

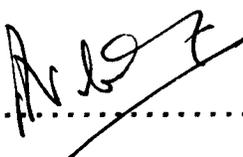
UNITED NATIONS DEVELOPMENT PROGRAM
Project of the Government of Mauritius

PROJECT DOCUMENT

Number: MAR/93/G31/A/1G/99
 Title : Restoration of Highly Degraded and Threatened Native Forest in Mauritius
 Duration: 3 Years
 Project site: Black River Gorges National Park, Mauritius
 ACC/UNDP sector & subsector: Environment : Enhancement and Management (2030)
 Government sector & subsector: Nature Conservation
 Govt Implementing and Executing Agency: National Parks and Conservation Service, Ministry of Agriculture and Natural Resources
 Associated Agencies: Mauritian Wildlife Appeal Fund (Local NGO), Faculty of Science, University of Mauritius
 Participating Agencies: National Youth Awards Section, Ministry of Arts, Culture and Youth
 Mauritius Herbarium (MSIRI)
 Royal Botanic Gardens, Kew
 Jersey Wildlife Preservation Trust (International NGO)
 Estimated starting date: 1995
 Government Inputs : (Local currency)
 (in kind) Rs1,397,500
 NGO Inputs (in kind): Rs850,000

UNDP and cost sharing financing	
UNDP	\$-
IPF	\$200,000
Other (GEF)	\$-
Govt or 3rd party cost sharing	
UNDP & cost sharing	
TOTAL	\$200,000

Brief Description
 The project aims at the restoration of a plot of highly degraded native forest in the Black River Gorges National Park. Through consultation with restoration ecologists, and effective means of controlling exotic weeds which are threatening the native forests will be developed. It will also document and restore to the extent possible the biological diversity of the degraded native ecosystem.

On behalf of:	<u>Signature</u>	<u>Date</u>	<u>Name/Title</u>
The Government		15/6/95	Honourable P. Nababsing Deputy Prime Minister and Minister of Economic Planning and Development
UNDP		15/6/95	E.P.L. André de la Porte Resident Representative

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on behalf of: Signature Date Name /Title
 The Government: _____

UNDP: _____
 United Nations official exchange rate at date of last signature of project document:\$ 1.00=
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TABLE OF CONTENTS

	PAGE
A. CONTEXT	
A 1. Description of the Country	4
A 2. Host Country Strategy	5
A 3. Prior and Ongoing Assistance	6
B. PROJECT JUSTIFICATION	
B 1. Present Situation and Problems	7
B 1.1. Global Overview	7
B 1.2. Current Situation	8
B 1.3. Location and site description	10
B 1.4. Conservation issues	10
B 2. Expected end of Project Situation	11
B 3. Target beneficiaries	11
B 4. Project Strategy and Implementation Arrangement	12
B 5. Rationale for GEF Support	13
B 6. Special considerations	14
B 7. Co-ordination arrangements	14
B 8. Counterpart support capacity	15
C. DEVELOPMENT OBJECTIVE	16
D. IMMEDIATE OBJECTIVES, OUTPUTS, AND ACTIVITIES	16
D 1. Development of control measures against invasive exotic plants	16
D 2. Assessment of the native biodiversity and training of staff and students in biodiversity assessment and monitoring	17
D 3. Restoration of a pilot degraded ecosystem to its original state as far as possible with the involvement of youth groups.	17
E. INPUTS	18
E 1. Government Contribution	18
E 1.1. Personnel	19
E 2. University of Mauritius Contribution	19
E 3. Mauritian Wildlife Appeal Fund	20
E 4. GEF Contribution	20
E 4.1 Personnel	20
E 4.1.1 National Consultants	20
E 4.1.2 Evaluation Mission	20
E 4.2 Sub-contracts	20
E 4.3 Procurement of equipment	21
E 4.3.1 Expendable equipment	21
E 4.3.2 Non-expendable equipment	21
E 4.4. Education and training	21

	E 4.5 Meeting costs	22
	E 4.6. Miscellaneous	22
F.	RISKS	22
G.	PRIOR OBLIGATIONS AND PREREQUISITE	23
	G 1. Prior obligation	23
	G 2. Prerequisite	23
H.	PROJECT REVIEWS, REPORTING AND EVALUATION	23
I.	LEGAL CONTEXT	23
J.	BUDGET	24
	GEF Contribution	25
	National Contribution	26
K.	ANNEXES	27
	Annex 1. Work Plan	28
	Annex 2. Terms of Reference Technical Advisory Committee	29
	Annex 3. Terms of Reference for Project Staff	30
	Annex 4. Schedule of Project Reviews, Reporting and Evaluation	32
	BIBLIOGRAPHY	33

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A. CONTEXT

A 1. Description of the Country:

Mauritius is a small tropical island in the south of the Indian Ocean and together with Réunion and Rodrigues, forms the Mascarene group of islands. It is located at latitude 20° South and longitude 58° East, some 800 km from the south east of Madagascar and has a land area of 1865 km². According to the Economic Indicators published by Ministry of Economic Planning and Development, the population of the Republic of Mauritius was estimated at 1,106,000 at the end of December 1993 and the rate of population growth was 1.3 percent (MEPD, 1994a). About half of the population is concentrated in the urban areas which are concentrated along the axis from Port-louis to Curepipe. The population is characterised by a wide diversity of ethnic groups composed principally of Indo-Mauritians, creoles of African origins, Sino-Mauritians and Europeans. The standards of health, nutrition and education are high compared to other countries in Africa. The adult literacy rate is 83 % and the life expectancy at birth is about 66 for males and 73 for females (MEPD, 1993).

Mauritius has a tropical maritime climate generally dominated by the south east trade winds and enjoys a warm moist summer during the months of December to May and a cool dry winter from June to November. Mauritius was formed by volcanic activity starting some 8-9 million years ago. In isolation the island has evolved a unique flora and fauna with high levels of endemism. Before human colonisation, the island was completely covered with dense native forests. These began to decline under the three successive colonial powers viz. Holland, France and Britain. The Dutch started the process of clearing the forest to exploit the ebony and palm in the lowland regions and coastal plains. Indeed, at one time Mauritius supplied most of the ebony used in Europe. The clearing process was later accelerated markedly during the French and British administrations to make room primarily for agriculture and also infrastructure like roads, and settlements. Cleared native forest areas in Mauritius have already been converted to monocultures of exotics crops and trees such as sugar cane, tea, *Pinus* spp., *Eucalyptus* spp., and *Cryptomeria japonica* with a resulting loss of important biodiversity. In the early 1970's, a forestry project to plant pine and eucalyptus in an area previously under native vegetation resulted in a drastic decline in the population of several endemic birds, including the Echo parakeet (*Psittacula echo*), now the most endangered parakeet in the world, the Mauritius Fody (*Foudia rubra*) and the olive white-eye (*Zosterops chloronothos*). Today there is no commercial exploitation of native timber. Nowadays the native forests are restricted to the south west escarpments which comprise some of the most inaccessible parts of the country and which contain some of the most scenic landscapes.

