Thematic Working Group
Land and Land Use

Final Report
August 2001

Preface

The Land and Land Use Working Group was given the task of proposing, detailing and prioritising research projects within the land and land use sector in Mauritius and Rodrigues.

The wide scope of the task called for input from a pluri-disciplinary team from various fields of expertise comprising planning, environment, engineering, architecture, conservation, agriculture, tourism, industry, housing, land information, remote sensing and other skills. The cross-disciplinary debates extended over a wider span of time than originally planned and required 3 meetings of the working group.

We are pleased to submit, in this Report, the output of our deliberations which will provide the MRC with the top-down approach that it has called for, to complement the bottom-up projects. We would like to place on record our appreciation of the enthusiasm and support of the Chairman of the MRC, Prof. Bhoojedhur, the Executive Director of the MRC, Dr Suddhoo and their staff throughout the task. We would also like to commend the co-ordinator, Mr Krishna Heeramun for his continuous and painstaking collaboration throughout the duration of the project.

We hope that there will be follow up to the numerous proposals that we have made, each of which is likely to play a critical role in the long term sustainability of our resources or in enhancing the quality of life.

As Chair of the Working Group, I would also like to thank my colleagues on the working group for their valuable inputs, for the cordial atmosphere that prevailed at our deliberations and the promptness with which everyone responded to the task required of him or her.

Mrs. V.L. Saha,
Chief Planner,
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List of Abbreviations.

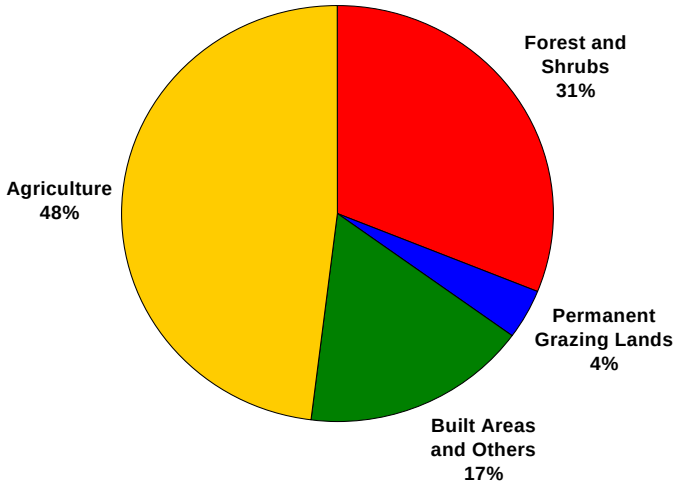
AHRIM	*Association des Hoteliers et Restaurateur, Ile Maurice*
AREU	*Agricultural Research and Extension Unit*
CEB	*Central Electricity Board*
CFTRI	*Central Food Technological Research Institute*
CHA	*Central Housing Authority*
CIRAD	*Centre de Cooperation International en Recherche Agronomique pour le Development.*
CSO	*Central Statistics Office*
CWA	*Central Water Authority*
EU	*European Union*
FCC	*False Colour Composites*
FT	*Food Technology*
G.I.S.	*Geographical Information System*
Ha	*Hectares*
HPLC	*High Pressure Liquid Chromatography*
HWM	*High Water Mark*
ICT	*Information and Communication Technology*
MCA	*Mauritius Chamber of Agriculture*
MHL	*Ministry of Housing and Land*
MoA	*Ministry of Agriculture*
MoE	*Ministry of Education*
MoEnv	*Ministry of Environment*
MoF	*Ministry of Finance*
MoH	*Ministry of Health*
MPIIT	*Ministry of Public Infrastructure and Inland Transport*
MRC	*Mauritius Research Council*
MSIRI	*Mauritius Sugar Industry Research Institute*
MT	*Ministry of Tourism*
NGO	*Non Governmental Organisation*
NHDC	*National Housing Development Corporation*
NPCS	*National Parks and Conservation Service*
NR	*Natural Resources*
SIFB	*Sugar Industry Fund Board*
UOM	*University of Mauritius*
UPS	*Uninteruptible Power Supply*
USLE	*Universal Soil Loss Equation*
WTO	*World Trade Organisation*
WWA	*Waste Water Authority*

REPORT

1. The Relative Importance of the Sector in Mauritius.

The Land and Land Use Sector are of critical importance to the socio-economic development of Mauritius because land is the basic commodity without which development cannot take place. The pressure on land is intense with intensive agriculture and gazing lands occupying more than 50% of the land. (Fig 1)

Fig 1: Land Use in Mauritius



Besides, the islands within the state of Mauritius have small landmasses, mainly volcanic in origin, which are surrounded by fragile coral reef ecosystems. Mauritius and Rodrigues islands which are endowed with substantial underground storage capacity for ground water can be highly vulnerable to economic activities, unless such activities are managed in a sustainable manner. Population density is high and heavily concentrated in certain areas.

Economic activities embrace wide-ranging sectors: agriculture, tourism, industry and business. They give rise to competing needs for land and water resources including pressure upon their biodiversity. There is a need to protect and enhance such land and water resources, both for future generations and us.

Land use patterns have a direct impact on the traffic intensity. It is the location of activities in relation to residential areas, combined with the absence of appropriate policies, that has led to serious traffic congestion problems in many areas.

There is also a need to ensure that all segments of the population, including the lower economic groups benefit from the development process. In this respect, access of the lower economic groups to land is necessary to ensure that the social dimension is fully taken into account in the land sector, on an equal footing with the environmental and development perspective. In this context, the safe housing of the poor, through facilitation of access to land, is an immediate priority.

Rodrigues has suffered traditionally from high rates of soil erosion as a result of deforestation, human settlement, farming and grazing, cyclonic rains and the mountainous terrain. Agricultural land use has also declined as a result of low economic returns from agriculture. There is also mounting pressure upon its coastal zone. Fig 2 gives the current land use pattern and 20-year projections for Rodrigues.

