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# Sectoral Integration in Madagascar

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## 1. Introduction

Madagascar reported[1] first explored integration mechanism, including sectoral legal frameworks, and operation mechanism, including environmental units, inter-sectoral structures and programs, making investments compatible with the environment (MECIE), and consideration of biodiversity in environmental evaluations. The report then considered biodiversity in tourism, education, scientific research, health, agriculture, fishing and halieutic resources, livestock, energy, forestry, mining, water, public works and meteorology, trade, industrial sector, transport, integration of the environmental dimension to crosscutting fields, and a case study on inter-sectorality: the environmental aspect of the QMM project.

## 2. Integration mechanism

A worsening population poverty couple with the environmental degradation which sped up across the same period was illustrated by the rapid shrinking of the forest cover, from 25% of the territory in 1950 to 16% in 1995. This situation highlights that environment issues are linked to poverty.

Sectoral programs have been developed to integrate CBD objectives and principles, as in the case of the Rural Development Support Program or "Programme de Soutien au Developpement Rural" (PSDR) that includes Fishing, Energy and Mining, Tourism, and National Education sectoral programs.

## 3. Sectoral Legal Frameworks

The table below describes policies, strategies, approaches, and activities related to CBD:

Table 1: Policies, Strategies, Approaches, and Activities that Linked to CBD

| Fields | Plans /programs/strategies and projects related to CDB | Approaches /Activities linked to CDB |
|---|---|---|
| Global | -Decree creating the environmental unit at each sectoral ministry<br>-Decree N°99-954 of December 15, 1999 amended by Decree N°2004 -167 of February 03, 2004 on Making Investments Compatible with the Environment (MECIE) | |
| Agriculture and Livestock | -Land policy (Provisional version 2005)<br>Irrigation development plan<br>-Policy of catchment basins and irrigated perimeters development (2006)<br>-National Strategy on Fertilizers (2006)<br>-Rice farming development policy 2003-2010<br>-National Rural Development Policy (2006)<br>Madagascar Fishing Legislation<br>-Fishing Sectoral Program MAG/92/004<br>-Act N°2001.020 on responsible and sustainable fish farming<br>-Decree N°94-112 on the general organization of maritime fishing activities | - Stabilize agriculture and improve family farms productivity;<br>- Guarantee the security land tenure in rural areas ;<br>- Reorient agronomic research on satisfying sector needs;<br>- Reinforce the agricultural information system;<br>- Control water to ensure regular agricultural and animal production;<br>- Restore Soils ;<br>- Improve fallow lands using agro-forestry;<br>- Manage aquatic environments in a sustainable way. |

[1] Madagascar (2009). 4th National Report to the Convention on Biological Diversity, Ministry of Environment and Forests, 144 pp.

| | | |
|---|---|---|
| | -Decree 2004-169: activities and halieutic products collection in continental and brackish stretches of water on public and State lands<br>International convention<br>-Act N°2005-025 of November 02, 2005 authorizing the ratification of Madagascar's adhesion to the International Plant Protection Convention<br>-Act N°2005 -042 of February 20, 2006 ratifying the International Treaty for Phytogenetic Resources for Food and Agriculture (TIRPAA)<br>Seeds<br>-Act N°94-038 of January 3, 1994 on seeds<br>-Decree NN°2006- 618 August 22, 2006 on organizations in charge of implementing seeds policy<br>Sanitary protection of plants and plant products<br>-Ordinance N° 86-013 of September 17, 1986 on Phytosanitary Legislation in Madagascar<br>-Act N° 86-017 ratifying Ordinance N° 86-013 of September 17, 1986,<br>-Decree N°86-310 on the enforcement of ordinance N°86-013 of September 17, 1986 related to the Phytosanitary Legislation in Madagascar. | |
| Water | Integrated Management of Water Resources<br>Act N°98.029: Water Code<br>Decree N°2003/192 : ANDEA<br>Decree N°2003.941: Surveillance of water<br>intended for human consumption and access to resource<br>Decree N°2003.943: discharge, drainage of wastes<br>National Sanitation Policy/Strategy | - Satisfy water needs in sustainable manner;<br>- Set up the institutional framework of sustainable le and integrated management of water resources;<br>- Implement Water Code;<br>- Improve knowledge on water resources;<br>- Build the capacities of management structures and stakeholders;<br>- Set up sustainable and independent financing of the water sector;<br>- Manage waters per catchment area;<br>- Manage solid wastes of the domestic type, excreta (installation of latrines and sewage system), waste waters, and rain water<br>- Ensure environmental conformity of infrastructures by prioritizing sites where environmental impacts are apparent or harmful effects are noted;<br>- Create a service systematically controlling domestic, industrial, and mining sewage infrastructures within the Ministry in charge of the Environment. |
| Energy and Mining | Energy policy<br>Act 96-019 of September 04, on Oil Code<br>Act N° 98-032 of January 20, 1999: Reform of the electricity sub-sector<br>Policy for developing renewable energies in Madagascar<br>Mining policy:<br>Act N°2005.021 : Mining Code<br>Act N°2001-031 of October 08, 2002 setting special rules for large-scale investments in the Malagasy mining sector (LGIM)<br>Decree N° 98-394 defining the mining policy<br>Order N°12032/2000 on the regulation of the mining sector regarding environmental protection | - Save energy by using alternatives to traditional sources of energy: firewood, coal, fuel, etc.<br>- Set up alternative sources of energy (solar, wind, biofuel) within rural communities<br>- Transform Sakoa's coal for domestic uses<br>- Improve the energetic efficiency of small –scale technologies by using biomass stoves (fatana mitsitsy)<br>- Ensure optimal management of the sector and reduce structural inequity;<br>- Enhance good governance and fight against corruption through this commitment. |
| Transport | Railway transportation<br>Reference to the "Environmental record of the rehabilitation program of railway system on the Northern line" | - Article II.18: Environmental preservation.<br>- Appendix 3: Matrix of Environmental.<br>Management Plan (charter of responsibilities and |

| | | |
|---|---|---|
| | Port, marine, and river transportation<br>Act N°99-028 of February 03, 2000 restructuring the Maritime Code : Malagasy Maritime Code 2000<br>Civil aviation<br>Act N°2004 – 027 of 09.09.2004 creating the Malagasy Civil Aviation Code: Article L1.5.1-1 of Title 5 –Environmental protection related to aircraft e missions of noise and harmful substances<br>Annex 16 of the International Civil Aviation Organization (ICAO) – Environmental protection: engine noise<br>Instruction N° 01 DG/DANA of 02.23.2007 defining the roles and responsibilities of all bodies in charge of preventing bird strike hazards on airfields<br>Road transportation<br>Interministerial Order N° 6941/2000 setting a threshold for the cars' emission of exhaust fumes and repealing the provisions laid down in Order N° 1186 of March 26, 1971 | action plan), Environmental impact 16 and 25.<br>Chapter 9: Biological Resources Management and Conservation<br>Chapter 10: Protection and preservation marine environment<br>Preserve surrounding environment<br>Control Air and water pollution<br>Control soil degradation and erosion effect<br>Reduce noises' harmful effects<br><br>Identify means to fight against poisoning, shoots, captures, startling, etc. in collaboration with the airport and forest services;<br><br>Conduct ornithological studies<br><br>Article 1: Enforce regulations related to the cars' emission of exhaust fumes and setting limits of acceptable emissions |
| Health | National policy of hospital waste management (2005)<br>Decree N°805-2007 of August 21, 2007: recognition of the traditional medicine practice | Manage hospital wastes<br>Raise awareness to traditional practitioners |

## 4. Operation mechanism

The operational intervention mechanism builds on the environmental units of the Ministries and intersectoral platforms.

## 5. Environmental units

Environmental units, created at each sectoral Ministry by Decree n°2003-439 of March 27, 2003, are in charge of:

1. Regulatory matters

- Enforce legislative and regulatory texts regarding environmental management;
- Propose and/or contribute to the development and enforcement of texts aiming to integrate environmental dimension to their respective Ministry;
- Harmonize their sector's regulations with environments and ensure that sectoral procedures are compatible with the environmental ones as well.

