     | Alternative energy sources; rainwater harvesting technologies |
| Center for Education  | Courses in environmental management                           |
| ISAR  | Agronomy; soil fertility                                      |

### The Legal Framework

4.7 The GOR has yet to develop and adopt environment laws or environmental assessment guidelines. However, the Land Decree of July 1960 makes reference to the ownership and use of hillsides, marshlands and other aspects of the environment. The Land Decree stipulates that all marshlands are exclusive property of the State and are available to the people of Rwanda for their use and profit. This decree also states implicitly that the government has an unconditional right to take land back for redistribution or other considerations for public benefit, in which case the original occupiers of the land should be compensated. As a common property resource with open access, there is no security of tenure and this has served as a disincentive to the sustainable management of wetlands. In February 1999, a draft revised Land Law was prepared, defining ownership of land, rights and obligations of land owners and transactions of land. The law recognizes private land, land owned by the state, and land owned by the commune. However, the law has not yet passed the parliament and is not yet effective.

### The Policy Framework

4.8 Priorities in the agricultural sector are defined in the Government's **Agricultural Development Strategy and the Food Security Strategy and Action Plan**. Priority is first and foremost given to assuring the food security needs of the Rwandan people. Intensification of agricultural production is a lynchpin of the Government's strategy, and sustainable management of the inland valleys and marshlands, watershed protection, soil and water conservation, and improving soil fertility are among the priority actions. The management of the marshlands (*marais*) figures prominently in the Government's agricultural development strategy, and one of

the objectives of the medium-term development plan is to rehabilitate and development 12,000 ha of *marais* by the year 2010.

4.9 A **National Poverty Reduction and Growth Strategy** is presently being elaborated. Policies are aimed at good governance, national reconciliation and stability, increasing productivity and incomes of the rural poor, and improving their access to social services. Increasing agricultural production will be an important element of the strategy.

4.10 **Rwanda's National Water Policy** (1998) aims to "attain maximum short, medium and long-term economically and ecologically sustainable social advantages for the well-being of the Rwandan population" and "guarantee everybody's access to water in an equitable and sustainable manner". To this end, the policy has adopted a holistic approach to water resource management. Issues linked to allocation, conservation, quality control and efficient use of water resources are to be addressed. On the supply side, the policy stresses the importance of protecting the major sources of water - lakes, rivers, underground water, wetlands, among others. The policy recognizes the need to minimize losses from inappropriate and unsustainable use of water resources. It furthermore recognizes that sustainable use of water resources must be strongly linked with environmental protection, and that the utilization of these water resources should take into full consideration existing regional and international agreements and treaties. The preparation of a wetland development Master-plan (to be funded by the African Development Bank) is due to begin shortly. This plan would identify suitable models for wetland development and result in a wetland development strategy.

4.11 The environmental degradation resulting from the catastrophic civil war in 1994 has been a determining factor in guiding Government's priorities. All of the protected areas and forest reserves have been seriously damaged and their continued existence remains under threat. The **Update for Rwanda's National Environmental Strategy** identifies the high population density and growth rate, the lack of land, and the problem of refugees displaced during the war as major problems with significant environmental impacts. Food insecurity and domestic energy concerns have been singled out as the greatest factors leading to the degradation of the environment. Constraints in addressing these issues include, *inter alia*, an absence of environmental legislation and policies, a lack of reliable environmental data and information, lack of trained environmental specialists, and a low level of environmental awareness. Key elements of Rwanda's environmental strategy therefore include: the integration of environmental concerns in all sectors, rational management of natural resources, development of an environmental information system, awareness-raising about the ecological, cultural, and economic value and role of natural resources, and institutional strengthening and capacity-building.

4.12 **The National Biodiversity Strategy and Action Plan (BSAP)** was approved in principle in June 2000, and defines the objectives and priorities for the conservation and sustainable management of biodiversity. This includes hillsides and wetlands, and also covers the government strategy vis-à-vis protected areas.

### **Decentralization of Environmental Management**

4.13 Under the decentralization policy adopted in May 2000, the central government will retain the function of conservation and environment protection policy while tourism and environmental management will be transferred to the prefectures and urban local governments. However, at prefecture and commune level, the capacity of implementation of environmental policy is extremely low. Although MINITERE has prefecture level offices, these are involved mostly with land management and resettlement issues. There are only environmental inspectors in 4 prefectures (out of a total of 10 prefectures).

## 5. ENVIRONMENTAL IMPACTS

### Potential Positive Impacts

5.1 Overall, Rwanda's natural resource base is subject to continuing degradation due to the high population density, high population growth rate (some 3% p.a.), and continuing uncontrolled resettlements following the civil war. High erosion rates on hill sides affect agricultural productivity, whereas deforestation and possibly changes in river hydrology may have caused changes in the local climate; rainfall has been deficient in each of the last three years.

5.2 The RSSP would contribute to an improved management of natural resources by: (i) improving sustainability and productivity of hill side agriculture through the application of soil and water conservation measures; and (ii) through increasing the productivity of wetlands already used for agricultural purposes. Besides tackling the issue of land degradation in the hillsides, this would lead to improved food security and income generation opportunities for the rural population. Increased productivity of agricultural land could lead to a reduction in the encroachment in protected areas. In addition, the project would support capacity building at all levels, including the local level. The project component 'integrated management of critical ecosystems' (financed by the GEF) would contribute to the protection of biodiversity in wetlands.

### Potential Negative Impacts

5.3 The project also has a number of potential negative environmental impacts. The main potential negative impacts are: (i) loss of habitat through increased cultivation of wetlands; (ii) changes in national hydrology through drainage and irrigation of wetlands; (iii) increase in diseases with a waterborne vector (in particular malaria and bilharzia) through the construction of irrigation reservoirs; (iv) increase in the use of pesticides; and (v) increase in erosion related to the construction and rehabilitation of roads. These impacts are described below. As the project would be demand driven, and precise project activities would be determined during its implementation phase, quantification of the environmental impacts is not possible.

(i) **loss of habitat through increased cultivation of wetlands.** In the first phase, the project would support agricultural activities in some 6,000 ha of wetlands (see Annex A). Currently, around 90,000 out of the total 164,000 ha of wetlands in Rwanda are under cultivation. This is a relatively extensive type of cultivation involving traditional drainage, cultivation of maize, sorghum, soybeans and sweet potatoes during the rainy season, and cultivation of sweet potatoes during the dry season. Nevertheless, these wetlands have lost the majority of their original vegetation cover. As the project would be limited to already cultivated wetlands (see Annex A), the environmental impact is thought to be moderate; nevertheless, adequate mitigation to avoid that the project would support development of wetlands that are not currently cultivated is required. In addition, it will be needed to check potentially significant biodiversity on wetlands adapted by agricultural land use in an environmental screening procedure.

(ii) **changes in national hydrology through drainage of wetlands.** The proposed project activities include drainage and irrigation. This will have a substantial impact on the hydrological properties of the wetlands. These include a reduction in the water holding capacities of the wetlands: when drainage activities are completed, there may be less possibility to absorb floods in the rainy season and, subsequently, less water available to be released in the dry season. As the project would ultimately cover up to 40,000 ha of wetlands in Rwanda (about 25% of the total area of wetlands), there is a risk that there would be a cumulative impact of the activities on the

national river water hydrology<sup>1</sup>. Taking into account that Rwanda is an important source of water for both the Nile and the Congo, this risk needs to be investigated, quantified, and mitigated. The total area of wetlands to be included in the 1<sup>st</sup> phase is limited relative to the total area of wetlands in Rwanda (6,000 ha as compared to 164,000 ha), but it is recommended that the environmental review after the 1<sup>st</sup> phase consider the results of the hydrological study and the list of wetlands proposed for inclusion in the 2<sup>nd</sup> and 3<sup>rd</sup> phase of the RSSP in order to ensure compliance with World Bank Operational Policy 7.50 (international waterways).