Mauritius has a narrow natural resource base. Agriculture has always been its main activity, with sugarcane and tea as the chief cash crops. Other main crops include tobacco, potatoes, maize, groundnuts, pineapples and vegetables. However the contribution of agriculture to the national economy has registered a significant decline with a reduction of the GDP from 23 percent in 1970 to 11 percent in 1991, mainly as a result of the rapid expansion of the manufacturing, tourism and services sectors. Nevertheless, the sugar industry still remains the most important net foreign-exchange earner because of the low import content of sugar exports. The manufacturing sector, principally textile and garment, has grown to become the largest single sector in the economy. Its share of the GDP has risen from a mere 15 percent to 23 percent. In addition, an Export Processing Zone (EPZ) has been set up to attract foreign capital through a combination of tax incentives and facilities. In Mauritius tourism is another fast expanding industry. It comprises 15 percent of the total export earnings and 3.3 percent of the GDP. The number of tourists has increased significantly in the past years and it is estimated that by the end of 1994, 410,000 tourist arrivals would be registered (MEPD, 1994b).

A 2. Host Country Strategy.

At a time when the country has been pursuing sound macroeconomic policies, Mauritius has seized the opportunity to focus on an approach that aims to reduce future costs from environmental degradation and to develop an overall strategy which integrates environmental concerns into its development process.

With the help of the World Bank, the Government developed a National Environmental Action Plan (NEAP) covering all the key sectors and the country as a whole. It also established a ministerial level National Environment Commission (NEC) chaired by the Prime Minister and created an Environmental Protection Department within the Ministry of Environment and Quality of Life to serve as its secretariat. This Department also has the mandate to coordinate environmental activities of the island as well as to review and enforce the environmental legislation.

In September 1988, the Government organised a Technical Seminar on the Environment, with the assistance of the World Bank and UNDP to discuss the key environmental issues facing the country. The outcome of this seminar was a comprehensive Environment Investment Program (EIP) to address the key issues of the NEAP. The EIP comprises a number of components, including institutional strengthening, land management and tourism, industry, sewage and solid wastes, agriculture, marine conservation and terrestrial conservation. The latter included a World Bank funded project to set up the country's first National Park to conserve endangered endemic species of flora and fauna (World Bank, 1990)

Mauritius has initiated a National Long-Term Perspective Study (NLTPS), which seeks to look into the development prospect of the country in 2020. The key objective is to shape a vision of the country by making an assessment of the opportunities and challenges ahead,

articulating a clear vision of what the country would look like a generation from now and setting out a practical strategy to translate that vision into reality. Environmental considerations will be a key factor in defining the long term strategy of the country (MEPD, 1994b)

A 3. Prior and Ongoing Assistance

There are a number of projects related to the conservation of flora and fauna already ongoing in Mauritius. In the early 1970's the Smithsonian Institution and International Council for Bird Preservation (ICBP) assisted Government to set up a Captive Breeding Centre at Black River with the aim of rearing endangered endemic birds. The Wildlife Preservation Trusts has been active in the conservation and captive breeding of endangered birds and reptiles and has helped the Government in the training of staff and in running of the centre. They have also been involved in the restoration of Round Island, an offshore islet of great biological importance. The Trust, through the Mauritian Wildlife Appeal Fund(MWAF), now provides the services of Research biologists to work on endangered birds projects such as the Mauritius Kestrel, Pink Pigeon and Mauritius Parakeet.

Since 1982 the World Wide Fund for Nature (WWF) has been running a plant conservation project in Mauritius (including Rodrigues). The assistance of a botanist was obtained to study and to assess the status of the flora. A Red Data book on Rodrigues has been published as a result of this work (Strahm, 1989), while one on Mauritius is nearing completion. The WWF project also investigated some measures to protect the native forests from degradation involving the manual elimination of exotic plants from small areas of forest. The Friends of Kew, Royal Botanic Gardens, Kew is now assisting with plant conservation works on the island. They have provided two students in horticulture to assist in the propagation of rare plants and to undertake plant conservation field work. Much progress has also been achieved in the propagation of endangered plants at the Native Plant Propagation Centre.

With the financial support of the Overseas Development Administration, a survey of the offshore islets of Mauritius and Rodrigues was undertaken in 1993 with the aim of assessing the conservation, tourism and education potentials of the islets and of developing an overall management plan (Bell *et al.* 1994). The second phase of this project will involve the implementation of specific actions identified during the first survey phase. This project is also part of the Environment Investment Program of Mauritius.

Presently, the World Bank is funding the establishment of the first National Park for Mauritius. The Wildlife and National Parks Act was enacted in 1993 and the first National Park of the country, namely Black River Gorges National Park, was proclaimed in June 1994. A new body, the National Parks and Conservation Service, has been set up to administer the Park and other conservation areas. This Service is attached to the Ministry of Agriculture and Natural Resources and has the mandate to carry out the duties under the Wildlife and National Parks Act. The project has a strong education component.

B. PROJECT JUSTIFICATION

B 1 Present Situation and Problems

B 1.1 Global Overview

The majority of the remaining natural areas in the world are either threatened with significant degradation or already degraded. Island ecosystems are especially prone to degradation because of their small size, increasing population pressure and introduction of exotics.

Most international and national efforts to conserve biodiversity have concentrated on species rather than on ecosystems. Although efforts to conserve species are obviously important, conservation efforts directed exclusively at this level will not achieve the intended long term results as this approach does not address the conservation of the species' habitat. Biodiversity must be addressed not only at species and genetic level, but also, and importantly, at the ecosystem level.