Fig 2: Land Use in Rodrigues.

SCENARIO	Current	Extrapolation to 2020 (% of useable land)	Vision 2020 Statement
Agriculture	45%	36%	39%
Forestry	30%	30%	30%
Built up	14%	19%	18%
Unusable	1%	1%	1%
Other	9%	14%	12%
Total	**100%**	**100%**	**100%**

2. The Current Status of the Sector.

Mauritius is at the crossroads of new developments so far as land and land use are concerned.

Land and land use issues in Mauritius will need to adapt to the new economy that Mauritius has opted for at the turn of this new millennium.

The traditional sectors are making room for ICT, regionalisation, globalisation, modernisation and rationalisation within the sugar sector itself and other sectors like tourism and industry.

The repercussions on land and land use are expected to be pervasive. The last decade has been characterised by a sharp drop in the acreage affected to agricultural and forest occupied areas, in favour of development as shown in fig 3.

Fig 3: Land Use in Mauritius (1986 and 1996).

Land Use		1986[2] Area (ha)	%	1996[1] Area	%	Change
Agriculture		**91,574**	**49.1**	**84,424**	**45.3**	**-7150**
	Sugar cane	83,289		76,814		-6,475
	Tea	3,776		1,109		-2,667
	Tobacco	600		611		11
	Food crops	1,791		1,333		-458
	Fresh vegetables	2,118		4,557		2,439
Forestry		**65,400**	**35.6**	**56,639**	**30.4**	**-8,761**
	Planted forests[3]	12,307		13,089		782
	Natural forests[3]	8,485		8,325		-160
	Savannah, scrub, grazing and other forest lands	44,608		35,225		-9,383
Community[4]		**29,526**	**15.8**	**45,437**	**24.4**	**15,911**
	Reservoirs	1,180[6]		1,165[5]		
	Swamps and rocks	1,430[6]				
	Roads (including agricultural roads)	3,465[6]				
	Built up areas	23,451[7]				
Total		**186,500**	**100**	**186,500**	**100**	

Source: 1 1996 State of Agriculture (Mauritius).
2 CSO and 1987 Annual Report of the Forestry Service of the Ministry of Agriculture.

Notes: 3 Includes mountain reserves (government and privately owned), excluding river reservoirs.
4 Including built-up areas, reservoirs, roads, including swamps. No figure available for 1996.Figure provided = total land area – agriculture – forestry.
5 Pers comm CWA, 1998.
6 CSO. Breakdown based on aerial photographs taken in 1965.

Source: National Environmental Action Plan for the Next Decade 1999.

This trend is likely to intensify over the next two decades which are expected to reshape the development structure of Mauritius, through massive investment in high tech business activities, ICT zones, mass transit, upgrading of infrastructure, tourism and social development.

Rodrigues is also poised for some fundamental restructuring with the improvement of air access, investment in water and integrated tourism planning. There is a need to adopt a sensitive approach to land planning in Rodrigues so as to retain the unspoilt nature of the countryside.

3. The Constraints and Challenges Facing the Sector.

Mauritius has one of the highest population densities in the world, with about 550 inhabitants per km^2 in 1991 (state of the environment in Mauritius, 1991). This figure has gone up to 614 inhabitants/km^2 in 1999 (Health statistics annual 1999). The population density is projected to reach 700 in 2020 (FAO in Agenda 21 National Report 1997).

The main challenge facing the land and land use sector in Mauritius and Rodrigues is to ensure that land is readily available for the economic development objectives of the nation, whilst taking into consideration environmental concerns and vulnerability of resources as well as the social dimension. Such zoning of land has also to take into account the long-term perspective needs of the nation.

A long-term vision for the use of land (the National Physical Development Plan) was proposed and approved in 1994. The National Physical Development Plan has been the guiding document for land use over the last decade. The document is coming up for revision during 2002 and will cover both Mauritius and Rodrigues.

The timing of this revision is appropriate in view of the numerous structural changes affecting and about to affect profoundly the land sector. These include, for Mauritius, regionalisation, the new sugar sector strategy, the mass transit proposals and the profound changes likely to affect the urban areas, the focus on the ICT sector and tourism. For Rodrigues, this includes the opening of air access, with the extension of the runway, the planning of selective tourism and the consolidation of settlements.

Land planning is affected by constraints of digitised mapping at appropriate scales. A project on a Land Information System has started, but progress is slow on account of limitations of staff and equipment. There is a scarcity of skills in the land development sector. This acts as a constraint to proactive planning as well as enforcement in the sector. Absence of infrastructure such as water in the right places is also a major constraint to land development. The altered role of the sugar sector within the overall economy of Mauritius will allow more land to be released for development. This is in the normal course of development.

The greatest challenge will be in the development of areas which have to date been considered sensitive - such as forest areas, coastal areas, areas near water bodies - whilst at the same time responding appropriately to environmental concerns, such as protection of water quality, appropriate design, proper waste disposal.

90% of the lands belong to private owners, and the remaining, state lands, consists of forests, natural reserves and Pas géometriques.

No national land development can be sustainable unless it incorporates a strong element of social justice and redistribution. There is a need to ensure that the housing programme for the lower economic groups remains viable, live and sustainable and there are appropriate and accompanying measures of social integration. There is also a need to ensure that the lower middle income groups who do not benefit from direct government subsidy are not priced out.

The land and land use sector is also characterised by a plethora of legislation which have been introduced at different times and which constitute a legal maze through which different developers have to sort out their different track. There is a need for rationalisation, modernisation and consolidation of legislation in this sector.

4. Proposed Measures to Enhance the Development of the Sector

The land use sector covers a vast field over which Government is a major stakeholder and is taking a lead to enhance the development of the sector.