(iii) **increase in waterborne diseases through the construction of irrigation reservoirs.** These diseases are in particular malaria and bilharzia. Irrigation reservoirs provide a habitat for mosquito larvae and water snails, the respective vectors of malaria and bilharzia. In particular malaria is one of the most dangerous diseases of the country. Even though there currently already exist ample breeding habitats for the vectors of these diseases, there is a risk of an increase in malaria and bilharzia due to the construction of irrigation reservoirs in the wetlands.

(iv) **increase in the use of pesticides.** Pesticide use on most staple crops is not very high in Rwanda as the majority of farmers can not pay for pesticides. However, pesticide use can be substantial on cash-crops such as coffee, tea, vegetables and rice in the wetlands, and potatoes in the hillsides. As the project would specifically be targeted at increased cultivation of cash crops, there is a risk that this could contribute to an increased use of pesticides in the country, requiring adequate mitigation. The negative environmental impact of an increased use in fertilizers would be negligible as, in the large majority of the fields, the current use of fertilizers is too low to even replenish the soil nutrients taken out by the crops. Increased use of fertilizers would thus have a positive environmental impact as it would help to maintain the soil fertility of agricultural plots.

In order to mitigate the potential environmental impacts related to an increase in the use of pesticides, the RSSP would include an extensive integrated pest management (IPM) component that would train some 2000 to 2500 farmers in IPM, following the farmer field school approach. This would lead to a considerable reduction of pesticide use, in many countries reductions of over 50% in the use of pesticides by the farmer have been achieved. The IPM component is described in Chapter 2. Regarding the EA, it is believed that the inclusion of the IPM component in the RSSP would serve to adequately mitigate the risk of an increase in pesticide use.

(v) **increase in erosion related to the construction/rehabilitation of roads.** With the exception of the national parks, there is virtually no untouched habitat left in Rwanda and the risk of an impact on habitat through the construction of local infrastructure such as roads is low. However, there exists a risk that the construction of roads could lead to erosion, in particular when road design insufficiently takes into account the substantial erosion risk in a high rainfall country such as Rwanda.

**Other environmental impacts.** An activity that may be supported by the RSSP is the construction of agro-processing units. These processing units (in particular for coffee) may cause pollution of waterways through the disposal of wastewater. However, it is currently not known if, and what types of processing units would be supported. There is also a chance that the improvement of the market structure for rice, vegetables and legumes (peas and beans) could lead to increased demand for these products, and thus to encroachment on other wetlands. This also holds for the construction of roads, which may facilitate the transport of agricultural products and thus may stimulate the growing of these crops, possibly causing encroachment on currently non-cultivated wetlands. Because these impacts can only be assessed when more detailed information is available on the precise activities of the project, they have not been further investigated.

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<sup>1</sup> In addition to the RSSP, a number of other donors (including CRS and USAID) are also preparing projects to assist in the intensification of agriculture in the wetlands, albeit at a smaller scale than the RSSP.

However, it is recommended that these impacts be included in the environmental review of the project after the first phase (see chapter 6, section 7).

5.4 **Socio-economic impact<sup>1</sup>**. Overall, the RSSP would have an important positive socio-economic impact on the beneficiaries as it would increase income earning opportunities, improve food security, improve the possibilities of local people to manage their natural resources, and contribute to capacity building, in particular at the local level. There are no major negative socio-economic impacts foreseen, however, a number of risks are identified that may influence project implementation. These include: (i) a risk that terraces, and drainage and irrigation structures will not be properly maintained; (ii) a risk that local people would not be sufficiently trained in operation of local infrastructure; and (iii) in some areas local labor availability may be insufficient for rice cultivation. These risks have partly been addressed in the current project design (which includes local training activities in operation and maintenance of infrastructure works; and emphasis the role of local participation in subproject formulation and implementation). In addition, it is proposed to screen project proposals on the presence of an adequate maintenance plan and local labor availability. Besides social implications, these issues could have an (indirect) environmental impact as a lack of maintenance (through lack of workforce or lack of an appropriate management plan) could result in increased erosion of constructions (such as dykes), siltation of drainage canals, gully forming beneath damaged terraces, etc.

5.5 An overview of the potential environmental risks of the RSSP is provided in table 4., mitigation measures for which have been included in project design (see chapter 6).

**Table 4. potential environmental risks of the RSSP**

| Potential Environmental Impact    | Cause                                 | Environmental risk | Justification  |
|-----------------------------------|---------------------------------------|--------------------|--|
| Loss of biodiversity              | Wetland conversion                    | ++                 | The project would include only wetlands that are already under cultivation (see mitigation measures)   |
| Change in hydrology               | Wetland conversion                    | ++                 | The environmental risk is not known; adequate studies followed by support for the preparation of a management plan would be required (see mitigation measures) |
| Increase in malaria and bilharzia | Construction of irrigation reservoirs | ++                 | The project may contribute to an increase in vector breeding sites   |
| Increase in pesticide use         | Intensification of agriculture        | ++                 | Pesticide use would increase when growing of cash crops increases, adequate mitigation measures required.  |
| Increase in erosion               | Infrastructure construction           | +                  | Through appropriate engineering most of the erosion risks may be avoided.  |
| Socio-economic impact             | Changes in agricultural practices     | +                  | The socio-economic implications of the project are mostly positive (improved living conditions, improved local capacity to manage natural resources).          |

Key: ++ moderate; + low.

<sup>1</sup> As described in detail in the 'Annexe Sociologique', prepared in June 2000 as part of RSSP project preparation.

## 6. MITIGATION MEASURES

6.1 In order to mitigate the potential negative environmental impacts of the project, the RSSP includes an environmental mitigation plan, composed of the following elements:

**(i) Exclusion of currently uncultivated wetlands from the project.**

6.2 Undeveloped wetlands will be excluded from the project. The priority list of wetlands to be developed under the first phase only contain areas that have already been modified by agricultural activities; in addition, a biodiversity assessment of wetlands will be conducted (as part of the GEF component) and an environmental screening procedure will be adopted (see below). The assessment would, amongst other outputs, result in a list of wetlands, that because of their importance for biodiversity conservation or maintenance of national hydrology, would be excluded from development by the RSSP (a 'negative' list). A screening procedure would also be applied to cultivated wetlands proposed for rehabilitation or modernization by the RSSP in order to provide an additional environmental safeguard, as specified in section v.

**(ii) Implementation of a study on the role of wetlands in the national river water balances.**

6.3 Even though the role of wetlands in maintaining Rwanda's hydrological network is recognized, there is currently no quantitative information available on this subject. As already some 90,000 ha of wetlands have been brought under agriculture, and as the RSSP would support the intensification of agriculture in up to 40,000 ha of these (involving drainage and/or irrigation), there is a risk that this process will lead to changes in dry season water availability or local climate. Therefore, the project would fund, during the first phase, a study that would result in an analysis of the potential impact of wetland modification on river hydrology in the project area. This study will provide an input into the scheduled formulation and implementation of the Master-plan for wetland management (ADB funded), of which the formulation phase is planned to start shortly. The TORs for the Master-plan do not include the examination of possible changes in water flows at the national scale because of wetland development.

6.4 The proposed study would determine: (i) the potential impacts of different types of agricultural development in wetlands on river hydrology; (ii) the possible cumulative impact of modifications in wetland hydrology on river discharges in the project area; and (iii) possible ways to mitigate this impact (such as the protection of certain (types of) wetlands that have a crucial function in the regulation of water flows and/or the proposal of adapted wetland development models, e.g. using buffer zones). In addition, the study would investigate the current hydrological monitoring capacity in Rwanda, and propose a detailed program to monitor the potential hydrological impacts of the RSSP, in particular the impact on downstream water users for consideration for possible funding under the programme's 2<sup>nd</sup> phase. The outcomes of the study, in combination with the results of the hydrological monitoring program, if supported, would enable a more detailed assessment of the hydrological impact of the RSSP in the programme's subsequent phases.