There are very few cases of true restoration attempts in the world today, and relatively fewer in Africa. Most of the limited efforts have focussed on ecosystems other than forests. It is important to note that restoration differs from rehabilitation in that restoration attempts to restore an ecosystem not only in the sense of ecosystem functioning, but also in terms of form. This is much more complex, costly and time consuming compared to rehabilitation where any species, including exotics, can be used to achieve the intended result of restoring ecosystem function, but where form per se is not of critical importance. Notwithstanding the few restoration initiatives that are being undertaken in the world today, these activities are becoming increasingly important as the global community begins to appreciate more the importance of biological diversity.

Some of the more relevant pioneer restoration work which has been undertaken in the world include restoration of the dry deciduous forest in the eastern coast of Costa Rica (Janzen, 1986), tallgrass prairie in central US, abandoned rainforest pasture (Nepstad *et al.*, 1990) and in marine systems such as coral reefs (Guzman, 1991). Very few examples of restoration projects exist on islands. These include restoration of New Zealand biota (Townes and Atkinson, 1991) and a project on Nonsuch Island, an oceanic island of Bermuda (Wingate, 1990). The aims of these projects have been the restoration of the indigenous island ecosystem to a state approximating that prior to colonial settlement.

B 1.2 Current Situation

Mauritius is known to possess one of the most diverse floras in the world in terms of number of species per unit area of forest land. The flora is composed of over 700 species of indigenous plants out of which about 250 are endemic (found naturally only in Mauritius) and about 100 that are shared with the other islands of the Mascarene group: Réunion and Rodrigues. A high proportion (about 80%) of the endemics are threatened or endangered. There are 51 native species which are known from less than 10 individuals. Some examples include *Hyophorbe amaricaulis*, *Pandanus pyramidalis*, *Ochrosia borbonica*, *Badula reticulata*, *Ocotea lancilimba* (all known from one individual), *Chionanthus boutonii*, *Chasalia boryana*, *Claoxylon linostachys* var *pedicellare* (2 individuals) and *Tambourissa cocottensis*, *Diospyros chrysophyllus* (4 individuals). IUCN quotes Mauritius as being the third place in the world after Hawaii and Canary Islands to have the most threatened plant species (IUCN/WWF, 1984). Loss of this biodiversity would represent a significant loss to the global community.

This diversity is being highly threatened through degradation by exotic species. Two of the most aggressive exotic plants are privet (*Ligustrum robustum* var *walkerii*) and chinese guava (*Psidium cattleianum*). Both plants can form thickets so dense that they stop the regeneration of native plants. Introduced animals can also prevent the regeneration of native plants. Monkeys (*Macaca fascicularis*) often pick and bite immature fruits and flowers of native trees so preventing the seeds from maturing and germinating. Pigs (*Sus scrofa*) and deer (*Cervus timorensis*), now common in the forest, often dig up and eat any seedlings which do manage to germinate. Thus the native forest which still persists is often a broken canopy of increasingly old and non-regenerating trees. It is important to point out that most introduced species are cosmopolitan and are in no danger of global extinction, whereas most island species are endemic. Biological invasion can therefore cause a net loss of species worldwide and a homogenisation of the biota of the Earth with the consequent loss of biodiversity on which stability of ecosystems may depend.

If nothing is done to halt the spread of exotics in the native forests, the remaining indigenous flora and fauna will be wiped out since they are unable to compete with these alien species. The natural forest will lose its capacity to sustain a wide diversity of native organisms many of which have still not been studied in sufficient detail. The preservation of the climax forests is vital in maintaining the natural heritage of the area and its use as a tool to educate people of Mauritius (in particular the youth community) on the merits of biodiversity conservation. the tourism sector will also suffer.

Many of the plants from Mauritius could be of economic value. Several species may have great ornamental value. An example is the extremely rare *Trochetia boutoniana*, known from a small population growing in a single vulnerable location. This plant has been declared as the national flower of Mauritius. Others may have economic potentials as herbal remedies. The climbing plant *Embellia micrantha*, for example, is so highly regarded as a remedy for kidney stones that local people cut it whenever they find it.

Other plants have more obvious economic importance because they are close relatives of major crops. *Coffea myrtifolia*, for example, is an endemic coffee species from Mauritius together with *C. mauritiana* and *C. macrocarpa*. They are wild relatives of *Coffea arabica*. This important crop, worth \$16 million a year, pollinates its own flowers and so is highly inbred. Indeed the coffee industry in Sri Lanka was destroyed because of the small degree of genetic variability in its coffee crop. Wild coffee species might provide new genes for improving this globally important crop. The Mauritian species is known to be naturally caffeine-free and could thus be of great importance in developing low caffeine cultivars. Some preliminary phytochemical investigations carried out on a number of native plants from Mauritius have revealed the presence of useful active ingredients. For example, extract of the leaves of *Aphloia theiformis*, a native species of Mauritius was found to be active within 24 hours against *Biomphalaria glabrata* snails, the intermediate hosts of *Schistosoma mansoni* (Gopalsamy, 1988). Similarly the endemic species *Polychias dichroostachya* was shown to have strong molluscicidal activity.

The once rich fauna of Mauritius has become impoverished due to forest clearing, habitat destruction, predation by alien species such as Macaques (*Macaca fascicularis*) and rats (*Rattus rattus* and *Rattus norvegicus*) and through competition by aggressive exotic birds like Indian Mynah (*Acridotheres tristis*), Indian Ring-necked Parakeet (*Psittacula krameri*) and Red-whiskered Bulbul (*Pycnonotus jacosus*). The only endemic mammals which have ever existed on Mauritius are fruit bats. Of the three species (*Pteropus niger*, *P. subniger*, and *P. rodricensis*) known to have occurred on Mauritius, only one is left viz the Mauritius fruit bat *Pteropus niger* (Cheke, 1987). This species is still locally common, having major populations in the Black River Gorges and Combo areas of the National Park. *P. rodricensis* still occurs on Rodrigues island.