The largest programmes so far have been the Environment Investment Programmes. Government has completed the First Environment Investment Programme (EIP1) and is now embarking upon EIP 2. Major studies have also been made of the land use/transportation interactions.

The Working Group has sought to focus on projects which are not currently on government's agenda, but which would enhance selective aspects of the sector. The specificities of Rodrigues are taken on board, wherever possible. The topics identified have been categorised under the following headings:

- Protection of the Environment;
- Strengthening the Data Base;
- Capacity Building for Land Use/Transport Modelling;
- Promoting Good Practices at Micro Level;
- Protection of Historic Buildings;
- Coping with New Industrial Parameters;
- Strengthening the Social Dimension; and
- Tourism.

5. Research Topics that Need to be Undertaken.

The research topics chosen by the Working Group cover a wide range of issues and can be compartmentalised under the following broad headings.

5.1 Protection of the Environment

Title of Project	Priority
5.1.1 Mapping of Coastal Wetlands in the Grand Bay, Pereybère to Cap Malheureux Region and their preservation. (MoEnv)	A
5.1.2 Forestry Inventory for the Determination of Total Forest Cover.(MoA)	A
5.1.3 To study soil erosion in different land use areas in Mauritius and develop strategies for their correction. (UoM)	A
5.1.4 An Assessment of the Environmental Impacts of the Construction of Buildings on Steep Slopes.(MoEnv)	B

5.1.5	Identification of Appropriate Remedial Measures Against Beach erosion (MoEnv).	B
5.1.6	Study of the effects of intensive pesticide and fertiliser use on different soil types and land quality index. (UoM)	B
5.1.7	An assessment of the impact of sugar cane cultivation on soil conservation in Mauritius (MCA).	C

5.2 Strengthening the Data Base

Title of Project		Priority
5.2.1	Integrated Mission for Sustainable Development Using Remote Sensing Technology. (Remote Sensing Unit, MoA)	A
5.2.2	Digital Cartographic Database update procedure amongst Government Departments and Para-statal Bodies.(MPIIT)	B

5.3 Capacity Building for Land Use/Transport Modeling

Title of Project		Priority
5.3.1	Macro Level Transportation Model for Mauritius and Rodrigues. (MPIIT)	A

5.4 Promoting Good Practices at Micro Level

Title of Project		Priority
5.4.1	Rain water Harvesting from Housing Units in Rodrigues.	A
5.4.2	Alternative agricultural activities for lands released from sugar cane. (AREU, MoA)	A
5.4.3	To reduce the Buffer Zone around stone crushing and associated activities through innovative design principles to effectively mitigate environmental impacts. (MoEnv)	A
5.4.4	Preparation of a design guide for dissemination to the public. MHL)	A
5.4.5	To determining the feasibility of maximising upon floor space below ground in housing units in Mauritius and Rodrigues, in the light of land scarcity and the need to make optimum use of scarce land resources. (MHL)	B

5.5 Protection of Historic Buildings

5.5.1	Inventory of Historic Buildings (Mauritius and Rodrigues). (MHL)	A

5.6 Coping with New Industrial Parameters

Title of Project	Priority
5.6.1 Identification of the locational criteria for different types of industries (Ministry of Industry, Commerce & International Trade).	A

5.7 Strengthening the Social Dimension

Title of Project	Priority
5.7.1 Low cost housing potential savings using new building technology (MRC task force on construction technologies)	A
5.7.2 Provision of Social Infrastructure and Amenities in existing Low Cost Housing Estates. (Trust Fund for the Social Integration of Vulnerable Groups, MoF)	A
5.7.3 Identification of the effetive demand for the housing from the Lower Middle Income groups. (MHL)	A
5.7.4 Type of housing estates to identify factors which contribute to the proper integration of the community or those who hamper this integration. (Trust fund for the Social Integration of Vulnerable Groups, MoF)	B

5.8 Tourism

Title of Project	Priority
5.8.1 Assessment of Informal Tourist Accommodation in Mauritius. (AHRIM)	A
5.8.2 Identification of New Inland Tourist/Leisure Space For Mauritians/Visitors (AHRIM).	A
5.8.3 Study of Development Potential of Outer Islands and Islets around Mauritius (AHRIM).	C

Short write-ups on 24 project proposals identified by the Working Group are attached in Annexure 1.

6. Summary and Recommendations.

The economic development of Mauritius and the expansion of the construction industry have put tremendous pressure on the limited land resources available in Mauritius. The last decade has seen a sharp drop in the acreage used for agriculture and the area used for built-up purposes has risen significantly. This, coupled with a lack of adequate planning, has given rise to serious problems like traffic congestions in certain areas of the island. In Rodrigues along with a shift in the pattern of land use in favour of

construction, more specifically in the coastal region, land has also traditionally been suffering from a high rate of soil erosion.

Given the economic, social and environmental aspirations of Mauritius and Rodrigues, the trend in the pattern of land use and the pressure on land is expected to intensify over the next two decades. This calls for sensible and adequate planning in this sector. The working group hence, recommended a list of research topics which addresses several critical issues concerning the development of land in both Mauritius and Rodrigues. These issues are

1. Protection of the Environment;
2. Strengthening of the existing database;
3. Capacity building in both land use planning and transport modelling;
4. Promotion of good practices at micro level;
5. Protection of Historical Buildings;
6. Coping with New Industrial Parameters;
7. Strengthening of the Social Dimension; and
8. The Tourism Industry

RECOMMENDED READING.

- National Environment Action Plan for the next decade, Environment Resources Management (July 1999).
- L'avenir de l'Environnement dans l'Ocean Indien Occidental, COI, PNUE, UE (1999).
- Ministry of Economic Development and Regional Cooperation, *Vision 2020: The National Long-term Perspective Study*, (1997).
- *Agenda 21 National Report*, Ministry of Environment and Quality of Life (1997).
- *Global Environment Outlook National Report*, Ministry of Environment and Quality of Life (June 1998).
- *National Physical Development Plan*, Ministry of Housing, Lands, Town and Country Planning (1994).
- *Land Suitability Map-Rodrigues*, Food and Agricultural Organisation (1974).
- *State of the Environment in Mauritius*, Ministry of Environment and Quality of Life (1991).