6.5 The study would be conducted by a national consultant, with support from an international consultant (TORs in Annex C). The outcomes of the study would be discussed among the main stakeholders (i.e., MINAGRI, MINIRENA, MINITERE) in a two day seminar. The study will use existing data on rainfall and river discharges and will test the hydrological impact of wetland drainage in a number of test sites. It is proposed to split the 3 months of international consultancy in two periods of 6 weeks in order to allow for data collection in the meantime (by the national consultant). If funding were secured for the proposed hydrological

monitoring program, it is essential that due to Rwanda's complex hydrology, monitoring be continued throughout the life of the project (see chapter 7)..

**(iii) Testing of biological vector controls for malaria and bilharzia.**

6.6 Three mitigation measures are proposed: (i) the local level environmental training program (as described in detail in section (vi) ) would include a module on these diseases (describing vectors, vector control, prevention, symptoms, medication, etc.); (ii) a test will be conducted on the possibility to use biological vector control measures; and (iii) the incidence of malaria and bilharzia will be measured in the environmental monitoring program (which is described in chapter 7 below). In addition, a separate budget will be reserved for health care activities (medications, mosquito nets, etc.) in case there would be an outbreak of malaria or bilharzia in a project area.

6.7 It is proposed that the vector control test will be undertaken by a national consultant (4 months), supported by an international consultant (1 month in project year 1) and in cooperation with the PSCU and MINAGRI; TORs are included in Annex D. It is recommended to investigate if the national consultancy could be implemented by the Ministry of Health (MINISANTE). In the test, the suitability of a number of biological control measures will be examined (e.g. use of different fish species, removal of water plants). The results of the test would be included in the local level training program. The environmental monitoring program is described in chapter 7.

**(iv) Environmental screening procedures.**

6.8 The project would adopt stringent environmental screening procedures, closely matched to the RSSP field activities appraisal procedure. In the RSSP subproject cycle, subprojects would be proposed by Commune Development Comities (CDCs) or other local organizations supported by local NGOs or MINAGRI extension officers. The subprojects would be appraised and approved by the PSCU located in the MINAGRI. In order to facilitate the environmental appraisal of subprojects, the PSCU would employ a national environmental specialist supported with periodic interventions from an international consultant over the programme's first 3 years. As part of the subproject appraisal, the project environmental specialist would be required to examine the potential environmental impact of the project. Although the environmental specialist is expected to be familiar with EA, if needed, he would receive additional training in the subject matter (see below). The environmental screening procedure is shown in Annex E.

6.9 In the environmental screening procedure, the PSCU environmental specialist would apply the wetlands assessment methodology developed under the GEF-supported Critical Ecosystem's component (see RSSP component 2). The application of this methodology, together with the results from the hydrological study, would provide the basis for the preparation of a list of methods which, due to their high value for biodiversity and/or role in water resources conservation, would be excluded for development under the project). This list would be discussed with the relevant Ministries and local level stakeholders, so that the methodology behind and justification for exclusion was transparent and clearly understood. The wetland assessment methodology and the results of the hydrological assessment should be completed by the end of project year 1. RSSP will not support subprojects located inside protected areas.

6.10 Proposed wetlands sites not previously excluded through the application of the wetland assessment methodology described above, would be subject to regional assessments. As the rehabilitation component design has adopted a catchment approach, regional assessments would be applied on a catchment basis. The justification of the regional assessment would be to

reduce the need for sub-project specific EAs. Where a regional assessment demonstrates project interventions are likely to pose little risk to the environment due to local characteristics (e.g. highly degraded environments), no further environmental analysis will be required. More likely, the results of a site-specific RA will yield a mosaic of areas differentiated by environmental sensitivity to programme-supported activities. Where low, project activities can proceed with no further analysis. Where high, further treatment may be warranted through more detailed EA. Regional assessments have the added advantage of providing a key input into the preparation of management plans which will guide programme supported interventions in each catchment area. The RAs will be prepared by national consultants.

6.11 Currently, there is very little capacity in Rwanda to conduct environmental assessments and the RSSP would support adequate capacity building in this field (see below). In addition, an illustrative environmental screening list in the form of an impact questionnaire checklist and a list of potential mitigation measures have been prepared and included in Annexes F and G, respectively. The regional and sub-project specific environmental assessments would be reviewed by the PSCU environmental specialist and would need to be approved by the Ministry of Land, Human Resettlement, and Environment (MINITERE).

6.12 In case of doubt about the environmental impact of a project or the quality of the environmental assessment, the environmental specialist could make field checks. In addition, the environmental specialist would be required to visit the project sites after implementation to check if the mitigation measures have been implemented (for which a travel budget would be available), see chapter 7. It is recommended that the projects environmental screening procedure would be included in the Project Implementation Manual (PIM).

6.13 The environmental assessments would be funded out of a special environmental assessment fund that would be made available by the RSSP. The size of the fund is established at US\$ 150,000 for the first phase, or 1% of the budget available for development of marshlands and hillsides in the first phase. The environmental review after the first phase (see below) would determine the size of the fund for the 2<sup>nd</sup> and the 3<sup>rd</sup> phase.

**(vi) Environmental capacity building (see also table 6)**

6.14 At the central level, a project environmental specialist would be contracted (and trained in environmental [impact] assessment [4 weeks], if needed) as well as wetland ecohydrology (2 weeks). These training courses would be held at qualified international institutes in the region, possibly in Kenya or Uganda (project year 1). In view of the potential environmental implications of the project and the limited environmental capacity currently available in Rwanda, the PSCU environmental specialist would be supported by an international environmental consultant. This consultant would assist in the fine-tuning of the environmental screening procedures and the environmental monitoring program, the development and organization of the environmental training courses, the delegation of environmental responsibilities to the prefecture level, etc. The international consultant would work in Rwanda during the first three years of the project, on average spending 4 months/year in country (TORs are added in Annex H). Through on-the-job training by the international consultant, the national environmental specialist is expected to take over full environmental responsibility of the RSSP for the remaining years of the project.

6.15 In addition, a training course in environmental assessment would be organized in Kigali (project year 1). It is scheduled to have some 25 to 30 participants from MINITERE, MINAGRI, MINIRENA, the 6 prefectures participating in the project (staff from the prefecture offices of MINAGRI and/or MINITERE), the National University of Rwanda, the Rwanda Institute for Science and Technology, and the Centre for Education (the latter three being research

and education institutes working in the environmental field, and candidates for conducting EAs). The training would be given by an experienced international consultant, in collaboration with the PCSU environmental specialist and a national consultant. An outline of the EA training is provided in Annex I; TORs are presented in Annex J. It is scheduled to have a two week refreshment EA course by the end of the first phase (project year 4).

6.16 At the prefecture level, a one week environmental training course would be provided to prefecture level staff of MINAGRI and MINITERE, and representatives of local organizations, such as NGOs and Commune Development Committees (CDCs). The training would address environmental assessment, environmental management of wetlands and cultivated hill sides, and environmental monitoring. These training courses would be organized in the 6 prefectures participating in the RSSP. The training manual and the course program would be designed by an international consultant in collaboration with the project environmental specialist, and the training courses itself would be organized by the project environment specialist in collaboration with MINITERE and MINAGRI (project year 2). Two months of national consultancies would be made available to support the project team and MINAGRI in the implementation of the courses. A refreshment course of 3 days would be organized by the end of the 1<sup>st</sup> phase (project year 4). It is envisaged that the same EA specialist responsible for the EA training in Kigali would develop the manual and training program for this course, TOR are provided in Annex K.

