MAURICE ILE DURABLE

CONSULTATIVE WORKSHOPS 14 JUNE – 29 JULY 2011

Working Group 2

ENVIRONMENT - PRESERVATION OF BIODIVERSITY AND NATURAL RESOURCES

Final Report

15 August 2011

Preamble

The diversity of plant and animal life is vital to the very survival of life on this planet. It contributes in an integral and integrated way to ecosystem functions, goods and services, among them, nutrient recycling, plant pollination, provision of food and energy, control of erosion, pest and disease control, air and water purification, climate stabilisation, detoxification of waste products, etc. For a healthy and productive biological diversity, it is imperative that the ecological habitats in which the plant and animal species live must also be maintained in their natural, healthy state. This in turn requires that the natural environment be preserved and protected in as pristine a state as is possible. Even economic development is not possible without environmental sustainability. Hence a Sustainable Environment is a *sine qua non* condition for all aspects of Sustainable Development.

Government's vision of Maurice Ile Durable rests on five pillars, namely Energy, Environment, Employment, Education and Equity. Achieving sustainability in all of these would help to bring together all the ingredients necessary to put our small island state firmly on the path to realising the dream of being a global model for Sustainable Development.

With respect to biodiversity and natural resources, the MID vision for our present and future generations is as follows:

1. *Our nation is environmentally conscious, adopts a sustainable lifestyle and acts responsibly.*
2. *Our natural resources including biodiversity, historical and cultural heritage are effectively managed, protected, monitored and used in a sustainable manner.*
3. *Our nation enjoys security in terms of water and food and a high quality of life in a clean, green, zero waste and pollution free environment.*

A working group on Preservation of Biodiversity was set up by the Ministry of Environment & Sustainable Development (MoESD) in collaboration with the PMO's office, with representatives from governmental institutions, private institutions, Non-Governmental Organisations, Trade Unions and the Civil Society, to undertake the national consultations on the theme Biodiversity.

The objectives of the working group, referred to as Working Group 2 (WG2) were to formulate through a series of working sessions, practically acceptable proposals and associated targeted action plans for the conservation and sustainable use of biodiversity in order to achieve the MID vision. A two day working session during which was discussed the theme Biodiversity amongst others was carried out with representatives from the governmental and private institutions in Rodrigues.

The animation team prepared a Base Paper (**Annex 2**), which served as the basis of the discussions of the WG2. The Base Paper outlined the current status of our biodiversity and natural resources in the Republic of Mauritius and outer islands, the existing legislation and policies, and the gaps and constraints in their implementation. It made reference to a large number of national strategy and action plans, annual reports and other official documents, research documents, the MID Green Paper and the MID documents prepared by the University of Mauritius on Sustainable Agriculture, and Ecotourism. This base paper was sent to all participants of WG2 prior to the first Working Session.

The WG2 met on four occasions (**Annex 3**) at La Cannelle, Domaine des Pailles. In addition, three additional meetings were held to discuss further on the recommendations of the working group. At the four formal Working Sessions, discussions were held in subgroups, and validated by all participants during plenary sessions. While, in general there was unanimity among all participants on almost all issues, on a very few points, there was disagreement among different stakeholders. These have been duly recorded in this document. All measures proposed apply equally to the islands of Mauritius, Rodrigues, and the other outer islands.

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List of Acronyms

AAP	Africa Adaptation Programme
AFRC	Albion Fisheries Research Center
AREU	Agricultural Research and Extension Unit
BRGNP	Black River Gorges National Park
CBO	Community Based Organisation
CMA	Conservation Management Area
COP	Code of Practice
CSER	Corporate Social and Environmental Responsibility
CSR	Corporate Social Responsibility
CWA	Central Water Authority
EIA	Environmental Impact Assessment
EMS	Environment Management System
ESA	Environmentally Sensitive Area
EU	European Union
FAD	Fish Aggregating Devices
FS	Forestry Services
GAP	Good Agricultural Practice
GEF	Global Environment Fund
GIS	Geographical Information System
GMO	Genetically Modified Organism
HACCP	Hazard Analysis and Critical Control Point
IAS	Invasive Alien Species
ICZM	Integrated Coastal Zone Management
IPR	Intellectual Property Right
IRS	Integrated Resort Scheme
LAVIMS	Land Administration and Valuation Information Management System
MAAS	Multi Annual Adaptation Strategy
MDG	Millennium Development Goal
MoAFS	Ministry of Agro-Industry and Food Security

MOI	Mauritius Oceanography Institute
MPA	Marine Protected Area
MSIRI	Mauritius Sugar Industry Research Institute
MWF	Mauritian Wildlife Foundation
NCG	National Coast Guard
NDS	National Development Strategy
NEF	National Empowerment Foundation
NGO	Non-Governmental Organisations
NIASSAP	National Invasive Alien Species Strategy and Action Plan
NPCS	National Parks Conservation Service
NPPO	National Plant Protection Office
PAN	Protected Area Network
PMO	Prime Minister's Office
PPG	Planning Policy Guidelines
PPP	Public and Private Partnership
R&D	Research and Development
REDD	Reduced Emissions from Deforestation and Forest Degradation
RES	Real Estate Scheme
SADC	Southern African Development Community
SEA	Strategic Environmental Assessment
SEMPA	South East Marine Protected Area
SIDPR	Sustainable Integrated Development Plan for Rodrigues
SIDS	Small Island Developing States
SWIO	South Western Indian Ocean
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UoM	University of Mauritius
VAT	Value Added Tax

Executive Summary

The Government has placed environmental issues high in its order of priorities for making Mauritius a sustainable island. A large number of policies, laws, regulations and guidelines have been formulated to ensure that the various facets of our natural and built environment remain clean, healthy and productive. However, gaps and discrepancies in the legislation and fragmentation of jurisdiction, coupled with dispersed institutional responsibilities and poor implementation and enforcement, undermines legal and institutional authority, leading to failures in achieving the high standards expected by Government and society.

It is recommended to develop and promulgate a single **Biodiversity Act** that will encompass all the various facets of the country's terrestrial and aquatic biodiversity, including its protection, management, preservation and use for the benefit of one and all. It is further proposed that a new Ministry be created-the **Ministry of Ecology and Sustainable Development**, which will be responsible, *inter alia*, for all the various aspects of the identification, investigation, archiving, study, management, preservation and sustainable utilisation of ecosystems in all sectors of the economy. The Biodiversity Act must come under the jurisdiction of the Ministry of Ecology and Sustainable Development. Pending the establishment of these two core instruments necessary for preservation of the biodiversity and natural resources, it is proposed that a Gap Analysis of existing legislation and regulations be carried out with a view to **updating and harmonising** them. This should be followed by allocation of clear, **unambiguous mandates** to existing institutions and organisations for the various components of biodiversity and natural resources.

There are considerable gaps in our knowledge of the exiting terrestrial (e.g. mountain, wetlands, and caves) and aquatic (freshwater and marine) biodiversity. We also know and understand very little of the effects of invasive alien plant and animal species on local biodiversity. Similarly, the effects of varying climate and global climate change on our flora and fauna are not sufficiently studied. It is therefore necessary to undertake large scale investigations on **identifying, inventorying and characterizing local plant and animal species**.

It is strongly recommended to establish **Ecological Corridors** that are contiguous areas of natural habitats. This will reduce habitat fragmentation, reduce competition for space, food and shelter, and effectively increase the geographical area available to plants and animals to spread out and carry out their ecological functions.

Environmental impacts of anthropogenic changes for economic development are normally evaluated through the same set of parameters and threshold values (e.g. noise, odour, emissions, smoke, wastes generated, effect on water quality, on surrounding vegetation, etc). However, land use and habitat changes cannot be supported by all species and all ecosystems to the same extent. Hence it is not appropriate to use the same measuring yardstick for estimating environmental impacts of developmental projects. EIA requirements make mention of 'carrying capacity of the site', but does not specify whether this refers to the carrying capacity of the natural habitat/ecosystem. Furthermore, there is no baseline data available in the country on the carrying capacity of ecosystems, for whatever purpose. It is therefore imperative that detailed scientific studies be conducted on investigating the ecosystems in depth with a view to **estimating the carrying capacity of every ecosystem for different activities**. This should be a periodic exercise, since carrying capacity of an ecosystem will vary with even minor changes in the composition and structure of the habitat.

A number of recommendations have been made for the protection and conservation of biodiversity and natural resources associated with various key sectors of the economy, such as forestry, agriculture, fisheries, tourism, and also in different ecotypes such as mountains, rivers and river reserves, wetlands, caves, islets, etc. The recommendations vary according to the level of attention accorded so far to biodiversity issues in that sector (e.g. in terms of policies/ legislation/ guidelines/ regulations promulgated), according to the level of implementation of such policies/ legislation and and/or success of implementation, as well as the scientific need for protection of a particular ecotype. In some sectors, e.g. land use planning and procedures, ecotourism, etc. for all land-based issues, and by extension of terrestrial biodiversity, the **existing land use policy and land use planning procedures must be completely reviewed and revised** for more transparency and greater equity, and more rational decision-making based on environmental decision-support tools. **National strategy and action plans need to be developed specifically** for (i) protection and conservation of agro-biodiversity and native germplasm, (ii) protection and preservation of

mountain, wetlands and cave habitats and biodiversity, (iii) ecotourism and leisure (including cultural tourism, agritourism, geotourism, educational/scientific tourism, etc).

In certain sectors, strategy and/or action plans and policies have already been developed (e.g. the National Biodiversity Strategy and Action Plan, the National Invasive Alien Species Strategy and Action Plan, the Integrated Coastal Zone Management Plan, the management plans for islets, the Sustainable Agrifood Diversification Strategy Plan, the National Forest Policy, etc.). All these **plans must be implemented fully and in the immediate short term**.

1. **Capacity must be built** in terms of human resources, equipment and tools, technologies, and funding, at different levels. **Environmental education** at primary, secondary and tertiary levels must be reviewed and revised for greater effectiveness. **Promote greater awareness** of the need to protect natural resources and biodiversity in particular.

2. There is a need to **promote greater local Research and Development**, relevant to the specific needs of the country. There must be greater inter- and intra institutional **collaboration and sharing** of data and resources.

3. It is imperative to promote **good governance, transparency, accountability, and ethical and moral values** among leaders, policy/ decision makers, the business community, and individuals, in order to avoid exploitation and mining of environmental goods and services.

4. It is recommended to develop a **MID Charter** for use by all individuals and organisations. Such a charter can have as foundation a **Mauritian Sustainability Index.** The MID vision applies to the entire Republic of Mauritius, and due importance must be accorded to the outer islands and other islets. Hence Maurice Ile Durable (MID) should be converted to **Maurice Iles Durables (MIsDs).**

1.0 Introduction

Economic development is not possible without environmental sustainability. Environmental sustainability in turn rests on a foundation of a healthy natural biodiversity and its various interactions with each other and with other components of the ecosystem. The biodiversity within any ecosystem contributes in an integral and integrated way to ecosystem functions, goods and services, among them, nutrient recycling, plant pollination, provision of food and energy, control of erosion, pest and disease control, air and water purification, climate stabilisation, detoxification of waste products, etc. Thus, the diversity of plant and animal species can be considered as vital to the survival of life. Floral and faunal speciation is higher in island ecosystems than on the continents on a per area basis. However, given their smaller size and geographical isolation, human pressure too is much higher in islands leading to drastic habitat changes.

Mauritius is one of the world's biodiversity hotspots; however, this biodiversity is under increasing threat from land use and land cover changes, habitat destruction/habitat modification, alien invasive species, pollution, pests and diseases, climate change and other natural disasters. In recognition of the need to protect and conserve the uniqueness of the country's biodiversity, Government has made this an issue of national priority (MEO, 2011). A number of Strategy and Action Plans have been developed for a number of key sectors, which attest to the importance placed by Government on biodiversity and environmental protection. The Government of Mauritius is signatory to a number of biodiversity-related international conventions. Conservation, protection and management of native biodiversity as well as offshore islets' management are being done through collaboration and partnerships by Government departments, private sector organisations, academic institutions, research organizations and NGOs.

According to the National Biodiversity Strategy and Action Plan, it is estimated that MUR 200 million is spent annually, in addition to external funding, on the conservation of forests and terrestrial biodiversity (MEO, 2011). There are some areas where the vision and strategies have been outlined, and action plans are in the process of being elaborated, or need to be developed. However, there are shortcomings in implementation, monitoring and evaluation, without which the best plans can be rendered ineffective on the ground.

Inadequate monitoring, unavailability of sufficient scientifically validated data and information, absence of indicators, insufficient follow-up activities, failure to impose the full stipulated penalties for non-compliance with legislation/ regulations, lack of transparency in land dealings, inadequate capacity and resources for monitoring and enforcement, are some of the factors that undermine the efficient implementation of national policies and strategies for environmental protection and conservation. Without addressing these issues upfront, Mauritius cannot hope to fully achieve the MID vision for a healthy, productive, clean environment, and one that provides the ecosystem functions, goods and services that mankind needs for its very survival.

In line with the MID vision, the overall aim of this report is:

To ensure, through the involvement of all state and non-state actors (including civil society), that our natural resources and biodiversity are increased, protected and maintained in pristine natural habitats as a source of ecosystem goods and services, for greater resource use efficiency, as well as enjoyment and spiritual nourishment, for present and future generations.

The objectives identified in order to meet the above aim are, *inter alia*:

1. To ensure that our terrestrial and aquatic biodiversity is effectively managed, protected, monitored, and used in a sustainable and equitable manner.
2. To develop a holistic and coherent approach to promoting sustainable development.
3. To ensure that the laws of the country are in harmony with the exigencies of sustainability for the natural and manmade environments.
4. To ensure careful, integrated planning and implementation of legislation, and equitable access to natural resources (land, water, green spaces).
5. To develop a mindset that creates assets, values and accepts equitable sharing, compliance with legislation/ regulations, honest payment for use of natural goods and services, and a sense of ownership/ stewardship towards the natural environment.

The present report summaries the existing status of the various terrestrial and aquatic ecosystems, identifies gaps, challenges and emerging issues, and makes short term (2012-2015), medium term (2016-2019 years) and long term (2020-2022 years) recommendations for the protection and conservation of habitat, species and genetic diversity of our local flora

and fauna. It should be noted that while strategies are based on policy, there is no need to wait for the completion of a policy before actions can start. Hence, the actions proposed here can be implemented with immediate effect, and updated periodically, or adjusted to changing circumstances.

2.0 Methodology and Approach

The Working Group 2 (WG2), set up by the Prime Minister's Office (PMO) under the aegis of the Ministry of Environment and Sustainable Development (MoESD), met on four (4) occasions as scheduled, with additional meetings following the request of the Chairperson and participants. On the first day of the workshop, as per the terms of reference (TOR), the general approach and methodology was highlighted to the participants. The participants took cognizance of the "Maurice Ile Durable"(MID) Vision, the Green Paper, the Base Paper, and other relevant documents provided on CD. Four Consultative Workshops were planned and held on 15th June, 27th June, 11th July and 25th July 2011, including wide ranging stakeholders from Mauritian civil society. All participants were strongly advised to be present for all four sessions. It was proposed that the conclusion of debates and group discussions be approved at plenary sessions. The workshop report was aimed to be submitted by the 15th August 2011, with participants being consulted for the 'draft MID Policy, Strategy and Action Plan'. The participants were grouped into thematic groups, with a Chairperson and a Rapporteur to present the group findings and discussions in the plenary sessions. The six focus groups for the first two sessions included Aquatic Biodiversity; Agriculture, Food Security and Terrestrial Biodiversity; Mountain and Forestry; Fisheries and Aquatic Resources; Ecotourism; and Natural Resources (land, water, germplasm). Each thematic group focused on the current status, relevant policies and strategies, projects, governing legislations, the gaps, challenges and emerging issues. The third and fourth sessions entailed prioritisation of the recommendations in the form of actions/projects/strategies, for the short term (0 to 3 years), medium term (4 to 7 years) and long term (8 to 10 years) as per MoESD, and the way forward.

While taking stock of the current situation under each theme, several strengths and weaknesses were discussed by the participating groups. The existing strengths noted were provision of several policies, strategies and legislations which in a way or the other cater to some extent for the biodiversity protection and conservation. However, a number of cross-cutting gaps, challenges and emerging issues related to biodiversity protection and conservation were highlighted by the participants of the working group.

Following the first and second working sessions of the participating groups, the Chairperson, Vice- chairperson and the Rapporteur and the Vice-Rapporteur grouped the gaps, the challenges and the way forward recommended proposals under thirteen (13) topics, namely: Terrestrial Biodiversity (Forest, Mountains and River Reserves); Agriculture; Aquatic Biodiversity; Aquaculture; Invasive and Alien Aquatic Species; Fisheries; Sustainable Tourism and Ecotourism (Terrestrial and Aquatic); Effluent Discharge; Natural Resources (Land, Water and Germplasm); Coastal Zone Management; Legislation For Aquatic Biodiversity and Resources; Capacity Building For Aquatic Biodiversity and Resources; and Islets Management. These topics were then discussed during the third session in two working groups: 1) Agriculture, Terrestrial Biodiversity, Food Security, Natural Resources and Eco-tourism and 2) Fisheries, Marine, Aquatic Resources, Natural Resources and Eco-tourism for prioritising the proposed recommendations for appropriate actions.

During the fourth day working sessions, the participants prioritised the recommendations into the following sub-sections:

1) Legislation and Enforcement;
2) Biodiversity and Natural Resources Protection and Conservation;
3) Mechanisms for Sustainable Management of Biodiversity and Natural Resources;
4) Capacity Building, and Research and Development; and
5) Future development plan for a 'Maurice Ile Durable'.

3.0 Gap Analysis and Recommendations

The outcomes from the discussions of the six focus groups were combined and classified under the following main themes:

1. Legislation and Enforcement;
2. Know, Conserve and Protect Biodiversity and Natural Resources;
3. Mechanisms for Sustainable Management of Biodiversity and Natural Resources;
4. Capacity Building, and Research and Development; and
5. Consolidate the future of MID

The detailed short, medium and long terms proposed actions are tabulated in **Annex 1**.

3.1 Theme 1: Legislation and Enforcement

In Mauritius, the importance placed on the natural environment is attested to by the many laws that have been promulgated so far. Most of them include aspects of biodiversity, its management and protection, and span most of the major ecosystems, namely forests, agriculture, mountains, river reserves, coastal and marine resources, fisheries, aquaculture, tourism, and natural green spaces/landscapes.

There is a need to review and revise existing legislations and regulations for protection and preservation of the various aspects of biodiversity and natural resources (land, water, germplasm), with a view to harmonising and making them more coherent. Similarly, the enforcement of the legislations and regulations also needs to be reviewed and revised.

Proposal 1: *Conduct a Gap Analysis, review, update and harmonise existing legislation and regulations.*

In spite of the wide range of existing legislations, efficient application and expected outcomes are sometimes hindered by a few legal shortcomings. Therefore, all the legislations that are directly concerned with biodiversity and biodiversity-related issues, such as the Forests and Reserves Act 1983 (e.g. with regard to construction on/ near river reserves), Wildlife and National Parks Act 1993, National Parks and Reserves Regulations 1996, Wildlife

Regulations 1998, Animal Disease Act 1926, as well as those legislations that govern activities impacting on biodiversity, for instance, Local Government Act 2003, Planning and Development Act 2000, and others must be thoroughly reviewed, and **a Gap Analysis must be carried out by the year 2014.**

So far, many laws relating to environmental issues have been promulgated, and most of them include aspects of biodiversity, its management and protection, and span most of the major ecosystems, namely forests, agriculture, mountains, river reserves, coastal and marine, fisheries, aquaculture, tourism, and natural green spaces/ landscapes. However, less emphasis is laid in the law on protection of **freshwater biodiversity**, and there is no dedicated institution mandated with responsibility for freshwater biodiversity protection and management, although there is a plethora of legislations and responsible institutions for domestic and irrigation water. For instance, the Wildlife and National Parks Act 1993 regulates the protection and management of the following crustaceans: 'camarons' and 'shrimps', while the Fisheries and Marine Resources Act 2007 refers to protection of fresh water bodies from 'poisonous substances'.

The Local Government Act (2003) also has gaps, for e.g. it legislates basic requirements in **solid waste management** (waste collection and disposal), but does not include clauses regarding solid waste prevention, minimization, sorting, reuse and recycling.

Presently there is no legislation for the protection of wetlands. Development on wetlands warrants an Environmental Impact Assessment (EIA) and Environmentally Sensitive Areas (ESAs) are protected in the Outline Planning Schemes. It is noteworthy that the Draft Environmentally Sensitive Areas Conservation and Management Act (2009) (Draft ESA Act) submitted as part of the ESA Study proposes a number of uniform rules for the valuation of lands, enforcement of easements, and the development of other types of incentives for conserving and managing ESAs. It was also highlighted that there is no existing management plans for caves, which according to Ramsar Convention falls under the Wetlands.

Similarly, there is no legislation or control for certain ecotourism activities, such as **dolphin and whale watching,** but only a general code of conduct which does not really impact on the control of these activities**. The Dolphin and Whale Watching Regulation** is in preparation

for the last two years. However, the regulation is still under scrutiny of the State Law Office. Appropriate actions must be taken to promulgate legislation to rectify such gaps.

In the time frame of the subsequent two years (by 2016), **laws must be reviewed, updated and revised appropriately in keeping with the changing developmental status of the country and national priorities of the Government in line with the MID vision**. Under the Protected Area Network (PAN) and Strategic Land Management (SLM) projects, a timid attempt has been made to review relevant legislation, but there has been no follow up action to revise the laws.

Existing laws must be reinforced to include penalties to those contravening official recommendations and regulations. A supplemental instrument for ensuring good practice is regular review of existing strategies and policies. Strategies must be dynamic and mirror the changing circumstances. Such review and update must be undertaken regularly, in consultation with the public. Such revised policies can then be incorporated into the suitable legal framework.

Proposal 2: *Remove discrepancies and harmonise laws to make it easy to understand by the public and enforceable by the authorities.*

Efficient application and expected results are at times hindered by apparent discrepancies among various legislations. An example of discrepancy in existing legislation is the fact that the Forestry Service is responsible for granting permission to cut down trees, but the relevant legislation for this is in the Pas Géométriques Act (which is under the Ministry of Housing and Lands), and not in the Forest and Reserves Act. Furthermore, the latter Act gives jurisdiction for biodiversity protection on public land, but not on private land (although this is being amended to include tree protection on private lands).

Another instance is the Wildlife and National Park Act (1993) which includes regulations for biodiversity protection only in the national parks, and not in the wild. The Forest and Reserves Act specifies that 5% of the state land leased for deer farming can be developed for pasture. However, it is unclear if this refers to 5% undergrowth clearance or complete deforestation of 5% of the area and replanting with pasture species. An example of

incomplete action is provided in the shooting and fishing leases, which authorises a lessee to arrest a poacher, but does not specify the follow up action.

An example of ambiguity in the case of islet managements resulting in the need of harmonising relevant Acts was highlighted. Eight islets have been declared as Nature Reserves and the others as National Parks resulting in confusion in management principles.

Proposal 3: *Create a new Ministry – the Ministry of Ecology and Sustainable Development*

Responsibilities for biodiversity protection and conservation are spread over several Ministries. There is **NO ONE** Ministry that has an overall jurisdiction and responsibility for protection of biodiversity and all other biodiversity-related issues. It is strongly proposed that a **Ministry of Ecology and Sustainable Development** be set up, by 2015, with the mandate of all aspects of the composition, structure, functioning, protection and conservation of natural ecosystems. An ecosystem is composed of both biotic and abiotic components. All the flora and fauna within an ecosystem constitutes the biotic diversity (biodiversity) and would therefore be under the responsibility of this new Ministry. The existing situation where responsibilities for biodiversity protection and conservation are spread over several Ministries, and a different institution/organisation is responsible for one aspect of biodiversity, would then change to group together all aspects of biodiversity within one umbrella Ministry.

This Ministry will have the responsibility of developing, promulgating and enforcing all appropriate legislation and regulations pertaining to all biodiversity issues. This would ensure better coherence among the different components of biodiversity, and more efficient control of the health and functioning of the ecosystem. This would enable efficient coordination and integration, and better management over ecosystem goods and services. It would also address the challenging issue of the current inordinately lengthy procedures for plan-making, approvals, appeals and enforcement, which lead to long delays and stagnation of projects.

Sustainable Development encompasses everything from nature, environment, health, education, culture, research, trade, law, family. Hence there is a need to have a separate Ministry which will be responsible for sustainable planning and development of all these cross-cutting issues (it would be the equivalent of the former Ministry of Economic Planning

and Development). This will help in ensuring better coordination and coherence in policy formulation and implementation.

This proposed new **Ministry of Ecology and Sustainable Development** must be headed by a non-elected Minister, nominated on the basis of academic qualifications and extensive experience in the relevant technical field. Environmental issues are complex, involving a large number of stakeholders and vested interests. As such, strong leadership is crucial to be able to resolve such matters.

Proposal 4: *Develop and promulgate a single common law – The Biodiversity Act*

In direct line following the Gap Analysis (*Proposal 1*), the harmonisation of existing laws (*Proposal 2*) and the creation of the **Ministry of Ecology and Sustainable Development** (*Proposal 3*), it is strongly proposed that, by year 2016, all the various legal provisions relevant to biodiversity issues should be grouped under one common law: **The Biodiversity Act**, which should include biodiversity in forests, wetlands, mountains, caves, terrestrial, freshwater, coastal and marine ecosystems, agriculture, fisheries, aquaculture, tourism, and others.

The State Law Office (SLO), being the responsible authority for vetting all legal matters of the State, would be a main actor in the implementation of these recommendations, along with the concerned Ministries. Technical support should be provided to the SLO by all the organisations/ institutions involved in the relevant biodiversity-related issue by the creation of a Biodiversity Unit. The proposed **Ministry of Ecology and Sustainable Development** should coordinate the process.

The process of preparing the Bill, debating and approving it, and formalizing the Act is a lengthy procedure. It is therefore proposed that the process be given highest priority following the completion of the Gap Analysis and be started urgently, and completed by year 2016.

Since, legislation/ regulation that appears in one law/ Act cannot be duplicated in another law/ Act, a large number of laws have been promulgated in order to provide the necessary legal provisions to any given economic activity, which then is regulated by several laws

relating to the same issue. There is no one comprehensive legislation that combines together all issues related to biodiversity protection and conservation. This results in a situation where a given ecosystem (and thereby, its contained flora and fauna) comes under the jurisdiction of several institutions/organisations, e.g. the area, 100m inland from the high water mark is controlled by the NCG under the NCG Act, the beach itself comes under the responsibility of the Beach Authority for a distance of 100m from the high water mark, while the Pas Géométriques land area of 81.7m from the high water mark comes under the Ministry of Housing and Lands, but is controlled by the Forestry Service. This makes for a situation where responsibilities are not easy to establish. Therefore, appropriate mandates should be clearly defined for each institution, department and authority.

Proposal 5: *Review all leases and update the old ones in light of the changing economic, development and environmental situation of the country*

Many of the very old leases which are still in force do not give sufficient attention to protection of biodiversity in the leased areas. Moreover, they are not being properly monitored for compliance with lease agreements.

Examples include:

(i) Powers of arrest in the shooting and fishing lease agreements need to be clarified and streamlined, by 2014. Increasing the powers of arrest is being presently discussed at the Ministry of Fisheries and Rodrigues to give more power to the lessees in the Marine Protected Areas (MPA). Similar action needs to be applied to terrestrial leases.

(ii) The existing leases must be reviewed and assessed for compliance with conditions specified in the lease agreements. Those that are not in conformity must be cancelled or reviewed. The lease conditions must be reviewed in the light of the changing development, economic and environment status, e.g. leases for activities that may impact negatively on the environment should not be accorded in buffer zones around water bodies (including reservoirs), whether for agricultural or other purposes. An organisation must be mandated with the definition, responsibility and management of these buffer areas.

(iii) Long term analysis, monitoring and evaluation must be conducted on the real impacts of development activities on leased state and private lands on the continued provision of ecosystem services and their quality. The mechanism will need to be worked out.

(iv) Owners/ lessees of land that is declared 'protected' may be allowed to retain ownership/lessee ship provide he can demonstrate his capability and willingness to manage the land in accordance with the principles of sustainable biodiversity protection and conservation. As per existing laws, leased/private land that is subsequently declared as coming under the status of 'protected', automatically becomes the property of the state, even if the lessee exhibits willingness to manage the land in accordance with laws for biodiversity protection and conservation.

Proposal 6: *Proclaim the ESA Act*

Adoption of the ESA Act is imperative as it would provide a unified and coherent structure and binding legal obligations that could not be reversed through the adoption of regulations. Moreover, because the hybrid regulations-amendments approach requires significant amendments to existing laws and thus parliamentary approval, it would be worthwhile to pursue the full range of legislative changes needed to provide a unified, coherent legislative framework for protecting and managing ESAs. This Act gives the ESA Map, and the data that supports the ESA Map, the force of law for identifying the existence of ESAs on private land and State land. The ESA Act should be rapidly proclaimed and its regulations enforced by year 2014. The relevant provisions of this Act must be incorporated into the proposed Biodiversity Act. It is recommended that appropriate legislation be promulgated to enable swapping of leased land that now falls under the definition of an ESA with another one that is not designated as an ESA.

Proposal 7: *Promulgate regulation to have 25% green areas in all new developments*

Regulations must be passed under the Biodiversity Act, by 2015, to require all new public and private developments to have 25 % green areas planted with native species, and those with limited space to meet this requirement by undertaking restoration in an existing forested area or create a nature park of an equivalent size in an alternate site approved by relevant authorities, in order to meet a target of 35% high quality native green cover by 2050, as per the Millennium Development Goal (MDG).

Trees and vegetation have an important role to play in climate change mitigation and adaptation, and thereby increase the resilience of the country in adapting to global climate change. As an example of action, old trees cut down for any infrastructural development must be replaced by native species either within the development area (e.g. IRS/ RES/ residential areas/ industrial zones/ hotels/ shopping malls/ roads, etc) or on an alternate site approved by the relevant Authority. Native species are more resistant to drought conditions, as well as to cyclones and storms; this has particular importance in the context of climate change wherein it has been predicted that rainfall will decrease, and the frequency and severity of cyclones and storms will increase.

Proposal 8: *Review construction norms for greater environmental sustainability*

With a view to reducing pressure on the environment and natural resources, construction norms must be reviewed and revised, by 2014, to cater for new environmentally friendly initiatives, e.g. water harvesting structures, energy-saving designs, use of renewable energies (solar, wind, etc), waste recycling, waste-water reuse, etc. The Working Group did not elaborate on actions to be proposed on existing constructions, as we expected this matter to have been taken care of other working groups. However, we all expressed our concern on this issue.

Proposal 9: *Implement reforestation policies for water catchment areas*

Reforestation policies must be properly implemented in all water catchment (as defined by the Water Resources Unit) and peripheral areas according to the specificities of the area, and strictly regulated. The present penalty of paying three times the value of illegally cut wood should be increased substantially to discourage felling of trees along river reserves. Illegal and uncontrolled vegetation cutting in all catchment and peripheral areas must be banned. The strict monitoring will involve additional human resources and capacity building.