ANNEXURE 1:

List of Research Proposals

PROTECTION OF THE ENVIRONMENT

5.1.1 MAPPING OF COASTAL WETLANDS IN THE GRAND BAY, PEREYBERE AND CAP MALHEUREUX REGIONS AND THEIR PRESERVATION.

Objective:

- To establish specific criteria for the definition of wetlands.
- To update the wetlands map and identify wetlands requiring urgent protection.
- To set up mechanisms for effective wetlands management and protection for environmental sustainability.

Brief Background:

Land is a scarce resource in Mauritius. The small size of the island and the high population density coupled with the spatial impact of multiple economic activities, including human settlements render encroachment on environmentally sensitive areas such as wetlands very difficult to control. Most of the wetlands are privately owned. They are under constant pressure. Backfilling of wetlands and their reclamation have done harm in places as Flic en Flac and Grand Bay. A large percentage has been built up. Several areas designated, as wetlands in the outline scheme do not exhibit characteristics typical of wetlands.

Methodology:

- Carry out an inventory of wetlands as designated in the Outline Scheme including ownership and current status.
- Establish criteria for defining wetlands and ensure environmental sustainability.
- Map the wetlands according to the criteria.
- Identify the values and benefits of the wetlands.
- Propose engineering solutions and monitoring plans.
- Establish protection measures including legal measures.

Resource requirements:

Financial:	Rs. 1, 500, 000
Manpower:	One Consultant/Civil Engineer and University students.
Equipment:	Digitised large-scale land use maps.
Institutional Support:	The District Council, Ministry of Housing and Lands (Survey Division), Ministry of Environment, National Parks and Conservation Service, University of Mauritius, Wildlife Association, Ministry of Fisheries.
Time Frame:	One year
Expected Results:	Reduction in downstream lagoonal pollution resulting from lesser nutrient inputs, better lagoonal water quality, reduced risks of flooding, protection of biodiversity.
Beneficiaries:	The tourism industry, the public at large and the inhabitants.

5.1.2 FORESTRY INVENTORY FOR THE DETERMINATION OF TOTAL FOREST COVER.

Objectives:
- Preparation of Digitised Forest Maps
- Establishment of a set of criteria for the zonation of sensitive areas

Brief Background:
The total area of forests is estimated at 57,000 Ha, of which only 22,492 is state-owned. State forests lands are the first to be sacrificed for new developments. Private forests also are being cleared at an alarming rate for deer ranching and housing developments. An adequate vegetation cover is crucial to ensure that our forest continue to perform their environmental, social and economic functions. Research will provide the essential information and basis for the sustainable management of our forest resources.

Methodology:
Use of satellite images, Aerial photography and G.I.S., supported with ground surveys and truthing.

Resource Requirements:

Financial: Rs. 2M.

Manpower: A Forest Inventory Expert, 1 Assistant Conservator of Forests, 1 Surveyor + Survey Team, 2 Foresters, 4 Forest Guards and 10 labourers

Equipment/Vehicle: 1 Double cab 4x4, 1 P.C. + Software (other equipment available with Remote Sensing Unit.

Institutional Support: Ministry of Housing and Lands, Ministry of Agriculture, Food Technology and Natural Resources, Ministry of Environment, University of Mauritius and other relevant organisations.

Time Frame: 1 Year

Expected Results:
- Digitised Forest Maps/ Accurate data on the forest resources
- Zonation of sensitive forests areas.

Beneficiaries: Forest Department, National Parks and Conservation Service, Ministry of Housing and Lands, Ministry of Environment, University of Mauritius, NGO's

5.1.3 TO STUDY SOIL EROSION IN DIFFERENT LAND USE AREAS IN MAURITIUS AND DEVELOP STRATEGIES FOR THEIR CORRECTION.

Objectives:
To quantify the extent of soil erosion in agricultural and other land use areas, and to study erosion-prone areas, with the ultimate aim of helping policy makers in making informed choices for mitigation strategies as well as policy formulations for future developments.

Brief Background:
The topography of Mauritius is quite hilly. The prime lands in flat areas have already been exploited, mostly for agricultural but also for other types of development. There are also a large number of agricultural plots on mountain slopes, all of which suffer from loss of topsoil due to wind and water, and the consequent effects on the environment. Furthermore, future development will most probably be concentrated in marginal and fragile lands, such as steep slopes. It is important that the current level of soil erosion from these sites be quantified, and a model constructed for predicting extent of soil erosion under different scenarios of varying levels of development. Mitigation and/or correction strategies for certain sites also needs to be studied.

Methodology:
Soil erosion will be quantified over time using the USLE model from development sites using standard techniques that have been developed. The effect of such levels of erosion will be evaluated on different aspects of the environment, in particular on water bodies.

Resource Requirements:

Financial:	1 million MRU
Manpower:	3 academics from the Faculty of Agriculture, University of Mauritius, 1 research assistant, University students.
Equipment:	will be constructed locally.
Institutional Support:	Laboratory and computer facilities available at UoM.
Time Frame:	5 years.
Expected Results:	Database, GIS maps, recommendations to policy makers and farmers.
Beneficiaries:	Ministry of Environment, Ministry of Housing and Lands, Ministry of Agriculture, AREU, University of Mauritius.

5.1.4 AN ASSESSMENT OF THE ENVIRONMENTAL IMPACTS OF THE CONSTRUCTION OF BUILDINGS ON STEEP SLOPES.

Objectives:

- To develop a policy for development on steep slopes and propose appropriate precautionary measures that would be incorporated in Guidelines.
- To define a proper mountain reserve line.