6.17 At the commune level, 3 day training sessions in environmental management would be organized for every participating CDC. These training sessions would principally serve the purpose of awareness raising on environmental issues. Topics would include erosion control, role of wetlands in the national hydrological system, biodiversity, malaria and bilharzia control, etc. The manual and the course program for these training session would be prepared by the PCSU environmental specialist in collaboration with MINAGRI and MINITERE. The first courses would be organized by the project environmental specialist; it is expected that prefecture level staff, by participating in the teaching of the first training sessions in their respective prefecture, would gradually be able to take over the organization and implementation of the training sessions. It is envisaged to have 2 day refreshment training session by the end of the project, organized by the prefecture level staff. These sessions would also serve as a way to discuss the local environmental impact of project activities with prefecture staff.

**Table 6. Summary of capacity building activities**

| Entity   | Number of participants                                    | Topics   | Location                | Timing                                 |
|--|---|--|-------------------------|--|
| PCSU environmental specialist  | 1   | EA, wetland management, soil and water conservation  | International institute | year 1                                 |
| Environmental specialists from environmental institutes and ministries | 20-25   | EA   | Kigali                  | year 1; refreshment training in year 4 |
| Prefecture level environmental and agricultural staff and NGOs         | 6 prefectures, 10 to 20 participants                      | EA, ecohydrology, biodiversity assessment, soil and water conservation, grazing functions of wetlands, interactions between hillsides and wetlands.  | Prefecture              | year 2, refreshment training in year 4 |
| CDCs   | In the first phase: about 60 CDCs of each 10 to 20 people | Three days training / awareness raising in environmental management. Topics would include erosion control, biodiversity, wetlands hydrology, malaria and bilharzia control, pesticide use, interactions between hillsides and wetlands, etc. | In field                | starting year 2.                       |

**(vii) Environmental review of the project after the 1<sup>st</sup> phase.**

6.18 Finally, it is proposed to conduct a relatively extensive environmental review after the 1<sup>st</sup> phase of the project. This would involve an international EA specialist (8 weeks) backed up by a national consultant. In addition, an environmental specialist should participate in supervision missions, in particular during mid term review. The environmental review would, based on the experiences of the first phase, propose an updated environmental mitigation plan for the 2<sup>nd</sup> and 3<sup>rd</sup> phases. In addition, this environmental review would identify the subsequent capacity building needs, would determine the replenishment requirements of the environmental assessment fund, and would propose an expanded environmental capacity building program for the 2<sup>nd</sup> and 3<sup>rd</sup> phase. Particular attention would be given to the required training activities at the field level.

## 7. ENVIRONMENTAL MONITORING PROGRAM

7.1 The implementation of the environmental monitoring program will be integrated into the overall RSSP monitoring program. The latter would be implemented by a Monitoring and Evaluation Unit in the PSCU. Of particular relevance for the environmental monitoring is the GEF component 'Integrated Management of Critical Ecosystems' that would support an assessment of wetland biodiversity in Rwanda. With the PDF-B funds currently at the disposal of the GEF preparation team, a biodiversity assessment of a limited number of wetlands of global significance would be conducted, a more comprehensive biodiversity assessment would be carried out during implementation of the GEF funded component. Overall, the RSSP would fund the monitoring of baseline activities, whereas the GEF component would cover the monitoring of activities related to protection and sustainable management of critical ecosystems.

7.2 **Available baseline data.** From the interviews conducted during the preparation of this EA, it is clear that the amount of data currently available, as well as the capacity for environmental monitoring in Rwanda is limited. There is no information system regarding uplands, and the most detailed information available on wetlands is an Access database constructed in the period 1989-1992 containing climatological, pedological, hydrological and agricultural data for all wetlands in Rwanda<sup>1</sup>.

7.3 In addition, 1:50,000 maps are available with the location of the wetlands (not in electronic format). Agricultural use of the wetlands is updated up to about 1990-1992 and can not be considered accurate anymore. The database is managed by the Division's 'Genie Rurale' of MINAGRI. As a result, prior to the finalization of the monitoring programme, a review of existing baseline information will be required. Where data are missing, either baseline studies will have to be completed a priori to field monitoring, or suitable indicators selected as replacements supported by the necessary baseline information.

7.4 Based upon the identified potential environmental impacts of the project (Table 4), and taking into account the current capacity for environmental monitoring, a number of illustrative indicators have been developed to monitor the effectiveness of the EA's proposed mitigation measures (Table 8). These will be reviewed and revised, where needed, during the preparation of the project implementation manual (PIM) and first annual work plan (WP).

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<sup>1</sup> MINAGRI's database covers a total of 3017 wetlands; major wetlands have been sliced up into 2 to 4 km long stretches.

**Table 7. Illustrative Environmental indicators for the RSSP**

| Potential Impact                    | Mitigation Measure   | Output Indicator  | Impact Indicator   |
|-------------------------------------|--|---|--|
| Loss of habitat and/or biodiversity | Natural wetlands excluded from development<br><br>Regional and Site-specific EAs                       | No. ha of natural wetlands identified for conservation purposes<br><br>No. of RAs and EAs completed | Increase in biodiversity (represented by indicators TBD in PY1).   |
| Changes in river hydrology          | Hydrological study<br><br>Catchment specific water monitoring programmes<br>Catchment management plans | Study completed<br><br>No. of programmes implemented<br><br>No. of plans prepared                   | Reduction of upstream/downstream water use conflicts               |
| Health aspects                      | Training and awareness raising activities and testing of biological vector controls.                   | No. of training sessions completed;<br>Completion of biological vector control study.               | Reduction of incidence of water-borne disease at project sites.    |
| Increase in pesticide use           | IPM sub-component supported activities.  | No. of farmer field schools conducted;<br><br>No. of farmers adopting IPM practices                 | Reduced presence of agro-chemicals in the environment.             |
| Increase in erosion                 | Regional and site-specific EAs.  | No. of RAs and EAs completed  | Rehabilitation and sustainable production of steep, fragile lands. |

7.5 The environmental specialist would be the individual responsible for the environmental monitoring program, however regarding data collection he/she will be assisted by national consultants and various stakeholders involved. The data would be recorded and processed in an Environmental Information System (as described below).

## 8. COSTS OF THE MITIGATION MEASURES AND THE ENVIRONMENTAL MONITORING PROGRAM

8.1 The costs of the mitigation measures are indicated in Table 8. Table 8 includes only the costs for the 1<sup>st</sup> phase, except for the employment and travel budget of the EA specialist, and the costs related to environmental monitoring, for which the costs over the 14 year period are indicated in between brackets. The environmental review in project year 4 would determine the budget for environmental mitigation in the 2<sup>nd</sup> and 3<sup>rd</sup> phase of the project. Table 9 provides detailed costing of the central level EA training. The total costs of the environmental mitigation and monitoring plan in the 1<sup>st</sup> phase are US\$ 588,000, or 1.15% of the total IDA budget.

## **9. RECOMMENDATIONS**

9.1 Because the projects activities have not yet been defined in enough detail to implement a comprehensive environmental analysis (e.g. considering locations of project sites, infrastructure activities, agricultural processing facilities to be supported, etc.), it is recommended that more detailed analysis of the environmental impact, and possibly the environmental mitigation plan, be conducted. In order to ensure continued compliance of the mitigation plan with the RSSP project activities and procedures, this should preferably be done at the same time as the post-appraisal project formulation work.