2. Technical matters

- Participate to the National Environmental Policy implementation by ensuring environmental promotion and management in their own sector of activity;
- Promote better use of renewable natural resources in the relevant sector of activity;

- Promote the control of pollutions, harmful effects, and wastes deriving from appropriate sector's activities;
- Promote environmental education actions among the decentralized governmental services agents;
- Contribute to the risks of environmental degradation identification and propose mitigation, compensation, and prevention measures in the relevant sector of activity;
- Contribute to the development of technical tools for environmental management (standards, guides, etc.);
- Ensure control and monitoring of the environmental aspects of the relevant sector's activities;
- Ensure the management of complaints and all environmental issues related to sector of activity in collaboration with other competent authorities;
- Participate to the different committees or other groups of environmental reflection works;
- Represent their respective Ministry within the ad hoc Technical Evaluation Committee (CTE) to whom the MECIE decree has entrusted the Environmental Impact Assessment (EIA) proposals. However, if necessary, Environmental Unit may resort to the competencies of its Ministry or related organizations;
- Evaluate Environmental Commitment Program (ECP) proposals relevant to their Ministry, in compliance with the provisions of the MECIE decree created.

3. Communication matters

- Ensure the dissemination of environmental information within the ministry as well as among other authorities and partners involved in environmental management;
- Enhance communication synergy among the sector and different entities involved in environmental management.

## 6. Inter-sectoral structures and programs

Platforms were set up to address specific issues of the environment sector and other sectors, with the objective of facilitating the integration of environmental concerns with the sectors' development. While some of the platforms are permanent ones, others are ad hoc.

The "Environmental Units Platform" serves as interface for environmental authorities, other sectoral Ministries, decentralized structures, operators, and other partners and offers support and advice on the environmental issues relevant to each Ministry concerned.

There are currently two permanent platforms, the Mining-Forests Commission and the Forest- Fishing Commission. For the National Protected Area creation process, both commissions were created to mitigate conflicts related to the population's (immediate) needs, the communities' and actors' perception, and the use of space and resources (e.g. land conflicts, the populations' priorities in a context of poverty).

Intersectoral programs and projects include, among others:

- The Action Plan for Rural Development or " Plan d'Action pour le Developpement Rural" (PADR), which is a framework guiding the design, definition, and orientation of rural development strategies and programs in Madagascar and the National Rural Development Program (PNDR), which is the basic reference document of all rural development programs and projects;

- The Erosion Control Program or "Programme National de Lutte Anti-Erosive" (PLAE), which contributes to upholding rice production bases by protecting catchment areas surrounding rice farming plains in collaboration with the relevant population to reduce the sanding of the peripheral channels and rice fields. The program has been working in five (5) regions of Madagascar since 2004;

- The National Catchment Areas and Irrigated Perimeters Program or " Programme National des Bassins Versants et Perimetres Irrigues" (BVPI), which aims to durably improve the living conditions and rural population incomes in catchment areas by integrating irrigated perimeter areas; this program also ensures better valorization and preservation of natural resources for the whole country's benefit. The program is implemented in four (4) districts. The current phase started in 2007;

- The Project to Support Rural Development or "Projet de Soutien au Developpement Rural" (PSDR), whose objectives are to increase income and reduce poverty in rural areas while preserving basic natural resources;

- The Pole of Integrated Growth Project or "Projet Pôle Integré de Croissance" (PIC), which combines activities that promote private sector development, construction and rehabilitation of key infrastructures in poles of growth, and capacity building of local associations, while considering social and environmental components. Although renovated infrastructures may have huge economic impacts, environmental and social impacts have been forecasted and will be monitored throughout construction. An Environmental Management Plan has been developed for each PIC building site. The PIC is focused on three flourishing poles and sectors: Nosy-Be (e.g., tourism), Taolagnaro (e.g., mining, tourism), Antananarivo-Antsirabe line (e.g., new information technologies, food processing, industry); and

- The Mineral Resources Governance Program or "Programme de Gouvernance des Ressources Minerales" (PGRM), which aims to support the Government in implementing the strategy to accelerate sustainable development and poverty mitigation in Madagascar. PGRMs are conducted through the reinforcement of transparency and governance in mineral resources management with

special support to small-scale mining and crafts exploitations. PGRM specifically aims to improve the management of natural resources and prevent environmental degradation.

## 7. Making investments compatible with the environment (MECIE)

The MECIE decree (decree n° 99954 on December 1999 modified by the decree n° 2004-167 of February 03, 2004) is a legal instrument requiring public or private investors to perform an Environmental Impact Studies (EIS) when their investments can potentially harm the environment, in application of Art 10 of the Environmental Charter.

1. Environmental assessment, environmental commitment program, and environmental compliance

1.1. Environmental Impact Study (EIS) or "Etude d'Impact Environmemtal" (EIE):

Investment projects that may have large-scale impacts on the environment or located in sensitive areas are subject to the following prescriptions:

- performing an environmental assessment by the Promoter;
- obtaining an environmental license delivered by ONE pursuant to EIS's favorable evaluation by an ad hoc Technical Evaluation Committee; and
- delivering the Project's Environmental Management Plan or "Plan de Gestion Environmental du Projet (PGEP) which forms the project's environmental record.

1.2.Environmental Commitment Program (ECP) or Programme d'Engagement Environnemental" (PREE):

Investment projects having lesser potential effects on the environment are subject to the following prescriptions:

- Implementing an Environmental Commitment Program by the investor. The content, admissibility conditions, and modalities of enforcement are defined by official regulations and the transitional provisions of the present Decree;
- Obtaining an Environmental Authorization delivered by the relevant sectoral Ministry and pursuant to the ECP's favorable evaluation by the Environmental Unit who will draw up and forward the relevant reports to the Ministry in charge of the environment and ONE.

1.3. Environmental compliance or "Mise en Conformité" (MEC):

Existing companies will follow the procedures of an EIS or an ECP, as any ongoing investment must align with the guidelines and standards of environmental rational management and achieve environmental compliance either through an EIS or an ECP. A MEC process guide is available at the National Office of Environment or at www.pnae.mg.

Certificate of Compliance or Environmental Approval: depending on the case, the administrative act will be delivered either by the National Office of Environment (i.e., certificate of compliance) or the Ministry supervising the activity (i.e., environmental approval), after receiving technical approval from the Technical Evaluation Committee (TEC) on the EIS or the relevant Environmental Unit's approval of the Environmental Commitment Program (ECP).

The Promoter will be released of its environmental liability only at the project's end, upon obtaining of the environmental final discharge. The final discharge is the administrative act of approval that the competent body, which also granted the environmental license, issues to acknowledge the completion, acceptability, and exactness of the rehabilitation works conducted by the promoter.

The MECIE decree does not consider the "Strategic Environmental Evaluation" notion which applies to Plans, Programs, and Policies and requires submission of evaluations following the same procedure as environmental impact studies. This gives rise to a legal imprecision that should be corrected by the State.

2. Monitoring and supervision of the project's environmental management plan (PEMP)

The PEMP, which is delivered with the environmental license in the form of Environmental record, aims to describe the surveillance and monitoring activities required to ensure the implementation of the environmental measures recommended in the Environmental Impact Study (EIS) of the project, check its results, and evaluate its soundness. "Environmental measures" refer to the measures of elimination, mitigation, and compensation of the project's impacts on the social and natural environment. The PEMP complies with the Malagasy regulations, as they apply to the Project, as per the provisions of the Establishment Convention. The relevant provisions of MECIE, the Mining Code, and the Interministerial Order N° 12032/2000 are specifically referenced. The Order lists the elements that a Project's Environmental Management Plan must include. It defines the PEMP as "a program for implementing and monitoring the measures laid down in the environmental assessment to avoid, suppress, mitigate, and eventually compensate for the project's detrimental consequences on the environment."

The PEMP's implementation requires that the promoter enforce the measures prescribed to avoid, mitigate, and eventually compensate for the project's detrimental effects on the environment, throughout the life of the project.

The monitoring of the PEMP's implementation includes tracking changes in the environmental status as well as the efficiency of mitigation measures and other provisions recommended by the same PEMP.

Evaluating the PEMP's implementation aims to ensure that the promoter keeps his/her commitments and obligations, as defined in the PEMP and throughout the project's cycle and entails taking sanctions in case of non compliance. The table hereafter lists the institutions concerned by MECIE and their respective roles.