Brief Background:

Man's interference on development is so pervasive that no place is safe from the assault of development unless deliberate measures are taken to ensure that they are not degraded. There is a strong realisation that since many environmentally sensitive areas such as wetlands and mountain slopes are irreplaceable and severely at risk, irreversible damage can occur if adequate safeguards are not taken or enforced. The resource base of the mountain slopes in terms of biodiversity, natural landscape beauty, potential for ecotourism have to be safeguarded to ensure sustainability.

Methodology

- Carry out a survey of all mountain areas which are currently under pressure for development.
- Define the severity of slopes of such mountains.
- Identify a pilot site and carry out a survey or inventory of the biodiversity and assess slope stability, visual obtrusiveness.
- Establish recommended various mountain reserve lines for each mountain area based on contours and/or slope levels.
- Effect bearing capacity tests and work out specifications and costs of infrastructures, including drains.
- Assess potential for ecotourism
- Define criteria for construction with regard to maximum plot coverage, building height, specifications for drains, mode of sewage disposal, and measures against erosion.

Resource requirements

Financial:	Rs. 1,500,000
Manpower:	Civil Engineer, geologist, landscape architect, surveyor
Equipment:	Digitised maps
Institutional Support:	Ministry of Environment, Ministry of Housing and Lands, Ministry of Agriculture, FT & NR (Forestry Service and NPCS), Ministry of Public Infrastructure, Inland Transport, University of Mauritius.
Time Frame:	Six months – one year
Expected Results:	Proper planning on slopes
Beneficiaries:	Decision makers, landowners, local authorities, present and future generations.

5.1.5 IDENTIFICATION OF APPROPRIATE REMEDIAL MEASURES AGAINST BEACH EROSION.

Objectives:
To identify the main causes of beach erosion in order to understand the erosional phenomena and find out long-term solutions.

Brief Background:
Erosion of beaches has become a serious problem along the coastlines of Mauritius. The reasons are both natural and of anthropogenic origin. Climate change can exacerbate the problem. Vertical walls, groynes, revetments and other structures constructed on the coastline to mitigate erosion have not been subject to comprehensive studies. The problem if not properly addressed can be compounded. Hard measures (gabion boxes) are seen as an eyesore.

Objectives:
- To carry out a survey of the beaches affected by erosion and select 3 pilot sites.
- Study the hydrodynamic conditions in the area and identify the causes.
- Identify and evaluate mitigating measures such as laying of gabions on the shoreline compared to placement of submerged gabions acting as breakwaters as opposed to use of sand bags.
- Monitor sediment transportation and deposition.

Resource Requirements:

Financial: Rs. 2,000,000

Manpower: A Coastal engineer, surveyor and university students in civil engineering.

Equipment:

Institutional Support: Ministry of Housing and Lands, University of Mauritius, Ministry of Environment, Meteorological Services, Ministry of Fisheries.

Time Frame: Two years - ongoing.

Expected Results: Plan coastal development. Recommend proper coastal protection measures. Establish setbacks to be observed from HWM.

Beneficiaries: The tourist industry and the public.

5.1.6 STUDY OF THE EFFECTS OF INTENSIVE PESTICIDE AND FERTILISER USE ON SOIL AND LAND QUALITY INDEX.

Objectives:
To quantify the pesticide and fertiliser residues in soil and water under intensive vegetable cultivation and correlate with various bio-indicators.

Brief Background:
The injudicious use of fertilisers and pesticides is known to have deleterious effects on the environment, especially the soil and water bodies. Pesticides and fertilisers are abundantly used by vegetable growers in Mauritius. The consumption pattern is expected to further increase with the recent subsidies offered by the Government on these farm inputs. It is important to scientifically quantify the levels of these agrochemical residues and study their effects on bio-indicators such as soil and aquatic faunal and floral populations.

Methodology:
A site where intensive vegetable production is practised will be identified. Farmers will be surveyed for their agronomic practices. Soil and water samples will be analysed for their physical, chemical and biological characteristics. This will be correlated with soil health factors.

Resource Requirements:

Financial;	1 Million MRU.
Manpower:	*2* academics from the Faculty of Agriculture, 1 research assistant and *U*niversity students.
Equipment:	Available at Faculty of Agriculture. Consumables such as HPLC columns *a*nd reagents need to be purchased.
Institutional Support:	Faculty of Agriculture laboratory and computer facilities.
Time Frame:	3 years.
Results:	Database, recommendations to farmers and policy makers.
Beneficiaries:	MoA, MoE, MoH, UoM, AREU, farmers.

5.1.7 AN ASSESSMENT OF THE IMPACT OF SUGAR CANE CULTIVATION ON SOIL CONSERVATION IN MAURITIUS.

Objectives:
The main objective of the project would be to provide scientific evidence as to whether sugar cane cultivation has a positive effect on soil conservation in the long term.

Brief Background:
Agriculture covers more than 45% of the land area of Mauritius, of which 90% is under sugar cane cultivation. Sugar cane is a perennial crop with an extended root system, providing extensive soil cover throughout the year. It is thus acknowledged as being beneficial to the soil by providing a natural cover against erosion. This characteristic of the sugar cane crop is a major argument put forward by Mauritius in different international forum, e.g. WTO, to support the maintenance of preferential trade arrangements like the Sugar Protocol.

Methodology:
To perform comparative measurements of soil erosion, based on a number of set parameters, for lands placed under different uses, e.g. sugar, other crops, bush, fallow land, etc.

Resource requirements:

Financial:	to be determined.
Manpower:	to be determined.
Equipment:	to be determined.
Institutional Support:	University of Mauritius, MSIRI
Time Frame:	Two calendar years to cover both wet and dry seasons repeated at least twice.
Expected results:	Availability of scientific data to support views as regards the impact of cane cultivation on soil conservation.
Beneficiaries:	Policy makers. Sugar cane growers. Researchers.