Proposal 10: *Formulate a Water Act*

In the water sector, there is a plethora of relevant legislations and responsible institutions for domestic and irrigation water, but there is very little reference to freshwater biodiversity and

its protection in those legislations. Moreover, there is no institution mandated with responsibility for freshwater biodiversity protection and management. The Ministry of Energy and Public Utilities is presently formulating a Water Act and the Master Plan is due for November 2011. Further to this Master Plan, a consolidated Integrated Water Resources Management Strategy must be developed by the year 2014. Existing policies on extraction of river water, construction of dykes, etc. must be urgently reviewed and revised while considering the importance of freshwater biodiversity protection.

Special emphasis should be given to river reserves as rivers and canals are natural ecological corridors which need urgent protection and consideration. Legislation should be reviewed in the Rivers and Canals Act and enforcement measures taken for:

(i) Stringent application of the law concerning legal and/or illegal constructions, set back not usually respected and should, therefore, be reviewed especially where derogations are often granted without highlighting real reasons,
(ii) Fragmented river reserves between land owners along the full length of the waterway
(iii) Illegal use of river reserves for subsistence or commercial activities (e.g., cattle rearing).

Proposal 11: *Review and update the role and responsibilities of implementing authorities.*

Alongside change in legislation, the role and responsibilities of the implementing authorities must also be reviewed, revised and harmonised to reflect the provisions of the law. Clear mandates must be allocated to each institution/organisation. For instance, the proposed scheme to integrate the Central Water Authority, Water Resources Unit, Irrigation Authority and Wastewater Management Authority into one Water Authority must be applied to other sectors as well. The present fragmentation in implementation responsibilities among the various institutions/ organisations is a drawback in efficient management and implementation of legislation.

For instance, different aspects of water management and use are under the reasonability of different authorities: the Water Resources Unit (Ministry of Energy and Public Utilities) is responsible for the assessment, development, management and conservation of all water resources in the country. The Ministry of Environment and Sustainable Development is responsible for the preparation and issue of guidelines, standards and regulations on water

quality and effluent limitations, while the Central Water Authority provides a sustainable water supply service to the people and to support economic development. The Wastewater Management Authority is responsible for the collection, treatment and disposal of wastewater from domestic, commercial and industrial sources (MEO, 2011).

Proposal 12: *Develop and apply the 'Polluter Pays Principle'***.**

All companies and enterprises producing any kind of waste should be made responsible for its proper storage and appropriate disposal. Furthermore, companies selling beverages must be required to take back the empty bottles (glass as well as plastic) and tins can, and to recycle them locally or export them.

Proposal 13: *Pass legislation to ban the import, export and sale of all coral and sea-shells.*

Legislation must be passed to ban the import, export and sale of corals, sea-shells and related coastal and marine organisms, in order to protect the coastal/ lagoon/ marine eco-systems.

Proposal 14: *Rodrigues Regional Assembly (RRA) should pass a specific regulation to reinforce MID.*

All legislation passed in Mauritius applies to the entire Republic, i.e. to Rodrigues and the other outer islands as well. However, it is sometimes not applied/ enforced to the same extent. It is proposed that the RRA pass specific regulation(s) to reinforce the proposals made under the MID and to ensure the achievement of the MID vision in Rodrigues.

3.2 Theme 2: Know, Conserve and Protect Biodiversity and Natural Resources

A. Update our knowledge

The main threats affecting plant diversity are small population sizes and fragmentation, and invasive alien species (IAS). Inappropriate land conversion for settlements, roads, dams, buildings, industries, agriculture and economic development in general is leading to destruction of natural habitats and decline in ecosystems and their services, and is one of important causes of loss in habitat, species and genetic diversity. Introduced pests and diseases also have important impacts on native plants and animals, but to date their actual impacts have not been thoroughly studied. All of these have negative and often irreversible effects on the biodiversity.

Proposal 15: *Identify and Inventory the Terrestrial and Aquatic Biodiversity*

In spite of the small size of the islands of the Republic, the floral and faunal diversity has still not been fully identified and inventoried. New endemic species are still being found, e.g. the Apocynaceae *Cynanchum* (Florens and Baider, 2006), the orchid *Taeniophyllum coxii* (Roberts *et al*, 2004). Explorations and large scale studies must be undertaken to identify the terrestrial and aquatic flora and fauna of the entire Republic of Mauritius. An inventory must be prepared of the biodiversity in the various ecozones by 2014, following identification of existing gaps. In particular, an inventory of the freshwater biodiversity, especially on the river reserves, is a matter of priority. Updating of existing inventories must be done regularly. As the Mauritius Herbarium is the focal point for Global Taxonomy Initiatives for the Indian Ocean according to the Convention on Biological Diversity, priority should be given to this institution to reinforce and consolidate its database, especially for all terrestrial and aquatic flora. Similarly the Albion Fisheries Research Centre (AFRC) must be reinforced to develop and consolidate its database for marine biodiversity

With the increasing interest shown by other countries in bio-prospecting of marine resources in the Exclusive Economic Zone (EEZ) of Mauritius, it is imperative that the biodiversity of

the EEZ be identified, inventoried and studied for ecological purposes and also for sustainable utilisation.

Proposal 16: *Conduct a full survey and an impact study of all terrestrial and aquatic exotics*

Detailed, comprehensive, scientific surveys of existing forests, and their health status, particularly in private lands, must be undertaken. A full survey must be conducted of all terrestrial and aquatic exotics (invasives, non-invasives, captive, pets, feral, etc.) and studies undertaken on their impacts on the native biodiversity, and take necessary and appropriate actions. Furthermore, in order to keep track of native and invasive species regularly updated lists must be prepared of:

(i) Environmentally and commercially acceptable species for aquaculture, mariculture, mini-livestock farming, for the pet trade, for zoos and animal parks, and for the aquarium trade to prevent accidental spread of invasives that can potentially cause irreversible damage to the natural environment;
(ii) Native tree and shrub species that can be used as windbreaks for agricultural fields based on geographical area, climate, soil type, etc.;
(iii) Plant and animal species that can be permitted into the country and that which are prohibited.

Proposal 17: *Prepare GIS maps of the terrestrial and aquatic ecosystems of the entire Republic*

Mapping ecosystems is imperative in order to have an updated and comprehensive overview of the prevailing situation on biodiversity and natural resources and their uses. Without appropriate maps it would be almost impossible to accurately elaborate and coordinate biodiversity-related projects in line with MID. The maps produced will help prioritise protection measures of different sites according to the degree of degradation and/or the urgency of restoration/ protection. Dynamic GIS maps must be prepared by the Ministry of Housing and Lands of the terrestrial and aquatic ecosystems of the entire Republic, with interactive data sharing and data management features. For effective and successful collaborative and integrative efforts for preservation of biodiversity and natural resources to be achieved, removing the barriers to sharing and management of appropriate data across

departments within an institution (vertical integration) and among relevant organisations (horizontal integration) is crucial.

B. Restore, Protect and Conserve Terrestrial and Aquatic Biodiversity

Presently, there is less than 2% of good quality native forests left, and these are geographically spread out over different parts of the island, there is insufficient information about micro and macro organisms present in the fresh water, while the ecological studies on marine organisms have been limited to some economically important fishes, crustaceans and molluscs, corals, sponges and mangroves species. Terrestrial, freshwater and marine biodiversity is highly threatened by incorrect and inappropriate practices (e.g. Municipality and District Council field workers sometimes cut down, out of ignorance native trees while clearing river reserves or other areas), excessive use of pesticides on agricultural fields, urbanisation and development, imports of alien invasive species and uncontrolled coastal development. All biodiversity must be protected and preserved through a number of measures directed at different levels: ecotypes, specific habitats, or individual ecological niches.

Proposal 18: *Create Ecological Corridors*

It is strongly recommended that protected **ecological corridors** be established, formed by linking contiguous areas of river reserves, other natural habitats, green areas rich in native species as well as public green spaces in order to reduce ecosystem fragmentation. Habitat/ ecosystem fragmentation, and resulting small population sizes of inhabiting fauna and flora, are two of the three main threats affecting plant and animal diversity. Land conversion for settlements, roads, dams, buildings, industries, agriculture and economic development in general is leading to destruction of natural habitats and reduction in ecosystems, and is another important cause of loss in species and genetic diversity. Not properly managed and defined IRS/RES associated infrastructures are replacing to some extent large tracts of previously natural and/or agro environments. Even the remaining small areas of native vegetation are being replaced by grazing lands and hunting grounds for deer ranching. All of these have negative and often irreversible effects on the biodiversity.

Creating ecological corridors would ensure ecological continuities and enable movement, spread, distribution and interaction of plant and animal species over a much wider

geographical area than would otherwise be possible. This concept represents a new paradigm for Mauritius, and a new way of land use planning. In this aspect the proposal of a dynamic GIS mapping (*Proposal 17*) of terrestrial and aquatic ecosystems would be a strategic tool for an overall view. Special and immediate attention should be given to restore the river corridors (*Proposal 19*) as rivers and canals flow naturally all around the island.

The strategy and action plan and the legal framework for the same must be developed by 2014, in order to ensure that it is incorporated into all national development projects as well as at the level of local authorities. It must also be legislated for use at the level of societies and individuals. Incorporation of privately owned spaces into such living corridors must be encouraged through the provision of financial or in-kind incentives, or if necessary, compulsorily acquired. Small farmers must be grouped to enable creation and management of ecological corridors through individual field boundaries.

Uncultivated/ unused marginal lands and abandoned lands in urbanized regions must be to reforested and incorporated into the ecological corridors or converted into nature spots, all of which can serve as stepping stones for biodiversity maintenance and protection.

The sustainable management of the ecological corridors and nature spots would be under the purview of the proposed Ministry of Ecology and Sustainable Development. Such green belts created must be maintained permanently, with maximal population involvement, with integrated services and facilities to incorporate nature-based leisure and tourism. 20% of ecological corridors must be put in place by 2020, and 100% by 2050.

Proposal 19: *River corridors must be created that link river reserves to provide a larger habitat and a wider geographical range for the distribution of riverside plant and animal species by year 2015.*

Wherever necessary, land must be compulsorily acquired from owners/lessees to incorporate into such living corridors. Proper sustainable management of such ecological linkages must be ensured and enforced by the responsible authority (the proposed Ministry of Ecology and Sustainable Development).

Presently, there is insufficient emphasis on protection and conservation of river reserves and rivulets. The rivers are in a piteous state, with excessive loss of native freshwater biota. The dyking of rivers and over-abstraction of water are destroying riverside ecosystems. Invasive alien plant species have infested and taken over about 95% of river banks. Furthermore, the specified building setback is rarely respected and moreover derogations are often granted. Also, people build constructions on river reserves in their private land illegally and inform the Forestry Services later. There is no control of the use of rivers and river reserves in private/leased land, e.g. in the shooting and fishing lands. This makes it difficult to take protective action. All such constructions have adverse effects on the ecosystem, and also increase the risk of flooding and flash floods. In addition, people make use of river reserves for certain subsistence/ commercial activities, e.g. cattle rearing, which are not permitted by law. Other problems include increased siltation of rivers as a result of upland soil erosion, contamination by agrochemicals from agricultural fields situated upstream, discharge of effluents (many of them are toxic) from industries, and contamination by soap/ detergents from the practice of washing up in the rivers.

Removal of IAS and replanting with native species must be a priority, with at least 20% of actual degraded area to be upgraded by year 2015. Management of river reserves must cover the full length of the waterway and fragmentation between land owners must be reduced as far as possible. Following education and public awareness-raising of the importance of maintaining native biodiversity on river reserves, the law must be strictly applied. No derogations must be given for constructions on river reserves, and all illegal constructions must be demolished, at the owner's/ lessee's cost.

There must be regular patrolling and monitoring by the Forestry Services of all rivers and river reserves, including those in privately-owned and leased land, and strict enforcement with regards to illegal, unauthorised, and/or unsustainable practices, e.g. unauthorized logging or land clearance, animal rearing, domestic and/or commercial activities with potentially toxic effluent discharge into or near the waterways.

The present penalty of paying three times the value of illegally cut wood should be increased substantially to discourage felling of trees along river reserves.

Proposal 20: *Increase forest cover*

Acreage under forest cover must be increased substantially by planting native trees in strategically selected areas, e.g. in water catchment areas (this will have the advantage of helping to increase precipitation), abandoned sugarcane lands, uncultivated slopy lands, and unused scrub land, river reserves, water ways, alongside roads, in public places, etc. Presently, there is < 2% of good quality native forests left, and these are geographically spread out over different parts of the island. While the need to take appropriate measures for environmental protection generally extends to almost all natural sites, inadequacy of resources makes this unfeasible. For instance:

(i) Large scale reforestation of river reserves as detailed in *Proposal 19* could increase forest cover by 2-3%.
(ii) All trees cut down for any infrastructural development must be replaced by native species either within the development area (e.g. IRS/ RES/ residential areas/ industrial zones/ hotels/ shopping malls/ roads, etc) or in an alternate area designated and allocated by the Forestry Service.

A target of 50% replacement of all exotics by native species over the next 10 years must be aimed for by 2020. In Rodrigues, forest cover must be increased to reach a target of 40% cover of the entire island. National capacity to produce seeds and other planting materials of native species must be substantially increased. It is proposed that Conservation Management Areas (CMA) be set up on abandoned tea lands, and the possibility of obtaining funding for the initial capital from corporate bodies must be explored. Rewilding operations must be carried out in Mauritius and Rodrigues with value added cultural and economic activities.

Proposal 21: *Ban land clearance near reservoirs and catchment areas and reforest*

It is proposed that with immediate effect no land clearance and land use change near reservoirs and on natural drains should be allowed, in order to ensure that there is no obstruction of such feeder channels and also to prevent contamination of the water by agrochemicals and effluents. It is also proposed to update information on catchment areas and disseminate same to all stakeholders (but particularly to EIA consultants to help them provide the appropriate advice to their land promoter/developer/ client). It is imperative that a large

scale reforestation programme be undertaken and this could be done by planting native tree species in all the catchment areas by year 2015.

Proposal 22: *Protect mountain ecosystems and mountain biodiversity*

Mountains represent a unique ecotype, often with flora and fauna not found elsewhere. Mountains are extremely important for endemic plants, snails and insects and other species. Since all rivers take their source from mountains, the health of a mountain ecosystem is an important issue, not only for the preservation of biodiversity, but also for weather conditions (increasing precipitation) in the area and local water resources.

In Mauritius, mountains are being denuded and degraded as a result of illegal cutting down of trees, illegal plantations, land use changes, fire, overgrazing, leading to soil erosion resulting from loss of vegetative cover, landslides, etc. Loss of mountain biodiversity is a serious issue, since in Mauritius, the mountain biodiversity has not yet been fully identified and studied, and plant and animal species may be lost without ever having been known to mankind.

The following measures have been proposed:

(i) The definition of 'mountain top' must be extended to cover a greater area of the upper part of mountains.
(ii) Financial incentives and legal protection must be provided for private owners to restore and protect forest land on mountainous regions.
(iii) All development on mountain and hill slopes, particularly IRS/ RES, must be banned.
(iv) The role of the private sector in funding and managing mountains as ecosystems for ecological and social services as well as sustainable ecotourism must be enhanced through public-private partnership projects. It is recommended that a Public-Private Partnership be promoted as a means of managing mountains and slopy areas in a "water and mountain initiative" in order to reduce erosion.
(v) The people living in mountain areas must be encouraged to establish Mountain Village Associations which should group together all the villages surrounding the mountain(s) for cooperative action, e.g. conservation and restoration work; awareness, educational and touristic tours, upland/lowland nexus co-management, etc.

Proposal 23: *Assess the sustainable carrying capacity of ecosystems and the impact of development on these ecosystems*

Another strong instrument for environmental and biodiversity protection is the concept of **carrying capacity** of ecosystems and entire islands (e.g. Rodrigues, Agalegala, St. Brandon, and even the islets). This must be introduced for all considerations of ecosystem and biodiversity utilisation. It represents a scientific, evidence-based **decision support tool (DST)** for all economic development that has an impact on the natural environment. The carrying capacity of economically exploitable ecosystems must be studied and determined scientifically for different sites, economic activities, management options, and seasons. Approval for any development project must be granted only after a thorough risk assessment has been carried out based on carrying capacity figures. The carrying capacity of any ecosystem, being evolutive and dynamic, must be regularly reviewed and revised.

Proposal 24: *Review and revise policies related to land issues*

The entire policy for land use and land use planning must be reviewed and revised by 2015. For instance, the Land Productivity Enhancement Scheme presently applicable for agricultural land that already has conversion rights must be extended to apply to other (non-agricultural) lands as well, and these lands may then be dedicated for maintenance of terrestrial biodiversity.

Agricultural land must not be converted to non-agricultural use, unless the land use is guaranteed to be reversible. The Land Administration and Valuation Information Management System (LAVIMS) must be made online and easily accessible to all (even if against payment of a subscription fee) and include clear extractable information on state lands and non-utilised agricultural and non-agricultural land, a zoning system for bad neighbourhood activities with respect to development in residential areas as defined in the National Development Strategies (2002).

It is recommended that the possibility of land swaps must be explored, e.g. swapping an Environmentally Sensitive Area (ESA) with another one that is not designated as an ESA in the ESA study

Proposal 25: *Strategies for integrated renovation and development around and within existing urban infrastructure must be developed*

Strategies for integrated renovation and development around and within existing urban infrastructure must be developed by 2014 and implemented by 2020. The inexorable spread of built up areas must be limited by encouraging vertical development, and novel building designs (e.g. for more water and energy efficiency, waste management and reuse, facilities for roof gardening, hanging gardens, etc.). Large-scale landscaping along high way, roads, commercial buildings, and industrial sites must be undertaken. It is necessary to review siting considerations for all development, with a view to avoiding land degradation, e.g. redeveloping residential areas and inner town centres to limit urban sprawl, encouraging vertical development, higher development densities, etc.

All large development projects must be required to have a minimum of 25% green space, and/or an accompanying reforestation programme, for instance, building a 'Green Belt', or building a plant nursery alongside new developments, e.g. NeoTown, Highlands. Maintenance of such green areas must be undertaken by the building/society syndicate with the help of the residential community, local NGOs, and local government. Such green spaces and green belts should be mandatory in all public development projects also e.g. schools, social amenities, industrial zones, airport, roads, Ministries and other official buildings of the State. These should be quick growing trees with good aesthetic value and capacity for shading, windbreaks, absorbing heat and CO_2 and not just grass lawn and odd shrubs and bushes. Facilities must be provided for the development of local, community-based nurseries, NGO-owned nurseries, and state nurseries to provide seeds, seedlings and other planting materials of native plant species. This can be accompanied by the preparation of lists of native plants that can be grown in different agro-climatic zones for various types of development projects, with details of appropriate translocation stage/size.

Proposal 26: *Develop a mechanism to protect old trees in towns or alongside roads (including exotic trees), as well as those in the gardens and yards of old traditional houses*

Old buildings represent a cultural heritage, and often such old buildings/houses possess gardens and yards that have old native trees (a natural heritage) growing therein. Such old houses/buildings must be conserved and protected. Incentives may need to be provided to the

owners to maintain such cultural and natural heritage, such as financial support for renovation.

Proposal 27: *Develop mechanisms for Sustainable Waste Management*

With regard to solid waste management, it is proposed that a mechanism (backed by a policy and relevant legislations) be developed for waste reduction, waste segregation for recycling and for better disposal, and waste reuse. Composting of organic wastes must be promoted at all levels – domestic, local Government, private office complexes, shopping malls, supermarkets, etc. State-of-the-art leachate treatment plants must be set up at landfill sites. The possibility of regional cooperation for certain waste streams may be explored.

Proposal 28: *Conduct studies for protection of threatened species*

Conservation status of floral and faunal species must be assessed with a view to protecting threatened species. Monitoring, management and conservation plans for identified species must be developed and implemented. Public awareness of the importance of native biodiversity must be increased, and people must be encouraged to make use of native plants for landscaping, instead of exotics. In Rodrigues, invasive plant species are still being cultivated by hotels and the Rodrigues Regional Assembly for decorative purposes. This should be discouraged.

With respect to faunal diversity, conservation programmes for protection of endemic animals (including birds, reptiles, snails, insects, etc.) must be further developed and advanced. Damage by, and abundance of, predators on the mainland and on outer islands must be determined and appropriate control measures undertaken. The protection of fruit bats has recently come under fire from fruit growers; there is a need to conduct scientific studies on the population, distribution and ecology of fruit bats and their real potential as fruit pests.

Proposal 29: *Increase effectiveness and efficacy of border control and quarantine*

Invasives can be introduced into the country through different sources, for example, introduction for commercial purposes, pet trade, fouling on ships, ballast water and others. It is noteworthy that the native forest is struggling with invasive plants and 95% of the river banks are infested by IAS. It is proposed to develop lists of plant and animal species that are

prohibited entry into the Republic, and to introduce legislation and strengthen effective border control and inter-island quarantine to prevent introduction of invasive alien species by the creation of a Pest Control Unit under the Alien Invasive Committee.

It is noteworthy that the introduction of new species such as sea cucumber or jathropha for commercial purposes in Rodrigues has to be cautioned.

Proposal 30: *Develop by year 2014 and implement by year 2017 a national strategy for conservation of agro-biodiversity and utilisation of local biodiversity*

Agriculture in Mauritius is characterised by one dominant crop (93% of arable land), heavy use of agrochemicals (particularly pesticides and fertilisers), increasing soil degradation (erosion, health and fertility loss, etc), inadequate postharvest storage and/or processing, insufficient provisions for food safety, and inadequate capacity at all levels (except in the case of the sugar sector).

Specific agricultural sectors have specific environmental and biodiversity-related problem issues, for instance in the horticultural sector, there is an excessive use of insecticides and fungicides. Although the sugarcane crop in Mauritius has certain ecological advantages (e.g. prevention of soil erosion, large amounts of biomass, tolerance to drought, and natural pest control), its production depends on a heavy use of fertilisers and herbicides. The combination of monocropping and high agrochemical use has led to drastic reduction of biodiversity in sugarcane fields.

Other problems that are also jeopardising agro biodiversity, directly and indirectly, include limited land area, insufficient capacity for Research and Development, incomplete inventories, inadequate inter-institutional communication and collaboration.

Proposal 31: *Increase food security*

Food Security is a major concern for the Republic of Mauritius. In 2008, was adopted the Food Security Strategic Plan for 4 years and the promulgation in 2009 of the Food Security Fund of MRU 2 milliards to increase agricultural production. Unfortunately, this fund has not achieved its targets and objectives. The sustainability, in fact the independence of a nation,

lies in its being self-sufficient in food. While this would be difficult for all foods eaten in Mauritius, it is imperative that levels of self-reliance are increased by promoting sufficient local production of strategic food reserves for a few months, especially of staples such as rice, wheat, maize, pulses, potatoes, onions, ginger, turmeric, meat and fish.

The following measures have been proposed:

(i) *Promotion of eco-friendly sustainable agricultural production*

Presently, Mauritius is self sufficient in fresh vegetables. However, food security is currently being met through substantial food imports, with potatoes, onions, and all staples being imported. While there is considerable scope in the country for increasing agricultural production, there is presently insufficient adherence to the principles of Good Agricultural Practice (GAP) in both domestic and export-oriented agriculture. Hence, there is a need to increase food production through research, promotion and adoption of environmentally sustainable practices, e.g. reduced use of synthetic pesticides and inorganic fertilisers, increased use of biopesticides, plant based pesticides, biological control, using trap crops and repellent plants, biofertilisers, compost, green manures, etc.

Routine spraying of pesticides must be changed to targeted applications of selective pesticides based on the concept of scientifically determined economic threshold levels. Similarly, routine application of fertilisers must be changed to a need-based, targeted application following scientific soil and plant analyses. Furthermore, pesticides and fertilisers are often used at higher level of concentration than recommended. It is further proposed that the existing strategies and action plans (e.g. the Food Security Strategic Plan, the Strategic Options in Crop Diversification and Livestock Sector, the Blueprint for a Sustainable Diversified AgriFood Strategies for Mauritius) for this sector be put into practice, and that implementation should begin in the immediate short term, as from year 2012.

(ii) ***Develop cross border initiatives***

With a view to ensuring food security without further land conversion for agricultural purposes, it is recommended to step up cross border initiatives and encourage collaborative development of food production systems in the region, and to explore new trade/ regional markets. It is also recommended to develop an updated Food Security Strategy and Action Plan that will take on board recent developments in the global food sector and different socio-

economic scenarios for the future, e.g. sugar market worsening, rice and wheat producing countries banning all export, effect of changing climate in countries supplying us pulses, success of cross-border initiatives, etc.

(iii)***Increase seed production***

Local seed production must be enhanced for commonly grown vegetables, e.g. local production of minitubers for use as potato seed. Provision of tissue culture plantlets of ginger and pineapple must also be stepped up and further extended to other crops.

(iv)***Promote kitchen gardens and roof gardens***

Ecological kitchen gardening and other household gardening models set up by AREU, must be encouraged through provision of incentives (composting, infrastructure, setting up pilot projects, 50% grants).

(v) ***Promote production of underutilized vegetables and fruits***

Consumption of local vegetables and fruits must be promoted. People, particularly the youth, must be sensitized about healthy eating, particularly fresh vegetables and fruits. Production and sale of local underutilized vegetables and fruits must be encouraged in school and college canteens, e.g. sale of banana, pawpaw, starfuit, pineapple, guava, seasonal fruits, cherry tomato, processed/ boiled breadfruit/ taro/ cassava, etc. However some of the underutilized species are invasives, and must be promoted with caution. There is a need to strike a balance between food security and biodiversity protection.

(vi)***Promote agro-processing***

Agro-processing and better storage facilities must be further promoted and facilitated with a view to extending the availability of seasonal produce and to reduce postharvest losses of agricultural products. The possibility of setting up common post-harvest/ processing facilities must be explored.

Proposal 32: *Revise the "Land Productivity Enhancement Scheme" announced in the 2011 Budget Speech*

Revision must enable prioritisation of land cover conversion and leasing to existing and new farmers for food production by 2013. However, transparency must be guaranteed in the

allocation of lands for food production or other uses. An independent body must be set up to monitor agricultural state lands that are left uncultivated, and take appropriate action (e.g. recall the lease, and then allocate it to other farmers). Alternatively, the existing Land Use Division of the MoAFS must be empowered to carry out this exercise.

Proposal 33: *Validate and promote Traditional Knowledge*

Local knowledge developed over generations of planters is usually better adapted to the specific agro-environment of the region, and is more resilient to changing weather and other conditions. Very often, such knowledge has a valid scientific basis, even if the planter is not aware of it. On the other hand, some practices may be based entirely on superstitions and have no foundation in any scientific fact. It is proposed that traditional knowledge, in particular that relating to crop varieties, pest control techniques, soil fertility management measures, locally adapted animal breeds, trap crops, storage practices, etc, be subjected to scientific validation, and the validated ones actively promoted, e.g. use of traditional plant varieties and animal strains in breeding programmes.

Proposal 34: *Incentives and dissuasive measures must be put in place to adopt eco-friendly practices*

In spite of official recommendations to the contrary, farmers continue to make excessive use of synthetic pesticides and fertilisers. Insecticides are sprayed on a routine spraying calendar basis and not based on the concept of damage threshold or economic threshold values. Similarly, fertilisers are applied to the soil without any soil analysis having been done to test for soil fertility. Such practices led to injudicious and unwarranted application of agrochemicals in the field, the major proportion of which leach down into nearby water bodies and thence to the sea.

The following measures have been proposed:

(i) The law must be reinforced to include penalties to farmers contravening official recommendations and regulation.

(ii) Tax benefits and subsidies must be used to reduce the price of biopesticides, biofertilisers and other such ecofriendly agricultural inputs.

(iii) The possibility of setting up bio fertilizer plants in Mauritius using local micro-organisms must be explored.

Proposal 35: *Promote organic agriculture*

It is proposed that the organic cultivation be strongly encouraged in Mauritius and particularly in Rodrigues (which until recently had enjoyed an entirely organic production system). Alternative methods to the use of synthetic pesticides and inorganic fertilisers must be developed through research. It is proposed that organic standards and norms be developed, and the necessary certifying body be established. Aggressive campaigns must be conducted at the level of the farming community as well as the consumer (e.g. hotels, hospitals, educational institutions, and the individual householder) in favour of organic produce. This will help create marketing opportunities for planters producing organic produce.

Proposal 36: *Develop and promote site-specific, environmentally-friendly control measures*

It is important to encourage adoption of biosecurity measures to limit threats of existing and emerging pests and diseases. Pests and diseases cause substantial losses to farmers, causing them to make heavy use of pesticides. Fruit flies and other insects are major problem pests in vegetable and fruit production. With the increase in air and sea travel, and the increase in imported foods and other items for consumption, the risk of introducing new pests and diseases is high. It is proposed that Pest Risk Analyses be carried out for likely pests, that quarantine and border control be strengthened (*Proposal 29*), and that the present mechanism for detection, identification and control of inland pests and diseases be reviewed and updated for more efficiency and efficacy. Furthermore, there is need to develop ecofriendly pest control methods through farmer participatory research.

Proposal 37: *Develop a sustainable solution to the problem of fruit bats*

Bats form a very important part of our natural terrestrial ecosystems given their role in propagation of native plants through fruit dispersal. It is also noteworthy that bats are prone to reduction in population due to natural disasters for example high intensity cyclones. Bats and birds are believed to be responsible for decrease in litchi and mango yields. However, the real extent of the decrease in fruit yields by bats and birds has not been accurately quantified.

Bird nets are being provided at subsidised prices to fruit growers and those having at least 25 trees. This should be continued and extended even to other people not having 25 trees in their backyard.

There were controversial views regarding the problem of fruit bats. Some participants were of the view that fruit bats should be eliminated, while others stressed the need for protection of the species. Those favouring elimination of the bats pointed the need for a review of the legislation in order to permit culling of fruit bats in cases where fruit trees cannot be covered with bird nets.

On the other hand, those who stressed the need for protection of the bats were in favour of action based on scientific research on the real and relative impacts of fruit bats on fruit yields, which has not yet been sufficiently established. The fact that the drought conditions of the last season (which would theoretically have forced bats to raid orchards more) did not result in any loss in litchi yield substantiates maintaining the existing legislation which prohibits killing of bats. A sustainable solution to the problem of bats and birds needs to be developed, e.g. dwarf trees and more affordable bird nets.

Proposal 38: *Develop a professional apiculture industry*

It is strongly recommended to develop a professional apiculture industry for benefits in crop production, and also as a business and employment generating activity through the commercialization (local and export markets) of bee-derived products such as honey, beeswax, Royal Jelly and propolis. For instance, the Rodriguan honey from eucalyptus has got prizes internationally. This sector must be further developed and promoted.

Proposal 39: ***Implement the Strategic Environmental Assessment of the MultiAnnual Adaptation Strategy (MAAS-SEA) plan***

The part of the MAAS-SEA plan that recommends reforestation and developing agroforestry systems on marginal lands removed from sugarcane cultivation has not yet been implemented. It is proposed that pilot project (s) on agroforestry systems be set up by year 2014.

Further abandonment of sugarcane cultivation must be discouraged wherever possible by providing small planters financial incentives, e.g. increased share in special sugars, bagasse and molasses. Alternatively, the ex-small planters can be provided incentives to turn to forest derived products, such as apiculture, organic mushroom production, etc. with the appropriate technical and resource capacity building and suitable land cover change (e.g. planting melliferous trees).