Table: Institutions concerned by MECIE and their roles

| Institutions concerned by MECIE | Roles |
|---|---|

| | |
|---|---|
| Ministry in charge of the Environment | Client throughout the whole environmental evaluation process and proposal management. |
| National Office of the Environment (ONE) | Ensure enforcement of the MECIE decree as part of the Environmental Impact Studies under the supervision of the Ministry in charge of the Environment. |
| Environmental Units at different levels | Participate in EISs evaluation during the different phases of the process as Technical Evaluation Committee (TEC) members and ensure the evaluation of ECP p roposals. |
| Decentralized territorial structures | Communes affected by the project are consulted during public evaluations. They organize and/or take part in procedures for the public's participation in environmental assessments (e.g., CDP, EP, and AP). They may also participate in the technical evaluation of the environment as resource people upon TEC's request and are associated to the project's supervision and monitoring. |
| Decentralized administrations | Regional environmental units participate in th e EISs' evaluation; ensure control of requirement specifications or "Cahier de charge"' effectiveness, and the monitoring of changes in the environment hosting the project in each region. They are organized in Regional Environmental Committees when monitoring "large-scale projects" Regional environmental administrations representing the Ministry in the appropriate region. |
| The Regional Environmental Liaison Committee | Build on the population's participation in monitoring. Collect information and raise awareness towards progress status of large-scale projects in the region concerned. Ensure processing and information dissemination from the population and all projects having potential impacts on the environment. |
| The Regional Committee Managing Environmental Claims | The committee is a design, sensitization, and negotiation structure which aims to efficiently address environmental claims at the local level. It is also in charge of the management planning of proximity claims as part of effective decentralization. |

3. Order on sensitive zones (cf. Order n° 4355/97 of 05/13/97 defining and delineating sensitive zones)

The notion of "sensitive zones" is integrated to the MECIE decree to provide guidance for performing an EIS for any setting up or modification of developments, structures, or works that are located in sensitive zones (Art 4) or may affect them (Annex I).

Art 2 defines a zone as sensitive when:

- it includes one or several elements of biological, ecological, climate, physical and chemical, cultural, and social and economic nature; and
- it has a specific value or a certain vulnerability to human activities and natural phenomena that may modify these elements and/or degrade or even destroy the zone.

Types of sensitive zones are defined in article 3 and include: coral reefs, mangroves, islets, tropical forests, areas subject to erosion, arid or semi-arid areas subject to desertification, marsh areas, natural conservation areas, protection perimeters of safe, mineral, or underground waters, paleontological, archeological, and historical sites as well as their perimeters of protection.

As such, areas that support protected species are considered as areas of natural conservation, and as areas of natural conservation, protected areas are classified as sensitive zones.

## 8. Consideration of biodiversity in environmental evaluations

Some tools were developed and are available to enforce MECIE: the General Guideline for Conducting an Environmental Impact Assessment, the Environmental Evaluation Guide, the Environmental Compliance Guide (MEC), the Environmental Audit Guide, the ESE Guide (for sensitive areas and

wetlands), the Guide for Decentralized Territorial Collectivities, and EIS guides on specific sectors such Tourism, Roads, Fish farming, Oil (upstream), Logging, and Open-cut Mines.

The Environmental Strategic Evaluation (ESE) is a voluntary process for programs and policies to follow. E.g., the environmental strategic evaluation process which allows defining important biodiversity areas of Madagascar Protected Areas System: the ESE of the regional development scheme of Anosy Region which resulted in the development of fourteen (14) regional environmental prescriptions documents and finalization of those of the other regions is planned for 2009.

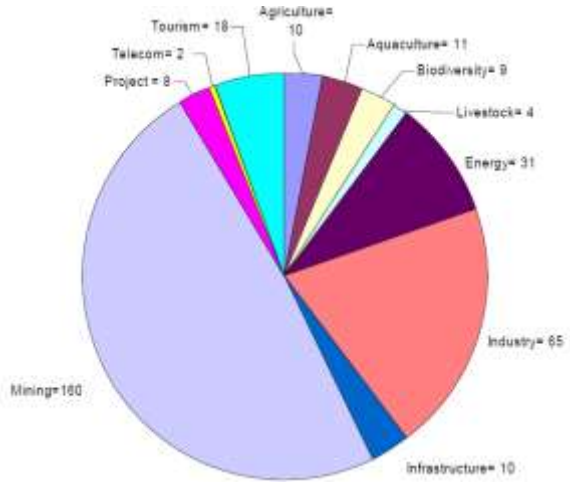
Partnerships were built to encourage promoters to perform environmental evaluations, such as the case of the partnership between ONE and bank agencies: the screening of each request for credit was performed to determine the level of environmental evaluation required.

Ten years after the issuance of the decree, investors are willing to abide by legal requirements, as expressed by the annual increase of the number of applications for environmental license submitted at the National Office of the Environment (ONE).

Table: Change of the number of environmental permits delivered

| Year | Number of applications submitted | EIS | MEC | Permit delivered | EIS | MEC |
|---|---|---|---|---|---|---|
| 2000 | 14 | 12 | 2 | 16 | 15 | 1 |
| 2001 | 21 | 19 | 2 | 14 | 13 | 1 |
| 2002 | 13 | 11 | 2 | 9 | 8 | 1 |
| 2003 | 21 | 14 | 7 | 20 | 14 | 6 |
| 2004 | 44 | 32 | 12 | 19 | 14 | 5 |
| 2005 | 45 | 37 | 8 | 36 | 28 | 8 |
| 2006 | 72 | 68 | 4 | 61 | 49 | 12 |
| 2007 | 58 | 52 | 6 | 63 | 57 | 6 |
| 2008 | 87 | 79 | 8 | 60 | 57 | 3 |
| 2009 | 28 | 24 | 4 | 33 | 28 | 5 |
| TOTAL | 427 | 368 | 59 | 344 | 292 | 52 |

Chart 5: Environmental Permits Delivered per Sector (1998- 2009)



The data and information related to the environment are compiled in the Environmental Dashboard (EDB) or "Tableau de Bord Environmental" (TBE) which is a set of environmental indicators that gives an overview of the environmental status: results related to climate change impacts, continental waters, coasts, soils and vegetation cover, and biodiversity. It is a decision-making tool developed under the Malagasy Environmental Program. 17 out of 22 regions have an environmental dashboard. The national EDB has been updated twice since 2002 (www.pnae.mg).

II. Achievements per sector

Each sectoral Ministry's environmental unit contributes to MECIE decree enforcement through activities such as: EISs, representation of the Ministry within the Technical Evaluation Committee (TEC), supervision and monitoring of environmental specifications requirement.

## 9. Tourism sector

One of the commitments made by the Ministry of Tourism consists in promoting the development of tourism and ecotourism that protects and preserves the natural environment and the social and cultural identity of Malagasy citizens. This commitment directly contributes to biodiversity conservation.

Projected actions:

- Align the Tourism sector's regulations and sectoral procedures with environmental requirements; Ensure the dissemination of intra-ministerial environmental information to authorities and partners involved in environmental management.

Achievements:

- Eco-tourism standards implemented in collaboration with MNP and ONE;
- Development of the Green Label, initiated by ONE and the Ministry of Environment and Forests continued; and
- Regional Tour operators contribute to environmental protection program and the enforcement of applicable texts.

## 10. Education

The Educational Policy Related to the Environment (EPRE) or "Politique de Education Relative à l'Environnement" (PERE) of the Malagasy Government is enforced through close collaboration between the Ministry of Education and Scientific Research and the Ministry of Environment and Forests.

Projected actions:

- Implement decree 2002-751 setting the EPRE
- Train trainers on the exact definition of the environment and relevant methodology; and

- Enhance practical activities in arts centers on environmental education.

Achievements:

The following were achieved based on collaboration of national and international institutions and NGOs, and various environmental education programs and projects:

- Environmental dimension Integrated to school syllabus;
- Environmental Department available in most Universities in Madagascar;
- Regional trainers' trainings on environmental education performed at Arts and Environmental Education Centers in the 22 regions;
- Pedagogical kits and summaries of the Regional Environmental Dashboard (REDB) and various educational documents conveying environmental topics (illustrated in Malagasy such as "IMANANKASINA") published;
- Environmental issues and proposed solutions identified;
- Teachers and soldiers trained on environmental practical actions;
- Tools for environmental education developed: EPRE training modules, including "The notion of natural resources sustainable management", "Environmental issues", "Lessons guide on using Teaching Materials", "Creative figurines in papier mâché" , "Using and developing the MAD'ERE kit for informal and formal education";
- A pilot project to support the Regional Promotion of Education for Environmental Management (ARPEGE) implemented by the four ACP countries member of IOC (Comoros, Madagascar, Mauritius, and Seychelles) to solve environmental sustainable management problems, in a context of permanent and alarming degradation.

## 11. Scientific research

Projected actions:

Integrate the Environmental Unit to the implementation of the "Valorizing Research" Program.

Achievements:

- Different Departments within MENRS informed about the integration of the environmental dimension;
- A collaboration among researchers established in the form of information exchanges and communication;

- Project to extend handicapped people's rights in the school of the environment (June 2006-February 2007) implemented; and

- The Convention between the Ministry of Education and Scientific Research and GDRI in Tsimbazaza implemented.