STRENGTHENING THE DATA BASE

5.2.1 INTEGRATED MISSION FOR SUSTAINABLE DEVELOPMENT USING REMOTE SENSING TECHNOLOGY

Objective:

- To generate various thematic maps on Natural Resources in digital format
- To identify the potentials and problems of land, water and socio economic parameters
- To integrate various thematic information and socio-economic data for generation of action plans namely land capability, land use change analysis and watershed development planning

Brief Background:

The social and economic development of our country is still interlinked with our natural resources and the manner in which they are managed and exploited. The steadily shrinking area of land under cultivation, water and biomass resources are currently under tremendous pressure in the context of highly competing and often conflicting demands of expanding populations. The results of which are land degradation, water/air pollution and biomass degradation. The challenge before us is therefore to reverse the process of degradation. This is not only to meet the present needs of the people but also their future needs without jeopardizing the possibilities of future generation to satisfy their needs i.e. sustainability.

Remote Sensing data by virtue of its synoptic coverage, receptivity and easy availability can provide update information's on various natural resources within a short time frame. Moreover this will give a holistic view of the entire region and an integrated approach of the various resources, their potential and their mutual dependence.

Methodology:

Three seasons of latest satellite images of Mauritius will be processed using digital image processing techniques to generate geocoded False Colour Composites (FCC). The FCC will be interpreted visually to see any change detection. The final maps will be prepared in four-tier approach:

1. Pre-field mapping
2. Checking of different mapping units in the field and modification if necessary
3. Correlation with existing information's and post refinement
4. Final mapping with field validation and quality assurance and standardization

All the maps thus obtained will be interpreted jointly by multi-thematic team of scientists to arrive at land and water resources development plans (Refer Fig. 1.1)

Resource requirements:

Financial: Estimated cost

- Consultancy/training (foreign): Rs.700000
- National Remote Sensing Software and hardware set up will be used
- Data collection and field work: Rs.100000
- Purchase of satellite data: Rs. 300000

Manpower: 1 consultant for conceptual design, training and quality check of the project .1 head of project (suggested from NRSC), 2 research

	assistants of geology and soil background and assistance from staff of the NRSC
Equipment:	-
Institutional Support:	Ministry of Housing and Lands, Ministry of Environment, Water Resources Unit, University of Mauritius, Meteorological services and Ministry of Public Utilities
Time frame:	Two years
Expected results:	Digital National Natural Resources Information System
Beneficiaries:	Policy makers, planners and to the country at large

5.2.2 DIGITAL CARTOGRAPHIC DATABASE UPDATE PROCEDURE AMONGST GOVERNMENT DEPARTMENTS AND PARA-STATAL BODIES.

Objective:
To set up an official procedure amongst all Government and Para-statal agencies to update the Digital Cartographic Database System of the Cartographic Section of the Ministry of Housing and Lands with all land utilization information in Mauritius and Rodrigues.

Brief Background:
Maps are essential for planning and implementation of projects.
Organisations like CWA, CEB, WWA, MT, SIFB etc., are producing their own map data.
These data are kept by each of these organisations and are consequently not available for users in general and especially with regard to the implementation of national projects.

Methodology:
- Identify shortcomings/obstacles and problem areas.
- Identify a common reference digital map for Mauritius and Rodrigues.
- Devise a common map legend as well as of a security and validation of information protocol.
- Start a pilot project in township areas and some large villages.
- Establishing appropriate procedures for digital map updating and data sharing/ disseminating within legal framework.

Resource requirements:

Financial:	Consultancy fees:	Rs. 500,000
	Software:	Rs. 400,000
	Hardware:	Rs. 600,000
Manpower:	One consultant, One head of project (preferably Chief Cartographer, two cartographers, one IT specialist, 3 research assistants.	
Equipment:	Server (minimum 100 gigabyte), 2 powerful PCs, network to server, UPS, backup device, one CD writer, 1 A0 plotter .	
Institutional Support:	The Ministry of Housing and Lands, Government Departments, Para-statal bodies as well as all the University of Mauritius.	
Time Frame:	12 months.	
Expected Results:	Approved policy and procedures for digital map updating and data sharing/disseminating within legal framework.	
Beneficiaries:	The Cartographic, Survey and Planning Section of the Ministry of Housing and Lands, all Government Departments, Para-statal bodies, Local Authorities, Rodrigues Administration, Decision Makers, Researchers and Land Users in general.	

CAPACITY BUILDING FOR LAND USE/TRANSPORT MODELLING

5.3.1 MACRO-LEVEL TRANSPORTATION MODEL FOR MAURITIUS AND RODRIGUES.

Objectives:
Set up a macro-level transportation model, covering both public and private transport modes, that will able to replicate current traffic and travel patterns. The model must be able to test future land use occupancy (infrastructure projects links and habitations) and economic development scenarios and indicate its implication to traffic growth, energy consumption and environment impact.

Brief Background: -

Methodology:
Identify and obtain a transport modelling consultant and software for the setting up of the macro-level transport model. Create the necessary facility and methodology for data collection, model set up / validation and model maintenance, model updating and forecasting capacity.

Resource Requirements:

Financial: Estimated cost:
- consultancy / training (foreign): Rs. 300,000
- Software programme and set up: Rs. 300,000
- Hardware requirements: Rs. 100,000
- Local setting up fees: Rs. 100,000 (data collection and management)

Manpower: 1 consultant (foreign) for the software and transport planning training, (local) 1 head of project (suggested University of Mauritius Civil Engineering Department), 2/3 research assistants, expect data input from the Ministry of Public Infrastructure, Land Transport and Shipping, and the Ministry of Housing and Lands.

Equipment: 1 macro-level transport modeling software (note: extensive traffic survey data is already available from Government); 2 PC, complete with UPS, printer, and back up device.