**Table 8. Costs of the mitigation measures and environmental monitoring programme on 4 years**

| Mitigation Measure  | Units  | Unit Costs                                 | Costs                     |
|---|--|--|---------------------------|
| Hydrological Study  | 3 months international consultant;<br>6 months national consultant<br>1 workshop                                   | 15,000 / month<br>3,000 / month<br>lumpsum | 45,000<br>18,000<br>3,000 |
| Malaria and bilharzia vector control test + writing of a manual   | 1 month of international consultant<br>4 months of national consultant<br>study materials                          | 15,000 / month<br>3,000 / month<br>lumpsum | 15,000<br>12,000<br>2,000 |
| Additional health care measures (mosquito nets, medication)   |  | lumpsum                                    | 10,000                    |
| IPM component   |  |  | separate budget           |
| Employment of an environmental specialist in the PSCU   | 4 years  | 18,000 / year                              | 72,000                    |
| Travel budget environmental specialist  | 4 years  | 2,000 / year                               | 8,000                     |
| Environmental assessment fund   |  | lump sum                                   | 150,000                   |
| <i>Capacity building</i>  |  |  |                           |
| International environmental specialist to support the PSCU  | 12 months over the three year period   | 15,000 / month                             | 180,000                   |
| Environmental assessment training of the PSCU environmental specialist.                                       | 1 month  | 12,000 / month                             | 12,000                    |
| Wetland management training of the PSCU environmental specialist.   | 2 weeks  | 12,000 / month                             | 6,000                     |
| Environmental assessment training in Kigali   | (see table 10)   | (see table 10)                             | 62,000                    |
| Refreshment EA training Kigali  | 2 week international consultant;<br>2 week national consultant   | 15,000 / month<br>3,000 / month            | 7,500<br>1,500            |
| Preparation of course program and manuals (for all participants) of the prefecture and field level workshops. | 2 weeks international consultant;<br>4 weeks national consultant;<br>materials                                     | 15,000 / month<br>3,000 / month<br>2,000   | 7,500<br>3,000<br>2,000   |
| Environmental assessment training at the prefecture level   | 6 1-week workshops of on average 15 participants, costs including training manuals.                                | 4,000 / workshop                           | 24,000                    |
| Refreshment EA training at the prefecture level   | 6 3-day workshops of on average 15 participants  | 2,500 / workshop                           | 15,000                    |
| Environmental training at the field level   | 19 3-day workshops of some 10 to 20 participants, including training manual  | 500 / workshop                             | 9,500                     |
| <i>Environmental monitoring</i>   |  |  |                           |
| Biodiversity assessment of wetlands included in the project   | national consultant: 4 months  | 3,000 / month                              | 12,000                    |
| Environmental monitoring: malaria and bilharzia incidence   | Travel and material costs PSCU environmental specialist and health workers, incentive health workers               | lumpsum:<br>(2,000 / year)                 | 8,000                     |
| Preparation of environmental information system, training of users  | international consultant: 2 months<br>national consultant: 3 months<br>Hardware (pc + printer) + software (Access) | 15,000 / month<br>3,000 / month<br>lumpsum | 30,000<br>9,000<br>5,000  |
| Environmental review after the first phase  |  |  | 25,500* <sup>1</sup>      |
| <b>Total costs</b>  |  |  | <b>754,500</b>            |

\*1 To be funded out of the World Bank supervision budget.

\*2 Budget to be updated during the environmental review after the first phase. Most likely the budget will increase as additional mitigation measures and a capacity building program for the 2<sup>nd</sup> and 3<sup>rd</sup> phase would be proposed.

**Table 9. Detailed costing of the EA training**

| <b>Element</b>            | <b>Unit Costs</b>              | <b>Units</b>   | <b>Costs</b>                   |
|---------------------------|--------------------------------|--|--------------------------------|
| International consultant  | 15,000 / month                 | Preparation: 2 weeks<br>Introduction course : 4 weeks<br>Concluding course : 2 weeks                                   | 30,000                         |
| National consultant       | 2,000 / month                  | Preparation: 2 weeks<br>Introduction course : 4 weeks<br>Supervision fieldwork: 2 weeks<br>Concluding course : 2 weeks | 5,000                          |
| Course materials          |                                | lump sum   | 1,000                          |
| Travel costs participants | 100 \$ (average) / participant | 30 participants (includes travel costs for field work)   | 3,000                          |
| DSA participants          | 20 \$ / day / participant      | 30 participants*   | 20 * 15 * 11 weeks =<br>23,000 |
|                           |                                |  |                                |
| <b>Total</b>              |                                |  | <b>62,000</b>                  |

\* It is expected that over half of the participants are residential to Kigali and would not require DSA during the course sessions in Kigali; DSA includes the DSA for fieldwork.



**ANNEX B**  
**PROPOSED LIST OF MARSHLANDS TO BE INCLUDED IN THE**  
**FIRST PHASE OF RSSP<sup>1</sup>**

| Name of Marshlands                 | Préfecture   | Communes  | Total area (ha) | Agricultural land Use      |      |                   | Remarks |                                      |
|------------------------------------|--------------|---|-----------------|----------------------------|------|-------------------|---------|--------------------------------------|
|                                    |              |   |                 | Actual type of cultivation | Area | Future under RSSP |         | Area to be developed under RSSP (ha) |
| Gishoma-Gihitase                   | Cyangugu     | Gishoma   | 626             | Traditional                | 586  | Potatoes          | 590     | Modernization                        |
| Migina                             | Butare       | Ngoma, Shyanda<br>Ndora<br>Nyaruhengeri<br>Gishamvu               | 575             | Traditional                | 575  | Rice              | 500     | Studies available                    |
| Cyili                              |              | Mugusa Ntyazo<br>Muyaga   | 480             | Rice                       | 480  | Rice              | 450     | Dike                                 |
| Ngiryi Nyiramageni                 |              | Shyanda Mugusa<br>Ndora   | 420             | Rice                       | 420  | Rice              | 350     | Dike                                 |
| Agasasa                            |              | Ntyazo  | 360             | Rice and Traditional       | 320  | Rice              | 300     | Dike and Extensions                  |
| Nyarubogo                          |              | Muyira  | 330             | Rice and Traditional       | 330  | Rice              | 300     | Dike and extensions                  |
| Kinyegenyege (or Burakari)         | Gitarama     | Ntongwe -   | 250             | Rice and Traditional       | 250  | Rice              | 200     | Dike and extension                   |
| Bishya-Base                        |              | Nyabisindu (Butare),<br>Murama,<br>Kigoma,<br>Mukingi,<br>Masango | 320             | Traditional                | 320  | Rice and maize    | 300     | Rehabilitation                       |
| Mukunguri                          |              | Nyamabuye<br>Ntongwe Mugina                                       | 420             | Rice                       | 400  | Rice              | 300     | Dike and extension                   |
| Kabuye                             | Kigali Rural | Gikomero<br>Rutongo<br>Rubungo                                    | 450             | Rice                       | 400  | Rice              | 400     | Rehabilitation                       |
| Gahosha                            |              | Ngenda  | 240             | Rice / Traditional         | 180  | Rice              | 214     | Rehabilitation                       |
| Bigaga                             |              | Ngenda  | 460             | Traditional                | 360  | Rice              | 439     | Rehabilitation                       |
| Agatare                            |              | Ngenda  | 430             | Rice traditional +         | 400  | Rice              | 406     | Rehabilitation                       |
| Rugazi-Bisenga                     | Kibungo      | Kabarondo<br>Kigarama   | 220             | Traditional                | 200  | Rice              | 170     | Extension                            |
| Gahondo                            |              | Birenga   | 230             | “”                         | 200  | Rice              | 200     | Rehabilitation                       |
| Cyunuzi                            |              | Rukira  | 270             | “”                         | 250  | Rice              | 250     | Rehabilitation                       |
| Rwabitazi                          |              | Rusumo  | 220             | “”                         | 200  | Rice              | 200     | Rehabilitation                       |
| Around the lakes Sake and Mugusera |              | Mugesera, Sake,<br>Bicumbi (Kigali Rural)                         | 620             | Traditional                | 130  | Rice              | 500     | Rehabilitation                       |
| Kanyonyomba                        | Umutara      | Murambi<br>Muhura (Byumba)  | 280             | Traditional                | 160  | Rice              | 250     | Dike and Extension                   |
| <b>TOTAL</b>                       |              |   | 7201            |                            | 6161 |                   | 6319    |                                      |

<sup>1</sup> Priority list provided by MINAGRI in November 2000. Priority has been given to rehabilitation of wetlands already under rice cultivation and to wetlands where farmers have shown an interest in rice production.