## 12. The network of conservation educators and practionners (NCEP) or reseau des educateurs et professionnels de la conservation (REPC)

Projected actions

NCEP is a triennial project in its second phase spanning from 2008 to 2010, led by the American Museum of Natural History (AMNH), Conservation International (CI), Wildlife Conservation Society (WCS), and Durrell Wildlife Conservation Trust (DWCT), and funded by the MacArthur Foundation. The network counts more than 950 members from all over Madagascar and from 187 institutions including governmental organizations, public and private universities, conservation and development NGOs, and various associations working in the field of education and/or biodiversity conservation. Its main activities include:

- Setting up a platform of exchange between biodiversity conservation practitioners and educators/trainers;

- Developing and disseminating biodiversity conservation syllabus; and

- Expanding the network by implementing resource centers at the level of the decentralized collectivities where the six universities of Madagascar are located.

Achievements

- 31 course modules distributed under five topics developed: basic notion of biodiversity conservation, biodiversity crises, natural resources management, marine conservation, and conservation planning tools;

- 46 professional trainings and mini-trainings on specific topics for regional groupings carried out on created and adapted to the Malagasy context modules;

- Seven topic-related support provided to "pilot" institutions involved in the integration of the Network Conservation of Educators and Practitioners (NCEP) modules to their curriculum;

- 631 PECN members received training from 2004 to 2008.

## 13. Health sector

Integration of the environmental dimension by the Ministry of Health was evidenced by the following achievements:

Health environment service

1. Ecosystem Approach

- For evergreen dense rainforest (EDRF) of Eastern Madagascar: Health sector participated to the validation of the environmental management plans for Makira protected areas creation in the Regions of Sava, Sofia, and Analanjirofo;

- Concerning the dense dry deciduous forest (DDCF) of the West, the health sector involved in the Exxon mobile project implementation (April 2008).

2. Standardizing of waste management equipments in health facilities

- The national hospital waste management policy developed (2005);

- Incinerators of the Montfort type setting up at 19 public hospitals (DHC1 Andramasina, Ambatomainty, Betioky-Sud, Mahabo, DHC2 Sainte Marie, Antalaha, Nosy be, Bezaha, Mananjary, Ifanadiana, Antalaha, Moramanga, RRHC Sambava, Morondava, Maintirano, Antsohihy, Ihosy, Ambovombe, and Taolagnaro) in 2009.

3. Multipartite Collaboration (Collaboration among the Ministry of Health, the Ministry of Environment, and the Ministry of Defense for the destruction of expired medicines.)

Pharmacopeia and traditional medicine department unit

The pharmaceutical Industry constitutes also a threat. Tradipratician's collection was never threatened in situ conservation of medicinal plants, because they just take what they need for local use. When private operators step in, the collect increases and damages may occur. The rapid extermination of Ravensara aromatic and Pygeum africanum in their natural environment is illustrative of this situation.

- Decree N°2003-1097 on the regulation of medicinal plants' sale, manufacturing and sale of medicinal products of plant origin created;

- Basic health centers informed and trained on the use of medicinal products of plant origin (cf. Appendix on health centers trained and using medicinal products of plant origin);

- Pharmacopeia and traditional medicine health workers' capacities improved: Master in traditional medicine created in 2007 (two-year training, 19 graduate students in 2009).

Integration of medicinal and aromatic plants in public health promotion

Integrating the use of medicinal plants within modern medicine practice is being promoted by the Ministry of Health. Research on medicinal plants and on the scientific manufacturing of medicinal plant products from revised traditional manufacturing methods were conducted within the different pharmaceutical research centers and institutions, such as the National Center of Applied Pharmaceutical

Research or “Centre National d’Application de Recherche Pharmaceutique” (CNARP), the Malagasy Institute of Applied Research or Institut Malgache de Recherche Appliquee” (IMRA), and Homeopharma.

Currently, affordable medicinal products made from Malagasy plants are available at IMRA and Homeopharma for public health promotion. 40 medicinal products made from Malagasy plants developed by IMRA.

Small collections of medicinal plants can be found in different institutions, more or less specialized parks or gardens or a few specimens for research purposes (CNARP, PBZT, and IMRA).

They have generally been collected in situ. For instance, CNARP currently has 110 acclimatized species, 34 of which are endemic.

A few economic operators connected with CNARP cultivated aromatic and medicinal plants. COREMA Companies are based in Marovoay Moramanga; PROIMPEX in Andasibe; SIMPEXMA has successfully been cultivating Catharanthus roseus over more than 4ha since 1989. Unsuccessful cultivation trials were performed in other regions with other plants (e.g., Catharanthus in Fianarantsoa).

Integrating the use of medicinal plants in public health must go along with some reinforcement of these plants’ rational management through ex-situ conservation activities. Plants that benefit from ex-situ conservation currently represent an insignificant proportion (less than 0.5%) of medicinal plants as a whole. Existing of living plant collections are overall very poor and far from being comprehensive.

## 14. Agriculture sector

1. Description of the Means and per-Ecosystem Approach Adopted by the Sector

- Dissemination of agricultural seed varieties adapted to a diversity of ecosystems: According to the Seeds Program (PGROSEM), fast growing seeds for the Southern bush ecosystem and seeds resistant to fungal diseases for the evergreen dense rainforest (EDRF) of Eastern Madagascar disseminated, training on seeds conservation and production and grants for infrastructure provided (completed in 2000);

- The Project to Support Rural Development (PSDR) funding sub-projects according to the potential resources to address promising sub-sectors as identified by farmers’ and/or professionals’ associations in the 22 regions of Madagascar;

- PPI or Irrigated Perimeters rehabilitation Program (1988-2000), currently taken over from by the Catchment Area/Irrigated Perimeters Program (BV/PI), which specifically uses improved varieties of rice and conducts research on phytogenetic resources for food and agriculture (PGRFA) in four target sites, Andapa, Itasy, Alaotra, and Marovoay;

- In January 2008, the Ministry of Agriculture, Livestock and Fishing (MAEP) developed an Agricultural Sectoral Program (PSA), a translation of the agricultural sectoral policy paper for operational purposes. As a whole, this program aims to modernize agriculture in Madagascar by

improving key stakeholders' agricultural development performances. It is based on a value chain and public-private partnership approaches (approaches that need to be promoted in the field).

2. Results per Objective

Concerning food crops, valorizing local ecotypes ecologically and socially adapted to the different regions contributed to food security, sustainable management and use of PGRFAs, and sustainable agriculture (cf. MAEP Annual Report).

3. Crops Improvement and Food Security Program

The food crops improvement program is more focused on rice. Before Madagascar's independence in 1960, the program aimed at improving rice production within large-scale farms, especially perimeters that have enough water. For 20years or so now, ongoing use of local varieties crossed with introduced ones has allowed for obtaining:

- Varieties specifically adapted to the different types of rice farming as characterized by their water management mode, type of soil, tolerance of salinity, tolerance of cold at the cycle's beginning and end, and resistance to diseases (RYMV, Pyriculariosis, etc.). This allowed the Malagasy agriculture to address some climate, edaphic, and pathological issues and to a certain extent, improve food security;

- Early varieties or "varieté precoce" allowing for double crops or earlier availability of rice fields for off-season crops that will shorten the lean period and yield products alternative to rice;

- Competitive export products on the international market (long-grain rice, red rice, perfumed rice), which generated income for producers and granted them means to buy food.

At present, FIFAMANOR's (Malagasy-Norwegian Cooperation for Livestock and Agriculture Development) program for improving crops is based on genetic and agronomic research combined with an evaluation program. Although biotechnologies have been used for certain species – for instance, the haplomethod on rice and induced mutagenesis for cassava and oats – conventional crossing is still commonly used. Crop improvements, among other strategies, aim to improve agricultural yield, and thereby contribute to food security.

As regards cash crops, since 1997, CTHT (Technical and Horticultural Center of Toamasina), an inter-professional association of producers, operators of the para-agricultural and food processing sectors, and downstream subsector interveners, produces and disseminates improved plant material such as litchis, mangosteens, grenadillos, pink peppercorns, pepper plants, and clove trees. Other professional organizations such as CNCC (National Coffee Marketing Committee), GNEV (National Vanilla Exports Group), and CTHA (Technical and Horticultural Center of Antananarivo) make large contributions to crop development: introducing varieties of onion or groundnut, coffee operation, technical support, and coordination of the different economic actors to improve the products' quality and to increase the quantities exported.