Institutional Support: The University of Mauritius, the Ministry of Public Infrastructure, Land Transport and Shipping and the Ministry of Housing and Lands.

Time Frame: 3 months (estimated), continuous maintenance and upgrade of model on a 6/8 years period (through an educational partnership with the University of Mauritius)

Expected Results: A fully functional and readily available macro-level transportation model for Mauritius and Rodrigues, capable of modeling current traffic patterns accurately, for both private and public transport, and forecast accurately various land utilization scenarios with respect to traffic, economic and environmental impact.

Beneficiaries: Planners at Government level, decision makers, researchers and students in the field of geography, engineering, economics and planning.

PROMOTING GOOD PRACTICES AT MICRO LEVEL

5.4.1 RAIN WATER HARVESTING FROM HOUSING UNITS IN RODRIGUES

Objectives:
To encourage the collection, storage and distribution of rain water on an individual basis to complement existing water distribution systems which are being overstretched.

Brief Background:
Rodrigues is characterised by water scarcity and increasing competing needs for scarce water resources. The problem is aggravated by a dispersed settlement pattern.

Methodology:
- Design, testing and costing of an affordable, but high performance prototype for low cost housing
- Design, testing and costing of a high performance prototype, incorporating pumping equipment with a view to increase the use of rainwater harvesting both in Rodrigues (and Mauritius).

Resource Requirements:

Financial: Around Rs. 500,000 for design, setting up and testing of several prototypes in Rodrigues (and possibly Mauritius). Also preliminary review mission in Rodrigues to appraise work already done there.

Manpower: Multidisciplinary team comprising architect, civil engineer and quantity surveyor.

Equipment Equipment required for the prototypes and identification of housing units that could be used for the testing and display.

Institutional Support: University of Mauritius, Rodrigues Administration, Ministry of Housing and Lands, NHDC, Trust Fund for Vulnerable Groups and Ministry of Health

Time Frame: 4 months for design and setting up
12 months for testing

Expected Results:
- Spread in the use of rainwater harvesting in Rodrigues and perhaps in Mauritius. Major contribution to water deficit at the level of individual households from rainwater harvesting. Ready Availability of Water for cleaning and Gardening.
- Spread in the use of rainwater harvesting at the level of institutions such as schools.
- Increase in Quality of life

Beneficiaries: Individual households
Consumers at level of Institutions
Water Authorities through better use of natural resources

5.4.2 ALTERNATIVE AGRICULTURAL ACTIVITIES FOR LANDS RELEASED FROM SUGARCANE

Objectives:
To identify alternative crops and livestock activities that can potentially replace sugarcane on lands marginal for sugarcane and likely to be released for alternative uses, keeping in view the soil conservation aspect.

Brief Background:
With the advent of WTO regulations governing international trade, the forthcoming erosion of our preferential EU markets and increasing competition, it is likely that sugarcane may not be profitable on marginal lands by virtue of their inherently low productivity, difficulty of access or difficulty of mechanical operations. It becomes necessary to identify suitable crops or livestock activities that can be undertaken on such lands that may be released. Such activities could be geared to substitute for imported food or feed or even for export markets. Lands likely to be released may involve sloppy lands and mountain slopes. Such lands may also deserve special consideration with regard to soil conservation, productivity and long-term sustainability.

Methodology:
Desk study, drawing on in-house experience of research and extension staff at AREU and reports and publications. Expertise will also be sought from Central Food Technological Research Institute (CFTRI) of Mysore, India and the Centre de Cooperation International en Recherche Agronomique pour le Developpement (CIRAD).

Resource Requirements:

Financial:	Rs. 600 000
Manpower:	AREU Economist, and Research Scientists in the fields of Agronomy, Animal Production and Soil Conservation. One expert-month each from CFTRI and CIRAD.
Equipment:	*(none)*
Institutional Support:	Partnership from CFTRI and CIRAD, and with the assistance of the Mauritius Chamber of Agriculture.
Time Frame:	Six months beginning August 2001
Expected Results:	Report with recommendations for alternative land use for marginal sugarcane lands as well as precautionary measures to assure environmentally-friendly and sustainable development.
Beneficiaries:	Community of small farmers

5.4.3 TO REDUCE THE BUFFER ZONE AROUND STONE CRUSHING AND ASSOCIATED ACTIVITIES THROUGH INNOVATIVE DESIGN PRINCIPLES TO EFFECTIVELY MITIGATE ENVIRONMENTAL IMPACTS.

Objective:

- To ensure judicious use of the limited land resources and juxtaposition of mutually compatible land uses.
- To adopt proactive measures and a forward planning approach to avoid unnecessary environmental conflict and reduce hardship on landowners.

Brief Background:

Land is a scarce resource in Mauritius. The intense pressure from multiple economic activities render land use conflict inevitable. The absence of a comprehensive policy has led to haphazard distribution of activities and to unnecessary environmental stress. Many complaints on pollution or environmental nuisances are the cause of incompatible land uses. The recent Government decision to ban removal of coral sand implies increased production of basalt sand. The 1km buffer between stone-crushing plants and residential zones presently imposed, although effective, is arbitrary and requires to be redefined with scientific backup whilst ensuring compliance with the environmental standards.

Methodology:

- Statistical sampling of the stone crushing plants.
- Establish land use pattern up to a 3km radius, assess rate of deposition of particles and particle size.
- Assessment of impacts and review the effectiveness of the mitigating measures at different radii from the plants taking into consideration water availability.
- Propose measures to be undertaken (e.g recessing) to reduce the buffer and release the pressure on valuable land.
- Establish the minimum required buffer and propose compatible land uses.