Eleven native species of land birds have so far escaped extinction on Mauritius. Extensive conservation works have been carried out both in captivity and management in the wild on the Mauritius kestrel (*Falco punctatus*), the pink pigeon (*Columba mayeri* Syn. *Naseonas mayeri*) and the Mauritius parakeet (*Psittacula eques*). While much success has been obtained with the first two species, the Mauritius echo parakeet remain the most critically endangered of all the birds, with only about 18 individuals surviving. Of the remaining eight species, only the Mauritius grey white-eye (*Zosterops borbonicus*) is common, Mascarene cave swiftlet (*Collocalia francica*) and the Mascarene swallow (*Phedina borbonica*) are fairly common, while all the others, namely Mauritius cuckoo-shrike (*Coracina typica*), Mauritius black bulbul (*Hypsipetes olivaceus*), Mauritius olive white-eye (*Zosterops chloronothos*), Mauritius fody (*Foudia rubra*) and Mauritius paradise flycatcher (*Terpsiphone bourbonnensis*) are threatened. The Mauritius fody and Mauritius olive white eye are the two most threatened. These species were censused in the 1989-1990 breeding season at around 90 and 150 pairs respectively, representing a decrease of 60% since the last census in 1975 (Safford, 1991).

Another important economic consideration is the value of unique flora and fauna of the country in fostering ecotourism. This unique natural heritage is one thing that no other tourist destination can duplicate. One of the objectives of the newly created Black River Gorges National Park is indeed to encourage inland tourism and facilities such as walking trails, visitor centres, picnic areas and boardwalks will be developed within the Park. By developing these facilities and enhancing the natural environment through the restoration of the native forest, the National Park will attract more visitors, both local and visiting tourists, which will be a source of revenue for the country. While there are inherent dangers in promoting ecotourism in ecologically sensitive areas, a zoning of the Park will ensure that there will be minimal adverse impact on the area.

All this shows the great benefits that the biodiversity of a small island like Mauritius can offer to the global community. It is therefore imperative that these biological resources be adequately conserved. This will only be possible by restoring the species' habitats.

B 1.3 Location and site description

The project site will be located in the Black River Gorges National Park, in the south west of Mauritius (see Map). The Park, which covers an area of 6574 ha, contains some of the best preserved native forest in Mauritius where there is still hope of reversing the degradation process.

The Black River Gorge area contains several plant communities. These may be divided into two main groups - the lowland dry forest and upland wet tropical sub-montane evergreen rainforest (Vaughan, 1968). Within the upland forest several distinct plant communities may in turn be recognised. The main ones are swamp forest, *Phyllia-Phyllipia* heath, *Stillingia-Croton* marsh, upland climax forest and a mossy cloud forest.

The project will be carried out in a climax forest type in the uplands. The area is very humid, receiving some 3000 - 4000 mm of rainfall annually. The dominant species belong to the Sapotaceae family (*Sideroxylon* spp., *Labourdonnaisia* spp. and *Mimusops* spp.). Other families that are also well represented include the Rubiaceae and Myrtaceae. The area also contains a number of highly endangered plants (*Zanthoxylon heterophyllum*, *Elaeocarpus integrifolius*, *Badula multiflora* among others) and is also one of few areas where endangered native birds still find refuge.

B 1.4 Conservation issues

At present, there are limited activities to conserve these precious resources of global importance. Most existing initiatives focus on preserving individual species. Government has set up basic propagation facilities to grow the endangered plants in nurseries. A list of 50 top priority plant species which need to be propagated and saved from extinction has been worked out and these are now in the process of being propagated. This is generating a stock of rare plants which will be reintroduced back in the wild in their natural

ecosystems. Although important, this will not suffice to ensure the conservation of the various native forest ecosystem types which, as ecosystems, are highly endangered. Consequently, parallel to the propagation, it is important to restore the natural ecosystem of the plants so as to ensure the long term viability of these reintroductions. A number of attempts at *in situ* conservation have been undertaken. This has involved the manual elimination of exotic plants from small plots of 1 to 2 hectares and the fencing of these plots to keep ground mammals out. Such manual weeding of the plots is very labour intensive. However the results have been very encouraging given that many native plants are now regenerating successfully within these plots.

In the case of the forests of Mauritius, restoration rather than rehabilitation will be necessary to ensure that the unique and globally significant biodiversity of these areas is conserved. Although Mauritius stands to gain from the restoration of ecosystem functioning that is normally associated with maintaining forest cover and biodiversity, there are important global benefits over and above these national benefits in terms of the conservation of endemic species.

B 2. Expected end of Project Situation.

The project will take into consideration several components which will deal with the restoration of the communities living in the study area. It is expected that by the end of the project duration (3 years), a sound measure of control of invasive plants and restoration technique would have been developed. There will be a need for continued monitoring of the project site well beyond the project duration, at least for two more years in order to show that the site has been effectively restored. Further assistance from GEF/UNDP will be required for two year to monitor the trend in species enhancement. Beyond this stage, the training of local National Parks and Conservation Service staff as well as with the involvement of Mauritian Wildlife Appeal Fund (MWAF) and the University of Mauritius which will provide students for further research and monitoring, will ensure the long term maintenance of the restored site. The site would become a unique area where ecological research could be undertaken and provide valuable information on management of natural ecosystem and biodiversity in general.

B 3. Target beneficiaries

The project will be targetting different groups, both within and outside the country. In Mauritius, it will help to create the capacity for Mauritius to protect and restore other areas of native forests and hence help to conserve the bulk of the remaining and highly threatened indigenous biodiversity in the country as well as to enhance the tourism industry.

The University of Mauritius will also benefit from the project activities by participating in the ecological investigation and assessment of biodiversity within the study area. The project also provide an opportunity for the University to develop human resources in the field of restoration ecology.

Based on the results obtained, the project could serve as a model for the restoration of other threatened significant forests types in other parts of the world

B 4. Project Strategy and Implementation Arrangement

The purpose of the project is to halt the degradation of the native forests caused by exotic weeds and animals and to restore to the extent possible the original structure and functions of the forest ecosystem. To achieve this, three main components have been identified.

The first of them is the control of exotic weeds and animals. Previous studies undertaken by Government and Mauritian Wildlife Appeal Fund scientists have shown that by simply eliminating the exotic species by uprooting weeds, fencing to exclude ground mammals and poisoning of rats, native species regeneration can be accelerated. However, the process is heavily labour dependent and cannot be applied to large areas. The strategy adopted to address this component is to hold a meeting of top restoration ecologists at the outset of the project to discuss various alternatives for the control of exotics and the restoration process to be undertaken. Based on the outcomes, experiments will be undertaken to find out the best methods for the control of exotic weeds in the forest ecosystem. Different treatments (manual elimination, chemical treatment, ring barking or any other method identified by the restoration meeting) will be applied to the experimental area.

The second component is to make an assessment of the biodiversity of the area to be restored. This will be undertaken by University students and NPCS staff under the supervision of specialists to be recruited under the project. They will assess both the exotic and native biodiversity and investigate their interaction. They will also monitor the response of the biodiversity to the control measures adopted.