Concerning cultivated plants that are from wild plants, the genetic improvement program is based on crossing such as the case of rice and coffee. However, for farming new species, domestication is required, especially for those used for food (rice, sweet potato).

Regarding forest phytogenetic resources, in agroforestry, the forest species planted alongside food crops protect soils and help maintain the hydrological regime. It contributes to sustainable agriculture while protects the physical natural resources for production.

Projected Actions:

In addition to the environmental unit's activities, it is also planned to:

- Implement the International Treaty for Phytogenetic Resources for Agriculture and Food or "Traité International sur les Ressources Phytogenetiques pour l'Agriculture et l'Alimentation" (TIRPAA); and
- Set up an intersectoral national technical committee.

Achievements

- Participated in aligning sectoral texts and procedures into the environmental legislation;
- Provided comments in the provincial order for the consideration of the Onilahy valley as a protected area to enforce decree n°4355/97 relating to sensitive zones;
- Showcase sites with instructions on catchment areas protection identified and implemented in the Rural Development Regions; and
- Participated to the evaluation of the ECP of the Agricultural Mechanization Training and Application Center (CFAMA) of Antsirabe: development of environmental requirement specifications and delivery of the Environmental Approval.

## 15. Fishing and halieutic resources sector

Projected Actions

- Contribute to the MECIE enforcement;
- Monitor the UNEP project related to the impact assessment of agricultural products marketing policies on biodiversity: case of the shrimp in Madagascar;
- Protect and conserve coastal and marine ecosystems;
- Conduct fishing control; and
- Manage halieutic resources in sustainable manner.

Achievements

- Contributed to the amendment of the decree governing imports and use of ozone-depleting substances (ODS);
- Technical and financial support provided to the Erosion Control Program or " Programme de Lutte Anti-Erosive" (PLAE);
- The Regional program for sustainable management of the Indian Ocean countries' coastal areas (ProGeCo) transferred to the relevant DRDRs;
- Fishing data for the clearing-house mechanism (CHM) of the Nairobi convention fed and updated;
- Contributed to the orientation and monitoring of the ACCA (Adjusting to climate change in Africa) /CRDI project;
- High-level training on Environmental monitoring and the integration of the environment into development cooperation received;
- Participated to the development of the second National communication as part of the Kyoto Convention (UNFCCC, United Nations Framework Convention on Climate Change) ;
- A project for the integration of environmental issues and tavy stabilization in MAEP's development programs developed, under the MAP Commitment 4; and
- The Ecosystem Approach in Fishing (EAF) project in Madagascar initiated with FAO collaboration;

### 16. Livestock sector

Projected actions

Develop and/or update legislative and regulatory texts integrating the environmental dimension.

Achievements

- Participated in the planning of the development of the national profile for chemical management;
- Contributed to the implementation of the "Integrated evaluation of the impacts of marketing policies on biodiversity: case of the shrimp trade in Madagascar.

### 17. Energy sector

Actions projected

- Conduct transfer of forest resources management for energy purposes;

- Perform reforestation for energy purposes;
- Improve carbonization yields by disseminating improved carbonization techniques of (yield increases from 8% to 18-20%);
- Substitute firewood with other sources of energy (ethanol, solar energy, etc.);
- Promote energy from agro-industrial products; and
- Develop and promote energy-saving cooking equipment using firewood and charcoal.

Achievements

- Promotion of renewable energies to replace traditional ones: the degradation of forest resources decreases conversely to the number of improved stoves extended and the use of charcoal drops off to 50%; and
- Rigorous enforcement of the provisions of texts, COAP (Protected Areas' Code) and MECIE.

Collaboration between Energy-Forests-OMNIS-NGO should be set up to propose texts to govern research, with consideration of environmental issues.

## 18. Forestry

The logging also contributes to the forests degradation. Indeed, loggers do not always follow the written exploitation standards in their logging permit, neither in qualitative terms (species and individuals that can be exploited) nor in quantitative terms (size and amounts exploited). In addition, ecological values of trees are underestimated compared to their economical values. Thus, the extraction of individuals from the forests disturbs the ecosystem's stability and has negative consequences on the genetic heritage of the species logged, the living conditions of other biodiversity elements (other wild plants and animals), as well as physical elements (soil, water sources, etc.).

## 19. Mining sector

Mining activities lead to habitat fragmentation. While large-scale mining is not shifting, its footprints on forests are huge, especially clearing for mining perimeters access. In general, their impacts zone and the type of impacts are known in advance. Conversely, small-scale mining activities develop with no control, and footprints on forests are multiplied as miners increase in number. Mining impacts on forests are not only due to the extractive activities but also to the precarious human settlements that come with it.

Besides achieving integration of the environmental license award process to mining, the per ecosystem approach is characterized by the sector's involvement in local consultations for setting up the new protected area (NPA) of the Forest Corridor of Fandriana Vondrozo (FCFV), under the lead of the Madagascar Protected Areas System (MPAS), in the evergreen dense rainforest (EDRF) of the East.

Projected actions

Contribute to the enforcement activities of MECIE decree.

Achievements

- Contributed to the improvement of Mining-Forest Inter-ministerial Orders;
- Texts addressing environmental issues in gold washing or artisanal mining established;
- A framework of an environmental monitoring book for small miners published in Malagasy and French version PEE-PREE: 441, PEE-RIM: 38, and PEE-RS: 12, EIE:35;
- Environmental monitoring performed within 24 sites;
- Posters and brochures on the environmental management of small mines established;
- Advice on PEE-PRE and PEE-RIM for operators upon request:
  - Reminder of the Communes' role in environmental management;
  - Reception, information, and supervision of Mayors or representatives of territorial collectivities requesting help on the mining environment.
- Participated in local consultations on the setting up of the new protected area (NPA) of Fandriana Vondrozo;
- Contributed to the design of GEIS according to regulatory texts.

## 20. Water sector

Pursuant to the World Summit on Water and Environment in Rio in 1992, the implementation strategy for water conservation as stipulated in the Water Sectoral Policy consists in:

- Adopting the Water Code in 1999, followed by its decrees of enforcement (Act N°98-029);
- Enforcing the Water Resources Integrated Management (GIRE) principle in accordance with the principles stated during the Conference of Dublin in 1992.

ACHIEVEMENTS

- The National Water and Sanitation Authority (ANDEA) created by the decree N°2003-191 to implement Integrated Management of Water Resources (GIRE), coordinate water resource conservation and protection actions in all sectors: improve knowledge of water resources and manage water within catchment areas in a sustainable way;
- Watershed Agencies and Catchment Area Committees created all over the country;

- Enforcement of GIRE: reinforcement of water pollution control, implementation of participatory water resource management, and enforcement of the “polluter pays” principle;
- A National Sanitation Policy and Strategy (PSNA) established. Direct intervention with operators: creation of the Environmental Unit;
- Monitoring and Assessment system established and implemented.

## 21. Public works and meteorology sector

In terms of per-ecosystem approach, the Public Works sector is involved in the environmental assessment of mines in the evergreen dense rainforest (EDRF) of Eastern Madagascar. In addition, training of agents for environmental actions in favor of the Southern bush’s ecosystem has been performed.

As agreed in the decree creating the environmental unit within the Ministry and the MECIE decree, the Ministry in charge of Public Works and Meteorology provided efforts to integrate the environmental dimension to its sector by implementing the action plan of the Environmental Impacts service.

Significant achievements include:

- Public awareness on Social and Environmental Impacts Management conducted with regional officers;
- Participated in the evaluation of Environmental Impacts Studies and delivery of environmental permits to different mining projects such QMM, Ambatovy Project, CANDAX Project, seismic exploration on unit 1101 in Ambilobe at the level of the road works site area (RN6), MAINLAND MINING Project, Mining and exports of 125,000,000 tons of ilmenite over a five-year period, and other Projects;
- Burrow sites restored along dirt roads;
- Treatment of environmental liabilities: Management of quarry site restoration works; and
- Environment Community Animators (ECA) from pilot communes trained.

## 22. Trade sector

Projected actions

- Enforce regulatory texts relating to environmental management;
- Align the trade sector’s regulations with those of the environment;
- Develop the text to integrate the environmental dimension into the Ministry in charge of trade;
- Build the capacities of the Environmental Unit;

- Promote environmental education with decentralized service agents.