## ANNEX C

### TERMS OF REFERENCE FOR THE STUDY ON THE ROLE OF WETLANDS IN NATIONAL HYDROLOGY

|                     |  |
|---------------------|--|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali; fieldwork in the country as required.   |
| <b>Duration</b>     | 3 months international consultant, and 6 months national consultant in the first year of the project.  |
| <b>Expertise</b>    | For the international consultant: more than 10 years of experience in hydrology, in particular in quantification and modeling of water balances. Experience in Africa highly desired. For the national consultant: more than 5 years of experience with hydrological measurements.   |
| <b>Output</b>       | A detailed study covering (i) the impacts of different types of agricultural development in wetlands on river hydrology; (ii) the cumulative impact of modifications in wetland hydrology on water balances at the national scale; and (iii) possible ways to mitigate this impact (such as the protection of certain (types of) wetlands that have a crucial function in the regulation of water flows and/or the proposal of adapted wetland development models, e.g. using buffer zones). |
|                     |  |

#### Tasks

In close collaboration with the Project Support and Coordination Unit and the Ministry of Energy, Water and Natural Resources, the consultants would:

- Collect existing (historical) data on river debits in Rwanda;
- Assess changes in river debits over the past 25 years;
- Implement about 5 case studies on the impact of wetland development on local (river) hydrology;
- Prepare simple models of the river water flows in Rwanda;
- Assess the cumulative impact of wetland development on national hydrology;
- Formulate wetland development measures that mitigate, as much as possible, modification of the national hydrology (such as the application of buffer zones).

#### Reporting

The consultants would write an elaborate report covering methodologies and results of the hydrological study, which would be submitted to the PSCU and the World Bank.

**ANNEX D**  
**TERMS OF REFERENCE FOR A STUDY ON THE APPLICATION OF**  
**BIOLOGICAL VECTOR CONTROL MEASURES FOR MALARIA AND**  
**BILHARZIA**

|                     |  |
|---------------------|--|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali; fieldwork in the country as required.   |
| <b>Duration</b>     | 1 month international consultant, and 5 months national consultant in the first year of the project.   |
| <b>Expertise</b>    | For the international consultant: More than 5 year experience with the application of biological vector control for malaria and bilharzia. Experience in Africa highly desired. For the national consultant: experience with malaria and bilharzia control.  |
| <b>Output</b>       | Analysis of the applicability of various types of biological control measures to control malaria and bilharzia. The international consultant should design the tests and select the vector control measures to be tested; the national consultant should conduct the tests, monitor the impact on breeding of mosquito larvae and snails population, and eventually on malaria and bilharzia incidence on the site. It is proposed to spread the 5 months of national consultancy over a 10-12 month period. |
|                     |  |

**Tasks**

In close collaboration with the Project Support and Coordination Unit and the Ministry of Health, the consultants would:

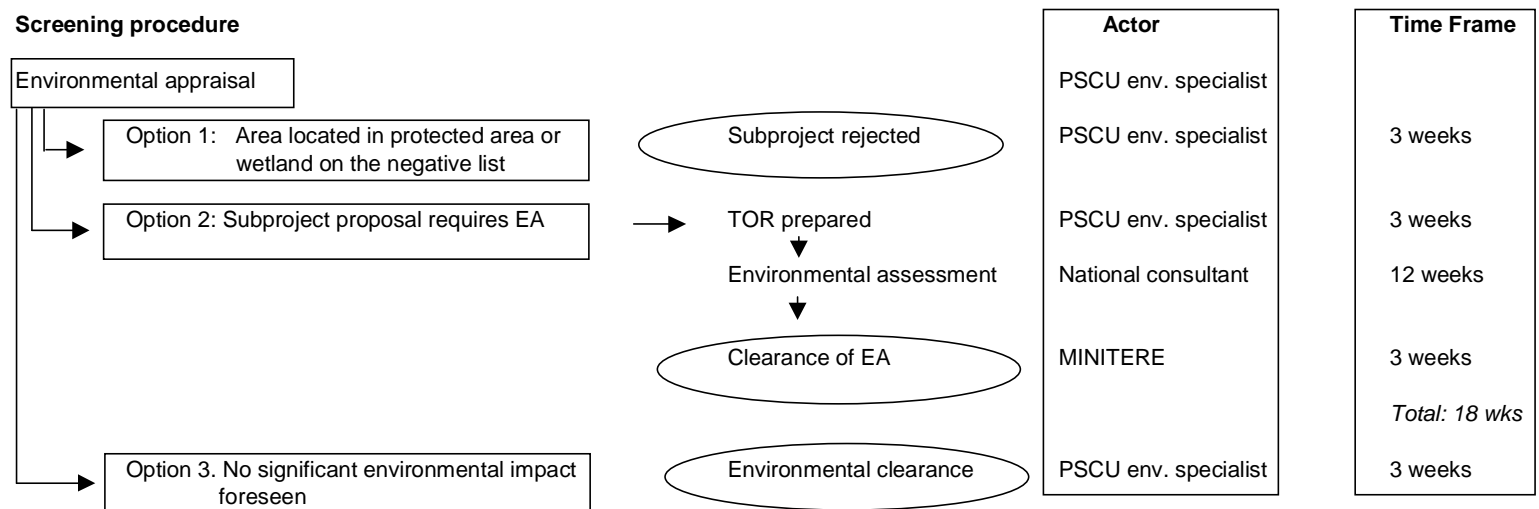
- Implement a number of test on the application of various biological vector control measures for malaria and bilharzia;
- Monitor the results in terms of decreases in mosquito larvae breeding and snail populations;
- Monitor the outcome of the test in terms of an impact on malaria and bilharzia incidence.

**Reporting**

The consultants would write a brief report covering methodologies and results of the test, which would be submitted to the PSCU and the World Bank.

## ANNEX E: ENVIRONMENTAL SCREENING PROCEDURE

The environmental screening procedure, to be part of the overall project appraisal procedure \*



\* Note that in case the environmental assessment, or the proposed mitigation measures are of insufficient quality, a revision may be required by MINITERE or the PSCU environmental specialist.