Proposal 40: *Increase livestock production*

Livestock (milk and red meat) production is highly inadequate to meet local demand. There is a shortage of good quality forage, lack of multiplier farms to provide stocks (e.g. calves, kids, piglets, ducklings, etc.), insufficient numbers of veterinary officers to service the needs of animal farms, no proper facilities for livestock waste management, inadequate facilities for hygienic slaughter, and lack of a traceability system and insufficient numbers of staff for ensuring meat quality and food safety. The financial incentives proposed through the Food Security Fund have not been fully benefiting the farmers.

Measures must be implemented for stepping up livestock production, among them:

(i) Review the procedures of the Food Security Fund: beneficiaries, procedures, funding proposals, etc.;
(ii) Encouraging production of small animals (e.g. rabbits, turkey, quails, guinea fowls) at household level;
(iii) Encouraging the setting up of multiplier farms to provide stock (ducklings, calves, kids, etc);
(iv) Strengthen veterinary services to provide efficient support to address animal health and reproductive problems;
(v) Encouraging integrated livestock waste management through biogas/ energy production;
(vi) Composting and production of added value products, such as enriched compost;
(vii) Establishing standards and norms for public and private slaughter houses;
(viii) Establishing breeding programmes;
(ix) Setting up appropriate mechanisms to discourage illegal slaughter and slaughter of breeding females;

(x) Promoting fodder production and browse species on wasteland and exploring the possibility of producing high value animal feed locally;

(xi) Encouraging and enforcing cold chain management and good marketing structures to ensure food safety and quality;

(xii) Promoting animal welfare, e.g. housing norms and good animal husbandry; establishing insurance schemes for cattle farmers.

(xiii) Enforcing appropriately the regulations concerning the cattle walks in Rodrigues.

Proposal 41: *Review deer farming practices with a view to making this activity more environmentally sustainable*

Deer ranching in privately owned land remains largely unregulated, with large proportions of native forest habitats being transformed to pasture lands (MEO, 2011). Existing law specifies that 5% of the state land leased for this activity can be developed for pasture. However, it is unclear if this refers to 5% undergrowth clearance or complete deforestation of 5% of the area and replanting with pasture species. Furthermore, the practice of fragmentation of leased areas results in greater areas of land being cleared for pasture. Deer are stocked at much higher densities than specified.

It is recommended that an in-depth review of deer activities be undertaken with a view to developing a sustainable management policy to reduce the adverse effects of this activity on terrestrial and aquatic ecosystems (e.g. low stocking density, fenced areas, strict pastures/restored native forests, etc.).

It is proposed that on state leased lands regulations be reviewed, including pasture ground, and land clearing. There must be herd control, with subsequent monitoring and enforcement of stocking density, as specified in the lease agreement. Alternative management strategies must be used, for example, herd control, using optimum stocking density, etc.

Wherever possible, closed system rearing must be adopted to keep deer out of high quality and mid-grade forests. The Forestry Services should undertake regular patrolling and monitoring of deer lands to ensure that deer farming activities are in strict compliance with

lease agreement, and take necessary action if a lessee is in contravention with the lease agreement.

There is a need to maintain a balance between forest health and deer production, with the aim being to achieve venison production as a by-product of Forestry. However, the Mauritius Meat Producers Association was not agreeable as in their views, without the lessee the leased land forests would have been in worst state than actual and under the Shooting and Fishing Lease agreement, deer production cannot be considered as a by product of forestry and the selling of venison is the main income of revenue to pay the rental fees.

Proposal 42: *Ensure food safety and quality*

There is an urgent and imperative need to enforce standards in food safety and quality, and to encourage farmers and agro-processors to adopt safety guidelines such as HACCP and other Quality Assurance Schemes. It is important to review the whole system of food distribution and marketing.

It is imperative to set up a traceability system from 'farm to fork' for all food products, including imported foods and feed in order to be able to trace back the source of any problem related to unsustainable farming practices, e.g. higher-than-allowable residues of pesticides, fertilisers, growth hormones, antibiotics, etc.

Imported agrochemicals must be assayed to ensure quality control and compliance with label claims. Farmers must be trained and encouraged to establish record keeping practices particularly with respect to use of fertilisers and pesticides. The Ministry of Agro-Industry and Food Security (MoAFS) must carry out regular analyses of pesticide and fertiliser residues in all foods (including imported foods).

Proposal 43: *Protect local germplasm and maintain native genetic diversity*

There is an urgent need to develop and implement *in-situ* and *ex-situ* conservation programmes and reinforce gene banks to protect native germplasm and maintain native genetic diversity. There is an alarming level of germplasm erosion, and loss of plant and animal genetic resources, as emphasis is being placed on a relatively small number of high

yielding crop varieties and animal breeds. The wide adoption of newly-introduced higher-yielding varieties tends to displace old locally-adapted varieties. It is proposed to enhance breeding programmes for native plant varieties and animal breeds, and particularly for Rodriguan red beans, chilli, lime, local breed of cattle, etc. There is a need to carry out characterisation studies of local flora (e.g. medicinal plants, pesticidal plants, perfume plants, etc.) and fauna with a view to Intellectual Property Rights (IPR) issues in the future.

Proposal 44: *Restore and protect wetlands*

Large scale restoration of wetlands must be initiated by year 2013 to halt the current loss of wetlands. In spite of being identified as wetlands, and recognizing their ecosystem function and importance, a large number of such natural sites are being lost at an alarming rate to other land use or land cover changes, usually to infrastructural development. Though caves are considered under the wetlands according to Ramsar Convention, there is no existing management plan for caves in the Republic of Mauritius.

(i) *Protection and Conservation*

Protection and conservation plans for natural caves and cave ecosystems must be developed by 2014. Though caves are categorised under wetlands as per Ramsar Convention, they have not been well understood nor studied, and hence not given sufficient attention in terms of protection. There is presently no national plan and no effort for the management, protection and/or sustainable utilization of caves. There are some unusual cave formations in the Republic of Mauritius, e.g. the Caverne Patate in Rodrigues is unique in the Mascarenes regarding the big area of Aeolian Calcarenite (limestone) with many caves and very interesting surface features.

(ii) *Carrying capacity for optimum sustainable use (Proposal 19)*

It is important by 2014 to determine the optimum use of each cave based on scientifically estimated carrying capacity data, and to give it legal force (by inclusion in the Biodiversity Act). It is also necessary to designate an appropriate division/body/ organisation responsible for developing and undertaking caves protection and conservation programme by 2014, which should be under the authority of the proposed Ministry of Ecology and Sustainable Development.

(iii) *Develop dynamic GIS maps for caves, pipes and tunnels.*

It is imperative to develop dynamic GIS based maps of caves, pipes and lava tunnels by year 2014, and by year 2015 to assess cave formations in terms of their specific characteristics, location, ownership status, current use (if any) of the cave and the land surrounding it, the biological contents with photographic records and virtual recreations, and any potential uses (conservation, recreation, science, education, tourism, water supply, etc.).

Proposal 45: *Islets Management*

The Islands of Mauritius and Rodrigues have been classified as Open Reserves (multipurpose with an array of activities allowed, ranging from protection, conservation, research, eco-tourism, education, and public awareness to recreation), or Closed Reserves (strictly for the purpose of conservation and protection of native biodiversity and access is restricted to authorized personnel for the purposes of monitoring, enforcement and restoration of native habitat). The range of activities has been determined through consideration of each individual islet's potential and their current value in terms of its native species biodiversity, cultural importance, naturalness, habitat fragility, and current use and potential for restoration. As regards to the management of the islets, only, the Islet National Park and Strategic Plan has been completed.

The following measures have been proposed:

(i) *Implement the islets management plans*

The various management plans developed for islets must be implemented fully by 2015 to ensure proper protection and conservation of islets, for example, Flat Island. The management plans must clearly define the responsibility of each islets management for each islet; require the lessee to participate in islets conservation and protection for long term sustainability through legislation. By year 2017, develop further management plans and extend restoration programs to other islets.

(ii) *Promote sustainable use of islets*

Based on carrying capacity data, islets can be used for ecotourism purposes. Sustainable utilisation of islets can also be made by using them as laboratories for ecological research, eco-education, conservation and ecotourism using the principles of Good Practice.

(iii)*Review access to islets through beaches*

The access to islets through beaches becomes an acute problem on for instance declared closed reserves as uncontrolled access to the beach may result in the introduction of invasive species that may impact negatively on the fragile ecosystems of the islet, for example, rats have been completely eradicated from Round Island.

Proposal 46: *Implement the National Environment Strategies by year 2018*

Water analysis for taste, odour, and other chemical parameters is carried out regularly. However, there is insufficient information about the micro and macro organisms present in fresh water. Information on freshwater organisms is restricted mainly to snails, while ecological studies on marine organisms have been limited to some economically important fish, crustacean, and molluscs, corals, sponges, and mangroves species. Following a survey carried out in 2002 by ARDA (Association Reunionnaise de Developpement de l'Aquaculture, 2002), 18 species of fish and 10 crustacean species were recorded in the main rivers of Mauritius.

The National Environmental Strategies, 2008, which proposes addressing the issue of water pollution, water quality monitoring and preservation, and establishment of a database on freshwater ecosystems, must be implemented by 2014.

(i) It is also imperative to review the institutional framework for this sector by year 2015.
(ii) The Phase 2 of the National Sewerage Programme must be adopted and the public sewerage network must be extended to the whole country with at least 50% of the population by 2018 and 80% by 2033.

Proposal 47: *Develop a National Water Policy*

Further to the proposal 10, formulate Water Act followed by the Integrated Water Resources Management Strategy, there is a need to develop a National Water Policy and to adopt an Integrated Water Resources Management Strategy approach by 2014. In Mauritius, 56% of the freshwater used comes from rivers and streams, 32% from reservoirs, and the rest from groundwater aquifers, and almost 40% of the water is used for irrigation, another 40% for hydropower and the remaining for domestic, tourism and industrial purposes. 47% of water

(unaccounted-for-water) is lost through leaks in the piping systems and illegal tapping (MEO, 2011).

Freshwater resources are threatened by dumping of solid wastes in rivers, heavy use of agrochemicals in nearby agricultural fields, sewage disposal, and backfilling of coastal wetlands (in Grand Baie alone, there has been a 23% reduction in wetlands since the year 2000). Climate change is expected to further exacerbate the situation due to decreasing rainfall and rising temperatures.

With respect to protection and preservation of freshwater biodiversity, the following measures should be included in the National Water Policy:

(i) Reduction in unaccounted water loss in the supply chain;

(ii) Optimising water use in industries, households and agricultural sector and encouraging re-use of treated wastewater by year 2014;

(iii) Putting in place sustainable wastewater collection, treatment and disposal systems by year 2014;

(iv) Promoting sustainable watershed management;

(v) Regular cleaning and clearing of rivers conducting a quality and ecological assessment of all fresh water bodies;

(vi) Enhancing water quality monitoring and enforcement by year 2014;

(vii) Given the specificities of Rodrigues, there must be a separate Master plan for the Rodriguan water sector. Given the water situation in Rodrigues, water pumps are a necessity; it is recommended that solar-operated pumps, or those running on some form of renewable energy, be developed and promoted; and

(viii) Encourage use of rain water harvesting structures. Government is promoting the construction of rainwater harvesting structures at individual household level as a means of capturing a greater amount of rainwater. However, another point of view put forward is that rainwater captured in such water harvesting structures represents a loss of water that would otherwise have reached ground level and seeped into the soil to recharge the underground aquifers.

Proposal 48: *Implement fully the ICZM plan*

The Integrated Coastal Zone Management (ICZM) plan has been developed by the MoESD under the ICZM division and the National ICZM Committee. Sound development practices must be promoted in the coastal zone by strict adherence to Outline Planning Schemes and Planning Policy Guidance. Intense pressure is exerted on coastal and marine resources from both sea and land based activities. Unplanned construction and urbanisation around the northern and eastern tourist zones, land clearing and reclamation have contributed to the degradation of the coastal and marine environment in this region.

Unsustainable patterns of development such as backfilling of wetlands for construction (about 90% of all wetlands have been so destroyed), the absence of drains and sewer network are putting pressure on the coastal zone (MEO, 2011). Some 7 km of beach have been affected by erosion, and are being further degraded by hard structures constructed on the beach.

It is Government's policy to further develop the tourism industry by encouraging the arrival of two million tourists by 2015. The increase in tourist arrivals will increase the already substantial pressure on the coastal zone, with the construction of more hotels and increasing tourist related activities in the lagoon. All of this is likely to have serious impacts on the coastal and marine biodiversity.

Other factors impacting the coastal zones are as follows:

(i) The coral reef habitats around Mauritius are being degraded due to a combination of factors such as: coral bleaching, algal blooms, global warming, upland soil erosion and downstream sedimentation, extensive coastal development, strong tropical cyclones (which damage delicate branching corals and overturn table corals), and the coral predator, Crown of Thorns starfish (*Acanthaster planci*, which feeds on corals and can cause damage to coral cover if found in large numbers). Boat/ ship anchors, fishing nets and removal of live corals for illegal trade are decimating the population of corals in the lagoon.

(ii) Desalinisation practiced by a few coastal hotels is an alternate source of water, but is not without environmental effects (discharge of concentrated brine back into the sea with adverse consequences on the marine biota).

(iii) Alien invasive species from the pet/ aquarium trade (e.g. the golden snail), from ballast water, and from other sources may bring about disruptive changes in the structure, composition and functioning of aquatic ecosystems.

(iv) Changes in the composition and structure of primary food chains can result in far reaching effects on fish stocks and on the fishing industry.

(v) Sea levels have risen by about 2.1 mm per year at Trou Fanfaron, Port Louis between 1998 and 2007, and by about 1.2 mm overall (Meteorological Services, 2009). Sea level rise will lead to salt water intrusion into aquifers, into agricultural soils (making them unproductive), and inundation of certain low-lying coastal areas, thereby affecting livelihoods, coastal wetlands and mangroves.

(vi) With the SEMPA project, some 20 % of the lagoons in Rodrigues will be protected. There is a need to put in place further protective measures.

The following measures have to be taken:

(i) Implement the ICZM plan fully by the year 2014;

(ii) Provide training to NCG and redefine their roles and responsibilities with respect to coastal zone. By 2014, the National Coast Guards (NCG) must be provided with appropriate capacity and equipment to be able to enforce appropriate legislations and regulations in the coastal zone. The NCG must have a clear mandate and responsibility in implementing strategies in the coastal zone;

(iii) Conduct studies on the impacts of tourism. It is imperative that by 2014 further studies be carried out on the environmental, social and economical impacts of the tourism industry both in Mauritius and Rodrigues, and by 2015 guidelines developed for Sustainable Tourism encompassing all forms of tourism – ecotourism, cultural tourism, agri-tourism, educational tourism, therapeutic, tourism, geotourism (wetlands, caves, volcanoes, lakes, mountains, reefs, etc), etc.

(iv) Identify and declare non constructible coastline zones for protection purposes. A target of 20% of the coastline protected has been discussed without a real consensus on the percentage to be adopted.

Proposal 49: *Implement the Blue Flag programme for beaches and marinas*

With increasing pressure in the coastal zones, deterioration in water quality resulting from release of agrochemicals from coastal agricultural fields on the east and south east coast (e.g. Belle Mare, Trou d'Eau Douce, Petit Sable, Grand Sables, Quatre Soeurs and Bambous Virieux), livestock farming (e.g. Palmar), sewage and other effluents from coastal hotels and industries, are causing significant eutrophication and destroying many aquatic species. It is recommended to implement the Blue Flag programme for beaches and marinas by 2014. Blue Flag is an international eco-label based on criteria involving water quality, environmental education and information, environmental management, safety and other services.

A larger extent of beach area must be declared as public beaches and equipped with the necessary amenities for the use and comfort of Mauritians, who have very limited leisure space and activities.

Proposal 50: *Adopt measures to prevent decline in fish stocks*

The total fish catch decreased from 19,690 tonnes in 1993 to 6,978 tonnes in 2009 (MEO, 2011).

In order to prevent decline in fish stocks, the following actions were proposed:

(i) The approved management measures for lagoonal and deep sea fishing must be strictly applied by 2013;
(ii) Efforts to encourage fishers to fish off lagoon in order to reduce over-exploitation of lagoons must be stepped up by 2013;
(iii) The fishing practices must be strictly monitored; In Rodrigues, for instance, exploitation of sea cucumbers and octopus must be regulated. As is the case in other countries, e.g. Madagascar, catches should be prohibited for certain periods of the year, and during which time, the fishermen can be provided alternative employment (e.g. reforestation activities).
(iv) Control on illegal fishing must be increased, and bank fishing must be strictly regulated.

(v) Commercial fishing and game fishing licenses and regulations are not always respected and there is insufficient monitoring and enforcement, leading to overfishing, illegal fishing, and other unsustainable practices that impact on the normal functioning of the ecosystems.
(vi) St Brandon needs to be declared as a marine protected site with least delay.
(vii) Amateur/ leisure fishermen's impacts have to be evaluated.
(viii) Shells and corals collection have to be strictly controlled.
(ix) More Marine parks and fisheries reserves have to be proclaimed to increase fish stocks, e.g. SEMPA project in Rodrigues.
(x) Lagoons have to be restored (coral rehabilitation ongoing by AFRC and MOI) under Africa Adaptation Program (AAP) of Global Environment Facility (GEF) for increasing lagoonal fish numbers.
(xi) Voluntary no-take zones have to set-up.
(xii) The potential of freshwater fish culture has to be reassessed and promote consumption of freshwater cultured fish but good quality water is limited
(xiii) The harvesting of octopus and sea cucumbers in Rodrigues has to be regulated.

Proposal 51: *Establish a clear definition of 'ecotourism' relevant to the local context*

With respect to nature-based tourism specifically, it is recommended that the term 'Ecotourism and Leisure' be officially adopted, and given a formal definition by 2013 that encompasses the key facets of this activity. A comprehensive eco-tourism strategy must be urgently developed by 2014 and one organisation/ institution be mandated to coordinate and facilitate the implementation of this strategy.

Nature tourism, ecotourism, sustainable tourism are some of the new terms being used to describe an increasingly popular form of tourism that is more geared towards the natural environment and biodiversity in particular. The concept of Ecotourism is not well defined or understood. Various terms and definitions are proposed, but there is no official term and no standard definition adopted in the country. While to some, ecotourism refers mainly to inland tourism away from the coast, to others it refers to any activity involving plants or animals (even taking a walk in the outdoors). There is a need to develop an official definition and description of what constitutes ecotourism. In Rodrigues, 80% to 90% of the tourists are interested in one form of nature tourism or the other.

The following proposals have been put forward:

(i) Involve the community in ecotourism activities

It is recommended that the philosophy of nature-based and equitable ecotourism, geared towards the local communities be encouraged, e.g. through employment of local guides with real detailed knowledge of local sites, dining at local residences (table d'hôte, Grandma's Kitchen, etc), paying guest system. Manufacturing and sale of local products must be given priority. Authenticity and proximity of ecotourism is needed, i.e. tourism should be more integrated into the local community.

(ii) *Provide appropriate public facilities*

It is proposed that the public facilities must be provided that will help in preventing environmental pollution and contamination, e.g. environment-friendly transportation system, toilet facilities, buildings, waste bins, etc. It may be desirable to promote, good quality, small/ medium scale tourism instead of mass tourism.

(iii)*Monitor ecotourism activities for compliance with regulations*

Regular monitoring of tourism activities must be done to ensure strict compliance with EIA licence, appropriate approval and planning guidelines and strict penalties imposed for non compliance.

(iv) Utilise funds raised from ecotourism activities for biodiversity protection and preservation

Funds/ taxation generated from ecotourism activities must be ploughed back for the biodiversity protection, enforcement of legislation for the same, research and development, and conservation and community-development projects.

(v) *Promote eco-friendly practices in the tourist industry*

It is proposed that the tourist industry by 2014 be required to adopt eco-friendly practices, e.g. reduction in water usage and energy consumption, increasing the proportion of renewable energy in total energy used, recycling and reuse of water and all wastes, etc. Such good practice can be encouraged through incentives, such as eco-labelling schemes, carbon-offset programmes (e.g. investing in forest restoration as payment for carbon emissions).

Development to meet tourist demands inevitably has repercussions on the terrestrial and aquatic environments and on biodiversity in particular. Several of the big hotels are increasingly adopting some environmentally sustainable practices (e.g. water recycling, solar energy, etc.). On the other hand, most small hotels and bungalows are still not connected to the national sewerage network and their impacts on the environment need careful monitoring and study.

Proposal 52: *Remove invasive alien species (both plants and animals)*

The National Invasive Alien Species Strategy & Action Plan must be implemented urgently. Spread of invasive alien species that have the potential to cause significant damage to endemic species must be monitored and controlled. However, some invasive alien species have economic importance, e.g. eucalyptus is a melliferous species and of immense importance in Rodrigues for the apiculture industry. Hence, a balance must be sought between clearing of invasive aliens and their economic role.

3.3 Theme 3: Mechanisms for Sustainable Management of Biodiversity and Natural Resources

Proposal 53: *Establish an Environment Monitoring and Management Unit/System for monitoring, evaluation and enforcement*

It is proposed to set up a separate **Environment Monitoring and Management Unit** (EMMU) by 2013, which would be housed and under the responsibility of the Ministry of Ecology and Sustainable Development. The mandate of this Unit would be to evaluate and assess the EIAs (Environmental Impact Assessments), SEAs (Sensitive Environment Areas), to monitor and assess all large scale projects at national level for compliance with EIA/SEA conditions, to make post-project studies on their environmental impact (particularly on biodiversity), and to make recommendations to the appropriate authority through its parent Ministry. The EMMU would also oversee the implementations of proposals made in this report, including the legislative and institutional frameworks, implementations, etc., relating to biodiversity protection, conservation, utilisation, etc. The EMMU would be advised and guided by a High Powered Committee that would be composed of national experts in all the various aspects of biodiversity.

On the ground, the existing Police de L'Environnement would be responsible for day-to-day monitoring and assessment of actions for compliance with environmental laws, Code of Practice, and Good Environmental Practices. This Unit should be under the new Ministry of Ecology and Sustainable Development, and should be provided with the necessary training (e.g. environmental auditing, pollution assessment, forestry, etc.), tools, logistics and funding to operate efficiently and without pressure. The Unit should be operational on a 24/7 basis, work at nights and even work undercover. It is proposed that technical people should be recruited and then provided with the normal police training. Officers should be posted in each district of the country.

The above proposal is made in light of inadequate monitoring and evaluation, and too weak an enforcement of the legislation, e.g. the Police de L'Environnement is unable to deliver an efficient service; the Unit is presently staffed with only nine officers for the entire island since 2009. Moreover, their expertise and skills are not fully satisfactory for efficient

environmental policing and enforcement. Furthermore they are not provided with adequate tools to conduct their job effectively. This is also the case for the other monitoring divisions/ staffs in other Ministries; resources and capacity for an efficient monitoring, evaluation and enforcement are limited.

Proposal 54: *Establish an Environment Court*

It is proposed to convert the current Environmental Appeals Tribunal to a full fledged **Environmental Court** by 2014, with magistrates and lawyers that are well versed in environmental laws. The entire legal structure must be better organised, with better infrastructure, more full time, dedicated staff and a greater number of technical specialists to deal with appeal cases. The Environmental Court must sit for the same number of hours daily as any other legal court. Appeal cases must be fast tracked.

Cases sent to the Environmental Appeals Tribunal take too long to be resolved, mainly because the tribunal meets only in the afternoons, it is not well structured, and the magistrates and lawyers are insufficiently versed in environmental laws.

Proposal 55: *Regulate the EIA system for greater effectiveness*

The present set up of preparing, assessing and monitoring EIAs must be thoroughly reviewed and made more stringent by 2013. This activity must be better regulated in the following ways:

(i) By 2013 all EIA experts must be registered with a Government authority;
(ii) The minimum scientific and technical qualifications and experience required to qualify as an EIA expert must be specified by Government;
(iii) Sufficient time must be provided to official staff for evaluation of the EIA;
(iv) There must be strict post-project follow up and monitoring for compliance with measures specified in the EIA, and enforcement of punitive measures for deviations from specified conditions.

Proposal 56: *Declare certain strategic areas as 'protected', and centralise their management for greater protection and conservation*

It is proposed to extend the present coverage of designated **Protected Area Networks**, and to identify new ones for protection by 2014. It is strongly recommended that certain natural spaces and natural landscapes having unique ecological features (e.g. cave formations, biodiversity hotspots, fragile ecosystems, mountain tops, MoAFS field stations having rich biodiversity, etc) be accorded '**protected status'**, and declared as Nature Reserves, National Parks, and brought under central management. In such cases then, the stricter legislation governing such areas will apply and thereby ensure better and more efficient protection and conservation from legal and illegal developmental activities. Some of these sites can eventually be declared as Natural Heritage Sites, and receive even further protection.

For instance, it is proposed that all state-owned mountain areas be listed as Nature Reserves, with compulsory land buy-back/ acquisition for isolated peaks that serve as ecological stepping stones for biodiversity. Similarly, the Pas Géométriques Choisy near Bras d'Eaux must be proclaimed as a Nature Reserve, and the Bambous Mountain Range and the area spreading across Yemen-Magenta as National Parks. A Public Private Partnership needs to be considered for the management of Yemen-Magenta.

Proposal 57: *Acquire compulsorily certain areas of high biodiversity importance for preservation purposes*

It is recommended that by 2014 Government should undertake **compulsory acquisition** of the region of Mt Cocotte and Bassin Blanc (the only lake that has no development at all, and this should imperatively be preserved) for inclusion into the Black River Gorges National Park. Those areas in Grand Bassin that have not been converted to parking, roads, toilets, etc should be reforested and restored to forest ecosystems. The Roches Noires forest is one of the last remnants of a coastal forest in the Indian Ocean, and is hardly been studied scientifically. It is proposed that Government buys back this land and institutes a full and independent study of its vegetation, fauna and geology with a view to according it protected status.

It is also recommended that the limestone area east of Anse Quitor Nature Reserve (including the Reserve) be declared as a protected area, and submitted to UNESCO as a potential Natural Heritage site.

It is recommended that St Brandon and the West Coast of Mauritius be urgently declared as a Marine Protected Area with special emphasis on turtle restoration and mammal conservation, respectively. As a mean to achieve the objective of having St Brandon an ecological model for preservation and protection of aquatic biodiversity, long term research field stations should be established on each outer island (i.e. Agalega, Chagos, St Brandon, Tromelin) and banks. Flanks of volcanoes such as Trou aux Cerfs and Trou Kanaka must be protected, and a full survey and mapping of true crater and non-crater volcanic cones be done by 2013, along with that of the surrounding biodiversity.

Proposal 58: *Designate one authority/institution to achieve proper coordination and integration of Nature Reserves / National Parks*

It is recommended that, as at present, the newly designated Nature Reserves/National Parks is put under the responsibility of one specific authority, in order to achieve better coordination of the management of such areas, and to facilitate their protection and conservation. For instance, the status of state and private forestlands must be re-evaluated and reassessed, and a greater number of priority areas must be identified for intensive management.

There is insufficient collaboration and coordination between and among Ministries and other institutions and sectors. The necessary inter-linkages between various stakeholders that enable a multiplicity of approaches for a common, holistic aim towards environmental protection are either not present at all or do not operate effectively.

Proposal 59: *Develop codes of practice to be applied in newly designated protected areas and for other activities*

It is recommended that by year 2014 a code of practice be developed and promoted for the sustainable management and utilisation of each of designated protected area according to scientifically researched criteria, such as the carrying capacity of each ecosystem. It is recommended that by 2014 appropriate codes of practice be developed for different activities

(e.g. agricultural, ecotourism, subsistence level fishing, recreational (game/ amateur) fishing, dolphin and whale watching, etc. While codes of practice are not legally binding, efforts must be made to incite stakeholders to comply with the conditions of the codes.

Proposal 60: *Implement existing environment-related strategy and action plans; integrate biodiversity protection into other national developmental plans and regional cooperation programmes*

A number of strategy and action plans have been developed over the years, while some are in preparation, most of them have been implemented to varying degrees. It is proposed that all the strategy and action plans be fully implemented rapidly, in accordance with the timelines specified in the action plans, particularly the National Biodiversity Strategy and Action Plan (NBSAP), the National Invasive Alien Species Strategy and Action Plan (NIASSAP), the draft Sustainable Land Management National Action Plan (SLM NAP), the Sustainable Agrifood Diversification Strategy Plan, the National Forest Policy, the ESA Study, the ICZM framework, the Sustainable Consumption and Production Strategy, Integrated Water Resources Management Plan, the Islets National Park Strategic Plan, Islet-specific management plans, the National Water Policy, and Marine Protected Area Network among others.

The Planning Policy Guidance (PPG) must be applied for residential and individual home development as well, and strictly enforced.

Furthermore, there is a need to develop and implement strategies, action plans, management plans, programmes, guidelines, operational systems, along with their appropriate legal framework, for some specific sectors, examples are as follows:

(i) A national action programme for sustainable management of forests.
(ii) A national strategy for conservation of agro-biodiversity.
(iii) A national eco-tourism strategy (including a geotourism plan).
(iv) An integrated waste management strategy.
(v) A national Pest Risk Analysis and Integrated Pest Management strategy.
(vi) A national Integrated Disease Management strategy.
(vii) A national Integrated Nutrient Management strategy.
(viii) A national Climate Change Adaptation strategy.

(ix) Management plans for specific protected areas (marine and terrestrial) and threatened species.

(x) Management plans and restoration programmes for other islets, wetlands and caves.

(xi) Management regulation plans for dolphin and whale watching activities.

(xii) An Integrated land planning system.

(xiii) A water quality indexing system for surface waters.

(xiv) A pricing policy guideline for water demand management.

(xv) National guidelines for carrying capacities (for each economic sector).

(xvi) Environment Management and Auditing Systems (for different sectors, e.g. hotels, IRS/RES, etc.).

It is recommended by 2014 to set up, equip and operationalise the following:

(i) A Water Authority to enhance overall water management.

(ii) A specialized unit for sorting and recovering recyclable wastes.

In addition, the entire system of forestry, land use, land conversion, legislation, allocation/ renewal of leases, etc. must be reviewed and reworked for more coherence. Consideration should be given to liberalizing the management of protected areas to include non-state actors.

The National Plant Genetic Resource Committee must be converted into a National Biodiversity Committee and reinforced through provision of expertise, equipment and tools and running costs to be able to ensure protection and conservation of genetic diversity and local germplasm. Furthermore, there is need to establish a gene bank for Rodrigues to preserve local plant varieties, e.g. beans, chillies, lime and others.

Proposal 61: *Integrate protection and conservation of biodiversity and natural resources into national development plans and regional cooperation programmes*

Biodiversity protection and conservation must not be considered as being the sole responsibility of environmentalists and other people working in the area of biodiversity related issues. Environmental protection, which *inter alia* includes natural resource conservation and biodiversity protection, must be an integral part of all developmental policies and plans, whether agricultural, tourism, industrial, health, education, etc. All sectors

that have the potential to impact significantly on biodiversity, such as land use planning, water resource management, waste management, agriculture, and all strategy and action plans for these sectors should include, as one of their decision-making parameters, natural resources protection, and maintenance/management of genetic and species diversity.

Even at the regional and international levels, all collaborative programmes must include upfront all aspects of environmental protection and biodiversity conservation as an integral part of the action.