Achievements

- Contributed to the implementation of the Decree relating to Ozone protection;
- Amendment of the regulatory text on food products' customs clearance;
- Participated in the evaluation of the CITES Policy;
- Involved in the project "Integrated evaluation of the shrimps trade impact on biodiversity";
- Contributed to the collection of data on Persistent Organic Pollutants (POPs) as part of the "Strategic Approach to International Chemical Management" (SAICM);
- Decree on "Commerce Equitable et Solidaire "(CES) or Fair Trade drafted;
- The "WATERLILY" association's activities in domestic waste management monitored and supervised;
- Progress enforcing texts on eco-labeling and packaging; and
- Awareness raising of Fair Trade actors in 14 regions performed.

## 23. Industrial sector

Projected actions

- Enforce Multilateral Environmental Agreements;
- Develop the text pertaining to solid wastes;
- Develop a Bill creating the national policy for chemical management;
- Enforce the MECIE decree;
- Officially approve pesticides and Agro-pharmaceutical products;
- Ensure environmental compliance of companies (Persistent Organic Pollutants [POPs]); and
- Raise awareness on the use of Renewable Energies.

Achievements

- Participated in the training workshop for developing projects on Sustainable Development Mechanisms in Madagascar;

- Participated in preparing the second National Communication in inventorying emissions of greenhouse gases from the industry sector;
- Action plan on reducing Dioxins and Furans established (to be submitted to Secretariat);
- Contributed to the development of the national profile for chemical management;

### 24. Transport sector

Per ecosystem approach

The sector of rail-bound transport, ports, and maritime and river transport contributes to upholding continental water and marine ecosystems by developing EISs prior to rehabilitation works (e.g.: rehabilitation of the Port of Antsiranana).

Achievements

Achievements of the transport sector are described in Table below . However, Civil Aviation has specific features:

Control of bird and animal strike hazards in airfields: Procedures for controlling bird and animal strike hazards have been agreed upon by the concerned bodies to avoid reduction or suppression of certain rare species. Indeed, ADEMA (Airport of Madagascar) is currently looking for ornithological specialists to undertake studies to improve these control procedures.

Mitigation of noise annoyances in airports: As member of ICAO and IATA (International Air Transport Association), Madagascar pays attention to the noise generated by the engines and reactors of aircrafts used at Madagascar airfields. Periodic controls are conducted for this purpose.

Table: Projected Actions and Achievements of the Environmental unit of the Civil Aviation, Road Transport, and Rail-bound Transport sectors

| | Projected actions | Achievements |
|---|---|---|
| Civil aviation | -Develop texts to enforce Act N°2004 – 027,<br>-Evaluate aircraft noise levels ,<br>-Research for funds and specialists in ornithological studies,<br>-Implement protocols and policies to ensure environmental compliance on airfields, and<br>-Environmental and social impact studies for the expansion of the international airport of Ivato /Antananarivo and the Antsirabe airport . | -Instruction N°01 - DG/DANA of 02.23.2007 defining the roles and responsibilities of all bodies in charge of preventing bird strike hazards in aerodromes developed,<br>-Shooting, poisoning, and startling methods performed with airport services consultation,<br>-Periodic controls of aircraft engines and reactors noise conducted,<br>- Airport waste management implemented with the collaboration of local authorities and nearby riparian population collaboration,<br>-Airport emergency plan (Propagation of dangerous goods) implemented,<br>-Environmental component integrated into airport projects,<br>-Terms of Reference of environmental and social |

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| | | impact studies to ensure environmental compliance in the expansion of the Airport of Ivato /Antananarivo established,<br>-Treatments of wastes and wastewaters in airports conducted,<br>-Birds frequenting aerodromes identified to avoid suppression of rare species, and<br>-Erosion in and around airport construction sites mitigated |
| Road transport | - Further develop synergy between organizations in relation with the motor vehicles control center (Customs, Criminal squad, Land transportation agency, etc.),<br>- Computerize all control centers in Madagascar, and<br>- Progressively equip relevant centers with apparatuses allowing to measure motor exhaust (combined gas analyzer/opacimeter kit). | -Consultation platform established, periodic meetings hold,<br>-Control centers equipped with a computer, vehicle control line, opacimeter/gas analyzer<br>-Decrease in the proportion of vehicles deemed unfit following the systematic control motor exhaust at the Center (Annex Nanisana) in Antananarivo |
| Rail-bound transport | -Make the riparian population responsible/ Raise awareness among the riparian population by setting up village associations to facilitate their participation in environmental conservation (i.e., control of bushfires or slash and burn fires, illegal logging, charcoal production within railway site areas),<br>-Prohibit timber and charcoal transportation,<br>-Conduct reforestation in target sites,<br>-Stabilize black spots by combining civil engineering techniques with reforestation,<br>-Implement EIS prior to large-scale projects,<br>-Transportation governed in compliance with environmental specifications<br>-Prohibit the use of wooden crossbeams<br>-Prohibit the transportation of wild plants and animals and the use of herbicides<br>-Clear out canals<br>-Set up de-oiler<br>-Prohibit discharge of caustic substances (acid/base) in sewers | - Report/Census of offences and law-suits of offenders conducted,<br>-No bushfire recorded in the Northern network this year,<br>-Income improved for Village Associations, which alleviates poverty, a major cause of the unsustainable use of biodiversity,<br>- transportation of timber or charcoal from 2006 to 2009 reduced in number,<br>-In 2008, EIS of the MLA line to set up projects implemented to address the degradation of catchment areas (both mechanical and biological techniques),<br>-Reduction of the use of wood: e.g.: replacing wooden crossbeams with metal or concrete ones – metal used over a length of 46,571 meters and reinforced concrete over 170,879 meters,<br>- transportation of wild plants or animals from 2006 to 2009 reduced,<br>- Clearing rivers of sands,<br>-Compliance with standards relating to the water quality prior to discharge, and<br>-Absence of eutrophication within canals. |

Table: Projected actions and achievements of the environmental unit of the Port and Maritime and River Transport sector

| Sectors | Projected actions | Achievements |
|---|---|---|
| Port, Maritime and river transport | -Build "collection facilities" in the ports of Toamasina, Antsiranana, and Mahajanga to collect and treat port wastes from ships, especially bilge water, tank water containing hydrocarbons, waste oils, and waste waters, as well as refuse,<br><br>-Considerate marine environmental protection for different port construction projects depending on investments from | -Suspension of bids, given the current situation in Madagascar,<br><br>-A Regional Workshop by OMI and the Indian Ocean Commission (IOC) as part of the "Project of maritime route development and prevent marine and coastal pollution in Western Indian Ocean" performed,<br><br>-Huge progress as compared to the situation in 2005 with regard to sanitation measures,<br><br>-Environmental prescriptions, visit of the Canal with an ONE Agent, training of |

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| | operators,<br><br>-Rehabilitate urgently the Pangalanes Canal,<br><br>-Monitor the completion status of the rehabilitation of the Container Terminal in the Port of Toamasina (TAC) by Madagascar International Container Terminal Service Ltd (MICTSL)<br><br>-Contribute to the ratification of important conventions,<br><br>-Draft text on the prevention of pollution by small boats,<br><br>-Develop a draft of New Malagasy Maritime Law (NCMM), and<br><br>-Develop a guide to "mark out" and "frame" the development of the future mineral port of Antserake in consultation with the National Office of Environment. | the participating staff including Fokontany heads on standards for work regarding aquatic plant removal, and sand clearing<br><br>-The New Malagasy Maritime Law and guideline developed, and<br><br>-Important conventions ratified: International Convention on Oil Pollution Preparedness, Response, and Cooperation (OPRC) in 1990, Hazardous Noxious Substances (HNS) Convention in 2000; International Convention on Civil Liability for Oil Pollution (CLC) in 1992, International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage in 1992, and MARPOL Convention 73/78 (International Convention for the Prevention of Pollution from Ships) |

## 25. Integration of the environmental dimension to crosscutting fields

The table below describes the achievements of the Environmental Unit in cross-cutting fields.