## ANNEX F IMPACT QUESTIONNAIRE CHECKLIST

### HYDROLOGY

1. Will the development reduce flooding of areas below or upstream of the proposed development site?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

2. Will the development modify the timing of floods at the proposed site?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

3. Will the development modify the base flows hence leading to an increase or decrease of dry season flows downstream of the development site?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

4. Will the development lead to drying out of the wetland?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

5. Will the development cause permanent changes in the water table of the wetland?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

6. Will the development lead to a reduction in the capacity of a wetland to store water?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

### WATER QUALITY

7. Will the development pollute the wetland at the site, and /or downstream?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

8. Will the development cause reduction in the ability for the wetland to retain nutrients?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

9. Will the development lead to eutrophication of downstream wetlands?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

10. Will the development lead to increase in silt content of the water flowing through the proposed site?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

11. Will the development lead to increase in salt content of the wetland?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

SOIL AND MORPHOLOGY

12. Will the development lead to increase in soil erosion of downstream areas?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

BIOLOGICAL IMPACTS

13. Will the development have any impacts on fauna and flora of the wetland?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

14. Will the development change the composition of :

FAUNA

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

FLORA

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

15. Will the development lead to reduction in the diversity of :

PLANT SPECIES

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

ANIMAL SPECIES

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

16. Will the development lead to loss of any rare

PLANT SPECIES

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

ANIMAL SPECIES

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

17. Will the development lead to loss of endemic

PLANT SPECIES

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

ANIMAL SPECIES

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

18. Will the development obstruct the natural movement of fauna?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

19. Will the development lead to creation of new habitats?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

**SOCIO-ECONOMIC IMPACTS**

20. Will the development lead to changes in access to wetland resources by the communities?

**Increased access**

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

**Decreased access**

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

21. Will the development lead to elimination of resources of the wetland?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

22. Will the development lead to loss of access to grazing area for livestock?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

23. Will the development lead to a reduction of area for flood-recession agriculture?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

24. Will the development lead to changes in income distribution among the local communities?

YES  NO  PROBABLY YES  PROBABLY NOT  DON'T KNOW

### **Narrative guidelines for use with the impact questionnaire checklist**

- The impact questionnaire checklist is intended to assist the environmental assessor in identifying the likely potential impacts of a development project on a particular site. Identification of the entire range of the impacts likely to be caused by a development action or wetland intervention is the first step in carrying out a meaningful environmental assessment.
- The impacts listed out in the checklist are grouped under various subdivisions. The questions asked under each subdivision guide the assessor in investigating the impacts under each category systematically. Both the physical and biological and socio-economic environment is taken care of. Subdivisions include hydrology, water quality, soil and morphology, biological, social and economic components.
- The questionnaire is designed for use as a quick reference to likely impacts of a development whose environmental effects are being assessed. Therefore it is possible to make a reasonable assessment of the likely impacts of a development by visiting the proposed development site.
- The assessor should endeavor to answer all the questions laid out in the questionnaire by ticking the appropriate box. If the assessor knows with certainty that the development will cause a specific impact, the box marked YES should be ticked. If the development is not likely to cause a particular impact, the assessor should tick the box marked NO. However, if the assessor is in doubt of the likely occurrence of a particular impact, then the box marked PROBABLY YES should be ticked. The box marked DON'T KNOW should be marked when the assessor has no idea that a particular impact will occur.
- In the event that the assessor is not certain of the likely occurrence of a particular impact resulting from a particular development action or wetland intervention, he/she must consult with the regard to the particular question.
- The final report should consist of a quantitative description of all the likely potential impacts of the proposed development of the stated site.

## ANNEX G

### POTENTIAL MITIGATION MEASURES

| Potential Negative Impact  | Possible Mitigation Measure  |
|--|--|
| <i>Wetland development</i>   |  |
| Loss of biodiversity (loss of flora or fauna biodiversity, loss of rare or protected species; obstruction of migration routes) | <ul style="list-style-type: none"> <li>- Exclude (parts of) wetlands that provide an important habitat for protected species;</li> <li>- Establish buffer zones;</li> <li>- Promote adapted management for buffer zones – note that the RSSP would provide support for the establishment of buffer zones and the preparation of local level environmental management plans (GEF funded).</li> </ul>                                    |
| Changes in local or national hydrology   | <ul style="list-style-type: none"> <li>- Avoid drainage of peaty soils, the soils will shrink and the (relative) water table will rise again and prevent agriculture;</li> <li>- Establish buffer zones that can be flooded in the rainy season;</li> <li>- Minimize the drainage depth, this will also maintain groundwater in the dry season.</li> </ul>   |
| Increase in malaria and bilharzia  | <ul style="list-style-type: none"> <li>- Ensure awareness raising on the risks of malaria and bilharzia;</li> <li>- Provide for biological vector control (e.g. suitable fish species) in irrigation reservoirs;</li> <li>- Monitor disease incidence;</li> <li>- In case of increased occurrence of the diseases, provide for medications at the local health center as well as prevention measures such as mosquito nets.</li> </ul> |
| Increase in pesticide use  | - Ensure training of participating farmers in IPM through inclusion in the RSSP IPM component  |
| Increase in erosion (dykes)  | - Protect the surfaces of infrastructure works, e.g. with a grass cover  |
| Siltation of canals  | <ul style="list-style-type: none"> <li>- Minimize erosion on fields;</li> <li>- Prepare a proper maintenance plan</li> </ul>   |
| Nutrient depletion on agricultural fields  | <ul style="list-style-type: none"> <li>- Ensure awareness raising on the need to apply lime and manure or fertilizers in order to avoid a loss of fertility on agricultural fields;</li> <li>- Provide assistance to farmers on fertilizer input.</li> </ul>   |
| Socio-economic impacts   | <ul style="list-style-type: none"> <li>- Ensure fair selection process of farmers participating in the scheme;</li> <li>- Ensure equal distribution of agricultural land in the wetland.</li> <li>- Ensure that an adequate operation and maintenance plan has been prepared.</li> </ul>   |
| <i>Hillside development</i>  |  |
| Soil erosion   | <ul style="list-style-type: none"> <li>- Radical terraces should not be constructed on shallow soils because of a risk of landslides;</li> <li>- Ensure formulation of a proper maintenance plan for the terraces.</li> </ul>  |
| Disturbance of the fertile topsoil during construction of radical terraces   | <ul style="list-style-type: none"> <li>- Separate and protect the topsoil during the construction works, and redistribute the topsoil over the terraces once they are completed;</li> <li>- Provide for liming and fertilizer input during at least the first 3 years of cultivation after construction of the terraces.</li> </ul>  |
| <i>Infrastructure development</i>  |  |
| Soil erosion   | <ul style="list-style-type: none"> <li>- Proper disposal of surplus soil;</li> <li>- Protection of roadsides by planting of vegetation;</li> <li>- Proper design of drainage canals and culverts;</li> <li>- Protection of the outlet of drainage canals and culverts to avoid gully forming downstream of the canal or culvert.</li> </ul>  |

**ANNEX H**  
**TERMS OF REFERENCE INTERNATIONAL ENVIRONMENTAL**  
**ASSESSMENT SPECIALIST**

|                     |   |
|---------------------|---|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali.  |
| <b>Duration</b>     | 12 months spread over a three year period (project year 1, 2, and 3)  |
| <b>Expertise</b>    | More than 10 years of experience in EIA, covering the practical, institutional and procedural aspects of EIA, preferably in the field of wetland management. Experience in Rwanda desired. English and French speaking. |
| <b>Output</b>       | Assistance of the PSCU Environmental Specialist. This assistance would be spread over the first three years of the RSSP as required by the PSCU.  |
|                     |   |

**Tasks**

In close collaboration with the Project Support and Coordination Unit, MINAGRI and MINITERE, the international expert would:

- Ensure the implementation of the RSSP environmental mitigation and monitoring plan, as described in this Environmental Analysis, including the environmental screening process and the environmental capacity building program.
- Provide on-the-job training in environmental assessment to the PSCU environmental specialist;

**Reporting**

The consultants would write a brief activity report after every mission.