Proposal 62: *Ensure land use and management information is made public and easily accessible*

It is recommended that, by 2013, all stakeholders be given easy access to the LAVIMS. Access must also be expanded to the various existing land use maps, satellite pictures and remote sensing imagery. This will help EIA consultants, scientists, researchers, land planners, other stakeholders, as well as the general public.

Proposal 63: *Reactivate the GIS Unit under the PMO*

It is proposed that by 2013 the GIS Unit must be reactivated and placed under the PMO rather than in any Ministry. A web based dynamic and interactive GIS mapping system must be created with a number of layers, namely:

(i) base maps;
(ii) district maps;
(iii) geological features;
(iv) drainage systems;
(v) eco-regions
(vi) relief and elevations (mountains and hills);
(vii) major habitats;
(viii) land use and land cover;
(ix) forest cover;
(x) watersheds and catchment areas;
(xi) forest extent data;
(xii) distribution of rare plants and animals;

(xiii) mangrove distribution;
(xiv) flood prone areas;
(xv) high risk areas for pollution;
(xvi) distribution of invasive alien species;
(xvii) maps of all rivers, streams and rivulets, projects/plans of large scale constructions;
(xviii) maps of prime agricultural land; and
(xix) maps of wetlands, including caves.

All of the above must be made accessible to the general public for a nominal fee.

Proposal 64: *Develop a mechanism to formally recognize the contribution of NGOs and CBOs*

A mechanism for formal recognition and acknowledgement of the collaboration and contribution of NGOs and CBOs to data gathering, research and investigations, development of policies and strategies, etc. must be developed by year 2013.

Proposal 65: *Develop indicators and milestones for environmentally sustainable activities, and provide incentives*

While qualitative descriptions of progress in biodiversity protection and conservation can help to measure situational changes, it is imperative to set quantitative indicators of success, and milestones for determining advances in the sector. Key Performance Indicators (KPIs) must be established by year 2014 for various project objectives, accompanied by the appropriate Objectively Verifiable Indicators (OVIs), all outlined within well defined milestones and timelines.

Proposal 66: *Set-up indicators for food security, sustainable agriculture and organic farming*

Different targets for self-sufficiency for different food crops must be established for the short, medium and long term. Indicators for food security must be set up, and used as a measure for estimating and assessing the food security status in the nation regularly.

By year 2014 standards and indicators must be developed for sustainable agriculture and for organic farming. A monitoring and certifying body must be established and provided with the necessary technical, scientific and administrative manpower, analytical equipment and tools, and vest it with the authority to issue certificates of compliance.

Proposal 67: *Provide incentives to encourage compliance with sustainable practices*

Incentives and taxation are important to encourage compliance with the principles of sustainability. Positive incentives can be financial or in-kind, while negative, dissuasive measures can be in the form of increased taxes, fines, imprisonment. Dissuasive measures can include the 'name and shame' strategy, and other similar actions. However, it is recommended that the positive incentive approach be adopted by year 2014, e.g. awarding of a 'green label', publicized lists of complying bodies (**Observatoire D'Activitees Durable**), establishment of a compensation plan along the lines of carbon credits to encourage sustainable practices, development and implementation of a national mechanism for a credit system (financial and/or in-kind) for reduced carbon emissions and/or increasing carbon stocks. Initially to be implemented at national level, it is proposed that this be extended in the near future, to regional mechanisms for a collaborative programme on benefiting from such reduced carbon emissions.

3.4 Theme 4: Capacity Building, and Research and Development

Proposal 68: *Develop capacity in terms of human and technological resources, infrastructure, tools, and funding*

It is imperative that by 2013 monitoring and policing capacity be built as a matter of urgency. In certain divisions, there is a need to recruit more staff, and/or empower existing staff to deal more efficiently and rapidly with enforcement matters through provision of more training, equipment, tools and logistics for monitoring and policing work. Forest Services must effect regular, unwarned site visits across the island to ensure that the recommended measures for biodiversity protection and conservation are applied.

The above proposal is made in light of insufficient capacity for policing and monitoring work in all implementing bodies, e.g. Police de L'Environnement, Forestry Services, NPCS, AREU, Commission of Agriculture and Commission of Environment in Rodrigues, etc. Environmental degradation is attributed to some extent to insufficient monitoring of compliance with licences and enforcement of laws due to a lack of capacity. Even though there is strong political will and commitment towards environmental issues, ministries that are responsible for enforcement in the various sectors are under-staffed and under-resourced. There is insufficient capacity (human, technical, equipment, logistical, and funding) to ensure efficient environmental services, proficient assessment of the environmental implications of development projects, competent monitoring and evaluation of projects for compliance with prescribed conditions, and effective implementation and enforcement of legislation. In particular, there is insufficient capacity and expertise to study PERs, EIAs and SEAs thoroughly and to do post-project monitoring for compliance with PER/ EIA/ SEA conditions.

Capacity must be developed by 2014 for further education and training of scientific and technical staff of the various Ministries and Commissions involved in environmental and biodiversity work and/or recruiting of trained and specialist staff with expertise in specific areas where it is lacking at the moment, e.g. identification and taxonomy of specific faunal and floral groups, herpetologists, acarologists, entomologists, ornithologists, natural resource economists, climate change economists, etc. As specific instances, there is a need for training

and capacity building to enhance the efficiency of the National Plant Protection Office (NPPO) to make speedy identification of pest species (including plants, animals and others) and to conduct a rapid risk assessment. Similarly, the Remote Sensing Unit at Bigara must be reactivated and strengthened in terms of manpower, equipment and running costs. Training must be provided to field staff of Municipal and District Councils on identification and importance of native species.

Similarly NGOs and CBOs are unavoidable stakeholders in the field of the protection and preservation of the biodiversity whether terrestrial or aquatic, in terms of public involvement and awareness. However, these organisations have financial and human constraints to fully fulfil their objectives. It is proposed to create sustainable funding mechanisms, provide incentives that will ensure sustainability of the NGS and CBOs (i.e. VAT exemption, non commercial fees applied to rental of phone lines and internet access, etc.).

Proposal 69: *Promote specialized training in selected specialist areas*

Capacity must be built in a few highly specialist areas, e.g. identification and systematics of certain floral and faunal, caves and their restoration/protection, sustainable landscaping, sustainable ecotourism/ sustainable nature tourism, GIS/ Remote Sensing/ ArcGIS/ Idrissi/ OpenSource GIS. It is recommended that local Universities be encouraged to develop, by 2013, and run part time formal and/or short term training courses in these areas for technical and scientific staff of various Ministries, Commissions, parastatal bodies, NGOs, CBOs, conservation groups, environmentalists, private sector, etc. from diverse backgrounds (physical and natural sciences).

Proposal 70: *Promote training to potential entrepreneurs in the food production sector*

More training must be provided in professional horticulture, organic food production and home food production, postharvest storage, hygiene guidelines and HACCP for food processing, etc. with strong emphasis on agriculture as a commercial enterprise.

Proposal 71: *Review the role of the National Empowerment Foundation (NEF) in funding environmental projects*

The role of the NEF must be reviewed by year 2013 to enable it to facilitate disbursement of funds for environmental projects in a transparent manner; the NEF should be seen as a facilitator of the environmental development. Alternatively, PPPs should be encouraged for environment protection projects.

Proposal 72: *Review and revise environmental education in the curricula*

Environmental education is not achieving its objectives, and there is an urgent need to review environmental education at all levels – primary, secondary and tertiary. The curriculum for environment in the formal and informal education system must be reviewed and revised to make it more interesting, more relevant, and more realistic. It is strongly recommended that environmental education must be taken out of the classroom and into the natural landscape.

It is recommended by year 2013 to develop capacity for imparting a strong grounding in environmental education in the classroom as well as outdoors. The curricula at all levels must be amended to include more outdoors and hands-on practical work, rather than merely classroom teaching. The mode of instruction must be changed from a theoretical lecture type impartation of knowledge to a more interactive, do–it-yourself learning through experience.

Proposal 73: *Intensify public awareness campaigns on environmental protection, including biodiversity issues*

Public awareness of environmental issues, and the need and benefits of environmental protection must be raised through regular campaigns and sensitisation programmes on a regular basis. While attempts by the MoESD are underway in this endeavour, there is a need to step up the effort and to try and reach a maximum number and range of people from all walks of life. Some facets of the environment, such as wetlands, caves, mountain tops, etc are normally not even considered by the general public as being important and fragile ecosystems and in urgent need of protection and conservation.

Television radio programmes, dramas and films, public talks, demonstrations, open days, contests and competitions, are some of the modes of imparting information that should be enhanced. In addition increasing public awareness of the obvious natural environments, it is also necessary to sensitise the public about our cultural heritage, e.g. the need to protect and conserve old traditional buildings/houses that often include native plants in the garden/yard.

NGOs and CBOs have a proven positive track record of education and awareness actions. However, there is a need to increase the visibility of the achievements through regular national TV and radio programmes: dedicated airtime should be provided freely to these stakeholders.

Proposal 74: *Provide training and awareness to all District Council and Municipality staff*

Incorrect and inappropriate practices either deliberate or through ignorance, continue to cause further environmental degradation. For instance, Municipality and District Council field workers (and those working in the relevant Commissions in Rodrigues) sometimes cut down native trees (through ignorance) while clearing river reserves and other areas. As per the legislation, they are required to inform the Forestry Services. However, this is not practical, since such clearing works are done almost daily. All District Council and Municipality staff and relevant RRA field workers must be trained and made aware of relevant legislations and regulations.

Proposal 75: *Promote greater local Research and Development*

By the year 2014, Research and Development (R & D) capacity must be enhanced in all the organisations/ institutions concerned with biodiversity issues, and at all levels. Research data and findings, and other information generated must be dissemination widely, and made available easily and freely to all, after having resolved and implemented the issue of Intellectual Property Rights. It is strongly recommended to establish a centralized storage facility for all research data and information on all aspects of biodiversity. An institution/ organisation must be identified to take the lead, and provided with the manpower, technical and logistical support, and running costs.

There is presently insufficient Research and Development in almost all areas dealing with biodiversity and the environment in general. A greater part of development comes through transfer-of-technology styled projects. In some cases, the measures adopted may not be appropriate (e.g. planting of exotic and at times even invasive species, for erosion control on river reserves, as windbreaks, or for embellishment of public places, or introducing biocontrol agents that themselves become pests). There is a need for local, site specific R & D that will be appropriate to the Mauritian context.

R & D must be stepped up on locally suitable technologies for increasing food production in an environmentally sustainable way, e.g. integrated nutrient management, soil health and fertility management, no-till, contour planting, terracing, mulching, integrated pest management, better irrigation systems, use of treated waste water, better cropping systems, breeding desirable traits, e.g. short statured fruit trees, etc.

Proposal 76: *Provide adequate funding for Research and Development*

It is imperative by year 2013 to regulate and enforce provision of funding for R & D. It is proposed that Corporate Social Responsibility (CSR) funds be allocated to environmental projects as well as to social projects such as poverty alleviation. It is recommended to change CSR to CSER: Corporate Social and Environmental Responsibility. It is further recommended that the choice of CSR/ CSER allocation be returned to the corporate bodies rather than be decided by Government. In all cases of CSR/ CSER and PPP projects, the funds must be allocated in a very transparent manner (see section on Good Governance), the budget allocation decided upfront, and the work monitored for compliance throughout the project cycle.

Proposal 77: *Explore regional opportunities to further build capacity*

Where expertise is lacking in the country, and/or a given technology is too expensive to develop locally, regional (e.g. SADC, COMESA, IOC) blocks can be explored for an exchange of staff for training, and for sharing of information and resources. Other avenues of collaboration and cooperation can also be sought through other South-South and North-South partnerships for mutual benefit.

Proposal 78: *Encourage intra- and inter-institutional/ sectoral collaboration and sharing of data, information and resources*

It is proposed that inter-sectoral and intra-sectoral collaborations be promoted at all levels. The involvement of NGOs, CBOs and other appropriate stakeholders that are affected by and/or can contribute to environmental and biodiversity protection and conservation must be increased and facilitated. Private sector collaboration can represent a substantial contribution in terms of funding, PPPs for large scale projects, and in terms of compliance with legislation and regulations. Private sector involvement can also be sought for the establishment, management and maintenance of designated green spaces such as roundabouts, national highways, other public roads, parks, playgrounds, etc.

Some specific examples of inter-sectoral partnerships include that between a hotel and a local planter for the supply of local organic produce, or that between a hotel and a householder to provide tourists with the experience of local, home cooked cuisine (Grandma's Kitchen concept introduced by Shanti Mauritius hotel), a system of Table d'hôte, etc.

The end users and grassroot level stakeholders must also be taken on board for any project that impacts on their livelihood, e.g. the AFRC involves fishers right from the beginning in any fisheries related development. Furthermore, the end users can serve as efficient stewards and marshals for monitoring of any development projects since they are likely to be directly impacted by the developmental works, e.g. any kind of lagoon reconstruction.

3.5 Theme 5: Consolidate the Future of MID

Proposal 79: *Develop a MID Charter*

It is recommended by 2013 to develop a MID Charter after extensive stakeholder consultation. The Charter must be approved by and applicable to all individuals and organisations - the Government, local citizens and visitors. The Charter should be a short, clear and crisp list that embodies the principles and vision of a sustainable island. It should be couched in simple terms, easy to read and understand, and written in a common language. It should give visitors an overview of the Mauritian peoples' pride in their natural and national environment, their sense of belonging and ownership to their country and their efforts to make their island nation a sustainable one that they can bequeath proudly to the future generations to come.

Proposal 80: *Develop and implement a Mauritian Sustainability Index*

It is recommended by 2013 that a Mauritian Sustainability Index be developed and implemented. The concept of sustainability transcends the purely natural environment and has linkages with human health and wellbeing, economic development, social and societal resilience, political stability, good governance, etc.

The parameters used to obtain a measure of sustainability must span a range of natural, developmental, economic and health characteristics, and correlations among them. Some of the parameters could include : extent of high quality native forest cover, floral and faunal species and genetic diversity, health status of ecosystems, quantum and proportion of green spaces per inhabitant, frequency of use of green spaces by inhabitants, life expectancy of the people, infant mortality, prevalence of respiratory, skin and other disorders in inhabitants, etc.

Proposal 81: *Ensure good governance, transparency and accountability and inculcate ethics and values at all levels to encourage environmental protection*

Good governance is also a characteristic of a sustainable environment and a sustainable society. Good governance is based on participatory, transparent, responsive, consensus-

oriented and equitable choices for a better, more informed and acceptable decision-making. Good governance practices with respect to budgeting exercises and project management bestow a positive effect on project delivery and delivery of efficient planning services.

It is, therefore, strongly recommended by 2013 to take the necessary steps at all levels to ensure good public sector governance, as well as good corporate governance. With respect to the natural environment and biodiversity issues, it is imperative that all relevant decisions be taken in a transparent manner and with clearly specified objectives and expected outcomes, for e.g. land use planning and development, granting of leases and permits, evaluation and approval of PERs, EIAs, and SEAs, derogations to biodiversity-related legislation/regulation, allocation/rent/sale of state land, islets, marine zones, etc.

Proposal 82: *Ensure transparency while dealing with all aspects of natural resource management*

There is an imperative need to provide more transparency in all dealings concerning land and other natural resources. All the relevant authorities must play a more active role in ensuring transparency in the allocation, sale, and lease of state lands for any purpose whatsoever, strongly advocate proper accountability in all dealings, and insist on follow-up action on audits of all publicly funded projects/ programmes.

Proposal 83: *Allocate funding to environmental projects though proper consultations*

Funding allocations for all CSR/CSER and PPP projects must be done through a multi-sectoral board involving all stakeholders.

Proposal 84: *Adopt a participatory democratic approach for decision-making involving biodiversity and natural resource management and use*

A mechanism for collective participation in decision-making processes must be put in place by 2013 to create a sense of ownership and ensure community stewardship throughout the project lifetime.

Proposal 85: *Develop and promote ethical and moral values among leaders, decision/policy makers, and individuals in all dealings*

It is also imperative to develop and promote ethical and moral values among the individual leaders, decision/policy makers, and the general public in all day-to-day dealings. With respect to the natural environment, and biodiversity in particular, people should be educated and made aware of the moral and ethical dimensions of environmentally unsustainable practices, their impact on the environment, and consequently on the livelihood, health and wellbeing of humans and other living beings. Exploitation and mining of environmental goods and services must give way to sustainable utilisation of natural resources and biodiversity, within an equitable, democratic and transparent framework of legislation, regulations and implementation.

Proposal 86: *Develop and promote the concept of Green Employment*

The concept of Green Jobs/ Green Employment is not yet known or understood in Mauritius. By 2013 the term must be defined, developed and promoted at all levels- specialist and technical. It is considered feasible to create about 10,000 green jobs. Existing jobs can be restyled and renamed in order to give a higher status and sense of worth, while a number of new administrative, managerial, scientific, technical and support level positions can be created in the context of sustainable living and sustainable development. However, the working group expects that this aspect has been largely discussed another working group: employment.

Proposal 87: *Convert 'Maurice Ile Durable' (MID) into Maurice Iles Durables (MisDs)*

Rodrigues, Agalega, Chagos and Tromelin and a number of islets all form part of the Republic of Mauritius and all the strategies and measures recommended here apply equally well to all these outer islands and islets, except if otherwise stated. Hence it is recommended to use the term Maurice Iles Durables, in order to explicitly convey the vision for all the islands and islets as a single entity. It is proposed to convert the term Maurice Ile Durable into Maurice Iles Durables MisDs).

4.0 Way Forward Towards Preservation and Sustainable Management of Biodiversity and Natural Resources

To achieve preservation and sustainable management of biodiversity and natural resources, the MID process should entail 1) knowing, conserving, and protecting the biodiversity and natural resources; 2) preparing strategies and policies for preservation and sustainable management; 3) creation of new and application of relevant existing legislations and their appropriate enforcement; 4) setting-up appropriate institutional structures for implementation and monitoring; 5) conducting capacity building, and research and development; and 6) adoption of good governance and best practices. In addition to the continued and unfailing government will, support and commitment, the short-term (0-3 years), medium-term (4-7 years) and long-term (8-10 years) priority measures enlisted below should be taken for preservation of biodiversity and natural resources.

A. Short Term Measures (2012-2015)

Top priority should be given to knowing, conserving and protecting the Biodiversity and Natural Resources and these should be addressed in the short term as follows:

- Identify and inventory the terrestrial and aquatic biodiversity
- Conduct a full survey and an impact study of all terrestrial and aquatic exotics
- Prepare GIS maps of the terrestrial and aquatic ecosystems of the entire Republic
- Create ecological corridors and river corridors that link river reserves to provide a larger habitat and a wider geographical range for the distribution of riverside plant and animal species
- Increase forest cover
- Ban land clearance near reservoirs and catchment areas and reforest
- Protect mountain ecosystems and mountain biodiversity
- Assess the sustainable carrying capacity of ecosystems and the impact of development on these ecosystems
- Develop mechanisms for sustainable waste management

- Conduct studies for protection of threatened species
- Increase effectiveness and efficacy of border control and quarantine
- Develop a national strategy for conservation of agro-biodiversity and utilisation of local biodiversity
- Increase food security
- Revise the "Land Productivity Enhancement Scheme" announced in the 2011 Budget Speech
- Validate and promote traditional knowledge
- Promote organic agriculture
- Protect local germplasm and maintain native genetic diversity
- Restore and protect wetlands, including caves
- Implement Islets Management plans
- Establish a clear definition of 'ecotourism' relevant to the local context

B. Medium Term Measures (2016-2020)

Since development of relevant policies, strategies, legislations and capacities for implementation purposes require appropriate resources and a long time period, the following need to be undertaken in the medium term:

- Declare certain strategic areas as 'protected', and centralise their management for greater protection and conservation
- Develop codes of practice to be applied in newly designated protected areas and for other activities
- Review and revise policies related to land issues
- Develop strategies for integrated renovation and development around and within existing urban infrastructure must be developed
- Conduct a Gap Analysis, review, update and harmonise existing legislation and regulations.
- Remove discrepancies and harmonise laws to make it easy to understand by the public and enforceable by the authorities.
- Create a new Ministry – the Ministry of Ecology and Sustainable Development
- Develop and promulgate a single common law – The Biodiversity Act
- Promulgate regulation to have 25% green areas in all new developments
- Implement fully the ICZM plan

- Reactivate the GIS Unit under the PMO
- Regulate the EIA system for greater effectiveness
- Implement the Blue Flag programme for beaches and marinas
- Adopt measures to prevent decline in fish stocks
- Establish an Environment Monitoring and Management Unit/System for monitoring, evaluation and enforcement
- Develop a mechanism to formally recognize the contribution of NGOs and CBOs
- Develop indicators and milestones for environmentally sustainable activities, and provide incentives
- Develop capacity in terms of human and technological resources, infrastructure, tools, and funding
- Promote specialized training in selected specialist areas
- Promote training to potential entrepreneurs in the food production sector
- Review the role of the National Empowerment Foundation (NEF) in funding environmental projects
- Review and revise environmental education in the curricula
- Intensify public awareness campaigns on environmental protection, including biodiversity issues
- Promote greater local Research and Development
- Provide adequate funding for Research and Development

C. Long term Measures (2020-2022)

In the long-term, to maintain preservation and sustainable management of biodiversity and natural resources, properly enforced legislations, relevant operational institutions for implementation, monitoring and evaluation, integration and collaboration and good governance are imperative. The following prioritized main proposals should be implemented:

- Establish an Environment Court
- Acquire compulsorily certain areas of high biodiversity importance for preservation purposes
- Designate one authority/ institution to achieve proper coordination and integration of Nature Reserves/ National Parks

- Implement existing environment-related strategy and action plans; integrate biodiversity protection into other national developmental plans and regional cooperation programmes
- Integrate protection and conservation of biodiversity and natural resources into national development plans and regional cooperation programmes
- Encourage intra- and inter-institutional/ sectoral collaboration and sharing of data, information and resources
- Develop a MID Charter
- Develop and implement a Mauritian Sustainability Index
- Ensure good governance, transparency and accountability and inculcate ethics and values at all levels to encourage environmental protection
- Ensure transparency while dealing with all aspects of natural resource management
- Adopt a participatory democratic approach for decision-making involving biodiversity and natural resource management and use
- Develop and promote ethical and moral values among leaders, decision /policy makers, and individuals in all dealings
- Develop and promote the concept of Green Employment
- Convert 'Maurice Ile Durable' (MID) into Maurice Iles Durables (MisDs)

Discussions of participants were mainly focussed on reviewing, revising, and harmonising legislations and regulations relevant to biodiversity protection, and their implementation. Working sessions strongly emphasized on research to be conducted on gaps, reviewing, updating and harmonising existing legislations and regulations under a to be created or a newly re-structured **Ministry of Ecology and Sustainable Development**, which among other responsibilities will develop and promulgate a single common law – the Biodiversity Act. The same Ministry will also be mandated to regularly review and update the role and responsibilities of relevant implementing Authorities. In order to provide an adequate and appropriate protection and conservation of habitat, species and genetic biodiversity, the participants highlighted that it is imperative to have a regularly updated inventory of both terrestrial and aquatic biodiversity, including an assessment of invasive alien species and their impacts. It was suggested to identify already degrading habitats in order to set appropriate rehabilitation of biodiversity before irreversible damage is incurred.

In the same line of understanding, participants proposed creation of ecological corridors, development of the concept of carrying capacity, and undertaking of specific sectoral and integrated restoration measures. The working sessions indicated the importance of appropriate continued capacity building for relevant Ministry Officers, non-governmental organisations, enforcement authorities like National Coast Guards and the Police Force, and other stakeholders along with provision of required resources, be they financial, technological, infrastructural and human capacities, greater local research and development, and enhanced intra- and inter-institutional or sectoral cooperation for sharing of data, information and resources.

Participants discussed the operational mechanisms for implementing MID Vision with respect to biodiversity and natural resources protection. Proposals from participants entailed setting up of a locally adapted Environmental Monitoring and Management Unit for monitoring, evaluation and enforcement. It was suggested to set up an Environmental court and have appropriate regulations for progressive Environment Impact Assessment (EIA) to achieve greater effectiveness. Declaration of strategic areas as 'protected' and centralising their management for better biodiversity protection and conservation was one of the key discussion elements of participants.

The working sessions highlighted that existing environment-related strategies and action plans and to be implemented and also integrate biodiversity protection into other national developmental plans and regional cooperation programmes.

In order to track the progress of implementation of upcoming MID, participants proposed the development of appropriate qualitative and quantitative indicators and milestones for environmentally sustainable activities. Regarding the future development of MID, the working groups pointed out that a short, simple and clear MID Charter that embodies the right principles and vision of a sustainable island has to be developed. Furthermore, it was proposed to develop and implement a Mauritian Sustainability Index that would encompass the natural environment and its linkages with human health and wellbeing, economic development, social and societal resilience, political stability, good governance, and others.

To ensure a sustainable environment for a sustainable society, participants emphasized on the promotion of good governance, transparency and accountability, inculcating ethics and values

at all levels of environmental/biodiversity protection. Good governance was defined as being based on participatory, transparent, responsive, consensus-oriented and equitability for well-informed decision-making. Other important points raised by the participants were promotion of the concept of green employment and conversion of MID to "Maurice Iles Durables" (MIsDs).

In a nutshell, to achieve adequate biodiversity protection and conservation under the MID context, the Republic of Mauritius needs to address issues including fragmented legislations, insufficient enforcement, setting of appropriate milestones and capacity building. To ensure sustainable development of our country, a proper mechanism (financial and structural) has to be developed and set up to take into account of the uniqueness, fragility, potential benefits, and protection and conservation of biodiversity along with governmental and non-governmental stakeholders' participations in each and every immediate and near future development plans. Our terrestrial and aquatic biodiversity needs to be effectively assessed, managed, protected, monitored, and used in a sustainable and equitable manner. Mauritius has to develop a holistic and coherent approach to promoting research, protection and conservation of biodiversity for sustainable development. Laws and legislations of our country pertaining to biodiversity preservation and use of its associated resources have to be harmonized with the exigencies of sustainability for the natural and manmade environments. Well-considered and carefully integrated planning and implementation of legislation, equitable access to and use of natural resources (land, water, green spaces), and protection of Biodiversity under appropriate Biodiversity Act have to be mandated for appropriate implementation and evaluation under a proposed new Ministry of Ecology for an unfailing promotion for sustainable development. Last but not least our country needs to foster an appropriate change in mindset for equitable sharing, compliance with legislation and regulations, accordance of due recognition for use of natural goods and services, and a sense of good governance, responsibility, ownership and stewardship towards the natural environments and their existing biodiversity.

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Annex 1. Recommended Actions for Biodiversity and Natural Resources Protection for the Short Term, Medium Term and Long Term.