Table: Achievements of the Environmental Unit in cross-cutting fields

| | Projected actions | Achievements |
|---|---|---|
| Ministry of Interior (MININTER) | -Ensure enforcement of legislative and regulatory texts relating to environmental management,<br>-Ensure dissemination of intra-ministerial environmental information to other authorities and partners involved in environmental management, and<br>- Conduct MININTER's annual reforestation. | - Four Districts (Moramanga, Ivohibe, Manajary, and Maintirano) informed about regulatory provisions in to enforce the required measures for solving environmental problems<br>- Grouping session of District Heads at the Ministry of Interior's premises to periodically assess fires in their respective districts and report on them to the Central level. |
| Ministry of Justice | -Restore rule of law regarding the environment,<br>- Launch forest RRIs at the level of 22 regions,<br>-Contribute to environmental protection, and<br>- Inform and raise awareness on the "Green Action". | - Maritime Code reformed to retrofit with the International Convention on the law of the Sea and on sea actions ratified by Madagascar<br>- Setting up of RRIs to process files relating to forest legislation<br>- Coordination between the procedure and training of agents in charge of enforcing the legislation conducted in Ambositra, Fianarantsoa, Manakara, Toliara, Ambatondrazaka, Taolagnaro, Antsohihy, Ambanja, and Analanjirofo<br>-The African Network of Environmental Information implemented, and<br>-Synergy of Focal Points actions related to environmental International Conventions. |
| Ministry of Foreign Affairs (MAE) | -Ratify the International Agreement on tropical wood 2006<br>-Present the Bill authorizing the adoption of | |

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| | the Bill relating to the Madagascar's Biosafety regime to the Parliament,<br>-Contribute to the implementation of environmental policy, and<br>-Contribute to the repatriation of Malagasy protected species seized at other International airports under CITES.<br>-Contributed to the repatriation of species seized at International airports under the CITES Convention<br>- Madagascar's candidature to host the AETFAT congress (Botanists' Congress) in 2010 accepted (166 votes against 70 during the 18 th Congress in March 2007 in Yaoundé),<br>-Participated in international meetings: various meetings held with the Consulate General of Thailand in Madagascar and the concerned sectors: sent the certificate confirming animal endemism to the Honorary Consulate of Madagascar in Bangkok, and<br>- Memorandum of Understanding of Cooperation between Madagascar and Thailand for the protection of endangered species established and signed. | |
| Ministry of National Defense (MDN) | -Contribute to the establishment of legislative and regulatory texts related to environmental management,<br>- Align sectoral procedures to be consistent with the environmental policies (underway)<br>- Reinforce bushfire prevention systems<br>-Draw up a memorandum of understanding for reforestation actions (MDN -MINENVEF, Ministry of Environment, Water, and Forests).<br>-Collaborate with MINENVEF to monitor and control environmental and forest monitoring actions<br>-Control marine pollution and illegal use<br>-Disseminate intra-ministerial environmental information<br>- Conduct a reforestation campaign | -Specific actions taken by the police force,<br>-Making 04 non-commissioned officers and 06 Gendarmes available to the MINENVEF to support its mission,<br>-Reforestation: 3,000 seedlings planted by MDN/PC, 402,000 seedlings by COMGN and EMGAM ,<br>-Mission of the army-gendarmerie unit performed to eradicate bushfires within the national territory , and<br>-Seizing of products (wood, precious stones, etc.) deriving from illegal exploitation seized. |
| Ministry with the presidency in charge of decentralization and land development | -Ensure implementation of regulatory texts,<br>-Participate in the National Policy relating to the environment,<br>-Reinforce our 2008 awareness-raising campaign relating to the environment<br>-Inform people on the environment's importance and the existence of texts relating to the environment, and<br>-Ensure land tenure security in collaboration with the Land Project of Millenium Challenge Account (MCA). | - Local Land Occupation Plans (PLOF) in the regions of Vakinankaratra, Amoron'i Mania, Menabe, Atsinanana, Boeny, and DIANA developed,<br>-Protected Areas cartographic data overlapped with PLOFs to avoid conflicts, with regards to land tenure security at the zones' periphery and/or within the zones. Delineation of the areas was created with collaboration from MPAS and concerned promoters through various working sessions. Each hard copy of PLOFs will feature the general layout of the concerned commune, including the boundaries and name of the protected areas located within it. |

In spite of these achievements towards the integration of environmental issues into other sectoral ministries, efforts still need to be provided to improve environmental communication and find funding for each sector's environmental activities.

## 26. Case study on inter-sectorality: the environmental aspect of the QMM project

ISSUES

The presence of QMM and its team of experts in the region of Fort-Dauphin for more than sixty years allows for gaining in-depth knowledge on various environmental aspects. The company's initiatives and its support to those of the region allowed for adopting a more sustainable development strategy for the sector's natural resources.

The projected mining area will first be cleared and scraped off as the dredger proceeds. 2010 out of 2370ha, a total surface of Mandena mining area, will be full transformed. The difference of 230ha corresponds to areas of coastal forest and marshes that have been set aside for conservation purposes. This conservation zone, which has already been integrated to the project's mining planning, amounts to 10% of the mining area's surface area and 8% of the ilmenite volume. A surface area of 20ha has also been set aside to serve as a protective strip on the edges of streams and lakes.

Open Habitat

Open habitat dominated by Philippia and the other types located in the mining zone are extremely degraded land environments. They are not home to any rare or vulnerable plant or fauna species. Biophysical studies conducted in such habitats suggest that the clearing of these areas will not raise any environmental issues. Therefore, the relating impact on the flora and fauna of open habitats is qualified as minor.

Marshes

The marshes located in the mining zone are subject to pressures and degradation, which will affect the biota living there on the long term. At the time of the mining or in 10 or 15 years, a certain proportion of the marsh surface areas, which are currently productive, could stop being so if the current trend is upheld. Still, unlike the littoral forest which is quickly and irreversibly degrading because of pressures and regular fires, marshes are less affected and have a certain capacity of regeneration (mahampy among others). This capacity enables the ecosystem to survive successive fires. However, such tolerance is limited and today some marshes that once were productive have become unproductive.

At present, it is difficult to determine the state of the marshes at the time of the mining and across a period of 25 years. Nevertheless, it is predicted that five to 10 years after the mining's set up, marshes will still be productive.

The mining will also alter the fauna community living in the marshes. While some species could be move and adapt to peripheral habitats, others will not. In terms of biological diversity, marshes doesn't

contain to any rare or endemic species: species living there are widespread in Madagascar and elsewhere.

Therefore, these areas' flora and fauna do not raise any particular conservation and protection concerns. As such, the project's impact on the marshes' flora and fauna is qualified as average.

Littoral forest

For numerous years, the littoral forest located in the mining area has been heavily altered by the increase of anthropogenic pressure in the region and the effects of a long process of deforestation and degradation. Different threats to littoral forest have impact on the reduction of almost the whole forest areas, increasingly fragmented and degraded units as the only vestiges of the original forest.

Consequently, the flora and fauna diversity has been reduced and there has been significant disturbance of the forest communities' structure. Moreover, the forest's increasingly marked fragmentation and advanced stage of degradation caused major intrinsic changes, making the irreversible loss of ecosystem biodiversity even more marked. The forest landscape of Mandena nowadays has a significantly fragmented profile with most residual forest parcels isolated one from another.

From 1950 to 2000, about 74% of the forest areas of Mandena had been cleared (60% of the coastal area as a whole), i.e. an average rate of 27ha/year. In 2000, an updated inventory of the mining area's residual forests revealed that there was no intact forest parcel left. It was described that nearly 73% of the forest areas as extremely degraded (stages 4 and 5) and the remaining (27%) as moderately degraded. Deforestation will continue, with or without the mining project, and if the current trend in Mandena of 27ha forest lost per year remains constant, the forest may be totally cleared as soon as 2020.

Assuming that the different sources of pressure on the littoral forest and the intensity of collection remain the same over the next years, it is expected that most of the residual forest in 2001 (203ha) will have been cleared when the dredger will reach the first forest units and even if there still remains a few hectares of forest at that time, these will be highly degraded. If deforestation and degradation increased with the population growth, the surface area of the residual forest will shrink even more rapidly. It follows that it is difficult to accurately assess the surface area of residual forests in Mandena when mining will start, but historical trends suggest that the residual forest will be gone before the dredger. Inventories have shown that the Mandena forest is a home to 369 flora taxa. The last studies on flora and current knowledge of botany allowed for drawing up a list of 22 species endemic in Mandena forest. All of them were recently found and inventoried within the conservation area proposed in Mandena or out of the mining area, as well as elsewhere on the coastal area.

Fresh-water and estuary habitats

The physical and chemical properties of the aquatic ecosystems located upstream of the mine dump area will be altered. This alteration will cause changes of composition in aquatic floristic communities.

Upstream of the dumping, water will gradually become less salty and some fauna and plant species will progressively be changed. Nonetheless, none of the riparian plant species identified in the aquatic ecosystems upstream of the dumping as part of the present study are rare, endangered, vulnerable, or endemic.

The studies conducted in May and October 2000, upstream of the projected dump, show that mangroves are colonizing the banks of the lake of Ambavarano and river of Mandromodromota. Existing individuals form a thin fringe of trees along the banks and do not actually constitute mangroves. Indeed, this estuary is steep-sided and does not offer conditions favorable to the development of this type of ecosystem.