The third component will be the restoration activity itself. This will apply the results of the initial experimentation to an area of at least 5 Ha, the biodiversity of which has been previously studied. In-situ sowing of seeds and enrichment planting from nursery-grown stocks will be considered as possible restoration techniques to be applied, but these will be thoroughly discussed during the meeting with restoration ecologists at the outset of the project. A plot adjacent to the restoration area will be established to serve as a control plot.

Youth groups will be identified through the National Youth Award Scheme to participate in the restoration process. They will be educated and will provide part of the necessary labour for the project implementation. Their involvement will lead to an understanding of the threats to and value of the natural forest and necessity for its preservation, among the youth community.

The University of Mauritius will provide laboratory facilities for the study of biodiversity and the National Parks and Conservation Service will provide access to the experimental area and other logistic support. A Technical Advisory Committee, comprised of representatives of all the organisations involved, will be constituted to systematically monitor, evaluate and provide guidance to the project.

B 5. Rationale for GEF Support

If funded, this will be the smallest project in the GEF portfolio (excluding the small grants programme). Numerous organisations have suggested that it is possible to accomplish a great deal with projects much smaller than the average GEF project, especially in the area of biodiversity conservation. Although GEF is funding smaller scale projects through its Small Grants Programme for NGOs, this would be the first example of a small-scale project in the regular work programme.

This project is also an exception in the sense that it will be one of very few projects in the GEF portfolio that deals with ecological restoration per se. Moreover, very few GEF projects funded to date relate to island ecosystems.

The project is to conserve both the highly endangered plants as well as the threatened habitat types in which they exist, and to restore critical habitats for some of the most highly endangered species of birds that exist in the world today. Several of these species are being bred in captivity for release into their natural environment. Other native species (of both plants and animals) still exist in their natural environment, although in most precarious circumstances. This project is to relieve the most significant pressures on the remnant upland native forest in Mauritius, to restore this endangered habitat through ex-situ propagation of threatened and endangered plants, recreation of appropriate microclimatic conditions in the forest, and reintroduction of native species (both plants and birds) into the forest. The relevance of the project to GEF, and the urgency of addressing the situation is unquestionable.

The overall purpose of undertaking the project is to conserve this unique forest for its own sake, and to provide critical habitat for those species which naturally occur there, and which, particularly as a result of this project, may maintain viable populations. The intent is to learn how best the above can be accomplished and based on experience gained in this project, to eventually expand restoration activities to other endangered habitat types in Mauritius, and elsewhere in the world as appropriate.

B 6. Special considerations

The project will be undertaken in collaboration with the Mauritian Wildlife Appeal Fund a Non Governmental Organisation which works closely the Government on conservation projects. This organisation possesses the required technical back up to undertake many of the components of the project.

In the long term, the project will also benefit the tourism industry in offering a better quality environment for recreation and tourism.

B 7. Co-ordination arrangements

A Technical Advisory Committee comprising of expertise found within Mauritius will be established to systematically monitor, evaluate and provide guidance to this project throughout its life. The Committee will be comprised of a restoration ecologist to be identified nationally through the Mauritius Wildlife Appeal Fund, and representatives of all participating agencies.

The National Parks and Conservation Service of the Ministry of Agriculture and Natural Resources will be the implementing and executing agency for the project. Many project activities will be implemented in close association with the Mauritian Wildlife Appeal Fund, University of Mauritius, the Ministry of Arts, Culture and Youth Development and other International NGOs whose roles are defined as follows:

Mauritius Wildlife Appeal Fund will provide the specialist staff required by the project and will serve as the project management.

National Youth Awards Section, Ministry of Arts, Culture and Youth Development will be involved in providing part of the labour for the execution of some of the labour intensive activities such as weeding.

Faculty of Science, University of Mauritius, which has established a centre for Environmental Science, will be responsible for the conduction of the course on biodiversity conservation and assist in to carrying out the assessment of biodiversity under the guidance of specialists recruited under the project.

Mauritius Herbarium (MSIRI) will provide assistance in flora identification.

Local and international NGO's viz. MAAF, World Conservation Union (IUCN), Royal Botanical Gardens Kew, Wildlife Preservation Trusts will provide guidance and expert assistance in the implementation of all stages of the project.

B 8. Counterpart support capacity.

The NPCS works under the Ministry of Agriculture and Natural Resources and is responsible for the management of the Black River Gorges National Park and other areas of conservation interest. The Service is headed by an acting Director who is responsible for the general administration. At present there is a Project Manager for the Black River Gorges National Park who is under contract. The head is assisted by an Assistant Conservator of Forests, who has been posted to the NPCS and he is responsible for overseeing the scientific and management activities of the Service. The NPCS runs a Captive Breeding Centre at Black River and a Native Plant Propagation Centre at Curepipe. Each of these is under the responsibility of a Technical Officer. Another Technical Officer is responsible for Park interpretation and is presently the counterpart for an Interpretation Specialist funded by World Bank and under contract at the NPCS. Two Foresters and three Forest Guards and two gangs of Labourers are responsible for all the field work in the National Park and work under the supervision of the Asst. Conservator of Forests and the Director.

The Mauritian Wildlife Appeal Fund (MWAf) was established in 1984 to direct international and local funding to conservation projects in Mauritius. It obtains funding from international organisations such as Wildlife Preservation Trusts, Peregrine Fund, World Centre for Birds of Prey among others. It also raises funds locally and provides research biologists for undertaking management and research projects on endangered species. MWAf has a very good working relation with Government. They are party of the Memorandum of Agreement, signed between the Government of Mauritius and the Wildlife Preservation Trusts, the Royal Botanic Gardens, Kew, the Flora and Fauna Preservation Society and MWAf, for a partnership in the conservation activities in Mauritius.

The Faculty of Science, University of Mauritius has set up an Environmental Science Unit in the Faculty of Science and runs undergraduate courses in Biology and Environmental Science. The University has the capacity of providing local human resources for scientific research. University students have in the past successfully undertaken undergraduate research projects in conservation biology disciplines and have been supervised by NPCS and MWAf staff. This shows the strong and close collaboration which exists between the main conservation agencies in the country.

C. DEVELOPMENT OBJECTIVE

The overall development objective of the project is to restore remnant native upland forest that has been degraded by invasive exotic plants and animal species to a more natural state in order to conserve this unique forest type and to protect remaining elements of highly threatened native biodiversity found therein.