Themes/Issues	Recommendations	Short Term Actions (0-3 years)	Medium Term Actions (4-7 years)	Long Term Actions (8 – 10 years)
Terrestrial Biodiversity: Forests, Mountains and River Reserves				
Discrepancies in the legislation; Fragmentation in responsibilities among organisations	Review the legislation, and the role and responsibilities of implementing authorities.	Conduct a Gap Analysis. Update and harmonise laws. Allocate clear mandates to each institution/ Department	Set up a Ministry of Ecology; Promulgate a Biodiversity Act.	Enhance regional cooperation with surrounding islands and collective actions among islands having similar biodiversity issues (Reunion/ Comoros/ Madagascar/ Seychelles).
		Amend The Forest and Reserves Act to include tree protection on private grounds.	Reinforce existing capacity for monitoring	Provide greater policing capability to this specialized on-the-grounds Forestry unit.
		Some aspects of the National Forest Action Plan are going to be reviewed by an external consultant.		Review existing policies and update regularly. Communicate updated policies to all stakeholders. Incorporate policies into legal frameworks.
Legislation /regulation that appears in one law/ Act cannot be duplicated in another law/Act		Set up a Biodiversity Unit for coordination between Ministries/ Departments (FS/NPCS/Fisheries/etc). Formalise contribution of research institutes and NGOs.	Establish one common law - "The Biodiversity Act" - that will comprise of all the legislation relevant to biodiversity and its associated resources issues, including coastal zones, forests, mountains (which are considered as wetlands) and mangroves. One of main objectives of the Biodiversity Act will be to protect biodiversity on mountains and rivers.	Establish a Ministry of Ecology and Sustainable Development, to be responsible for all biodiversity related matters. This will house under one body all relevant legislations and departments that are currently scattered between Ministries. The Minister in charge of Ecology should be a specialist/ technical/ scientific person with expertise in the environmental field (Does not

				need to be an elected MLA, may be nominated)
Policing and Enforcement. Staff of the Police de L'Environnement is currently at 9 for the whole island since 2009. Hence, there is insufficient manpower and inadequate expertise for adequate environmental policing and enforcement		Empower existing staff to deal more efficiently and rapidly with enforcement matters	Review staffing structure to include more persons with expertise in environmental auditing, pollution assessment, forestry. Recruit technical people and provide them with usual police training.	Extend the presence and enforcement of the Police de l'Environnement unit in each district. Ensure that the policing service operates round the clock. Review and upgrade the operation of this policing unit to for undercover and night operations.
Cases sent to the Environmental Appeals Tribunal take too long to be resolved (court meets only in the afternoon and is not well structured)	Appeal cases must be fast tracked	Hire magistrates and lawyers specialised in environmental law.		Convert the current Environmental Appeals Tribunal to a full fledged Environmental Court. Make it more structured and recruit more technical specialists to deal with the appeal cases. Provide better infrastructure and more manpower.
Under the shooting and fishing leases, a leasee can arrest a poacher, but usually is not aware of further action to take.	Powers of arrest need to be streamlined. This issue is being presently discussed at the Ministry of Fisheries and Rodrigues to give more power to the leasees The review will apply to terrestrial leases as well (Dawson-Shepherd,)	Review legislation regarding powers of arrest, and clarify duties of lessees with respect to powers of arrest.		
Insufficient knowledge about priority geographical areas for		Provide greater accessibility to LAVIMS, and also building and land use maps and imagery.	Create a web based dynamic GIS mapping system to incorporate (i)	Reactivate (perhaps with help from external experts) the Remote Sensing Unit at

environmental protection and action.			existing land use data (ii) forest extent data (iii) distribution of rare plants and animals (iv) mangrove distribution (v) flood prone areas (vi) high risk areas for pollution (vii) distribution data of invasive alien species (viii) mapping of all rivers, streams and rivulets of the island with plans of constructions in place near and within river reserves (ix) mapping with high definition of coastal areas with current developments and spatial indication of future developments (x) mapping of prime agricultural land and wetlands.	Bigara. Re-establish the GIS unit and place it under the PMO rather than any Ministry. Develop and run full time professional certification courses in GIS/ Remote Sensing/ ArcGIS/ Idrissi/ OpenSource uGIS) at the University of Mauritius for participants from diverse backgrounds (physical and natural sciences). Also run similar courses on part time basis for in-service staff of various Ministries, NGOs, private sectors, etc.
Leased/private land, if declared as being 'Protected' automatically becomes the property of the state			Owners / leasees, who can guarantee appropriate action for protection and conservation of land, should be allowed to retain the ownership/ leaseeship of the land, even if so declared.	Implement the PAN project, which includes regulation on this issue
Municipality and District Council field workers sometimes cut	As per the legislation, they are required to inform the Forestry	Provide training to this category of staff on identification and importance of native species	For those cutting down trees willfully, the present penalty of paying	

down native trees (through ignorance) while clearing river reserve and other areas	Services, however this is not practical, since such cleaning works are done often		three times the value of the wood should be increased substantially to discourage felling of trees along river reserves	
There are existing constructions within river reserves, which increase risk of flooding and flash floods.		Review the Rivers and Canals Act with respect to legislation regarding construction on/ near river reserves. Take prompt preventive /punitive actions and streamline procedures for same	Implement and enforce the legislation strictly	Enforce strict legal measures e.g. if an illegal construction is found on a river reserve, structure to be pulled down and river reserve restored at the cost of the developer/owner.
There is Insufficient emphasis on river reserves and rivulets		Increase native forest cover along waterways and river reserves, and road reserves with native spp. Replace trees removed from road reserves with natives. Plants translocated should be ≥ 1m in height. Alternatively plant in a high enough number to offset the number of natives that get cut down and/or stolen		
		Establish a Development Plan that identifies ESA/areas of high agricultural and/or environmental value. Promote and increase capacity for native plant propagation for use in development projects. Develop lists of native plants to be grown in different agro-climatic zones for various types of development projects, with details of appropriate translocation stage/size. Establish local, community-based nurseries, state nurseries, NGO- owned nurseries.	All development projects must be required to have an accompanying reforestation programme, for instance, building a 'Green Belt', or building a plant nursery alongside new developments, e.g. NeoTown, Highlands. Green space – 25% as a minimum with native cover catering for different strata. Maintenance – Syndic, community involvement, local government, independent body. Legislation for developments with limited space to meet the	

			25% limit, must undertake restoration in an existing forested area or create a nature park in an alternate site in Mauritius.	
There is lack or insufficiency of application and enforcement of legislation.	Planning Policy Guidance must be applied for residential and individual home development.	Enforce strict adherence to PPG Review and implement construction norms	Encourage vertical development, and novel home designs for roof gardening. Provide incentives for individual households and residential units.	Review policy on extraction of water from river, building dykes, etc
	Undertake large-scale landscaping along high way, roads, commercial buildings industrial site	Build capacity in landscaping Support nurseries to enable larger amounts of planting materials		
	National Development Strategy already taking all into account.	The entire system of forestry, land use, land conversion, legislation, allocation/ renewal of leases, etc. must be reviewed and reworked for more coherence.		
Presently, there is only < 2% of good quality native forests left	Must be increased substantially. Reforestation of river reserves could increase forest cover by 2-3%.	Detailed, comprehensive, scientific survey of existing forests, particularly in private lands. Removal of IAS must be made a priority issues. Strong emphasis to be given to this issue in all projects as being imperative for forest restoration and biodiversity conservation. Afforestation of marginal lands. Reforestation of existing forest land. Impose setting up and financing	Target for a 0.5% increase in good quality native forest cover annually. Legislation for tax rebates, carbon tax, REDD and REDD+.	Target in the long term for a 30% overall forest cover out of which 7% must be high quality native forest cover Set up a management system modeled on the French Parcs Naturels Regionaux to ensure efficient operations and management based on the principles of sustainability. Island in SWIO to collaborate

		of CMAs by corporates (fencing must be strongly discouraged). Promote Ecotourism, Cultural Tourism, Scientific Tourism as a means to revalorize certain regions and ensure sustainable use. Liberalise management of protected areas to include non-state actors.		
Lack of coordination between and among Ministries and other institutions		There must be more active collaboration between the various Ministries that include biodiversity related domains.	Reinforce the National Plant Genetic Resource Committee into a National Biodiversity Committee	
Mauritian rivers are in a piteous state, with excessive loss of native freshwater biota.	River reserves must not be fragmented between land owners, and their management must cover the full length of the waterway.	Review the Rivers and Canals Act.	Prepare the Biodiversity Act	Reactivate the Rives and Canal Committee , under the eventual Ministry of Ecology
		There must be integrated development and management of all river reserves; including those in private lands (the 'syndic' can be mobilized to implement appropriate management measures).	Forest Services must effect regular, unwarned site visits across the island to ensure that protection and conservation is maintained.	
		Inventory must be prepared of the freshwater biodiversity, including the vegetation along the river banks.		
People build on river reserves in their private land illegally and inform Forestry Services later. This		Need to educate the Mauritian public for protection of river reserves falling in their land. Review water rights.	Enforce legislation strictly	

makes it difficult to take protective action.				
People make use of river reserves for certain subsistence/ commercial activities, e.g cattle rearing		More enforcement with regards to illegal rearing of cattle.	Prevent any commercial, household and rearing activity with potential toxic effluent discharge near waterways.	
The specified building setback is not always respected and moreover derogations are often granted. This leads to adverse effects on the ecosystem.		Stringent application of the law. If deconstruction required, so be it with reforestation at the owner's cost. Ensure patrolling on river reserves		
Protection of mountain tops and slopes		Punitive measures specified in the law must be applied strictly for illegal logging. Prioritise IAS removal and reforestation with native species.	Increase the protection range currently listed as "Mountain tops". Provide financial incentives for private owners to restore and protect forest land on mountainous regions. Ban all developments (IRS/ERS) on mountain and hill slopes. Integrate a mountain atlas in a Dynamic GIS system to cover base maps, district maps, geology, drainage, eco-regions, relief, elevation, major habitat, land use and land cover, infrastructure, settlement and watershed maps.	Enhance the role of public-private partnerships in funding and management of mountains as ecosystems for ecological and social services as well as sustainable ecotourism. Create and encourage development of Mountain Village Associations regrouping villages surrounding mountains for cooperative action– conservation and restoration work; awareness, educational and touristic tours; upland/lowland nexus co-management. State owned mountain areas to be listed as Nature Reserves, with compulsory land buy-back/acquisition for isolated peaks that serve as

				ecological stepping stones.
Ecological Restoration of hills	Emergency response planning	Compulsory acquisition of Bassin Blanc (this is the only lake which has no development at all, and this should be preserved) for inclusion into the BRGP. Increase protection status for Trou Kanaka. Issue an immediate ban for any further development/construction in and around Grand Bassin. Inclusion of Grand Bassin in the BRGNP with due restoration of forested zones in the area that have not been touched/destroyed for more parking/temples/roads/etc.	Undertake updated studies with live-mapping of potential seismic activity under and around our volcanic craters, especially those close to highly urbanized regions. Full survey and mapping of true crater and non-crater volcanic cones, with mapping of land-use over and around these.	Include hills and others into a National Geotourism Plan – with local, Government employed or Government-mandated operatives. Review land use allocation and development permits around volcanic craters, leaving a safety and natural buffer zone all around. Buffer zones could be developed into natural parks and green spaces.
Caves are not given sufficient attention in terms of their protection (caves come under wetlands as per Ramsar Convention, but in Mauritius their problems are different-caves have no management, wetlands are being degraded fast) Caverne Patate in Rodrigues is unique in the Mascarenes regarding the big area of Aeolian Calcarenite	Develop protection and conservation plans for natural caves and cave ecosystems To treat caves and wetlands issues separately to foster cave management, which is presently non-existent	Declare the limestone area east of Anse Quitor nature reserve (including the Reserve) as a protected area.	Submit this site to UNESCO for a potential natural heritage site	

(Limestone) with many caves and very interesting surface features and conservation.				
Presently no one body/organisation is mandated with the responsibility of protecting caves		Designate an appropriate body/ organisation responsible for caves		
		Re-actualise findings and proposals from the "Caves of Mauritius Project" (1998). Use the Dynamic GIS tool to map caves, pipes and lava tunnels of Mauritius and Rodrigues. Assess caves in terms of their specific values and potential uses (conservation, recreation, science, education, tourism, water supply, etc.) Determine optimum use of each cave.	GIS mapping to include information pertaining to location, ownership current land use and biological contents with photographic records and virtual recreations. Prepare management plans on the future use of each cave, including reservation. Education and publicity campaigns in relation to caves and their conservation	Inclusion of specific legal clauses (ideally in the all-encompassing Biodiversity Act) on caves, their management, protection, protection of contents and above-ground land use prohibitions, dumping prohibitions. Inclusion of caves under forest cover into Nature Reserves or creation of Mauritian 'SSSIs'. Hiring of specialists for definition of educational syllabus and material on caves, their monitoring and risk assessment. Designation of a specified unit to deal with caves and their management. (eventually Ministry of Ecology, long term)
Wetlands are being	Loss of wetlands must be	Designate an appropriate body/		

lost at an alarming rate	urgently halted. and a project for large scale restoration of wetlands must be initiated	organisation responsible for developing and undertaking such a project.		

Aquatic Biodiversity				
	To develop an appropriate platform/ compendium of research for dissemination to the public in layman language.	Create a database of these projects and identify actual actors of the projects To identify legislations and guidelines gaps through proper research List projects from the public and private sector	To establish accessible meta-database with all reports pertaining to aquatic biodiversity research/projects deposited Create website to share knowledge	Create a monitoring committee to collate, evaluate findings of long term monitoring of aquatic monitoring and disseminate the information on the long term
	To develop a comprehensive list of aquatic species of the Republic of Mauritius	To reinforce short, medium and long term assessments to monitor changes over time with respect to human activities and climate change impacts Flora and Fauna listing (freshwater, marine, cave systems, brackish) Non-invasive and IAS listings are necessary Introduction of legislation for introduced aquatic pets, example fish, snails, etc.	Reinforce and consolidate database of Mauritius Herbarium. (especially for aquatic flora) Mauritius Institute had a good mollusks collection: To create and expand on a systematic aquatic collection / Museum of Natural History for collection of aquatic organisms	Monitoring
	To establish an appropriately defined Biodiversity Act under a proper Authority to preserve, protect and make the rest of the Authorities respect	To introduce a new Ministry, for example the Ministry of Ecology with a non-elected nominated appropriately qualified Minister and this Ministry will act as an umbrella to develop, adapt and		

	aquatic biodiversity accordingly	implement all appropriate rules, regulations and legislations pertaining to aquatic biodiversity protection.		
Agriculture				
Food security and safety must be increased	Increase self sufficiency in major food crops - garlic, onion, potato, pulses, and maize.	Set different targets of self sufficiency for short, medium and long term. Revise the "Land Productivity Enhancement Scheme" announced in Budget Speech for 2011 to prioritise use of available land, including those land having conversion rights, to existing and new farmers for food cultivation purposes. Ensure transparency in the allocation of agricultural lands for food production and also for other land use. Ensure transparency in the workings of the technical committees and the Ministerial Committee on Land Productivity Enhancement Scheme to encourage stakeholders to make representations. Make an independent review, monitoring and evaluation of the use of the Food Security Fund. Implement all the recommendations in Food Security Fund Strategic Plan (2008-2011) and the	Develop an indicator for food security. Increase R & D on locally suitable technologies for increasing food production, e.g. integrated nutrient management, integrated pest management, better irrigation systems, better cropping systems, developing/ promoting short statured fruit trees, etc.	

	Encourage production of local vegetables and fruits, e.g. brede mouroung, jackfruit, breadfruit, amla, avocado, banana, pawpaw, grenade, etc.	Sustainable Diversified Agrifood Strategy (2008-2015). Encourage local production of "potato seed"(minitubers). Encourage ecological kitchen gardening and other household gardening models set up by AREU, through provision of incentives (composting, infrastructure, set up pilot projects, 50% grants). Set up an independent body to monitor agricultural state lands that are left uncultivated, and take appropriate action (e.g. lease out to farmers). Promote regular, easily accessible, regional courses in horticulture, organic food production and home food production. Encourage local vegetable seed production based on national standards to ensure seed supply in periods of crisis. Promote consumption of local vegetables and fruits. Sensitise people about healthy eating – consumption of fresh vegetables and fruits. Provide local organic foods in hospital kitchens, school canteens, etc.		

		Educating the youth on the benefits of good and healthy eating practices. Encourage sale of banana, pawpaw, starfuit, pineapple, guava, seasonal fruits, cherry tomato, processed / boiled breadfruit/ taro/ cassava, etc in school and college canteens.		
	Protect agro-biodiversity	Reinforce gene banks and set up in-situ conservation of fruit species. Declare those sites where collection of local agro-biodiversity exists as protected conservation sites / heritage sites.		
		Windbreaks must be planted for agricultural plots, and preference must be given to rapidly growing native/ endangered species. Prepare lists of native /endangered species that can be planted as windbreak in different regions of the island.	Regroup small farmers to enable creation and management of ecological corridors through individual field boundaries.	Gradual replacement of exotic species used as windbreaks by native, fast growing ones. Reduction in pesticide use
		To set up a Biodiversity Fund to help in cases of droughts or other relevant natural calamities		
	Tap traditional knowledge (crop varieties, locally adapted animal breeds, trap crops, storage practices, etc)	Use traditional varieties and breeds in plant and animal breeding program. Promote production and marketing of underutilized fruit species (jambos,		

		jamblon, jamalac, tmarin, carambole, breadfruit, grenade, fig, jackfruit and others) Caution was drawn as some of them are invasive; need to strike a balance between food security and biodiversity protection. It was suggested to better use Elocarpus, Combava as local non-invasive fruit species. A good example is the naturalized fruit species of citrus in Rodrigues. Stop the plan of onion plantation in Agalega, unless it is for local consumption only.		
	Promote and facilitate agro-processing to extend availability of seasonal produce and reduce postharvest losses of agricultural products	Set up common post-harvest/ processing facilities for micro entrepreneurs (as per international standards/ norms). Provide continuous training on processing technologies.		
	Enforce standard in food safety and encourage farmers/ agro-processors to adopt safety Guidelines such as HACCP / Quality Assurance Scheme	Provide continuous training of agro entrepreneurs in Hygienic guidelines and HACCP and capacity building in self auditing Support farmers and agro-processors to adopt Quality Assurance Scheme	Review the whole system of food distribution and marketing	
	Promote sustainable agriculture. Promote agro-ecology	Develop standards and indicators for sustainable agriculture Reduce use of synthetic agro-	Introduction of more severe laws concerning accidental cane burning which is against sustainable	Encourage planters to make their own compost with their agricultural wastes

	principles.	chemicals (e.g. reinforce the law to include penalties and fines of farmers contravening regulations and recommendations) Develop a strong, professional apiculture industry for benefits in crop production (and also bee-derived products). Encourage export of local honey through appropriate measures to ensure compliance with European standards and norms. Foster a farmers' compliance with respect to fertilization. Encourage farmers to do rapid soil analyses prior to fertilization. Laboratory facilities need to be made available to farmers. Encourage R & D on environmentally-friendly methods of pest control (e.g. botanical pesticides, biological control, bio-pesticides, etc), on soil health and fertility management technologies, on more efficient irrigation systems, etc. Increase use of bio-products (e.g. grant tax exemptions). Encourage farmers to apply fertilisers based on scientific principles, e.g. Carry out	agriculture. Increase qualified staff responsible for food safety issues. Post FSO in all Municipal and District councils with regular CPD programmes. Ensure a 24/7 service with undercover and night duty officers responsible for food safety. Legislation to require all planters and middlemen (arcanteurs) to be registered as a business.	

		foliar and soil nutrient / acidity testing to tailor their fertilizer applications and/or soil amendment practices accordingly. Provide incentives for bio fertilizer plants in Mauritius using local micro-organisms. Conduct aggressive campaigns and education of the farming community and the general public on the benefit of bio products. Create marketing opportunities for planters producing bio produce. Develop environmentally sustainable solutions to control of fruit bats and birds. Restart and continue the national fruit fly control programme on a continuous basis. Promote farm planning, soil conservation and fertility management, based on scientific principles. Establish record keeping practices particularly with respect to use of fertilisers and pesticides – cahier parcellaire. Need to ensure that sales of agro-chemicals are controlled; retailers of pesticides need to be appropriately registered and have to keep a record of who is buying how much of		

		pesticides from them. A proper business norm has to be established to enforce control on pesticides sales in Mauritius. Conduct assays to ensure quality control of imported agrochemicals. Carry out regular analyses of pesticide and fertiliser residues in all foods. Laboratory facilities need to be made available by government. The agricultural sector need to issue license to farmers to ensure better control of application of fertilizers and pesticides Carry out a study on possibility of using treated waste water. A list of appropriate crop plants is needed.		
	Promote Organic Agriculture	Establish local standards and norms for organic produce. Set up a monitoring certifying body. Establish a Mauritian organic label. Create market for local organic or certified food products (e.g. hospitals, clinics, hotels, etc.)		
	Promote production and marketing of compost/ enriched compost/	Introduce composting worms and evaluate them under local conditions. Some are invasive		

	vermicompost	and thus need to be carefully evaluated prior to application.		
	Promote multidisciplinary approach to agricultural research and holistic farming systems that integrate ecology, natural resources management, social, economic, environment and cultural aspects	Involve farmers in all agricultural research.		
	Promote Good Agricultural Practices	Establish a national Code of Practice (COP) and Good Agricultural Practice (GAP), and harmonise it with private standard as GlobalGap/ EuroGap. Promote awareness of COP and GAP. Provide incentives to farmers, e.g. training and technical support, to adopt the COP and GAP and use safer agricultural technologies.	Enforce legally binding Code of Practice for Good Agricultural Practices.	
	Promote implementation and adherence to GAP principles in both export and domestic-oriented agriculture to improve market access.	Support farmers to ensure compliance to GAP principles e.g. through certification schemes.		
	Promote food safety	Review the food safety control system in Mauritius and define role of institutions. Establish legally binding quality control and traceability systems at all		

		levels (farm to fork) and legislate for all food products, including imported food products. Promote the implementation of Codex Alimentarius standards in Mauritius. Implement the legislation regarding cold chain management. Carry out regular analyses of local foods at all levels (farm, distribution and retail) as well as imported foods for compliance with food quality and safety standards (including pesticides, fertilisers, heavy metals, and microbiological contaminants). Communicate analyses results to farmers, exporters and importers. Encourage certification of farmers and other food producers to quality assurance schemes. Encourage participation of Mauritius in regional and international standard-setting organizations dealing with food safety and quality standards / schemes.		
	Build capacity at all levels	Increase lab capacity for food safety analysis. Provide funding for specialist equipment.		

		Provide trained and skilled manpower. Provide funding for running costs.		
	Promote cross border initiatives	Encourage collaborative development of food production systems in the region.	Promote further South-South cooperation and explore new trade/ regional markets	
	Review land use particularly with regarding to large areas of sugar cane fields subject to abandonment , or unsustainable land uses, in environmentally sensitive areas	Undertake careful land use planning taking into consideration economic, environment, social and cultural issues. Undertake regeneration of degraded land through use of cover crops.		
	Encourage further livestock (milk and meat) production to reduce imports	Encourage production of small animals (e.g. rabbits, turkey, quails, guinea fowls) at household level. Encourage setting up of multiplier farms to provide stock (ducklings, calves, kids, etc). Strengthen veterinary services to provide efficient support to address animal health and reproductive problems. Encourage integrated livestock waste management through biogas/ energy production, composting and production of added value products, such as enriched compost. Set up appropriate mechanisms/norms to	Encourage setting up milk and meat processing units Setting up of an insurance scheme for livestock breeders (sudden death) Farm genetic conservation and utilization (local goat and local cattle) Implementation of a disease surveillance platform Promote use of alternative feed resources in animal production Conduct socio-economic and technical analyses of livestock farms	Implement a comprehensive livestock breeding programme Set up of a structured marketing system for meat, milk and their related products Set up an integrated livestock management

		discourage illegal slaughter and slaughter of breeding females. Promote fodder production and browse species on wasteland and study possibilities of producing high value animal feed locally. Encourage and enforce cold chain management and good marketing structures to ensure food safety and quality. Encourage setting up of a traceability system from farm to fork for animal products. Encourage adoption of bio-security measures to limit threats of existing and emerging pests and diseases. Promote animal welfare, e.g. housing norms and good animal husbandry.		
Small planters are abandoning sugarcane cultivation. Mauritius is losing an ecological product.	MAAS plan must be implemented, particularly regarding reforestation and developing agroforestry systems on marginal lands. Sugarcane plantation being still a viable crop and being a soil retaining plant should be encouraged in Mauritius.	Implement pilot agro-forestry and native forest restoration pilot project on ex-sugarcane lands. Planters should be given more incentives. e.g. increased share in special sugars, bagasse and molasses produced per ton	Implement reforestation and agro-forestry systems on lands released from sugarcane cultivation in marginal areas.	Convert land use to forest derived products for ex small planters e.g. organic mushroom production, bee keeping
Existing law specifies that 5% of the state land leased for deer	The 5% statement is unclear and thus must be clarified from Forestry	Clarification must be sought and made public to all stakeholders		

farming can be developed for pasture. However, it is unclear if this refers to 5% undergrowth clearance or complete deforestation of 5% of the area and replanting with pasture species.	Service and made clear to all stakeholders.			
The practice of fragmentation of leased areas results in greater areas of land being cleared for pasture.	Such fragmentation must not be permitted.	Review leasing regulations – including pasture ground, clearing for "patte poule"/ brisee, deer heads.	Conduct long term studies on the real impacts of development activities on leased lands on the continued provision of ecosystem services and their quality.	
Deer are stocked at much higher densities than specified	There must be herd control, with subsequent monitoring and enforcement of stocking density.			
The entire deer farming activity must be reviewed	Alternative management strategies must be used, e.g. use of feedlots, herd control, using optimum stocking density, etc	Encourage closed system rearing		
There is a need to maintain a balance between forest and deer production. The aim is to produce meat as a by-product of forestry.	Keep deer out of high quality and mid grade forests. The Forestry Services should ensure that the ecological equilibrium in State and private forests is maintained, and monitor for strict compliance with lease agreement	Responsible organization should ensure enforcement and take necessary action if a lessee is in contravention with the lease agreement.	Conduct an in-depth review of deer activities and develop a clear policy so that this economic activity does not threaten ecosystems as they do (damage to plants, loss of seedlings, soil erosion, water quality, etc). Deer ranches can support conservation if well done e.g. low stocking density, fenced areas, strict pastures/restored native forests, etc.	

Aquaculture:	To develop more inland aquaculture than in situ marine and freshwater aquaculture in order to avoid the dangers of accidentally release to the surrounding environment.	To identify a comprehensive list of environmentally and commercially acceptable species for aquaculture. To identify adequately studied and appropriately selected sites, with minimal or almost no impact on aquatic biodiversity To identify and involve all interested stakeholders in aquaculture projects	To strengthen capacity building, that is training at various levels of all stakeholders involved To establish appropriate guidelines that take into account technical, environmental and social considerations To issue permits based on appropriate legislations and guidelines for respecting aquatic biodiversity	To conduct monitoring, an ongoing process, of environmental, economic and social impacts
	To appropriately define and introduce more stringent legislations for aquaculture.	Assess actual EIA procedures: strengths and weaknesses Develop code of conduct and impose conditions on the permit Mitigate the impact of already introduced aquatic alien spp. by government authority or farming company? Eg. crayfish, ombrine, bar. For all aquatic activities, EIA should be preceded by a scoping report.		

		Assess the impact of actual fish farms on the environment Introduce on already developed farms progressive EIA Impose progressive EIA conditions for any new farms Reinforce the specificities for monitoring of lagoon/seawater/freshwater quality Cost benefit analysis and effectiveness as well as risk assessment of aquaculturable species. Promote aquaculture of local species. Regulate and issue permits for collections of fry e.g. cordonnier.		
Invasive and Alien aquatic species:	To produce an adequate and appropriate list of aquatic invasive species in an information system to meet appropriate and adaptive management.	Create an aquatic pest control unit based on AIS Committee. Undertake an inventory of all introduced aquatic species (flora and fauna). Establish short, medium and long term impacts of introduced aquatic species through ongoing and regular impact assessment.	Map distribution and movement of aquatic IAS.	Monitoring of entry and spread. Mitigate spread and distribution.

	To introduce appropriate control mechanisms and legislations for introduction of commercial aquatic exotic species through ships and pet/aquarium trade.	Finalize legislation to control ballast water management to prevent introduction of aquatic species.		
	Ballast water as a source of alien species	Study impact of ballast water as a source of alien species	Establish means to mitigate the impact of ballast water of the marine biodiversity	
	Other sources of introduction of aquatic species e.g. through biofouling			
	Establish principle of shared/full responsibility for introduction of aquatic species			
Fisheries:	To provide further incentives through the government for fishermen to go off lagoon in order to reduce over-exploitation of lagoons. Monitoring of different fishing practices and locations need to be reinforced.	To review incentives for alternative income generating activities To set and respect appropriate targets To encourage traditional artisanal cage fishing Encourage FAD fisheries	To eliminate inappropriate fishing practices e.g. gear like spearguns, castnet Capacity building	
	To increase control on illegal fishing	To eliminate inappropriate fishing practices To reinforce capacity (human and equipment) of fisheries protection services		

		To provide appropriate education and sensitization campaigns To train and appoint rangers from local communities given their indigenous knowledge and rich local experience To monitor performance of these rangers		
	To strictly regulate fishing on banks	Evaluate bank fisheries impact of the resource Review quotas for adaptive management and sustainable fisheries On site monitoring of banks for poachers Reinforce Vessel Monitoring Surveillance Capacity building for NCG should be extended to include all aspects of aquatic biodiversity, aquatic ecotourism, to empower them to implement and enforce appropriate legislations. This training could be extended to police force. Review the period of close seasons		
	To declare St Brandon as a marine protected site with least delay	To make St Brandon an ecological model for preservation and protection of aquatic biodiversity. Establish a long term research field station on each outer island (i.e. Agalega, Chagos, St Brandon, Tromelin) and banks To enforce measures in particular as concerns turtles given the IOSEA Marine turtle taskforce MoU signed by Mauritius		
	To evaluate amateur/leisure fishermen's impacts	Call back and collection of all banned No1 fishing hooks Registration of amateur fishers in process by AFRC		
	Enforce control Shells and corals collection.	Enforce ban on collection Ban imports		
	Proclamation of Marine parks and fisheries reserves to increase fish stocks, e.g SEMPA			

	project in Rodrigues Restoration of lagoons (coral rehabilitation ongoing by AFRC and MOI) under AAP of GEF for increasing lagoonal fish numbers Setting-up of voluntary no-take zone.			
	Reassess the potential of freshwater fish culture and promote consumption of freshwater cultured fish but good quality water is limited			
Sustainable Tourism and Ecotourism (Terrestrial and Aquatic)				
Concept of Ecotourism is not well defined nor clearly understood	Develop an official definition of the term 'Ecotourism' taking into account the following : 1. Small scale and low impact tourism 2. Community participation 3. Strong linkages, cooperation, partnerships 4. Authentic experience 5. Preserve local culture 6. Learning and education 7. Use and sell local produce	Encourage other forms of tourism, e.g. cultural tourism/ community-based tourism, educational tourism, agri-tourism, therapeutic tourism, etc. Develop guidelines for ecotourism based on ecological corridors, indigenous cultures	Promote and develop a plan for integrated Geotourism (volcanoes, lakes, caves, mountains, reefs). Assist local entrepreneurs i.e farmers to diversify into agri-tourism.: financial marketing, training support	

	8. Employs and generates income for locals 9. Eco-friendly processes i.e packaging, marketing, waste management, construction			
		Establish the legal framework to enable funds/ taxation from these activities to be awarded for R & D, and conservation and community-development projects Redirect the funds generated through ecotourism back for the protection of biodiversity, and enforcement of legislation for the same.	Further studies to be carried out on environmental, social and economical impacts of the tourism industry	
		Promote, good quality, small/ medium scale tourism instead of mass tourism.		
Promoting Sustainable Tourism	Develop a natural and equitable tourism geared towards the local communities.	Develop a genuine cultural ecotourism industry, e.g. Employ local guides with real and advanced knowledge of the local sites, promote dining at a local residence (table d'hote, Grandma's Kitchen, etc.), paying guest system.	Develop guidelines for Sustainable Tourism encompassing all forms of tourism, medical, cultural, educational, etc.	
		Manufacturing and sale of local products must be given priority.	Authenticity and proximity of ecotourism is needed, i.e. tourism should be more integrated into community	

	Ensure reduction in water usage and energy consumption, recycle water and waste.	Develop and adopt an EMS, defined on local requirements for all tourism activities, Promote international recognition of local EMS (as is done in Costa Rica, Seychelles, and elsewhere)		
	Enhance 'green' areas inland through reforestation.	Review use of marginal lands and abandoned lands in urbanized regions to reforest and convert into nature spots that also serve as ecological corridors and stepping stones for biodiversity Use existing policies as foundation	Ensure a continuum of native species-rich green areas across urban sprawls to link large stands of forests (NW/NE/SW/SE). Use same continuum to link rivers/freshwater bodies and intercoastal regions.	Review land use and land allocation in a way that green space and ecological corridors are created and maintained as a long term venture, with maximal population involvement, with integrated services and facilities to incorporate nature-based leisure and tourism.
	Build capacity	Provide regular education and training on the concepts and principles of sustainable tourism and Ecotourism To develop a Mauritian label for ecotourism and train local ecotourism guides		
	Promote intersectoral and intrasectoral collaborations	Develop partnerships, e.g. between a hotel and a local planter for the supply of local organic produce To review "all inclusive packages" so that both hotels and local communities can benefit		
	Improve existing and local infrastructure.	Provide environmentally-friendly transportation system, toilet facilities, buildings, littering (bins), etc		

Leisure and Recreation	Develop green spaces for public recreation in towns and rural areas	Identify green large areas for parks with playing fields, children's play areas, pets corner Identify and adopt greenways where footpaths and cycleways link green spaces Protection of old trees in towns or alongside roads including exotic trees	Collaboration of private and public land owners for provision, management and maintenance of these green spaces.	
	Protect heritage buildings including small colonial houses	Identify heritage buildings/houses in towns and villages that needs to be maintained Sensitize public about value of maintaining cultural heritage	Provide incentives for owners to maintain houses such as financial support for renovation	
Aquatic Eco-tourism:	To determine carrying capacities of touristic areas and used for proper management and sustainable development	To determine and set the carrying capacities for different activities per site and per season, for example, dolphin watching, undersea walk catamaran and others Introduce permits or recommend affiliation to relevant clubs, eg. for kite surfing Propose legislation for permits and clubs to interact sustainably with the environment To set the right tourism quality and optimum blend	To set the right tourism quality and quantity Strict conditions to be attached to permits issued – all conditions to be met/respected for permit to be valid	
	To determine carrying capacity of tourists that Mauritius can support sustainably	Assess target fixed by government - 2 million tourist in 2015 for Mauritius To establish tourist capacity for Rodrigues	Re-establish proper air-links for tourism	