The presence of the dumping will modify the seasonal fluctuation pattern in the Ambavarano Lake and the Mandromodromota River, when sand covers the mouth of the Anony River and will also affect the daily fluctuation pattern when the mouth is open. In the long term, the absence of daily fluctuations caused by the tide upstream of the mine dump area may affect the mangroves (characterized by Bruguiera gymnorhiza and Lumnitzera racemosa). Although daily fluctuations are non-existent two to three months per year – i.e. when a sandbar settles in the mouth of the river of Anony – they remain one of the ecological conditions intrinsic to the mangroves' growth.

Even if the species seem to tolerate the absence of daily fluctuations, it can be forecasted that the new conditions that will prevail following the mine dump construction will not be favorable to the inventoried mangroves. It follows that, in the long term, these trees will be replaced by freshwater species and freshwater mangroves (Barringtonia racemosa). Besides, mangroves downstream of the dump area will not be affected, given that the waters' physical and chemical properties and level fluctuations resulting from tides will be preserved. Mangroves are euryhaline species: they tolerate variations of the salt content in water but they do not need them to grow.

Long-term replacement of mangroves and other brackish water plants upstream of the dump area could impact on the banks' stability. Indeed, the mangrove fringe combining Bruguiera gymnorhiza and Lumnitzera racemosa plays a relatively important role in stabilizing the banks with respect to the distances covered and not the surface area covered.

An impact of average extent is therefore expected with respect to the modification of the vegetation structure on the edges of the lakes of Besaroy and Ambavarano, as well as along the first kilometers of the river of Mandromodromotra. Planting freshwater mangroves, Typha angustifolia, and cyperacea in areas at risk of erosion will mitigate the impacts on the water quality modification (brackish water and fresh water) on the plant cover in the parts affected. The residual impact forecasted is therefore of minor importance.

MITIGATION MEASURES

As regards rehabilitation, reforestation of the various mining areas in Fort-Dauphin will be conducted while they are exploited. Following mining activities, rehabilitation will result in the establishment of

some 6,000ha of forest that would never have existed without the project. A few years after the end of their exploitation, each of the three mining areas (Mandena, Petriky, and Sainte-Luce) will be fully reforested. The villagers' and authorities' commitment to implementing and managing rehabilitation activities throughout exploitation will contribute to effective management transfer, long before the closing of the various mining areas. Fast growing species will be planted to ensure the villagers' wood supply. Also, setting aside zones of littoral forests from the mining areas and ecologically restoring these areas will support conservation efforts and contribute to better protection of the unique biological diversity of the coastal forest.

As part of the region's sustainable development, the forest resources exploitation strategy will provide for the creation of reforestation zones, which will offer opportunities during and after the company's mining activities. In the event the Government decides to set up the conservation zones proposed in the various mining sectors and the efforts of QMM, authorities, villagers, NGOs, etc. prove successful, these areas will allow for protecting unique ecosystems and constituting a biodiversity legacy not just for the region, but for the island of Mada gascar as a whole. Like rehabilitation, the creation and management of conservation zones will require the participation of villagers and authorities, who will fully ensure such management before the end of the mining.

As part of the region's sustainable development, conservation zones will form an integral part of the ecotourism strategy and will offer opportunities during mining and after the company's departure.

Open Habitats

Valorization measures enforced will include reforestation of open areas with species valorized by the surrounding population. Experiments in recent years have shown that the selected plants will be able to adjust to the site's difficult conditions after mining.

Reforestation of the sites with fast growing species that villagers can use will allow for reducing pressure on remaining natural forests and restored forests.

The surface area that will be reforested with fast growing species (approximately 1,590ha) is estimated at nearly 75% of the mining area. The mitigation measures enforcement aimed at rehabilitating these environments so that they will support more economically valuable species than previously will add value to the sector. As such, a positive residual impact, estimated to be of average importance, is expected.

Marshes

Proposed mitigation measures provide marshy environments restoration, mainly marshes in Mahamy, which are actively used by women in the area. Restoration of the marshes is planned for approximately 15% of the mining area (318ha), i.e. the equivalent of the current surface area.

The main factor limiting the surface area of marshy environments restoration is the of organic soil availability. Setting aside 70has of marshy forests from mining activities will also enable conserver

important biodiversity in this region. The characteristics of the marshy environment in the sector of Mandena will therefore be conserved on the long term.

The measures enforced will also allow for valorizing the resources used by the population. A minor residual impact is identified.

Littoral forest

The actions, taken by QMM to conserve 160has of forest (units M15 and M16), are aimed at upholding the flora and fauna species representative of the littoral forest of Mandena as a whole.

Although the mining area is not home to any endemic fauna species, some species are extremely rare in Mandena, such as Eulemur fulvus collaris, whose last population in Mandena was recently relocated in the proposed conservation zone to promote its survival.

In short, in a context of progressive deforestation, the impact of forest's destruction (and consequently of the flora and fauna living there) for mining purposes is considered as limited.

Impact on the littoral forest's flora and fauna is qualified as minor. The intensity of the changes caused by the mine and its exploitation must be highlights. If the forest of Mandena had been free of any pressure, the impact associated with the destruction of 203ha of forest would be major.

Proposed mitigation measures include various actions, such as the conservation of 160ha of littoral forest and after mining, forest restoration will be approximately 10% of Mandena surface area (about 212ha). Proposed mitigation measures will promote the preservation of the flora and fauna components characterizing the coastal forest in Mandena. Other measures include creating a conservation zone, planting species that can become alternative solutions to wood, restoring the coastal forest, conserving seeds, and relocating some animal populations. Consequently, a positive residual impact of minor importance is expected.

REHABILITATION MEASURES

The whole surface area (2,120ha) of the sector to be exploited will be rehabilitated. Two types of rehabilitation have been tested in the last years: ecosystem restoration (to be implemented on 10% of the surface, or 212ha) and planting fast growing species (planned for 75% or 1590ha of the site).

The restoration of forest ecosystems will require quality topsoil with high organic content. Current estimations indicate that there will not be enough of this soil to restore more than 10% of the mining sector. Lastly, 15% of the marshes' surface area will be rehabilitated (318ha).

CONSERVATION MEASURES

To ensure protection of the forest's last vestiges and their plant and animal species, the promoter proposes to set a forest area of 160ha aside from the mining area. Conservation of this unique natural environment is essential to uphold the biological diversity and genetic variability of this type of forest.

This measure for conserving a vestige of littoral forest in Mandena is also vital to villagers who may find important resources in this forest, in terms of common medicinal plants, rights to use forest resource, income linked to tourism, etc. The conservation zone will be a site for collecting native seeds for restoration purposes, relocation of certain animal species, protecting one of the last fragments in good state in Mandena, conducting in situ conservation and propagation of vulnerable and useful flora species of Mandena, and performing permanent research on the littoral forest and its biodiversity.

The success of the conservation zone project depends on the collaboration among stakeholders, i.e. QMM, villagers, the Ministry of Water and Forests, and Regional Development Committee (CRD).

During the project implementation, numerous efforts were provided to protect the sectors. The method used by QMM to implement a global biodiversity conservation and renewable natural resources sustainable management strategy effectively focused on the creation of conservation zones. In a context of progressive deforestation and in consideration of the respective specificity of the forests of Sainte-Luce and Petriky, the promoter additionally proposes to create conservation zones in these two sectors.

It was therefore agreed during the project's planning phase, to set a zone aside from the mining sector of Mandena and use it to maintain the characteristics relating to the sector's biodiversity. As such, the conservation of 230ha mainly including littoral forests (70%), considered as in a state of moderate degradation and marshy forests (30%) will allow for safeguarding the distinctive characteristics of the zone's ecosystems. This measure, which pertains to forest units M15 and M16 will allow for conserving the flora and fauna species representative of Mandena littoral forest as a whole.

Proposed conservation zones in Sainte-Luce and Petriky (490ha) are also aimed at conserving endemic, rare, and threatened flora and fauna species.

The conservation zone of Mandena is in the process of being established, with collaboration from local partners (local authorities, villagers, and CRD). The zones of Sainte-Luce and Petriky will then be created. The pilot experience conducted in Mandena will help orient the strategy for the two other sites.

Other conservation measures, put on trial in the past years will be maintained. They pertain to:

- In situ and ex situ regeneration and propagation of vulnerable and endangered flora species;
- Long-term conservation of native species' seeds;
- Relocation of certain fauna species;
- Captive breeding of some rare populations for reintroduction purposes.