This is in conformity with the National Development Plan of Mauritius and with the National Environmental Action Plan.

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

As mentioned before, the purpose of the project is to halt the degradation of the native forests caused by exotic weeds and animals and to restore to the extent possible the original structure and functions of the forest ecosystem.

The immediate objectives of the project are:

- Development of control measures against invasive exotic plants.
- Assessment of the native biodiversity and capacity building in biodiversity assessment and monitoring.
- Restoration of a pilot degraded ecosystem to its original state as far as possible with the involvement of youth groups.

D 1 Development of control measures against invasive exotic plants.

Output 1.1: To determine through consultation and experimentation the most effective measure (use of herbicide and /or other means) for controlling exotic plants.

Activity 1.1.1: A meeting will be organised at the outset of the project to discuss with top restoration ecologists the different technologies available in weed control, to identify appropriate methodologies applicable to the local context and to define a strategy for the restoration of the native forest.

Activity 1.1.2: Various methods for controlling exotic plants including herbicides, mechanical removal and such other methods as may be identified in activity 1.1.1 will be assessed experimentally. The 5 Ha experimental area will be fenced and a randomised block design will be set up within this area to carry out the experiments. The response parameters to be measured would include numbers of exotic plants eliminated, regeneration

rate of exotic and native plants after treatment, use of area by native animals subsequent to treatment compared to prior to treatment, effects on soil biota, human resources required to undertake the treatment, and time/cost attributes. The MWAF will be the main agency which will undertake this research.

D 2. Assessment of the native biodiversity and training of staff and students in biodiversity assessment and monitoring.

Output 2.1: To train staff of the NPCS and students of the University in techniques of biodiversity assessment and monitoring and to create awareness within the youth community to the importance and significance of biodiversity conservation and habitat restoration. About four staff of the NPCS and two students a year, over three years will receive training.

Activity 2.1.1: To provide course modules on biodiversity assessment and monitoring in the undergraduate Biology and Environmental Science courses at the University for the benefit of undergraduate students and also for the staff of the NPCS so that they can be equipped for carrying out biodiversity surveys and activities of the project.

Activity 2.1.2: An awareness programme will be prepared for the youth participants so that they may be sensitised to the threats to and value of the biodiversity of the area they are working in and the relationship between the different components of the ecosystem. This activity will be undertaken by the Interpretation Section of the NPCS.

Output 2.2: A study of the biodiversity will be undertaken at the project site in order to document the different components of the biodiversity.

Activity 2.2.1: A survey of the flora, both angiosperms and lower plants, insects, molluscs, vertebrates (mammals, birds and reptiles) and soil organisms will be carried out by specialists recruited under the project with the assistance of students of the University of Mauritius and staff of the NPCS. This quantification will help to determine the different component parts of the forests and lead to a better understanding of the ecosystem. The Mauritius Herbarium will provide assistance in flora identification.

D 3. Restoration of a pilot degraded ecosystem to its original state as far as possible with the involvement of youth groups.

Output 3.1: Restore the project site so as to enhance regeneration of native species and provide better habitats for native animals.

Activity 3.1.1: To build a fence around the study area to exclude ground mammals (all ground mammals in Mauritius are exotic). This work will be sub-contracted out.

Activity 3.1.2: Elimination of weed plants and the control of animal pests as specified by methods developed in activity 1.1.2. The work will be carried out by staff of the NPCS, MAAF and youth groups.

Activity 3.1.3: Seeds and other propagules will be collected from around the study area. Part will be sown *in-situ* and part sown in the nursery at Native Plant Propagation Centre. The most threatened plants contained in the area will receive special attention and will be propagated for re-introduction.

Activity 3.1.4: Biotic components of the native ecosystem will be reintroduced into the project site by following re-introduction protocols developed by the IUCN/SSC Reintroduction Specialist Group. This will be thoroughly discussed during the meeting at the outset of the project.

Activity 3.1.5: Regular monitoring of the re-introduced species will be carried out by staff of the NPCS and MAAF and students of the University to insure that the re-introductions are successfully done.

Output 3.2: Produce a monitoring system to examine the effects of restoration of the native forest ecosystem, population dynamics of components of biodiversity.

Activity 3.2.1: Elements of biodiversity within the experimental and control plot will be monitored at regular intervals during the project in order that the success of the restoration effort may be assessed at the end of the project. Specific criteria including regeneration rate, recruitment rate, changes in species diversity, use of the experimental plots by native birds and others will be measured. This will be undertaken by University students and staff of NPCS and MAAF.

Activity 3.2.2: Results of surveys and other restoration efforts will be disseminated through scientific publications, reports and other media.

E. INPUTS

E 1 Government Contribution

The government will assign the staff of the National Parks and Conservation Service to run the operations. The government will be responsible for financing the payment of salaries and other allowances according to the government policies. The Government will also be responsible for providing field research stations and other administrative support for the project.

E 1.1 Personnel

The following staff will be assigned to the project by the Government.

Number	Position	Duration man months	Salary +Allowance (Mauritian Rupees)
1	Director	3	54,000
1	Asst. Conservator of forests	6	90,000
	Scientific officer*	16	240,000
1	Scientific officer (Interpretation)*	1.5	22,500
2	Technical Officer	16	160,000
1	Forester	1.5	12,000
2	Forest Guards	3	21,000
10	Labourers	120	420,000
1	Clerical Assistant	1.5	6,000
1	Typist	3	12,000
			1,217,500

* = Vacant posts at present

The cost of utilities including electricity, communication costs, maintenance , stationary and telephone charges for the three years is estimated to be 180,000 Mauritian rupees. **Thus the total contribution of the government will be Rs 1,397,500.**

E 2. University of Mauritius Contribution

The University of Mauritius will develop course modules in biodiversity and assign lecturers and technicians in this field for the training of students and for research, but their services will have to be paid by the project. The University will provide laboratory facilities for biodiversity studies.

The total University contribution in kind is estimated at Rs. 500,000.

E 3. Mauritian Wildlife Appeal Fund

The MAAF will be the project management for the project. They will contribute in the supervision and they will provide scientific advice on the implementation of the project. MAAF will meet all operation and maintenance costs for the vehicle and other equipment. However, the services of specialists will need to be paid by the project. MAAF also runs a field camp near the project site and these facilities will be used during project implementation. The total contribution of MAAF in kind is estimated at Rs.350,000.