		Identify problems related to this statement and assess max carrying capacity of MRU		
	To create more green employment opportunities – 'green fingers', local labor, enenvironmental managers in industries	To make provisions for generation of alternative incomes for fishers		
	To have all hotels and other tourist accommodation adopt appropriate sustainable management systems	To establish a Mauritian label for environment management system (EMS) To adopt an appropriate sustainability indexing and benchmarking, for example 'Blue Flag' for beaches and bathing zones	Reintroduce SEA before Rio 2012. Capacity building for consultants in conducting and assessing SEA and officers in Ministries evaluating SEAs. Set up database for outsourced expertise in EIA/SEA (principally local). Implement EMS	To monitor through independent audits and public reports, for example ongoing EIA process including post-implementation of project
	Encourage tourism industry to adopt carbon off-set programs	Evaluate ecological footprint of industries in the tourism sector	Tax rebates, eco-labeling recognized internationally Independent and external auditing with enforcement capacity	Legislation to define 'carbon-zero' labels. Control on false publicity
Effluent discharge:	To set appropriate legislations for recycling of effluent waters for irrigation purposes as well as water use and runoff from golf courses while respecting the assimilative capacities of our natural ecosystems.	To put in practice existing legislations Review and gap analysis of legislation for effluent discharge Bio-physico-chemical monitoring of discharges pre and post irrigation. To transparently report findings to public/concerned	Dynamic mapping of soil types in the context of soil permeability and water pathways from source to sea All golf course setups to come with an obligatory nature (70% of space) network creation with	

		stakeholders. Implement international labels for golf courses e.g Audubon Golf Certifcation, EU label.	endemics – set ecological corridors	
	To promote centralized sewage disposal and individual treatment systems under strict regulations	To connect all new development projects to a centralized sewage treatment plant system	To investigate more efficient mini and micro sewerage disposal systems To set a 50% target by 2015 for all coastal development areas to be connected with the set system	To target 100% of the coastal development to be connected to the sewer system
Natural Resources - Land				
There is a need to review certain legislation and policy	Provide more transparency in all dealings concerning land	All parliamentary members must play a more active role in ensuring transparency in all dealings concerning lands		
		Stop conversion of prime and agricultural land into non-agricultural land use, unless the land use is reversible		
		Approve and implement the Sustainable Land Management National Action Plan		
	Review existing leases	Ban leasing of lands around water reservoirs for agricultural practices or reclaim these lands Reclaim and put to use all use private owned, unmanaged scrub lands Re-use abandoned tea lands		
		Undertake compulsory acquisition of land for inclusion into the BRGNP e.g. Bassin Blanc and Mt Cocotte		
		Proclaim the Pas geometriques	Proclaim Bambous MR	

		Choisy near Bras d'Eaux as a national forest Proclaim the area spreading across Yemen-Magenta as a national park	as a National Park Promote Public Private Partnership for Yemen-Magenta	
	Promote Ecological Corridors to protect biodiversity	Designate areas along river reserves to create ecological corridors Conduct a full and independent survey of vegetation, geology and fauna present in Roche Noires with a buy-back proposal by the Government before this last extensive remnant of coastal forest is lost		
	Promote Sustainable Agriculture and Organic Agriculture	See section on Agriculture above		
The National Development Strategy 2002 is being reviewed	.	Consult all stakeholders Ensure inclusion of biodiversity and ecological aspects in the reviewed NDS Ensure regular reviewing and updating of the NDS to reflect changing situation		
		Establish a land zoning system for bad neighbourhood activities e.g. power plants, animal rearing, and farming	Implement a Land Bank for information on State lands and non-utilised non-agricultural land	
	Investigate the possibility of land swaps, e.g. swap an ESA with another one that is not designated under ESA Bill.	Proclaim the ESA Bill Include the provisions of ESA bill into the proposed Biodiversity Act Ensure regular communication as to the prevailing status of ESA Bill Implement provisions of ESA		

		Bill rapidly once it is proclaimed		
	Reduce upland soil erosion to prevent loss of fertile topsoil and also prevent flash floods	Monitor and map forest loss and degradation uplands and adjacent to agricultural areas. Review building permits allocated within flood prone areas Develop and promote sustainable technologies for soil health and fertility management, no-till, contour planting, terracing, mulching, etc.	Maintain and upgrade drainage systems especially in flood prone areas	Review watershed management upstream. Use public-private partnerships as a means of managing mountains and slopy areas in a "water and mountain initiative" in order to reduce erosion
	Develop a better and well managed land use planning system	Update existing land use maps, and make publicly available to all	Map and assess currently underused buildings. Implement strategies to review renovation of underused buildings for increased space use, energy and water use and general efficiency	Implement strategies for integrated renovation and development around and within existing urban infrastructure. Review reallocation of space in urban areas with drawing up of long term modernization plans within existing urban sprawls that should be made public and subject to public participation
	Disseminate information regarding all catchment areas to EIA consultants to help them provide the appropriate advice to their land promoter/developer client	Reforestation and ban tree cutting in all catchment and peripheral areas. Update information on catchment areas Repeat the point about Land productivity & enhancement scheme		
		Prepare a dynamic GIS map system of the entire island to help manage and protect natural resources. Make LAVIMS available online even if against a subscription fee. Updates from all stakeholders and institutes. Establish more cooperation between organisations (public and private), use and share info from LAVIMS, Remote Sensing participation from India and		

		SADC, ground truthing, updating regularly.		
Natural Resources –Water				
There is a plethora of relevant legislation and responsible institutions.	Government should adopt an Integrated Water Resources Management strategy, based on the Singaporean model, and review legislation and regulating authorities relating to water resources. The Ministry of Energy and Public Utilities is presently formulating a Water Act A Master Plan is in preparation by international consultants and is due in November 2011 with options to develop water infrastructure	Adopt an Integrated Water Resources Mgt Strategy Carry out review of legislation and authorities Formulation of a Water Act	Adopt an Integrated Water Resources Mgt Strategy Carry out review of legislation and authorities	
		Rationalize all water rights Redefine river reserves (e.g. start of slope line); demarcation of rivers must take into account the vegetation on the banks		
Water demand management	Pricing policy must be reviewed.	Develop a water pricing mechanism that can help in water demand management, and will give special financial consideration to low-income groups. Price rate must be higher for higher use		
	Inadequate water storage capacity	Master Plan. Construction of Bagatelle Dam (end 2011). Legalise, regularize, and develop artisanal fishing in the reservoir	Construction of Riviere des Anguilles Dam (end 2012)	

		There must be stricter controls and implementation of regulations with regards to waste/rubbish disposal in waterways, drains and in public areas More water efficient irrigation systems		
	Water Resources	The catchment area of Bagatelle Dam must be mapped and protected to prevent a similar situation as Mare aux Vacoas from developing in the future	Hydroelectricity Better control on water abstraction Control activities around the catchment area to limit contamination and pollution	
Rain is the only source of water for the country. Change in rainfall pattern and intensity	There is a need to develop rainwater harvesting systems	Stop deforestation. Promote reforestation and restoration of catchment and river catchments with native species Redirect urban runoff and storm drain water for use by industries, agriculture, etc.		
		Government must set a good example by making it obligatory for all government owned buildings (and also leased buildings) to have rainwater harvesting structure, and to encourage similar practice in all parastatal and private buildings		
		There must be enhanced sensitisation and legislation for proper water demand management, and management of systems, to increase		

		efficiency of use and avoid wastage		
		All invasives that are water-greedy (e.g. *Ravenala*, privet, some species of eucalyptus, etc.) be removed and planted with native, less water-demanding species. Studies should be carried out on the extent of water uptake by such plants		
Water losses in the potable and irrigation distribution systems		CWA and Irrigation Authority water supply infrastructure must be repaired and updated		
Alternate sources of water	Better treatment of waste water to expand its possible uses (with appropriate measures put in place to ensure water quality and safety)	Promote desalination central stations that group several hotels rather than the present small units for individual hotels		
	Investigate possibility of desalinization	Take into account Best Practicable Means and Best Application Technology		
		Reforestation using native species within catchment areas to induce additional precipitation		
Freshwater biodiversity is not given sufficient importance	The aspect of freshwater biodiversity must be included in all strategy and action plans	Define institution responsible for freshwater biodiversity	Carry out a complete inventory of freshwater biodiversity (some cursory studies exist)	
	Rivers need to be considered together with their catchment areas			
		Width of the river reserves specified in the law must be increased. Set up a technical		

		multi sectoral committee. Set up a stewardship system – that will also consider private owners		
Natural Resources – Protection of Local Germplasm				
Issue of GMOs is highly sensitive and controversial. It is highly technical and not well understood by the majority of the public	Organise a public debate on GMOs	Provide training and awareness-raising about GMOs among the general public Put in place mechanisms for GMO traceability. Build capacity for GMO identification and detection. Enforce the GMO Act with proclamation of the regulations. Finalise and approve the Comprehensive Biosafety Framework	Organise a public referendum with regards to the import and use of GMOs Conduct research on socioenvironmental and health effects of GMOs	
GMO Act exists, but regulations have not yet been proclaimed	Regulations must be proclaimed and implemented	Set up an independent Biotechnology Institute and provided with required legal framework Strengthen the Plant Genetic Resources unit		
	The State needs to be more proactive in protecting germplasm	Life forms cannot be patented but access to and benefit sharing of genetic resources can be developed Species or varieties can be registered as a trade mark and IPR Act can be applied	Make more funds and resources available for local germplasm research and conservation	
Vache creole is kept Cabri l'ile Ronde is already lost Chilli and lemons of Rodrigues need protection. So also Rodrigues' sheep	There is an urgent need to conserve local agrobiodiversity e.g. local plant species and varieties, and local animal breeds	Revalorise underutilized local fruits and vegetables, and maintain their germplasm e.g. Coeur de boeuf, cassava, bread fruit. Maintain Germplasm for local animal breeds		

Onion toupi is being encouraged				
		Increase use of biotechnology for finding solutions to certain problems		
		Maintain and manage the Crop Museum of the UoM Declare it as a National Heritage, together with the those stations of the MoAFS that have important floral and faunal collections, e.g. Barkly, Roches Brunes, Bois Marchand		
	There is need for carrying out studies on morphologic and genetic makeup of species	National Biodiversity Committee to define collaboration between the different institutions such as Ministry – Agricultural Services Plant Genetic Resources, Forestry Service, NPCS, AREU, - UoM, MSIRI Herbarium, SSRBG, Vallée Ferney, Vallée d'Osterlog Gardens		
The Seed Bank project of Mauritius, funded under the Darwin initiative, was listed as one of the best in the world for the 3 years that it ran		Provide funding and local expertise for maintaining seedbanks of native species Botanical gardens should be national heritage sites with one multi-partite body/institute responsible for their management	Ensure continued collaboration of Kew Gardens in maintaining the seed bank for Mauritius and enhancing its capacity Create a permanent and long term facility for housing of the Seed Bank project, with full time dedicated staff	Make the seed bank a Mauritian reference in the world

Coastal Zone Management:				
To set up a control mechanisms for use of lagoon and coastal areas to avoid/minimize deterioration of biodiversity resources and conflicts among coastal users	To introduce permits or oblige affiliation to appropriate clubs in order to exploit coastal space for example for kite surfing, boating, fishing and others To demarcate appropriate zones for activities as approved by existing or new legislation and regulations/guidelines To promote/reinforce use of less polluting engines for boats To maintain ban on the use of water scooters	To implement appropriate legislations and regulations To apply all principles set by the Integrated Coastal Zone Management Committee Implement, evaluate and disseminate findings of long-term monitoring of quality of aquatic resources/health	To set up a control mechanisms for use of lagoon and coastal areas to avoid/minimize deterioration of biodiversity resources and conflicts among coastal users	To introduce permits or oblige affiliation to appropriate clubs in order to exploit coastal space for example for kite surfing, boating, fishing and others To demarcate appropriate zones for activities as approved by existing or new legislation and regulations/guidelines To promote/reinforce use of less polluting engines for boats To maintain ban on the use of water scooters
	Ensure at least 25% of the coastline is protected	Survey and mapping of the coastal line occupancy Creation of more MPAs. In process of proclaiming south west coast Restoration of coral reef systems in MPAs in process	Beach resource centres on principal public beaches for awareness on environmental protection. Capacity and lead to be given to NGOs Create more Voluntary Conservation Areas – community participation, no extraction, community policing	
	Traffic Cargo and petrol carriers	Evaluate cargo boat and ship traffic around Mauritius.	Marine highways downwind and downcurrent – has to be on the west coast of Mauritius Evaluate impact of existing traffic lines on	Emergency Planning and Contingency plans for potential oil spills.should be included for short, medium and long term

			biodiversity e.g. sperm whales	
	To set present limit for construction in the coastal zone from 30m to 60m as a regulation in issuing of building permits; adequate and proper geotechnical surveys on dune/sand stability	Evaluate sufficiency of having only 30m construction setback. Evaluate advantages and feasibility of doubling construction setback.	Review policy in relation to findings Create relevant legislation Capacity building for enforcement measures and monitoring Speed court cases for breaches	Link to creation of an Environmental Court. Create an environmental review tribunal
	To ban the use of basalt rocks for gabions and revetments on coral beaches.			
	Strengthen monitoring of coastal hotel projects to ensure strict compliance with EIA license, planning guidelines and other national strategies	Improve EIA monitoring Capacity building of EIA monitoring committee To reinforce Tribunal		
	There is a need to monitor boat houses, particularly the practice of cleaning of boats and its impact on marine biodiversity			
	Ongoing mangrove replantation has to be further encouraged	To include both species of mangrove prevailing along the Mauritian coast and not just *Rhizophora* sp.		
Legislation for aquatic biodiversity and resources:	Identify gaps in legislation and guidelines, lack of harmonization	Audit of the actual legislation and identification of overlaps and gaps Audit of mandates of all departments /ministries involved in the marine		

		resources and biodiversity (Fisheries, Environment)		
	Penalty sanctions for contraveners of the legislations	Monitor various ongoing biodiversity related business activities Evaluate impact of actual penalties on activities and re-assess if necessary. Introduce compulsory community service as a penalty for minor environmental breaches.		
	To re-visit and revise/review some legislations and penalties pertaining to MPAs to make them more stringent and efficient. Procedures have started under UNDP/GEF project	To implement regularly reviewed and harmonized legislations and guidelines		
	To develop appropriate IPR for aquatic resource exploitation	Though currently State Law Office regulate research in the field of bioactive compounds from marine resources for example sponges, corals and others, IPR access and sharing need to clarified.		
Capacity building for aquatic biodiversity and resources:	To increase and facilitate the involvement of NGOs, CBOs and other appropriate stakeholders concerned with aquatic biodiversity	To help create a sustainable funding mechanisms for NGOs, CBOs and other appropriate stakeholders concerned with aquatic biodiversity To help provide incentives that will ensure sustainability of NGOs, CBOs and other	To help increase visibility of achievements by NGOs, CBOs and other appropriate stakeholders concerned with aquatic biodiversity through regular national TV and radio programmes -	

		appropriate stakeholders concerned with aquatic biodiversity. For example, VAT exemption, non-commercial fees applied to rental of phone lines and internet access	temps d'antenne dedicated.	
	Any sort of lagoon reconstruction/zoning need to involve the fishers as agents for monitoring and marshalling – for instance like rangers Fishers are already consulted (AFRC). But fishers are interested in compensation issues	Could be an alternative for fishermen in MPA. Introduce co-mgt for MPAs		
	Staffing and training	Reinforce existing staff of Fisheries post and provide adequate facilities to the Fisheries Protection Officers for enforcement		
Islets Management:	The Islet National Park and Strategic Plan has been completed	Approve management plan by cabinet. e.g. Flat Island Allocate resources for implementation (human resources, material) Survey on leasing activities on the islets Survey on sustainable carrying capacity of islets for recreational activities. Promulgate and enforce legislation to require all lessees to participate in islets	Further develop Management Plans and extend restoration programs to other specified islets Promote sustainable tourism as regards to the carrying capacity	Monitor cumulative impact of tourism development of islets Promote islets as a global laboratory of good practice in ecological research, eco-education, conservation and eco-tourism Monitor and evaluate leassees impact on the islets

		conservation and protection for long term sustainability Regular patrolling by NCG for access to all islets. Clarify role and responsibility of NCG with respect to managing or patrolling islets. Need to properly staff the NCG Forestry Services to monitor ongoing activities on closed Nature Reserves		
		Review access to islets through beaches that can allow introduction of species. Need to clarify legal status /control/legislation to these beaches		
		Clearly define responsibility of islet management for each islet	The Australian model for islet management could be locally adapted	
		Ambiguity of Nature Reserves and National Parks need to be clarified	Need to harmonise relevant Acts. For example eight islets are under Nature Reserves Act, while others recently have been declared as National Parks	
Cross Cutting				
There is insufficient capacity and expertise to study EIAs thoroughly and to do post-project monitoring for compliance with EIA.		Provide training to existing staff and/or recruit trained and specialist staff in the MoESD, the Forestry Services, AFRC, AREU (and also in other relevant organisations) to ensure implementation and enable enforcement of the various		

		regulations.		
There is insufficient R & D activities in specific areas	R & D capacity must be enhanced in all the organisations/ institutions concerned with biodiversity issues, and at all levels	Regulate and enforce provision of funding for R&D. Resolve and implement the issue of IPR		
There is unsatisfactory access to research and other relevant data and information	data and information generated must be made available easily and freely to all	Establish a centralized storage facility for all research data and information Identify an institution to take the lead. Dissemination of research data and findings		
	Interactive GIS maps of the island must be developed, and made freely available to all stakeholders			
Institutions are officially designated as National Focal Points for specific aspects, but are not given the appropriate lead	Designate leading expert institutes for specific sectors and empower them	Strengthen the Mauritius Herbarium through funds to operate more efiiciently Reinforce human resource, infrastructure, and financial capability of the Mauritius Herbarium. Promote public awareness about the role of the Mauritius Herbarium, and make it easily accessible to all Mauritians	,	
	There must be more transparency regarding use of funds for all public and private sector environmental projects	Put in place a multisectoral impartial, and independent board to oversee all collection and distribution of national funds Make publicly available information regarding		

		availability and use of funds e.g. Conservation Fund, Tourism Fund, Environment Fund, MID Fund, etc. Promote, public viewing and independent evaluation of projects prior to allocation of funding Ensure regular monitoring and evaluation of projects Ensure that independently audited annual reports are prepared and made available for public scrutiny		
Concept of Green Jobs not yet applied	The concept of Green Jobs must be developed and implemented at all levels- specialist and technical It is feasible to create green jobs (responsibilities) by redefining existing jobs and training people	Revalorise existing jobs by renaming and restyling their job description, and providing appropriate training for increased responsibilities, e.g taxi drivers taking tourists sightseeing, etc. Carbon footprint capacity building needed	Create green jobs across all sectors and at all levels, e.g. gardening and other horticultural works, restoration work to specialist ecologists/ project managers/ environmental managers, etc.	
Incentives and taxation are important to encourage compliance with the principles of sustainability	Stress the positive measures (incentives) more than the negative (punitive, taxations, etc)	Increase availability of funding for grassroot programs e.g. roof top and vertical gardening for home food production; rain water and grey water collection systems and other clean energy facilities for home owners, SMEs, businesses Establish mechanisms for tax rebates, effective pro-rata, for corporate to fund conservation as well as R&D Establish a compensation plan	Implement a national mechanism for REDD and REDD+ Implement legislation for differential taxation for green and environmentally-friendly building and development ventures Provide incentives to property developers to set up native plant nurseries close to	Implement regional mechanisms for collaborative SIDS in the SW Indian Ocean to benefit together from REDD and REDD+

		along the lines of carbon credits to encourage sustainable practices	development site And also to small home owners to regroup into cooperatives to set up such native plant nurseries close by	
		Review current taxes taken and allocation of those funds – transparency and good governance	Implement a congestion charge system in Port Louis, and direct money so collected to restoration of Citadel and Signal Mountains, in particular Le Pouce	
	Ensure and transparency and accountability as regards use of such taxes collected	Taxes levied from one activity must be allocated in a transparent manner for improvement of that particular activity in a transparent manner Enable financial tracking of taxes e.g. tax levied on plastic bags must go to a plastic collection, sorting and recycling plant		
EIA is being perceived as a one-off, administrative matter, and also is taken too lightly	This activity must be better regulated, e.g. minimum qualifications for an EIA expert must be specified, all EIA experts must be registered with a Government authority, etc.	Establish a licensing body and public lists of EIA experts and consultants Promote fully transparent EIA license Introduce progressive EIA	Ensure that promoters and developers remain independent of the reporting process and write up process of the EIA	
	Entire EIA process needs to be reviewed and made more stringent	Provide brand image and market incentives to encourage companies to undertake EIA studies throughout project lifetime		

		Make obligatory scoping studies for all EIAs		
	Must give sufficient time for thorough evaluation of an EIA	Ensure that relevant Ministries have enough time to collate public comments and review all EIAs independently and free of promoter pressure		
	Must ensure post-project follow up and monitoring for compliance with measures specified in the EIA	Enforce provision to authorities for a regular Environmental Monitoring Plan, and enforce negative sanctions for non-compliance	Implement SEA for combination of development plans and long term view of combined effects and impacts	
Introduction of pet animals needs more stringent controls	Set up a separate unit for animal quarantine (on the lines of the NPPO)	Enforce a stricter system (as in Australia) Conduct Pest Risk Analysis (use the Biosecurity Technical Committee – BTAC). Install a scanner at entry points with stringent application of legislation. Enforce stricter examination and control of packaging materials and casings. Conduct a full survey of all exotics currently in the country and their status (captive, pets, wild/feral, etc)		
		Review and strengthen existing institutions to deal with all types of plant and animal pests entering the country and also inland. Unit would merge NPPO, animal control and quarantine services into a single force – greater and more efficient		

		allocation of resources, authority, jurisdiction, and knowledge base. Unit will require stronger policing unit to effect control checks on official and non-official entry points		
Prevention of entry of exotics and/or invasive must be strengthened	Need training and capacity building for NPPO to make speedy identification of species and a rapid risk assessment	Training to be provided by the Mauritius Herbarium in plant identification and MWF and the University of Mauritius for faunal identification		
		Maintain regularly updated lists of plant and animal species that can or cannot be imported into the country Implement urgently and fully the NIASSP Provide public access to the NIASSP and follow-up to oversee its implementation		
Allocation of CSR	CSR funds must also be allocated to environmental projects (proposed to change it to CSER)	To develop Sustainability Fund and sustainability reporting instead of just CSR		
	Choice of CSR allocation should be returned to the corporate bodies rather than be decided by Government	Review the role of the NEF to enable it to facilitate disbursement of funds for environmental projects in a transparent manner		
	Alternatively, PPPs should be encouraged, and budget implementation must be decided upfront and monitored for	Encourage PPPs for environmental and biodiversity protection projects after having *a priori* worked out the financial and co-ownership/co-management	Promote participation of local communities in geographical range of action of the PPP projects	

	compliance	Ensure clear allocation of funding and financial incentives for PPP to work on actions and strategies as defined in their mandates Ensure clear definition and implementation of financial sharing by parties of a PPP in actions set forth in their agreements		
Environmental education is not achieving its objectives	There is an urgent need to review environmental education at all levels	Review the curriculum for environment in the formal and informal education system Take environmental education out of the classroom and into the natural landscape. Develop capacity for imparting a strong grounding in environmental education in the classroom as well as outdoors		
Governance	Good governance has to be promoted	Consultations with all relevant stakeholders required before elaboration of appropriate policies		

Annex 2. Base Paper

1. Current Status

The following sections outline the situation of relevant sectors, and the status of the associated biodiversity.

The island of Mauritius covers an area of 1,865 km² or 186,475 ha. The total land area of the Republic is 2045 km², with an Exclusive Economic Zone of 1.9 million km².

1.1. Terrestrial

Mauritian biodiversity exhibits a high level of endemism, uniqueness, and species diversity (Table 1). However, Mauritius has a highly modified ecosystem due to pressures from human activities and natural factors, and less than 2 % of the indigenous forests are remaining today.

Table 1: Number of flowering plant species and faunal species in Mauritius

Species	Number of native species		Number of extinct species		Number of existing species	
Flowering plants	***Total***	***Endemic***	***Total***	***Endemic***	***Total***	***Endemic***
	691	273	61	29	630	244
Mammals	5	2	2	1	3	1
Birds	30	24	18	15	12	9
Reptiles	17	16	5	5	12	11
Butterflies	39	5	4	1	33	4
Snails	125	81	43	36	82	45

Source: Baider et al., 2010 reported in draft MEO, 2010

Among the extinct endemic birds of Mauritius is the world famous Dodo (*Raphus cucullatus or Didus ineptus*) which was exterminated by man and rodents around 1693. Of the 9 endemic birds, 8 are endangered: Mauritius kestrel, pink pigeon, Mauritius echo parakeet, Mauritius cuckoo-shrike, Mauritius black bulbul, Mauritius olive white-eye, Mauritius fody and Mauritius paradise flycatcher. Of the three species of bats (the only endemic mammals), only 1 (the Mauritius fruit bat) is left. Greatest concentrations of native reptile species occur on Round Island (gecko and skink species). Two indigenous snake species are highly endangered. The invertebrate fauna is not well known (except for molluscs and some butterfly species). Many of the known native invertebrates have become extinct and others are endangered.

IUCN has characterised Mauritius as a Centre of Plant Diversity and ranked it third in the world (after Hawaii and Canary Islands), for having the most threatened plant species. 89 % of the Mauritius endemic flora is considered threatened 40% of endemic species are considered to be seriously endangered due to (i) the invasion of aggressive exotic species, which were introduced to the island centuries ago (Chinese guava, privet) and the spread of exotics by monkeys and birds, (ii) encroaching agricultural land clearance, (iii) land needed for services and dwellings, (iv) clearing of forest for deer ranching, (v) land based pollution, and due to (vi) cyclones. Very little information exists on the impact of pests and diseases on Mauritian biodiversity, and it is likely that their effect on ecosystem degradation has been underestimated.

1.2. Agro biodiversity

Agriculture occupies about 44% of the total land area in Mauritius. The agricultural sector comprises of two main sub-sectors, namely the sugar sector (which includes cane plantation and sugar manufacture) and the non-sugar sector (which includes tea, tobacco, foodcrops, fruit, ornamentals and livestock). Some 90,000 ha (48%) of land is cultivated, with 93% of this area being under sugarcane production. The rest is under cultivation of food crops, tobacco, tea, fruits and ornamentals.

The share of agriculture to GDP has been continuously declining over the last decade i.e. dropping below 5% in 2009. The share of agriculture in the GDP is constituted by sugar production (50%), foodcrops (19%), livestock/poultry (14%) and fisheries (4%). The total annual food requirement of the country is 686,000t, of which about 23% is met by local production.

Agro biodiversity is directly linked to food security and broadly categorized into two main groups: sugar and non-sugar (i.e. vegetables, fruit, medicinal plants and livestock). The key threat to agricultural biodiversity is the loss of plant genetic resources as emphasis is being placed on a relatively small number of high yielding varieties and breeds and that field station lands for plant genetic resources activities are being released for development. These field stations contain valuable species and varieties and their release for development, may lead to the extinction of valuable genetic resources. Similarly, the introduction of Living Modified Organisms in the future could contribute to genetic erosion and loss of traditional crops. Furthermore, limited area and capacity, incomplete inventories and research, lack of inter-institutional communication and collaboration are also jeopardising agro biodiversity.

Agrobiodiversity is characterised by introduced crop varieties (686 varieties of vegetables, fruits and ornamentals), and animal breeds. During the past two decades, many new varieties have been introduced by individuals, farmers' organisations and institutions to obtain higher-yielding varieties with better resistance and tolerance to diseases and longer shelf-life, with the possibility of transformation or processing into value-added products. All these imported varieties are screened for diseases and sometimes grown under quarantine conditions at the National Plant Protection Office. However, some have done harm to existing open-pollinated long-established varieties of crops such as pumpkins. The wide adoption of newly-introduced higher-yielding varieties tends to displace old locally-adapted varieties. All farm animal genetic resources were introduced to Mauritius during the period of colonisation. The 'local' breeds found in Mauritius originate from these introductions.

1.3. Forestry

Mauritius has an area of 1,865 km^2, of which 56,400 ha (30%) is forested (of which 22,000 ha are state land). The area of good quality native forest, (i.e. that with more than 50% native plant cover), is estimated to cover less than 2% of the island (Table 2). The rest consists of plantation forestry, deer-ranches or highly degraded vegetation invaded by alien plant and animal species. As a result Mauritian biodiversity is amongst the most threatened in the world. The forests of Mauritius are small in area but perform vital functions, the most important of them being soil and water conservation. Forests also play an important role in carbon sequestration and in the conservation of biodiversity and wildlife. Mauritius is rich in endemic species. Consequently, conservation, protection, development of such species through sustainable management of forests and the environment are priority objectives of the overall national forest policy of Mauritius.

Table 2. Decrease in the forested area in Mauritius

Year	Proportion of Forested Area on the Island of Mauritius
1773	82.5 %
1835	50.7 %
1872	22.9 %
1935	5.7 %
1997	< 2.0 %

1.4. Islets

The Islets of Mauritius and Rodrigues have been classified as Open Reserves (multipurpose with an array of activities allowed, ranging from protection, conservation, research, eco-tourism, education, and public awareness to recreation), or Closed Reserves (strictly for the purpose of conservation and protection of native biodiversity and access is restricted to authorized personnel for the purposes of monitoring, enforcement and restoration of native habitat). The range of activities has been determined through consideration of each individual islet's potential and their current value in terms of its native species biodiversity, cultural importance, naturalness, habitat fragility, and current use and potential for restoration. Zonation of islets include the following categories :

Protection Only - Monitoring, protection and enforcement only

Restoration Only - Conservation management only

Limited Public Access 1 - Eco-tourism and scientific research, conservation management

Limited Public Access 2 - Education and public awareness, conservation management

Recreation. - Mainly recreation.

1.5. Tourism

To meet the target of 2 million tourists by 2015, pressure on the environment, particularly the coastal zone, will increase with development of new hotel/villas. Not all hotel developers comply with prescribed EIA conditions. Tourism growth will also result in increased water and electricity demand. Most small hotels and bungalows are not connected to the national sewerage network and their impacts on the environment have not been studied. Sea level rise and extreme weather events are aggravating beach erosion and are detrimental to tourism-related infrastructure. Tourist activities impact on lagoon ecosystems.

1.6. Marine

Mauritius has a coast line of 322 km, with 150 km of coral reefs enclosing a lagoonal area of 243 km^2. It has an Exclusive Economic Zone (EEZ) of 1.9 million $km^{2.}$ Fisheries, coral reefs, mangroves, seaweeds, and sea grasses make up the major living resources within the coastal and marine areas while the non-living resources include sand, lagoons for recreation and common salt.

Marine Protected Areas in Mauritius cover an extent of 7 190 hectares, including six fishing reserves and two marine parks. Their establishment and management provide for the long-term protection and conservation of marine biodiversity and the sustainable use of the coastal zone. However, the marine park management has no control over the activities taking place outside the park boundaries in the adjoining area. These activities may have negative impact in the physical environment and the resources of the park.

This coastal and ocean territory holds an immense potential for development and will play a vital role in the economic development of Mauritius.

Two Marine Parks have been designated, namely the Blue Bay Marine Park (353 ha) and the Balaclava Marine Park (485 ha). The six Fishing Reserves are as follows : Port Louis (331 ha), Poudre d'Or (2,542 ha), Poste Lafayette (280 ha), Trou d'Eau Douce (574 ha), Grand Port Zone A (1,716 ha), Grand Port Zone B (112 ha), and Black River (787 ha).

Marine biodiversity in Mauritian waters is rich, with some 1,656 known species. Table 3 shows marine biodiversity in Mauritian waters.