**ANNEX I**  
**PROPOSED OUTLINE OF THE ENVIRONMENTAL ASSESSMENT**  
**TRAINING IN KIGALI**

| Element             | Timing                    | Topics  |
|---------------------|---------------------------|---|
| Introduction course | week 1-4                  | Purpose of EA, methodologies, report outline, EAs for wetland and infrastructure projects, literature based case studies, field visit, preparation of the EA studies.   |
| EA study            | week 5-20                 | In groups, the participants would implement an EA of one of the wetlands or road construction projects supported by the RSSP in the 1 <sup>st</sup> phase. The participants are expected to work on the EA for 4 to 6 weeks during this period. |
| Concluding course   | week 21-22                | Presentation and evaluation of the EAs conducted, and additional topics as requested by the participants.   |
| Refreshment course  | 2 weeks in project year 4 | Refreshment course in which the EA methodology is repeated, and in which the participants will discuss their experiences with EA in Rwanda.   |

## ANNEX J

### TERMS OF REFERENCE FOR THE ENVIRONMENTAL IMPACT ASSESSMENT SPECIALIST (CENTRAL LEVEL TRAINING)

|                     |  |
|---------------------|--|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali.   |
| <b>Duration</b>     | 2 months international consultant, and 4 months national consultant in the first year of the project.  |
| <b>Expertise</b>    | For the international consultant: more than 10 years of experience in EIA, covering the institutional and procedural aspects of EIA, preferably in the field of wetland management. Experience in Rwanda desired. For the local consultant: more than 5 years experience with EIA, preferably in the field of wetland management.                            |
| <b>Output</b>       | (i) Development of EIA training course program and manual ; (ii) teaching of a training course on EIA to about 30 participants (4 weeks); (iii) formulating 6 weeks EA case study assignments to all participants (in groups of 3 to 5); (iv) teaching of a concluding EIA course (2 weeks), in which the field assignments will be presented and evaluated. |
|                     |  |

#### **Tasks**

In close collaboration with the Project Support and Coordination Unit and MINITERE, the international and national experts would:

- Prepare and teach a 12 week EIA training course composed of a 4 week theoretical course, a 6 weeks practical assignment; and a 2 week concluding course. The international consultant would have 2 weeks for preparation, 4 weeks for teaching the first and 2 weeks for teaching the second course. The national consultant would, in addition, supervise the field assignments and would be involved for a total of 4 months.
- The international consultant would provide a course manual to the participants, possibly composed of a collection of relevant literature.
- In project year 4, under a separate contract, a 2 week refreshment course would be organized in which the EA methodology would be repeated, and participants would have the opportunity to discuss their experiences with EA in Rwanda. It would be advisable if the same consultant would conduct the refreshment course.

#### **Reporting**

The consultants would provide the participants with a manual on EA (the PSCU would organize translation in French or English) and would write a very brief activity report after finalization of the EA course.

## ANNEX K

### TERMS OF REFERENCE FOR THE ENVIRONMENTAL IMPACT ASSESSMENT SPECIALIST (PREFECTURE AND FIELD LEVEL TRAINING)

|                     |   |
|---------------------|---|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali.  |
| <b>Duration</b>     | 2 weeks international consultant, and 4 months national consultant in the first year of the project.  |
| <b>Expertise</b>    | For the international consultant: more than 10 years of experience in EIA, covering the institutional and procedural aspects of EIA, preferably in the field of wetland management. Experience in Rwanda desired. For the local consultant: more than 5 years experience with EIA, preferably in the field of wetland management.   |
| <b>Output</b>       | For the international consultant: Preparation of prefecture level environmental training manual;<br>For the national consultant: (i) assistance in preparing the prefecture level training manual; (ii) preparation of the field level training manual; (iii) teaching 6 prefecture level environmental training courses (in cooperation with the PSCU environmental specialist; (iv) providing on-the-job training to prefecture level extension officers in teaching local level environmental workshops. |

#### **Tasks**

The international consultant would, in cooperation with MINITERE and the PSCU environmental specialist:

- Prepare the prefecture level environmental training manual.

The national consultant would, in cooperation with MINITERE and the PSCU environmental specialist:

- Assistant in the preparation of the prefecture level training manual;
- Prepare the field level training manual;
- Teach 6 prefecture level environmental training courses (together with the PSCU environmental specialist);
- Provide on-the-job training to prefecture level extension officers in order to enable them to teach field level environmental workshops.

In project year 4, under a separate contract, the national consultant would organize three day refreshment courses in the 6 prefectures, in which the EA methodology would be repeated, and participants would have the opportunity to discuss their experiences with EA. It would be advisable if the same consultant would conduct the refreshment course.

#### **Reporting**

The consultants would provide the participants with a manual on EA (the PSCU would organize translation in French or English) and would write a very brief activity report after finalization of the EA course.

## ANNEX L

### TERMS OF REFERENCE FOR HYDROLOGICAL MONITORING

|                     |   |
|---------------------|---|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali.  |
| <b>Duration</b>     | 8 months national consultant during the first phase of the project.   |
| <b>Expertise</b>    | More than 5 years experience with hydrological monitoring in Rwanda.  |
| <b>Output</b>       | Yearly reports on (i) the development of river discharge in the included 16 sampling stations; (ii) sediment loads; (iii) N, P and K concentrations in river water. |

#### **Tasks**

The consultant would, in cooperation with MINIRENA, MINITERE and the PSCU environmental specialist:

- Implement a hydrological monitoring program including the above mentioned parameters.

#### **Reporting**

The consultant would prepare a yearly report summarizing the measurements and including an analysis of changes in water discharge and water quality.

## ANNEX M

### TERMS OF REFERENCE FOR MONITORING OF BIODIVERSITY ON RSSP PROJECT SITES

|                     |   |
|---------------------|---|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali, + field visits to all 19 project sites.  |
| <b>Duration</b>     | 4 months national consultant in project year 4.   |
| <b>Expertise</b>    | More than 5 years experience with biodiversity assessments in Rwanda.   |
| <b>Output</b>       | Report indicating the development of biodiversity and habitat in the 19 wetlands to be included in the first phase, based upon a comparison of the baseline biodiversity, recorded in the various environmental assessments conducted for the projects activities in these wetlands, with the actual biodiversity after 4 years, which is to be assessed by the consultant. |

#### **Tasks**

The consultant would, in cooperation with MINITERE and the PSCU environmental specialist:

- Implement a biodiversity assessment of all 19 project sites;
- Compare the results with the data on pre-project biodiversity, as recorded in the various environmental assessments conducted for the project;
- Make an evaluation of the impact of the projects activities on biodiversity;
- Evaluate the effectiveness of the various biodiversity related mitigation measures incorporated in project design.

#### **Reporting**

The consultant would submit a report to the PSCU.

## ANNEX N

### TERMS OF REFERENCE FOR THE PREPARATION OF THE ENVIRONMENTAL INFORMATION SYSTEM

|                     |  |
|---------------------|--|
| <b>Duty Station</b> | Project Support and Coordination Unit, Kigali.   |
| <b>Duration</b>     | 2 months international consultant and 3 months of national consultant in the first year of the project.  |
| <b>Expertise</b>    | International consultant: more than 5 years experience with the design and construction of Environmental Information Systems, in particular with Microsoft Access.<br>National consultant: experience with environmental monitoring, experience with Access.   |
| <b>Output</b>       | (i) An environmental information system (EIS) in Access for all 19 project sites, including the following indicators: land use, agricultural practices, types of hydrological management, terraces constructed in surrounding hillsides, biodiversity, incidence of malaria, bilharzia and pesticide related accidents, number of farmer field schools conducted, number of farmers using IPM, infrastructure activities implemented and erosion control measures taken. The EIS would incorporate the baseline data currently available in the Access database in MINAGRI, and would have a user friendly procedure for data input.<br>(ii) A brief (1 week) training course in the use of Access to the anticipated users (staff from the PSCU, MINAGRI and MINITERE). The training course would be prepared by the international consultant and implemented by the national consultant. |

#### **Tasks**

The consultants would, in cooperation with MINIRENA, MINITERE and the PSCU environmental specialist:

- Design the environmental information system (EIS, Access based);
- Program (in Access) the format of the data tables and the data input procedures;
- Include the relevant data from the MINAGRI database into the system;
- Give a one week training course to the potential users.

#### **Reporting**

The consultants would prepare a brief activity report to be submitted to the PSCU.