E 4. GEF Contribution

GEF will provide the remaining financial requirements not covered by the Government and other participating agencies. This will cover personnel, sub-contracts, equipment, education and training, and costs of seminar. The costs are in US dollars

E 4.1 Personnel

E 4.1.1 National consultants

Entomologist (9 m-m)	11,250
Botanist (Lower plants) (9 m-m)	11,250
Zoologist (9 m-m)	11,250
Malacologist (9 m-m)	11,250
Plant Taxonomist (9 m-m)	11,250
Statistician (9 m-m)	11,250

Subtotal national consultants 67,500

E 4.1.2 Evaluation Mission

Evaluation mission (1mission for a week at the end of the second year)	10,000
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E 4.2 Sub-contracts

Project Management (Mauritian Wildlife Appeal Fund)	23,000
Fencing of experimental plot	30,000

E 4.3 Procurement of equipment

The equipment for the project will be procured according to UNDP rules. The equipment will be allocated to the Project Management, Mauritius Wildlife Appeal Fund. This will be essential for the operation of the project and the achievement of the targeted goals.

E 4.3.1 Expendable equipment

Local purchase:

Stationary and Office supplies	600
Field materials (Flagging tapes, labels, paints etc.)	400
Rat poison	1,800
Nursery materials (top soil, fertilisers,compost etc.)	450
Animal Traps	600
Sieves	100
Measuring equipment	1,200
Tools	200

Sub total expendable equipment 5,350

E 4.3.2 Non expendable equipment

Local purchase	
Double cab vehicle	20,000
Computer and Printer	4,000
Aluminium Ladder	500

Sub total non-expendable equipment 24,500

E 4.4 Education and training

This component will cover the training of staff of the NPCCS and University students who will have the opportunity to conduct research on biodiversity in the project site to gain practical experience. The training will be offered by the Faculty of Science, University of Mauritius.

Training course (University of Mauritius) 15,000

E 4.5 Meeting costs

The GEF will meet the costs for a one week meeting (3 days meeting + 2 Field visit) which will bring together a number of international restoration ecologists who will advise on the methodologies and provide guidance for the project.

Air fares for Consultants (5)	12,000
Per diem including Hotel (5)	5,000
Seminar expences	4,000
<u>Sub -total Meeting</u>	21,000

E4.6 Miscellaneous

Reporting costs	1,800
Sundries	1,850
<u>Sub total miscellaneous</u>	3,650
<u>Total GEF Contribution</u>	200,000

F. RISKS

The major risk factor for the project is the availability of qualified personnel for the implementation of the different components of the project. The main organisation concerned, the NPCS is currently heavily understaffed with qualified and experience scientists capable of studying biodiversity. However there are three posts of Scientific Officers within the NPCS which will be filled soon, as recommended by World Bank. This is why the project has provided for the recruitment of specialists for carrying out some of the studies. The NPCS will provide counterparts to these specialists and at the same time this will enable capacity building of the Service.

The restoration work is a long term process. The time period may not be sufficient to show any tangible results relating to the habitat improvement, increase in biodiversity and research outcomes. However the monitoring system put in place by the project will ensure that project will be carried over by the local authority to achieve the long term objective, provided that additional funding is secured from GEF or other financing agencies for two additional years at the completion of this project.

G. PRIOR OBLIGATIONS AND PREREQUISITE

G 1. Prior obligations

None

G 2. Prerequisite

The government will ensure that qualified staff at the grade of Research and Development officer are recruited to work as counterpart to the specialist.

H. PROJECT REVIEWS, REPORTING AND EVALUATION

The project will be subject to review by the Technical Advisory Committee . The Committee will meet every three months. In addition there will be one evaluation missions from the GEF / UNDP to evaluate progress of the project at the end of the second year. The Project management will prepare and submit to each meeting a project performance evaluation report. Additional reports may be requested, if necessary, during the project.

A project terminal report will be submitted to the Government Executing agency and the UNDP at the end of the project duration.

I. LEGAL CONTEXT

This project document shall be the instrument referred to as such in the Article 1 of the Standard Basic Assistance Agreement between the Government of Mauritius and the United Nations Development Programme, signed by the parties on 20 August 1974. The host country implementing agency shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government co-operating agency described in that Agreement.

The following types of revisions may be made to this project document with the signature of the UNDP resident representative only, provided he or she is assured that the other signatories of the project document have no objections to the proposed changes:

(a) revisions which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the rearrangement of inputs already agreed to or by cost increases due to inflation, and

(b) Mandatory annual revisions which rephase the delivery of agreed project inputs, or reflect increased expert or other costs due to inflation, or take into account agency expenditure flexibility.

J. BUDGETS

The breakdown of budget covering the GEF contribution and the government contribution is as follows.

K. ANNEXES

GEF Contribution

Budget Code	Item	Total p/m	Total US\$	1995 p/m	1995 US\$	1996 p/m	1996 US\$	1997 p/m	1997 US\$
16.00	Mission costs								
16.01	Evaluation mission		10000				10000		
16.02	Meeting Cost		21000		21000				
16.99	Total Mission Costs		31,000		21000		10000		
17.00	NPPP								
17.02	Entomologist	9	11250	3	3750	3	3750	3	3750
17.03	Botanist	9	11250	3	3750	3	3750	3	3750
17.04	Zoologist	9	11250	3	3750	3	3750	3	3750
17.05	Malacologist	9	11250	3	3750	3	3750	3	3750
17.06	Plant Taxonomist	9	11250	3	3750	3	3750	3	3750
17.07	Statistician	9	11250	3	3750	3	3750	3	3750
17.99	Subtotal NPPP		67500		22500		22500		22500
19.00	Component Total		98500		43500		32500		22500
20.00	Sub contracts								
21.00	Project management	36	23000	12	8000	12	7500	12	7500
22.00	Fencing		30000				30000		
29.00	Component Total		53000		8000		37500		7500
30.00	Training								
33.00	Biodiversity course		15000		5000		5000		5000
39.00	Component Total		15000		5000		5000		5000
40.00	Equipment								
41.00	Expendable equipment								
41.01	Office supplies		600		200		200		200
41.02	Field materials		400		200		200		
41.03	Rat poison		1800		600		600		600
41.03	Nursery materials		450		150		150		150
41.02	Animal Traps		600		600				
41.03	Sieves		100		100				
41.04	Measuring Equipment		1200		1200				
41.05	Other Tools		200		200				
41.99	Sub-Total		5,350		3250		1150		950
42.00	Non-expendable equipment								
42.01	Double cab (4x4)		20000		20000				
42.02	Computer and printer		4000		4000				
42.03	Aluminium ladders		500		500				
42.99	Sub-Total		24,500		24,500				
49.00	Component Total		29850		27750		1150		950
50.00	Miscellaneous								
52.00	Reporting costs		1800		600		600		600
53.00	Sundries		1850		650		600		600
59.00	Component Total		3650		1250		1200		1200
99.00	GRAND TOTAL		200000		85500		77350		37150