Table 3: Marine biodiversity in Mauritian waters

Coral Reefs	There are five types of reefs around Mauritius, namely fringing reefs, patch reefs, atolls, reef flats and barrier reefs. About 43 genera of hard corals are found on the reefs of Mauritius and a total of 159 species of scleractinian corals from 16 families have so far been recorded.
Fish	Out of 340 species of fish identified, 42 within the lagoon area are sold commercially. 7 species of *Penaeid* shrimps have been reported in Mauritian near shore waters as well as two species of deepwater shrimp and several species of sea stars and other echinoderms.
Algae	Over 160 genera of marine algae and a few species of seagrass have been observed in Mauritian waters.
Marine mammals	17 marine mammal species have been recorded in Mauritian waters - mostly as they migrate to and from Antarctica to warm tropical waters for calving. Dolphins and whales are also encountered in Mauritian waters.
Sea turtles	2 species of sea turtles are commonly encountered in the shallow coastal waters of Mauritius, the hawksbill, *Eretmochelys imbricata* and the green *Chelonia mydas*.
Shoreline birds	The Rivulet Terre Rouge Estuary Bird Sanctuary located in the north east of the island, near Port Louis Harbour is a tidal mudflat that is used by migrating shorebirds. Around 1,000-1,200 migratory birds visit this site each year.

Source: ICZM Strategy Report, October 2009

The Fisheries sector accounted for 1.2% of the GDP in 2009. Table 4 lists the fishing activities and the fishery resources exploited in the Republic of Mauritius.

Table 4: Type of fishing activity and fisheries resources exploited in the Republic of Mauritius

Main Fisheries	**Species exploited**
Bank Fishery	Lethrinids, snappers, groupers
Artisanal Fishery	Lethrinids, snappers, groupers, octopus
Semi industrial fishery	Snappers, groupers
Sports fishery	Marlins, wahoo's, tunas
Amateur fishery	Lethrinids, siganids, etc.
Tuna fishery in the Western Indian Ocean	Tunas and associated species

Aquaculture	Red drum and sea bream sp

Source: National Status Report on the Coastal and Marine Environment, 2007

Over the last 16 years, total fish catch (lagoon and off lagoon) has decreased by three folds, with a catch of 19,690 tonnes in 1993 and 6,978 tonnes in 2009 as shown in Fig 1. The total fish catch may decrease over the next 20 years if management measures are not implemented to conserve the valuable marine resources for future generations.

Fig 1. Total lagoon and off lagoon fish catch (in tonnes) (1993 – 2009)

Source: Ministry of Fisheries and Rodrigues, Fisheries Division

1.7. Freshwater

Water is essential for healthy living and is vital for economic development. In Mauritius, the main sources of water are rainfall, river and underground water. The island receives an average annual rainfall of about 3,700 Mm^3 (million cubic meters). However, owing to its topography, hydro-geological conditions and tropical location, Mauritius experiences high levels of rapid run off. Only 10 % of the precipitation goes as ground water recharge, while evapo-transpiration and surface runoff represent 30% and 60% respectively. Part of the surface runoff is conveyed to the impounding reservoirs, abstracted from rivers for domestic, agricultural and industrial uses and the remaining flows to the sea. Mauritius has a network of 25 major river basins and 21 minor river basins. There are 5 main aquifers, 11 reservoirs and 350 boreholes. The freshwater biodiversity of Mauritius is contained within 92 rivers and 232 rivulets, several manmade reservoirs, natural lakes and marshy areas. Following a survey carried out in 2002, 18 species of fish and 10 crustacean species were recorded in the main rivers of Mauritius. Three endemic crustacean species were also inventoried: *Cardina mauritii*, *Cardina spathulorostris* and *Cardina richtersi* (petite chevrette). However, most of these species are few in number.

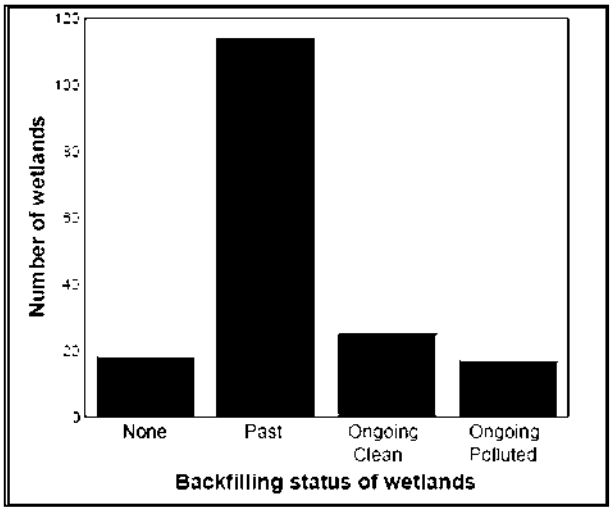
Many of the watercourses in Mauritius become overgrown with invasive plant species while in many cases, discharge and leaching of agrochemicals have promoted algae proliferation thus causing eutrophication. A survey conducted by the MWF on existing vegetation along riverbanks (January-February 2004) showed that watercourses and riversides have become degraded by invasive alien species, which have infested about 95% of river banks.

1.8. Coastal wetlands

There are 203 coastal wetlands in Mauritius and Rodrigues (Technical Report on Freshwater Wetlands, 2009). Backfilling of wetlands (Fig 2) for construction is affecting 90% of all wetlands and resulting in a reduction of biological habitats. A comparison of wetland area in Grand Baie over time revealed an estimated 23% decrease from 2000 to 2008 due to backfilling and increased

urbanisation. Flooding in Grand Baie and Flic en Flac has been exacerbated by backfilling of wetlands.

Fig 2. Wetlands affected by backfilling in Mauritius



Source: Technical Report on Freshwater Wetlands, 2009

1.9. Aquaculture

Aquaculture has the potential to play a determining role in the fisheries sector of Mauritius. Fish farming has increased from 68.2 tonnes in 1991 to 430 tonnes in 2009. An Aquaculture Master Plan was approved by Government in 2007 and the 2008-2009 national budget made provision for its development. Aquaculture activities are regulated by the Fisheries and Marine Resources Act 2007, as amended in 2008. All marine fish farming projects in the fish farming zones have to comply with operational guidelines for responsible fish farming practices and require an EIA licence. Presently, there are two medium marine and freshwater aquaculture farms. In addition, there are a number of smaller freshwater fish farms.

2. Policies and strategies

2.1. Cross Cutting for All Subthemes

2.1.1. Maurice Ile Durable Green Paper : Towards a National policy for a Sustainable Mauritius, 2011, MoESD.

2.1.2. National Biodiversity Strategy and Action Plan (NBSAP), 2006-2015 - Main policy and strategy document relating to biodiversity protection in the country. It includes the following thematic areas: forest, terrestrial, freshwater, coastal, marine and agricultural biodiversity as well as biotechnology and biosafety. The plans have an inbuilt independent review mechanism to enable adaptive utilisation of effort and resources to meet strategic objectives.

2.1.3. 1st (2000), 2nd (2003), 3rd (2006) and 4th (2010) National Reports to CBD - Updated reports of status, and national strategies and action plans regarding biodiversity in the country.

2.1.4. Mauritius Strategy for Implementation, National Assessment Report, 2010 - Initiatives taken to pursue sustainable development goals, with analysis of progress made, and constraints encountered.

2.1.5. National Environment Policy (NEP), 2007 - Establishes a clear policy framework and sets appropriate environmental objectives and strategies, including for conservation of habitats

and ecosystems, protection of native fauna and flora and enhancement of crop and animal production to meet food, health and other socio-economic needs of the growing population.

2.1.6. National Environmental Strategies (NES).

2.1.7. The National Physical Development Plan (NPDP) - An outcome of the Environmental Investment Program (EIP) to provide a framework for the spatial distribution of population, employment and economic activities. It is considered as one of the main instruments for guiding sustainable development and environmental interventions.

2.1.8. Climate Change Action Plan, 1999 - Proposes strategies and possible policy responses for the near-term and long term, which will allow Government to cope with the potential effects of climate change.

2.1.9. National Capacity Needs Self Assessment for Global Environmental Management, 2005 – Identifies national priorities and capacity building needed for national and global environmental issues, in particular, to enhance the capacity of Mauritius to meet its commitments under the three Rio Conventions.

2.1.10. First (1999) and Second (2011) National Communications to the UNFCCC, 1999 - Updated reports of status, and national strategies and action plans regarding climate and climate change in the country.

2.1.11. Study on Environmentally Sensitive Areas, 2010 - Comprehensive framework for protection and conservation of ESAs: marshlands, forests with native content, steep slopes, freshwater wells (boreholes), rivers and streams, lakes and reservoirs and caves.

2.2. Terrestrial

2.2.1. National Invasive Alien Species Control Strategy and Action Plan, 2010-2019 - Comprehensive and coordinated approach in the management of invasive alien species with a view to minimizing the negative economic, environmental and human health impacts of the species that threaten the ecosystem.

2.2.2. Thematic report on Access and Benefit Sharing – country status report on biodiversity IPR.

2.2.3. Thematic report on Alien Invasive Species, 2003 – status and impacts of alien invasive species, and national strategies and action plans.

2.2.4. First National Report to UNCCD, 2004. Country profile and status of land in the country.

2.2.5. National Action Plan for Sustainable Land Management (being finalised).

2.3. Agriculture and Food Security

2.3.1. Sugar Sector Strategic Plan 2003-2007 – Reforming the sugar sector to ensure its efficiency, viability, and competitiveness.

2.3.2. Non Sugar Sector Strategic Plan 2003-2007 – Reorienting and modernising non-sugar agricultural sector.

2.3.3. Food Security Strategic Plan 2008-2011.

2.3.4. Strategic Options in Crop Diversification and Livestock Sector, 2007-2015 - Increase food and agricultural production in a competitive and sustainable manner by 2015 through innovative production methods, novel product development while opening access to new markets.

2.3.5. Blueprint for a Sustainable Diversified AgriFood Strategy for Mauritius 2008-2015 – Facilitation for commercial production of crops and livestock for food security and quality, foreign exchange savings, ensuring sustainable development, and improving diet and health of the nation.

2.3.6. Multi Annual Adaptation Strategy; Action Plan 2006-2015 - Ensuring the long term viability, competitiveness and sustainability of the sugar industry through product diversification and cogeneration, and transformation of the sugar industry into a sugarcane cluster.

2.4. Forestry

2.4.1. National Forest Policy, 2006 - Protect and enhance the country's natural environment, biodiversity and national heritage, while at the same time promoting recreation and tourism.

2.5. Islets

2.5.1. Development of Management Plans for the Conservation and Management of Offshore Islets, 2004 – Conservation of five islets of the Islets National Park, and two not part of the Islets

National Park in order to restore, conserve and sustain (including ecotourism) their natural biodiversity.

2.5.2. The Islets National Park Strategic Plan, 2004.
2.5.3. Management Plans for eight islets individually.
2.5.4. The Rodrigues Islets Strategic Plan.
2.5.5. Report on Visitors Carrying Capacity and Plant & Animal Survey Results of the Islets.
2.5.6. Round Island Management Plan, 2008-2012 – Restoration of the island's palm-rich forest and hardwood forest, protecting the island's endangered plants and animals, using the island as a refuge for some endangered species.

2.6. Tourism

2.6.1. Tourism Sector Strategy Plan 2009-2015.
2.6.2. Hotel Development Strategy.
2.6.3. Tourism Environment Charter.
2.6.4. Design of Environmental Good Practice Guidelines for the Mauritius Hotel Industry : Handbook and Implementation plan, 2011.

2.7. Marine

2.7.1. 5-year Fisheries Action Plan.
2.7.2. Fisheries Management Plan (under preparation)
2.7.3. Second National Environmental Action Plan, several important projects have been commissioned to address various concerns within the coastal zone, namely:

- Bathymetry Maps and Habitat Resource Atlas for the Lagoon of Mauritius, 2004
- Study of Coastal Erosion in Mauritius, 2003 and
- Strategic Environmental Impact Assessment (SEA) for Identification of Potential Sites for Marinas, Ski Lanes and Bathing Areas for Mauritius.

2.7.4. ICZM framework for the Republic of Mauritius to effectively manage the valuable and pressurised resources through the :

- Development of an ICZM strategy for Mauritius
- Review and preparation of a national policy and comprehensive legislative framework
- Institutional strengthening and capacity building
- Preparation of Local Area Action Plans for six pressure zones,
- Preparation of Environmental monitoring plan and good practice guidance for coastal activities.

2.8. Freshwater

2.8.1. Premier inventaire des poissons et des macrocrustacés d'eau douce des principales rivières pérennes de l'île Maurice, ARDA, 2002.

2.9. Fisheries

2.9.1. National Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing, 2010.

2.10. Aquaculture

2.11. Potential for Sustainable Aquaculture Development in Mauritius, Board of Investment, 2007 – Promotion of aquaculture business projects in the country.
2.12. Aquaculture Master Plan, 2007 – Identification of sites, species, constraints, and production models.

3. Existing Legislation/Regulations

To protect native flora and fauna, the following regulations have been promulgated:

3.1. Terrestrial (including Agrobiodiversity, Forestry, Islets and Tourism)

- Environment Protection (Industrial Waste Audit) Regulations 2009
- Environment Protection Act 2002, as amended in 2008
- The Vallee D'Osterlog Endemic Garden Foundation Act 2007
- The Plant Protection Act 2006
- The GMO Act 2006
- The Tourism Act 2006
- The Dangerous Chemical Control Act 2004
- Planning and Development Act 2004
- Local Government Act 2003
- The Sir Seewosagur Ramgoolam Botanic Garden Trust Act 1999
- The Food Act 1998
- Wildlife Regulations 1998
- National Parks and Reserves Regulations 1996
- Wildlife and National Parks Act 1993
- Wildlife Act 1984
- Forests and Reserves Act 1983
- Mauritius Agricultural Marketing Act 1963
- Town and Country Planning Act 1954
- Animal Disease Act 1926
- Building Act 1919
- Mauritius Chemical Fertiliser Act

3.2. Aquatic (including Marine, Freshwater, Fisheries and Aquaculture)

The principal laws concerned with the management of the coastal zone are:

- Environment Protection Act 2002, as amended in 2008
- Fisheries and Marine Resources Act, 1998, amended in 2007
- Maritime Zones Act 2005
- Environment Protection (Standards for Effluent Discharge) Regulations 2003
- Environment Protection (Standards for Effluent Discharge into the Ocean) Regulations 2003
- Environment Protection (Effluent Discharge Permit) Regulations 2003
- Beach Authority Act 2002
- Establishment of the Mauritius Oceanography Institute (MOI).

4. Ongoing Projects and Activities

4.1. TERRESTRIAL

4.1.1. Protected Area Network (PAN) Project, 2009-2015. To expand and ensure effective management of the protected area network with a view to safeguard threatened biodiversity.

4.1.2. Sustainable Land Management (SLM) Project. To ensure land development for the various sectors of the economy in line with the principles of sustainability.

4.1.3. Management of Nature Reserves, National Park and Botanical Gardens-12 legally proclaimed protected areas: one National Park, seven Nature Reserves and four reserves, covering a total area of 7,292 ha. 16 offshore islets protected. 43 areas of native vegetation listed as priority areas for conservation management, whilst 20 areas of lowland native vegetation identified as requiring urgent conservation management and additional vegetation surveys.

4.1.4. Propagation of endangered plant species - Seven nurseries for critically endangered native species, among them 250 species (50 rare ones) of ferns and 86 species of orchids.

4.1.5. The Mauritius Seed Bank Project - started in 2006 under the Millennium Seed Bank Project and with the collaboration of the Royal Botanic Gardens (Kew), the NPCS and the Mauritius Herbarium (MSIRI) to conserve 300 native species (250 native species been conserved).

4.1.6. Reforestation programmes - 408 ha of new forest plantations created; 25 ha have been reforested.

4.1.7. Species recovery programmes for Critically Endangered birds - In addition to the 3 success stories, breeding of Mauritius Fody and Olive White Eye on Ile aux Aigrettes and their release on Round Island.

4.1.8. Translocation of reptiles to appropriate, predator-free islets - Telfair Skinks, Bojers Skinks, Orange-Tailed Skinks, Gunther's Gecko, Nactus Geckos.

4.1.9. Integrated pest management for agro biodiversity conservation - IPM against key pests of crucifers, onions, bean, banana and litchi.

4.1.10. Gene banks - Plant gene banks at MoAFS and Crop Museum at UoM.

4.1.11. Sustainable Land Management – Strategy and action plan for ensuring land development for economic purposes in line with the principles of sustainability.

4.1.12. Ramsar Site declaration.

4.1.13. Eprpv: Elargissement et Pérénisation du Réseau de Protection des Végétaux.

4.1.14. Initiative Régionale Agro-écologie Changement Climatique (IRACC). Regional project funded by the IOC, and involving the Indian Ocean islands and Zanzibar.

4.2. Marine

In order to promote sustainable use of the coastal resources and preservation of the marine biodiversity, the following initiatives have been undertaken:

4.2.1. Comprehensive legal framework for coastal zone management in place.

4.2.2. Many coastal activities are controlled by the EIA/PER mechanism.

4.2.3. Development of an ICZM Framework and a Study on ESAs for better management of the coastal zone.

4.2.4. Banning of sand mining and coastal rehabilitation works carried out over the last ten years to reduce coastal erosion.

4.2.5. Systematic long-term lagoonal water quality monitoring at established sites around the island.

4.2.6. Long term monitoring programme for coral reef ecosystem at established lagoon sites.

4.2.7. Proclamation of six fishing reserves and two marine parks.

4.2.8. Implementation of management measures for a sustainable fisheries sector.

4.2.9. Development of Oil Spill Contingency Plans to provide the framework for oil spill response.

4.2.10. 5 yr Action Plan; Fisheries Management Plan under preparation

4.2.11. Draft Law regarding marine mammals

4.2.12. Shoreline Management - Four km of coastal rehabilitation works, including soft measures (beach replenishment) and hard measures (rock revetments, gabions) at 8 sites. A further 3 km of shoreline being monitored and assessed for future coastal protection works. Vehicular parking been initiated at Flic en Flac, Belle Mare, Mont Choisy and Le Morne public beaches.

4.2.13. EU/IOC ReCoMaP project - Five-year regional programme (2006 - 2011) of the IOC for the Sustainable Management of the Coastal Zones of Indian Ocean Countries. Funded by EU for

18 million Euros. Involves improving the management of the natural coastal and marine resources with a view to reducing poverty amongst the coastal population of seven countries in the South West Indian Ocean region including Mauritius. Mauritius received support from ReCoMaP for:

4.2.13.1. Various micro-projects that were implemented by NGOs.
4.2.13.2. Sensitization of primary and secondary children on ICZM.
4.2.13.3. Awareness raising and sensitization for a clean and green environment.
4.2.13.4. Capacity building on ICZM principles, planning and policies, socio-economic monitoring programme.
4.2.13.5. CoReMo Coral Reef Data Base and others.
4.2.13.6. Development of a Tourism Development Strategy for Mauritius.
4.2.13.7. Feasibility study to start a small scale fish farming project.

4.2.14. UNEP/GEF WIO-LaB Project, 2004-2010 - Addresses land based activities in the WIO. Mauritius received US$ 310,000 for two demonstration projects, namely:

4.2.14.1. Solid Waste Management in the Port Area, where an incinerator has been installed in the Port Louis Harbour for the safe disposal of ship-generated quarantine wastes.

4.2.14.2. Use of native species to control soil erosion in the Black River Gorges National Parks.

In addition, a number of national reports have been prepared under the project. These include:

4.2.14.3. Status of Municipal Wastewater Management in Mauritius
4.2.14.4. Assessment and monitoring of water, sediment and biota quality in Mauritius
4.2.14.5. Preliminary assessment on status marine litter problems in Mauritius
4.2.14.6. Report on existing policy, legal and institutional frameworks with regard to management of land-based sources of pollution
4.2.14.7. Report on the status of ratification of international conventions relevant to management of land-based sources of pollution
4.2.14.8. Capacity building of national stakeholders has also been carried out though a number of training workshops.

4.2.15. MPA: A UNDP/GEF funded project entitled “Partnerships for MPAs in Mauritius and Rodrigues”, which aims at:
4.2.15.1. Improving management and conservation practices for MPAs.
4.2.15.2. Sharing equitably the benefits of MPAs to the local communities and economic operators.
4.2.15.3. Developing enabling policies and institutional frameworks for the sustainable co-management of the MPAs, and the development of a model co-management for a proposed MPA in Rodrigues.

4.2.16. MPA: The Indian Ocean Commission (IOC) has initiated a project entitled “Network of MPAs of the IOC Countries (2006-2010)”, which aims at: developing a regional strategy for biodiversity and marine resources management through eco-regional analysis; creating new marine protected areas and supporting existing ones; developing a regional forum of MPA managers as well as an awareness and communication strategy. Under this project, the biological inventory of Balaclava Marine Park was carried out and it is now envisaged to undertake the demarcation of the zones in the park.

4.2.17. African Monitoring of Environment for Sustainable Development - Funded by EU and coordinated by AU, involves bringing earth observation data closer to the African community, through acquisition of a satellite receiving station. This will enable fishing authorities identify and map potential fishing areas as well as develop a database on marine meteorology and physical models to help in the case of marine hazards.

4.2.18. South West Indian Ocean Fisheries Project. Regional project for mainstreaming biodiversity in national and regional fisheries management.
4.2.19. Western Indian Ocean Maritime Highway Development and Coastal and Marine Contamination Prevention Project (WIOMHP), more specifically Component 2: Capacity Building for Prevention of Coastal and Marine Contamination.

4.3. Freshwater

Mauritius has made significant investment in the water sector and to date 99.7 % of the population is connected to the piping network. Currently, 65 % of the population has uninterrupted water supply. In order to increase the availability of water, Government has launched various initiatives aimed at increasing water supply, namely:

4.3.1. Reformed institutional framework for the assessment, development, management and conservation of water resources in Mauritius.
4.3.2. Implementation of the National Sewerage Programme.
4.3.3. Preparation of a Wastewater Master Plan Study for the period 2014 – 2033.
4.3.4. Preparation of a National Water Policy and an Integrated Water Resources Management Plan to meet water requirements till 2040.
4.3.5. An ambitious project for the reduction of unaccounted-for water to an acceptable level of 25% has been initiated.
4.3.6. Ongoing river clean-up to prevent siltation and accumulation of wastes.
4.3.7. Implementation of the National Programme on Sustainable Consumption and Production, which promotes water-use efficiency.

5. Forthcoming Legislation

Seed Bill
Plant Breeder Right Bill
IPR Bill

RODRIGUES

Land and agriculture

Rodrigues is about 10,800 ha in size, of which only 1,000 ha (about 9%) is privately owned while the rest is managed by the State. The private lands are primarily located in Port Mathurin, La Ferme and Saint Gabriel-Mont Lubin and are in relatively small plots of two and three hectares. State land is leased to private individuals for development projects, be it for residential, agricultural or commercial purposes (Fig. 3).

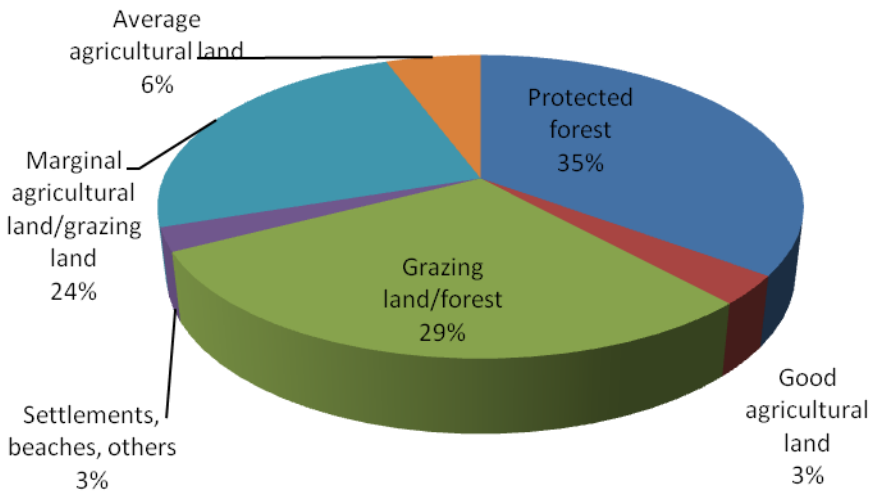


Fig 3. Land use in Rodrigues (2008) *Source: Rodrigues ICZM Strategy, 2008*

A number of challenges are faced in this sector and are as follows:

- *Soil erosion*
- *Demand for land*
- *Decreasing agricultural activity*
- *Environmentally Sensitive Areas (ESAs)*
- *Siltation of lagoons*

Coastal and marine resources

Rodrigues is outlined by 67 km of coast, consisting of 70% rocky coasts, 21 % of silt-clay coast and 9% of coral sand beaches, including two sand islets: Ile aux Sables and Ile aux Cocos. Despite the presence of a wide coral platform that encloses the 240 km^2 of lagoon, the latter is endangered by artisanal fishing, sedimentation and coastal erosion. Moreover, the legislative framework is inadequate for conservation of marine resources. These pressures are elaborated below:

Bad fishing practices

Artisanal fishers generally use seine, trap, line and harpoon (for octopus) as fishing methods. The majority of the fishermen work on foot thus destroying the delicate coral structures and the algal matting, which are both a habitat and primary food source for many marine animals (Sustainable Integrated Development Plan for Rodrigues, 2009).

Management of fishing reserves

Presently, there are five fishing reserves in Rodrigues in which no net fishing is allowed. However, these are not being closely monitored by relevant institutions due to capacity limitation. The comprehensive laws and regulations governing marine protected areas are vital for the sustainability of marine life and fisheries, but will only be effective if they have continued political support, are resistant to short term commercial and social pressures for relaxation of controls and are implemented by a regulatory body that operates with probity without fear or favour in this close knit cultural setting.

Sand extraction

Sand mining activity started in December 1993 at Banc Catherine. Sand extraction is carried out at a rate of about 25, 000 tonnes per year. Although sand should not be extracted within 1 km of any islet, it is reported that sometimes this activity is carried out outside the demarcated area. No study has been carried out to assess the sand stock to ensure its sustainable exploitation.

Beach erosion

The beaches in Rodrigues are generally classified as highly vulnerable to erosion (Cazes-Duvat, 2003[1]). The Northern beaches (e.g. Anse Aux Anglais, Baladirou) and Eastern beaches (e.g. Trou d'Argent, Anse Bouteille) are relatively stable as they are protected by cliffs, whilst those of the South East are highly susceptible to erosion (e.g. Graviers, Mourouk). Concerning the two sandy islets, Ile

[1] In the study, the beaches were classified on a scale of 1 (less vulnerable) to 4 (highly vulnerable) based on 7 parameters including: erosion status of the beaches, structure of the beach, erosion and accretion dynamics and resilience of the beach.

aux Cocos is considered to be vulnerable to erosion and Ile aux Sables is categorised as highly susceptible to erosion.

Marine biodiversity

Though Rodriguan waters are rich in biodiversity, the marine fauna and flora have not been intensively studied. The Study on Environmentally Sensitive Areas for Rodrigues has classified most of the lagoon ecosystem comprising of coral reefs, sea grass and algal beds as being environmentally sensitive. Table 5 gives details of the marine biodiversity in Rodriguan waters.

Table 5. Marine biodiversity in Rodriguan waters

Species	Number of species
Coral	160
Macro-algae	139
Sea grass	2
Fish	494
Bivalve	109 known species / 15 newly identified species
Echinoderms	74

Source: Rodrigues Regional Assembly

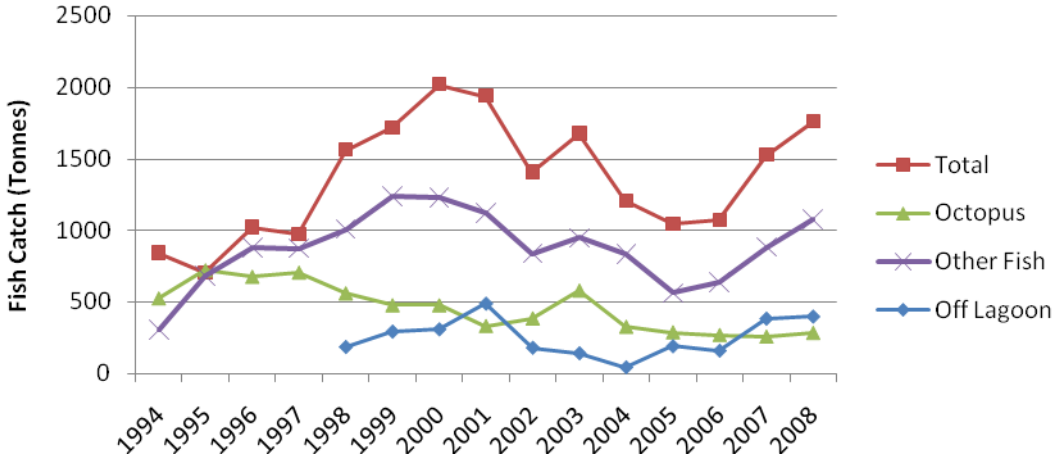
State of corals and coral reef

Rodrigues has the most substantial and best-developed reefs in the Mascarenes and the living coral cover is generally high. 88 species of corals were recorded during a survey undertaken in 2008. The results from this survey indicate that the reef around Rodrigues is relatively healthy, apart from the two sites used by the local octopus fishers. At these sites, hard coral cover is extremely low (between 2-5%) due to a disturbed environment (The Status of the Coral Reefs in Rodrigues, 2008). Moreover, soil erosion and sedimentation are other factors affecting corals.

Loss in fish stocks

The different pressures on the coastal resources including over fishing have resulted in a decrease in fish stocks in the lagoon. As shown in Fig 4, octopus catch in the lagoon is also decreasing, while off lagoon fishing is still not a common practice.

Fig 4. Fish catch in Rodrigues (1994 - 2008)



Source: CSO - Digest of Statistics on Rodrigues, 2009

Land and agriculture

Control of soil erosion and delineation of pasture lands

Some 3,500 ha or one third of the island is under forest cover. Reforestation programme with endemic species is ongoing. This prevents soil erosion, serves as windbreaks and provides timber. Owing to the hilly nature of the island, terrace farming is being re-developed to prevent erosion and allow exploitation of the land for agricultural purposes. Grazing is being controlled through the fencing of pasture lands and to date, 1,000 ha have been fenced.

Water resources

Rodrigues has taken steps to remedy the challenges in the water sector by strengthening the institutional framework and by setting up an independent water company for improving the distribution system. Before 2009, about 60% of the water was obtained from boreholes and 40% from surface water sources and springs.

In February 2009, the Water Resources Unit commissioned three desalination plants treating low salinity brackish borehole water (Setting up and starting the Rodrigues Water Company, 2009). A larger desalination plant of 500 m^3/day capacity treating sea water is also operational. Moreover, new large tourist facilities are required to provide their own desalination services. Currently, a new reservoir at Creve Coeur with a capacity of 1,000 m^3 is in the pipeline. Furthermore, plans have been prepared for a sewerage system and treatment plant for Port Maturin with possibility for using the treated water for irrigation.

Coastal and marine resources

Policy and legislation

Regulations have been enacted to promote sustainable exploitation of marine resources, namely to control octopus and sea cucumber catch and also to regulate sand mining under the Sand Mining Act 1991. Fisheries and Marine Resources (Marine Protected Area) Regulations for Rodrigues have also been developed and are being implemented. An Integrated Coastal Zone Management (ICZM) plan for the Republic of Mauritius including an ICZM Strategy for Rodrigues has been prepared in 2008.

Action Area Plans have been developed for Cotton Bay and Anse aux Anglais regions. Four islet-specific management plans have also been prepared for better management of islets.

Mangrove propagation

In order to control soil sedimentation in the lagoon, mangroves have been planted in several bays and they are growing successfully except in rocky areas. The mangrove ecosystem is being established in areas such as Diamant, Baie Malgache, Mourouk, Grand Baie and Anse Pansia. The mangroves are also helping to establish a new ecosystem and plants and animals are starting to colonize the area. Sand accumulation is also observed at Baie Malgache, where previously only silt sediment was deposited.

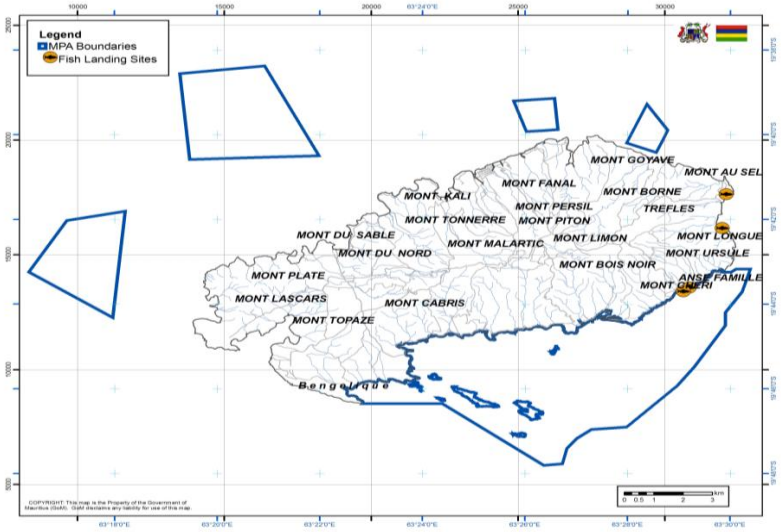
Control of sand extraction

To avoid illegal sand mining and sale, control measures have been reinforced at sand landing station. A sand mining monitoring technical committee has been set up to oversee and control sand extraction.

Setting up of Marine Protected Areas

In response to the decline in fish stocks, four marine reserves in the northern lagoon were proclaimed (Rodrigues ICZM Strategy, 2008). The southern lagoon from Pointe Corail in the West to Pointe Roche Noire in the East has been declared as a marine park. The development of a management plan is under process. Fig 5 shows the location of the Marine Protected Areas.

Fig 5. Marine Protected Areas in Rodrigues



SOURCE: RODRIGUES ICZM STRATEGY, 2008

There are four Marine Reserves, namely Grand Bassin Marine Reserve (1410 ha), Passe Demi Marine Reserve (720 ha), Passe Cabri Marine Reserve (150 ha), Rivière Banane Marine Reserve (150 ha). There is also one the South East Marine Protected Area (SEMPA) (4300 ha). Anse Quitor and Grande Passe were already declared fishing reserves and are presently part of SEMPA. A total of 1600 ha of Fisheries Reserve Areas include Pointe Venus to Pointe la Gueule, Pointe la Gueule to Pointe Manioc, Baie Topaze, Anse Quitor, and Grande Passe.

AGALEGA and ST BRANDON

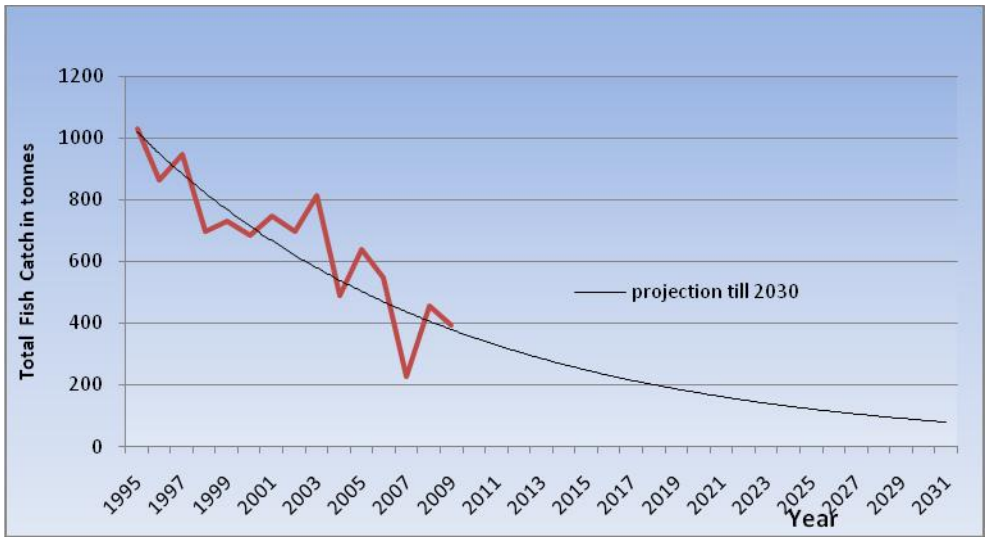
Land management

The absence of a land management plan for Agalega is a major issue of concern for the sustainable exploitation of land resources. The introduction of a land management plan to guide and assist landholders to actively manage their land and the associated resources for agricultural development for Agalega is important.

Decreasing fish catch

Fishing in Agalega is practised at artisanal level only for subsistence, as compared to St. Brandon, which has two major fishing grounds. The Food and Agriculture Organisation and the Albion Fisheries Research Centre have estimated the sustainable fish yield for St. Brandon at 680 tonnes per year (Blue Print on Saint Brandon, 2002). However, since 1995, a decreasing trend in fish catch has been reported as shown in Fig 6. Furthermore, the fish catch in St. Brandon area from 1995 to 2003 was well above the sustainable yield of 680 tonnes of fish per year. If management measures are not strictly implemented, it is estimated that fish catch will decrease to 100 tonnes by 2030.

Fig 6. Fish catch in St. Brandon (1995 - 2009) & projections till 2030



Source: Ministry of Fisheries and Rodrigues

Water supply

The key issues of concern in this sector include inadequate water collection and storage, contamination of groundwater, especially from salt water intrusion and absence of monitoring of water resources. Agalega and St. Brandon do not have piped water[2] supply and rely on rainwater and underground water for domestic consumption. In Agalega, the depth of water table is less than 1 m,

[2] The population in Agalega relies on bottled and boiled water for drinking. About 1,000 bottles of water are sent from Mauritius every 6 months. Ground water is used for washing purposes.

thus putting groundwater at risk from sea water intrusion and untreated sewage[3]. As a result, there is a need to develop wastewater management policies and strategies for more effective pollution control. Rainwater harvesting is a common practice and water is collected through run-offs from roof tops. The stored water is chlorinated for drinking purposes.

The majority of the islets of St. Brandon do not have potable water supply and there is no rainwater harvesting systems. The sizes of the islets are too small to allow the formation of a fresh water table separated from sea water. On these islets, rainwater infiltrates through the permeable upper sandy formations and finds its way to the brackish water table, which is unfit for human consumption.

Coastal and marine resources

St. Brandon area supports a valuable and fragile marine biodiversity, which is still in pristine condition with abundant large reef fish, corals and sea creatures. Sea turtles are found in most of the waters adjoining the islets. The sandy beaches of the islets of St. Brandon are the nesting grounds for Green turtles and Hawksbill turtles throughout the year. These species were declared protected in 1983 and are considered as endangered. However, there has been a sharp decline in their numbers and are now rarely seen due to intense hunting activities (Blue Print on St Brandon, 2002). Up till now, no new study on the biodiversity of the outer islands has been carried out.

St. Brandon is also an important seabird site. The populations of seabirds appear to be in decline due to poaching and predation from introduced rats. The most abundant[4] species is Sooty Tern (*Sterna fuscata*) and four other species of global or regional importance. The site is not a protected area but still holds impressive seabird populations because of its remoteness and the difficulty of landing on some of the islets.

As for Agalega, most of the seabirds disappeared in the 1940's due to purposeful nest destruction, poaching and predators. However, some seabirds are now seen on the island, suggesting that re-colonisation may be occurring.

A common problem to both of these islands is the accumulation of marine debris on their coasts. Marine debris comprise plastics, flip-flops, glass and nylon fishing nets and when these break down, they release harmful substance in the lagoon (Bouwman *et al*., 2011).

Terrestrial ecosystems

The natural vegetation of St. Brandon has suffered from the introduction of invasive plant and animal species, particularly on those islets where human activity is more intense. Plants and animals are introduced continuously as there are no quarantine measures for the Outer Islands. In Agalega, a host of invasive[5] species have been introduced, with the most invasive one being the Acacia (*Leucaena*

[3] Sewage and grey water (wastewater generated from domestic activities such as laundry, dishwashing, and bathing) are disposed into septic tanks and absorption pit. In view of high water table, there is an evident risk of groundwater contamination.

[4] Additional nesting seabird species are Lesser Frigatebird (*Fregata minor*), Greater Frigatebird (*Fregata Ariel*), Wedge-tailed Shearwater (*Puffinus pacificus*), Masked Booby (*Sula dactylatra*) and Red-tailed Tropicbird (*Phaethon lepturus*).

[5] Some 214 plant species have been surveyed on Agalega, 30 of which are native to Agalega (not endemic) and the rest (184) are introduced species, of which 50% (92) are invasive. Introduced species includes 61 ornamental plants, 39 vegetables, and 25 fruit trees.

luecoceph). Yellow Wasps (*Polistes hebraeus*) have also been introduced through bottle crates and these could have been easily prevented from entering the island. Agalega is also home to an endemic lizard, *Phelsuma agalegae*, which however merits further scientific research.

Progress made so far

Institutional and legal framework

The Outer Islands Development Corporation (OIDC) is responsible for the management of the Outer Islands of Mauritius, including the ways and means to promote their economic and social enhancement. The Outer Islands Development Corporation Act 1982 is the legal framework overseeing management of the islands. The Agalega Island Council set up in 2004, works in close collaboration with the OIDC for the social development of Agalega.

Policies and programmes in Agalega

Water conservation measures

The mean annual rainfall for Agalega is 1,600 mm with an average monthly rainfall ranging from 46 mm to 272 mm. It rains throughout the year with the driest months being August and September with about 50 to 60 mm of rainfall.

Water shortage in Agalega is addressed through the use of domestic rainwater harvesters. Most of the housing units are equipped with rainwater harvesting system with chlorination.

Policies and programmes in St. Brandon

Blue Print for the management of St. Brandon

A Blue Print on future economic development for St. Brandon was prepared in 2002 so as to manage and develop the islets with better land use, improvement in services, environmental protection, fisheries management, tourism development and diversification of the economy. The Blueprint has been approved by Government in 2004 and needs to be implemented. The salient issues in the Blue Print which are based on recommendations made in the World Bank Report 2001 are as follows:

- Declaration of St. Brandon as a Marine Protected Area.
- Division of the Archipelago into five distinct zones with specific recommendations for the sound management of each zone.
- No major economic activities to be carried out on the Archipelago except fishing within the sustainable limits of 680 tons of fish per year.
- No resort or hotel accommodation or supporting infrastructure such as harbours and runways to be set anywhere in St. Brandon.
- The Fisheries Division and the National Parks and Conservation Service to monitor at least once every year the populations of birds, turtles and fish.
- Restoration of the native fauna through eradication of introduced animals.
- Reinforcement of the Coast Guard Service on St. Brandon by the provision of patrol vessels and through training of officers.

Fisheries Management Plan and surveillance for St. Brandon

In order to exploit the fisheries resources in a sustainable way, fishing activities in the area of St. Brandon is managed through a precautionary approach via a Fisheries Management Plan, which includes strict control on the number of licences issued and the fishing methods used. Six vessels have been granted licences to operate in the St. Brandon area at any one time and the fishing methods authorised are basket traps and hand lining.

The Coast Guard aircraft carries out regular aerial surveillance against illegal fishing at St. Brandon and adjoining areas on a fortnightly basis. Limited patrol of adjoining lagoons is carried out by means of an inflatable boat.

Coastal rehabilitation works

In 1995, gabion was installed on Ile Raphael to prevent the shoreline from being washed away.

Policy options for the future

Land-use management

- Develop appropriate land management plans.
- Streamline the grant of leases.
- Monitor impact of development activities.
- Allow only low impact eco-tourism projects.

Water resources management

- Develop appropriate sustainable water resources management to meet present and future demand.
- Introduce and develop wastewater management practices that minimize environmental impact and safeguard public health.
- Introduce water monitoring.
- Promote rainwater harvesting.
- Investigate innovative methods of freshwater collection and storage.

Conservation and sustainable use of biodiversity

- Protect and manage marine and terrestrial biodiversity in a sustainable way.
- Undertake regular inventories of fauna and flora.
- Develop biodiversity management plans.
- Consider the designation of some of the islets as World Heritage sites.

Marine and coastal zone management

- Monitor fisheries resources and adjust fisheries quota accordingly on a regular basis.
- Regulate marine resource exploitation.
- Respect the 30 metres setback for infrastructure development.
- Create marine parks.
- Monitor beach erosion.

The built environment

- Define architectural guidelines in line with the specificities of the Outer Islands.
- Optimise the use of local materials, especially renewable ones, in construction.

- Consider the promotion of sustainable buildings.

Environment and health

- Consider the introduction of composting of organic wastes in Outer Islands.
- Plan the import and sustainable use of chemicals and products to minimise the generation of hazardous waste.

Energy and environment

- Encourage the use of renewable energy.

Waste minimisation

- Develop an integrated waste management plan for Outer Islands.
- Set up a proper sanitary landfill.
- Organise awareness campaigns on waste reduction initiatives, recycling and proper disposal.
- Develop appropriate schemes for the export of bulky and hazardous waste such as waste oil, tyres and batteries for recycling.

Natural and man-made disasters management

- Operationalise an Oil Spill Contingency Plan for Outer Islands.
- Build awareness of the local population with regard to response and evacuation strategies in the event of disasters.

Environmental education and awareness

- Develop an action plan on environmental education for implementation at school level.

Rapporteur : Dr S Facknath (Assoc Professor), University of Mauritius

Vice-Rapporteur : Dr R Bhagooli (Senior Lecturer), University of Mauritius

Annex 3: Schedule of meetings

Schedule of Meetings of Working Group 2 held from May to August 2011.

Date	**Time**	**Details**	**Venue**
24th May	9.30 – 11.00	Meeting of the Animation Team with Mr. G. Gomart	Prime Minister's Office – Office of Mr. G. Gomart
31st May	10.00 - 11.30	Meeting of the Animation Team	University of Mauritius
7th June	1.00 - 15.00	Meeting of the Animation Team	University of Mauritius
15th June	**8.30 - 17.00**	***Working Session 1***	**La Cannelle, Domaine des Pailles**
27th June	**8.30 - 17.00**	***Working Session 2***	**La Cannelle, Domaine des Pailles**
1st July	**4.30 – 18.00**	Meeting of all Animation Teams with Mr Gomart	La Cannelle, Domaine des Pailles
6th July	10 - 11.30	Meeting of the Animation Team	University of Mauritius
11th July	**8.30 - 17.00**	***Working Session 3***	**La Cannelle, Domaine des Pailles**
18th July	9.00 – 12.00	Additional working session with all participants	AREU, St. Pierre
21st July	9.00 – 12.00	Additional working session with all participants	Forestry Services, Curepipe
22-23 July	8.30-16.00	Rodrigues	Mon Plaisir, Rodrigues
25th July	**8.30 - 17.00**	***Working Session 4***	**La Cannelle, Domaine des Pailles**
4th August	9.00 – 12.00	Additional working session with all participants	Farmers Training School, Wootun
5th August	10.30 – 12.30	Meeting of the Animation Team	University of Mauritius

Annex 4: Rodrigues Workshop

WORKING SESSION IN RODRIGUES 22 and 23 June 2011

Report of the Working Group on Energy, Environment and Pollution

1.0 OPENING CEREMONY

The opening ceremony started slightly late due to delayed arrival of resource persons from Mauritius (due to late landing of aircraft).

Speakers in the inaugural session were namely:

- Mr Grandcourt
- Mrs Ng, Director of Environment, Ministry of Environment and Sustainable Development
- Mr Osman Mahomed
- Mr G Gomart
- Honourable Minister of Fisheries and Rodrigues

All the speakers spoke on the MID Project and stressed that Rodrigues would form an integral part of the MID Project. They also stated that Rodrigues had its own specifications in terms of climate, topography, etc. The SIDPR (Sustainable Integrated Development Plan of Rodrigues was evoked and it was stated that the MID Project should be in harmony with the SIDPR project which is already being implemented in Rodrigues.

The Honourable Minister of Fisheries and Rodrigues stated that the Maurice Ile Durable Project should be renamed to Maurice Iles Durable or Republic durable to emphasize the inclusion of Rodrigues Island. Even though Rodrigues suffers from scarcity of water, yet Rodriguans are able to rear livestock and grow food. He said that the experience of Rodriguans in managing scarce resources could be used by Mauritius which is presently undergoing serious draught conditions. Sustainable Fisheries in Rodrigues should be an important component of the MID Project due to the importance of the Fisheries sector in Rodrigues. He mentioned the unsustainable harvesting of Concombre de Mer in Rodrigues. He also cited the example of Madagascar, where octopus harvest is banned for certain periods in a year and the success of this project could be applied to Rodrigues. During the period when harvesting of octopus will not be allowed, Fishermen could be given alternative jobs such as in re-afforestation.

He also mentioned about the success of renewable energy in Rodrigues where about 8% of the annual energy production comes from wind energy although certain technical problems still need to be sorted out. The concept of Rodrigues as Ile-Bio (Organic Island) was also raised by the Minister. Rodrigues had also started with segregated waste collection.

The Island's topography and climate lends itself to solar energy and wind energy exploitation. Biofuel such as coconut oil and Jatropha could also be exploited on marginal slopy lands of Rodrigues. Because of the small size of Rodrigues, implementation of projects is much faster than from main land Mauritius.

Composting as alternative to chemical fertilizers should further be inculcated in the Rodriguan population. The Minister also mentioned about the use of Botanical pesticides (e.g. neem) to substitute for chemical pesticides. The Minister stressed on the motto: 'Produire ce qu'on mange – Mange ce qu'on produit'. That is, 'Produce what you eat and eat what you produce'. The session then broke away for refreshments and technical discussions.

2.0 TECHNICAL SESSIONS

Chairpersons:

1. Mr A. Aurele Andre,
2. Dr K. Elahee (University of Mauritius)
3. Mr J P Teeluck (Agricultural Research and Extension Unit)
4. Dr N Jaypaul (Ministry of Health)

Rapporteur:
Dr.B. Lalljee (University of Mauritius)

2.1 ENERGY

The issue of renewable energy from wind and solar was discussed. It was mentioned that about 8 % of the energy produced in Rodrigues comes from wind. However, all this energy is not harnessable at all times due to the small electrical network in Rodrigues.
The Meteorological Office in Mauritius and Rodrigues has data for sunshine hours as well as wind velocity in different areas in Rodrigues.

- Due to the topography of Rodrigues, the island receives maximum sunshine.
- Map of Rodrigues showing potential areas of location of wind farms and solar energy capture is not available and need to be prepared.
- Potential of bio-energy and bio-fuels need to be further studied as per the Minister's speech, Coconut oil, Jatropha, would be suitable candidates. At this moment, finance should not be an issue.
- Potential of coconut oil (Ministers speech) and Jatropha to be studied for Rodrigues especially in marginal lands.
- Reports are available on solar energy exploitation – For e.g, Rodrigues Ile Solaire - ARER.
- Some data are available on wind energy in Rodrigues - Storage of this energy is not possible presently.

- Technical problems of integration in small network of Rodrigues especially at night when there is low demand and electricity from wind energy continues to be produced.
- Excess energy from the wind mills could be used to raise water from lower altitudes for distribution as well as production of Hydroelectricity.
- Pricing policy for electricity in Rodrigues may be alternative for higher night consumption of electricity, e.g., Lower Tariffs at night.
- Excess energy can also be used for desalination of seawater. There is an ADEME Report available.
- CFC'S distribution to household in Rodrigues. A slight fall in consumption was noted but could not be related. The use of CFC'S needs much more awareness raising. Also, the economically vulnerable must be encouraged to join in the project.
- Noise emanating from windmills may be a source of noise pollution. The use state of art technology is proposed for further development of wind energy.
- The consumption of electricity is relatively high in Rodrigues. This could be mainly due to use of air conditioners in building.
- Building codes for eco-friendly and green buildings need to be introduced.
- Also the concept of Green procurement needs to be introduced.
- Set targets for renewable energy in Rodrigues. The limitations need to be studied.
- Electrical vehicles are not a solution but Hybrid vehicles need to be considered.
- There was a general consensus that Port Mathurin is converted into a Pedestrian Town.
- Parking provisions for all new buildings need to be enforced.
- Review land use planning in Rodrigues.
- Provision of Green space in Port Mathurin and possible delocalization of activities fron Port Mathurin.-Related to environmental health.
- There is the opportunity of energy management at seaport and airport.
- Off grid application opportunites for hybrid.
- High rise buildings. Rodrigues is situated in the seismic zone. There was general consensus that high rise buildings cannot be an alternative.

2.2 BIODIVERSITY

- Good knowledge of Biodiversity status in Rodrigues. Base paper may need modifications to include latest data available. Example the Marine Protected Areas in Rodrigues.
- SEMPA: 20 % of the lagoons in Rodrigues will be protected.
- Sea cucumber issue in Rodrigues: harvesting needs to be controlled. Also harvesting of Octopus needs to be regulated. The example of Madagascar where catches are prohibited by Law for 2 months may be considered. Fisherman not employed during this period may be provided alternative employment for reforestation activities,
- Species issue of sea cucumber. Should we introduce alien species in Rodrigues?

- Paleo ecology studies for Rodrigues. Invasive plant species are still being cultivated by hotels and the RRA for decorative purposes. This should be discouraged.
- Removal of invasive must be done carefully and scientifically. e.g. Rodriguan honey from eucalyptus has got prizes internationally.
- Copy of Action plan from the Commission of Agriculture addresses the Food Security issues.

2.2.1 PROJECT PROPOSALS

- Fight, eliminate and prohibit invasive alien species - Time frame: immediate.
- Strengthening Reforestation programme. Increase forest cover to 40% - Time frame: within 10 years.
- Effective management and enforcement of Marine protected areas - Time frame: immediate.
- Establishment of gene bank for Rodrigues to preserve local varieties e.g beans, chillies, lime - Time frame: immediate.
- Rewilding operations with value added cultural and economic activities - Time frame: immediate.

2.3 LAND USE ISSUES

- Haphazard allocation of state land for housing without proper planning was concerned.
- Planning should be as per SIDPR or new planning guidelines for Rodrigues to be promulgated.
- Mountain Reserves and River Reserves to be protected.
- Enforcement of existing regulations and laws and Political will and commitment is very important.
- There is problem with Cattle walk regulations (land planning) especially in the enforcement.
- Instead of fencing the animals, forests are being fenced.
- Needs more of coordination and cohesion in policy formulation and implementation.
- Downstream Mangroves are being planted but upstream cattles are being allowed for overgrazing and aggravating soil erosion. This is not acceptable.
- Preservation of heritage and geological sites important.
- Wetland in Rodrigues should be protected under the Ramsar convention.
- Multi-environmental agreements signed by Mauritius needs to be more publicised and steps taken in the implementation to be made more visible.

2.4 ECOTOURISM

- No statistics available. However it is known that about 80-90% tourists come to Rodrigues for ecotourism
- Studies needed on the carrying capacity of Rodrigues for Tourists.
- Tradeoffs should be carefully studied between economics and environment of the tourist industry.
- Desalination plants in all hotels to be made mandatory.
- Stray dog is also an issue in Rodrigues and needs to be addressed. Noise pollution also needs to be addressed.

2.4.1 PROPOSALS

TOURISM

- Target of 100,000 tourists by 2020
- Up to 120,000 by 2030
- The Rodrigues Tourist Development Plan should be taken on board.

2.5 WATER

More subsidies are required from the Government in addition to tanks to cater for piping and accessories for water harvesting. Rodrigues needs to have a Master plan for the water sector. Make-shift provision or piece-meal intervention is not a solution. There is also a large number of illegal connections to the network. Proper policy needs to be put in place. Rodrigues Water Company is working towards these goals. Use renewable energy for the operation of water pumps. Networks need to be upgraded.

2.5.1 PROPOSALS

- More water production (10,000 m3) to meet demand.50% of which from desalination without harming the biodiversity.
- Time frame: Start immediately and to be completed in 5 years (2015).
- Improve water management/ distribution network.
- Small dams to be constructed
- Further encouragement should be given to rain water harvesting.

2.6 SOLID WASTE

- The need an integrated Solid Waste Management Plan for Rodrigues.
- 24 TONS PER DAY.0.65 kg per capital.
- Segregated waste collection already in operation in Rodrigues.
- Cooperation between the Commission of Agriculture and Commission of Environment for compost making should be encouraged.

- Companies and enterprises producing wastes should keep them for disposal. Polluter pays principle should be applicable.
- New dumping site in Rodrigues should be state of the art.
- Controlled land fills
- Send recyclable wastes to Mauritius. Is it an option, and what are the costs? Further studies are needed. Awareness raising of the 3R's for waste management should be inculcated.

2.7 AIR AND NOISE POLLUTION

- Rodrigues needs air pollution monitoring.
- No equipment exists, training and capacity building required.
- Noise meter exist.
- Noise pollution monitoring required for private clubs, vehicles, etc.
- The above report as well as the attached report prepared by Dr Elahee was presented at the plenary and validated.

2.8 COMMENTS FROM THE PLENARY

- SEMPA will occupy 20% of the lagoon in Rodrigues.
- Migration of Rodriguan to Mauritius may be related to environmental aspects. Need robust study to see the cause and effect relationship.
- This study by the Rodrigues Regional Assembly is in progress.
- Green jobs should be created in Rodrigues.

Annex 5. List of Participants

Organisation	Name	Designation
Animation Team		
Chairperson	Mrs Sauzier Jaqueline	President, Mauritius Marine Conservation Society
Vice-Chairperson	Mr Teeluck Jay Prakash	Ag Director, Agricultural Research and Extension Unit (AREU)
Rapporteur	Dr (Mrs) Facknath Sunita	Associate Professor, University of Mauritius
Vice Rapporteur	Dr Bhagooli Ranjeet	Senior Lecturer, University of Mauritius
Lead Ministry (Ministry of Agro-Industry and Food Security, National Parks and Conservation Services)	Mr Puttoo Manikchand	Director, NPCS
Ministry of Environment and Sustainable Development	Mrs Seenarain Neermala	Environment Officer
Other Participants		
Ministry of Environment and Sustainable Development	Mr Beedassy Rajiv	Divisional Environment Officer, Integrated Coastal Zone Management Division
	Mrs Kanhye Parvatee	Environment Assessment Division
Ministry of Agro-Industry and Food Security (Forestry Services)	Mr Jhumka Zayd	Assistant Conservator of Forests
Ministry of Agro-Industry and Food Security (Agricultural Services)	Mr Seeruttun Seewon	Principal Agricultural Officer
Ministry of Fisheries and Rodrigues (Fisheries Division)	Mrs Hurbungs Mira	Divisional Scientific Officer
	Mr Rumjeet Dindoyal	Scientific Officer
Ministry of Energy and Public Utilities (Water Resources Unit)	Mr Juggoo Lomush	Deputy Director
	Mr Bissessur Varun	Principal Engineer
Ministry of Tourism and Leisure	Mr Purusram Rishi	Tourism Planner
Central Water Authority	Mr Mungra Rohit	Senior Adviser

Organisation	Name	Designation
AREU (Agricultural Research and Extension Unit)	Mrs Ramma Indoomatee	Principal Research Scientist
Mauritius Oceanography Institute	Mr Mussai Prakash	Associate Research Scientist
Mauritius Sugar Industry Research Institute	Mr Pynee Kersley	Senior Technical Assistant
Association professionnelle des producteurs-exportateurs de produits horticoles de Maurice (APEXHOM)	Mrs Bundhun Raifa	Secretary General
Mauritius Chamber of Agriculture	Mr Dana Chengan	Farm Manager
Association of Mauritian Manufacturers	Mr Echevin Mathias	Director
Mauritius Exporters Association (MEXA)	Mr Ahnee Loic	Junior Consultant
Mauritius Chamber of Commerce and Industry	Dr Padayachy Renganaden	Macroeconomist
Association des Hôteliers et Restaurateurs de L'Ile Maurice (AHRIM)	Mr Zjamil Coowar	Human Resource Director
Municipal Council of Curepipe	Mr Nawjee Avinash	Senior Building Inspector
Moka/Flacq District Council	Mr Hulloowan Goorooduth	Chief Health Inspector
	Mr Lobin Bhoonitra	Senior Health Inspector
Municipal Council of Beau-Bassin Rose-Hill	Mr Mohit Mohamed Hussein	Ag Deputy Chief Executive
Black-River District Council	Mr Koonjul Dharam	Planning Officer
	Mr Ghaseeta Mohammad Nizam	Principal Health Inspector
Municipal Council of Vacoas/Phoenix	Mr Beekawoo Sayed Nayim	Municipal Councillor

Organisation	Name	Designation
Mauritius Trade Union Congress	Mrs Manee Roomila	Vice President
Confederation Free Trade Union (CFTU)	Mr. Dewnath Lall	President
Federation of Public Sector and Other Unions (FPSOU)	Brizmohun Bhoopa	Secretary
Democratic & Progressive Unions Federation	Mr Seewsagur Benniparsad	President
Forever Blue	Mrs Langlois Catherine	President
	Franco Cangy Jean Marc	Vice-President
Reef Conservation	Mr Baissac Pierre	Assistant secretary
Friends of Environment	Mr La Hausse De Lalouviere Philippe	General Manager
Vallée de Ferney	Mrs Iranah Priscilla	Conservation Coordinator
Plateforme Maurice Environnement	Mr Padayatchi Nada	Member
Mauritian Wildlife Foundation	Mr Tatayah Vikash	Conservation Manager
MACOSS	Mr Baboa Dhaneshar	Deputy Chairman
First Steps Network	Mr Chintaram Vinesh	Architect, Urban Planner Sustainability Consultant
University of Mauritius	Miss Jawaheer Shobha	Senior lecturer
University of Technology	Mrs Naidoo Jodi	Lecturer
National Women Council	Mrs Bhagawan M.	Supervisor
Outer Islands Development Corporation (OIDC)	Mr Gurburrun R. K	Development Officer
Representative from Rodrigues	Mr Andre Anrele Anquetil	General Manager, Francois Leguat Giant Tortoise & Cave Reserve, Rodrigues. Regards. Aurele
Mauritius Cooperative Agricultural Federation (MCAF)	Mr Sewdeen Jeevesh kumar	Administrative Secretary
Mauritius Agricultural Marketing Cooperative Federation	Mr Beeharry Kritanand	Chairman
Syndicat des pêcheurs de l'île Maurice	Mr Ramphul Judex	Fisherman

Organisation	Name	Designation
Institution of Engineers	Mrs Seesaram Nadia	Secretary
Mauritius Meat Producers' Association	Mr Soupe Robert	Regional Development Manager
Taradesign Ltd	Mrs Puttay Kamlash Sandhya Devi	Landscape Architect
West Coast Landscaping and Ecole Du Nord	Mr Pitou Christophe P.W	Consultant en Ecologie, Environnement & Developpement Durable, et Conseiller
European Union Delegation	Mr Balloo Madev	Project Manager