National Contribution

Item	Total	Total	Year 1	Year 1	Year 2	Year 2	Year 3	Year 3
	p/m	US\$	p/m	US\$	p/m	US\$	p/m	US\$
Project personnel								
Director	3	54000	1	18000	1	18000	1	18000
Asst Conservator of forests	6	90000	2	30000	2	30000	2	30000
Scientific Officers (SO)	16	240000	4	60000	6	90000	6	90000
SO (interpretation)	1.5	22500	0.5	7500	0.5	7500	0.5	7500
Technical Officer	16	160000	4	40000	6	60000	6	60000
Forester	1.5	12000	0.5	4000	0.5	4000	0.5	4000
Forest Guard	3	21000	1	7000	1	7000	1	7000
Labourers	120	420000	40	140000	40	140000	40	140000
Clerical assistant	1.5	6000	0.5	2000	0.5	2000	0.5	2000
pist	3	12000	1	4000	1	4000	1	4000
TOTAL		1037500		312500		362500		362500

ANNEX 1. WORKPLAN

	ACTIVITY		YEAR 1				YEAR 2				YEAR 3			
1.1	Meeting	X												
1.1.2	Pilot Project	X	X	X	X									
2.1.1	Training	X	X	X	X	X	X	X	X	X	X	X	X	
2.1.2	Awareness programme				X				X				X	
2.2.1	Survey Biodiversity	X	X	X	X	X	X	X	X	X	X	X	X	
3.1.1	Fence					X								
3.1.2	Weeding						X	X						
3.1.3	Propagation	X	X	X	X	X	X	X	X					
3.1.4	Re-introduction									X	X	X	X	
3.1.5	Monitoring 3.1.4													
3.2.1	Monitoring					X	X	X	X	X	X	X	X	
3.2.2	Reporting			X	X	X	X	X	X	X	X	X	X	

ANNEX 2. TERMS OF REFERENCE FOR TECHNICAL ADVISORY COMMITTEE

The Technical Advisory Committee will be composed of members of the National Parks and Conservation Service, Ministry of Economic Planning, Ministry of Arts, Culture and Youth development, Mauritian Wildlife Appeal Fund, Faculty of Science, University of Mauritius and Mauritius Sugar Industry Research Institute, Representative of UNDP.

The Committee will be entrusted with the following tasks:

1. Hold meetings, every three months, to discuss issues relating to implementation of the project.
2. Approval of the project staff.
3. Ensure that the implementation of the project conforms to the project document
4. Monitor the progress of the project on a regular basis.
5. Provide technical guidance to the project management.

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ANNEX 3. TERMS OF REFERENCE FOR PROJECT STAFF

PROJECT MANAGEMENT

The project management shall have expertise in ecology and management and will be responsible to the Director of the National Parks and Conservation Service.

Specific responsibilities will include:

1. Be responsible for the day to day running of the project
2. Provide technical guidance for the project activities
3. Recruit and appoint project staff, subject to the approval of the Technical Advisory Committee
4. Monitor performance of all project staff

Entomologist

The Entomologist should have a degree or equivalent in zoology with emphasis on entomology and will be responsible for the carrying out survey of the insect fauna.

Specific responsibilities will include:

1. Conducting surveys of the control and experimental area for invertebrate fauna.
2. To assist the project manager in the restoration work of the project.
3. Supervise university students and train counterpart staff.

Botanist

The botanist should have a degree or equivalent in botany with emphasis on lower plants and will be responsible for the carrying out survey of the flora of the experimental area.

Specific responsibilities will include:

1. Conducting surveys of the control and experimental area for flora
2. To assist the project manager in the restoration work of the project.
3. Supervise university students and train counterpart staff.

Zoologist

The Zoologist should have a degree or equivalent in zoology with eand will be responsible for the carrying out survey of the fauna of the experimental area.

Specific responsibilities will include:

1. Conducting surveys of the control and experimental area for fauna
2. To assist the project manager in the restoration work of the project.

3. Supervise university students and train counterpart staff.

Malacologist

The Malacologist should have a degree or equivalent in Zoology with emphasis on invertebrates and will be responsible for the carrying out survey of the land molluscs of the experimental area.

Specific responsibilities will include:

1. Conducting surveys of the control and experimental area for land mollusc
2. To assist the project manager in the restoration work of the project.
3. Supervise university students and train counterpart staff.

Plant Taxonomist

The plant taxonomist should either have a degree or equivalent in botany with emphasis on taxonomy or have at least ten years experience with the flora of Mauritius and will be responsible for the identification of the plants.

Specific responsibilities will include:

1. Identification of plants collected during surveys.
2. To assist the project manager in the restoration work of the project.
3. Provide guidance to the botanist.

Statistician

The Statistician will be a Mauritian National and have a degree or equivalent in Statistics and will be responsible for the statistical analysis of data collected in the project.

Specific responsibilities will include:

1. assist in design of experiments.
2. carry out statistical analysis of data collected by the different surveys of the project.

ANNEX 4. SCHEDULE OF PROJECT REVIEWS, REPORTING AND EVALUATION

The project review will take place on every three months in which the project management will present results of the accomplished work to the advisory committee to evaluate the level of success of the undertaken tasks and the problems encountered in undertaking the tasks. The project work plan will be discussed and future accomplishments targeted.

MWAF as the project management will have the responsibility of reporting to the Director of the NPCS and the UNDP office. The reports will evaluate the work done by individual scientists or groups responsible for undertaking a certain assignment. The report will have a standard format and discuss the tasks undertaken, achievements, problems encountered and evaluation of the work accomplished.

Project evaluation will take place after the completion of the second year of the project. An external team summoned by UNDP will be responsible for evaluating the project work.

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