Resource requirements:

Financial:	Rs 3, 000, 000
Manpower:	A Civil Engineer, University of Mauritius students
Equipment:	Digitised large scale land use maps, air monitoring equipment, Noise level meters
Institutional Support:	Ministry of Environment, Ministry of Housing and Lands, University of Mauritius
Time Frame:	One year
Expected Results:	Develop a policy for the proper localisation of stone crushing plants and reduce the adverse impacts on nearby residential areas, taking into consideration the projected expansion in the production of basaltic rock sand in view of the phasing out of coral sand removal.
Beneficiaries:	The planning authorities, the inhabitants, decision makers and the land owners in the vicinity.

5.4.4 PREPARATION OF A DESIGN GUIDE FOR DISSEMINATION TO THE PUBLIC

Objectives:
The main objective behind the design guide is to have a popular handbook that would be used by all property developers and development promoters, including individual landowners, in the subsequent development of property. The guide would identify and encourage the use of key architectural features and landscaping ideas that suit the country's climate and cultural habits.

Brief Background:
There is a need to enhance the character of the built up areas. Mauritius is well known for its natural beauty. It is also poised for major development, including around the coastal areas. There is a need to ensure that whatever development is created in the environmentally sensitive areas of Mauritius enhances the harmony of the natural setting, whilst at the same time responds to the functional requirements of our tropical island setting.

Methodology:
Identify, through a planning and architectural appraisal, the main architectural and landscaping features that would contribute to the recommended design principles for our tropical island setting.

Factors to be considered:
(a) Functionality of traditional architectural features;
(b) Climatic conditions of Mauritius;
(c) Cultural habits of the various communities that live on the island;
(d) The prospective response of the construction industry; and
(e) Resilience of landscaping elements to the vagaries of our climate.

Resource Requirements:

Financial:	Rs. 1 million
Manpower:	Architectural and Planning Skills, 1 Landscape Designer, 2 Draughtsmen
Equipment:	-
Institutional Support:	Ministry of Housing and Lands, Ministry of Public Infrastructure, Land Transport and Shipping, Ministry of Agriculture, Food Technology & Natural Resources (Forestry Department), (National Park and Conservation Unit), Mauritius Association of Architects
Time Frame:	One year
Expected Results:	Popularisation of traditional design principles at all levels including at the level of individual house owners.
Beneficiaries:	Present and future generations of Mauritius; the tourism industry.

5.4.5 TO DETERMINE THE FEASIBILITY OF MAXIMISING UPON FLOORSPACE BELOW GROUND IN HOUSING UNITS IN MAURITIUS AND RODRIGUES, IN THE LIGHT OF LAND SCARCITY AND THE NEED TO MAKE OPTIMUM USE OF SCARCE LAND RESOURCES.

Objective: -

Brief Background:
Land is a scarce and expensive resource in Mauritius and Rodrigues. Government has invested substantially in housing directly and indirectly in the past and the trend will continue, with the Government committed to investing Rs. 1 billion in low cost housing alone over the next five years.

Traditional construction in Mauritius starts above ground level in the initial phase of works, with additional upper levels being added as the next generation requires extra space. The trends show that many parents are ready to give their children a "***droit de surélévation"*** on subsequent levels. In the meantime, the curtilage of the site which used to support 1 family is being used for more families in the long run.

Methodology:
Identify, with the collaboration of MHL and NHDC, a typical pilot site for the design and implementation of one prototype housing incorporating a semi basement as with a fully developed ground floor.

Identify the critical design and precautionary considerations which will protect basement areas from flooding in tropical cyclonic areas. Identify optimum opportunities and livability functions which could be undertaken in such basements, whilst contributing to the long term vision of the housing concept.

Work out the cost estimates of the basement as well as the revised cost per sq. metre of the basement plus ground floor.

Build the prototypes for appraisal by institutions and the public.

Evaluate the principle of basement development within the strategy of coping with land scarcity.

Resource requirements:

Financial:	Rs. 800,000 for the actual building of one prototype and expert costs. MHL & NHDC to put a pilot site at disposal of Team.
Manpower:	Multidisciplinary Team led by Architect and comprising civil engineer and quantity surveyor.
Equipment:	-
Institutional Support:	Ministry of Housing and Lands, NHDC, Ministry of Health, Ministry of Public Utilities, University of Mauritius.
Time Frame:	Eight Months
Expected Results:	Added experience in basement construction in Mauritius. Prospective spread in the use of basements in Mauritius, thereby making more effective use of scarce land resources.
Beneficiaries:	Present and future generations of Mauritians.

PROTECTION OF HISTORIC BUILDINGS

5.5.1 INVENTORY OF HISTORIC BUILDINGS (MAURITIUS AND RODRIGUES)

Objectives:
To carry out a detailed inventory of buildings which require to be listed; To submit detailed report, sketches and photographs, in hard copy as well as digitalised form.

Brief Background:
There is a considerable legacy of buildings of great historical, cultural and educational value in the country. Such buildings, unless rehabilitated and put to economic uses are under threat of demolition to make way for speculative development.

Methodology:
To carry out a detailed appraisal and cataloguing of buildings with supportive sketches and photographs in hard and digitised form. To establish 3 categories of listing requiring different degrees of legal protection. To suggest alternative appropriate uses and package of incentives.

Resource requirements:

Financial:	Rs. 800,000
Manpower:	Architects within a Multidisciplinary Team. Such Architects to have a post graduate diploma in conservation.
Equipment:	Digital Cameras
Institutional Support:	National Heritage Trust Fund, Ministry of Arts and Culture, Mauritius Association of Architects, Ministry of Housing and Lands, Local Authorities, Rodrigues Administration
Time Frame:	6 man-months
Expected Results:	Availability of Scientific Information with a view to Declaration of Conservation Areas, Listing Declarations, preservation and other policy making.
Beneficiaries:	Present and Future Generations of Mauritians as well as Visitors

COPING WITH NEW INDUSTRIAL PARAMETERS

5.6.1 IDENTIFICATION OF LOCATIONAL CRITERIA FOR SPECIFIC TYPES OF INDUSTRIES

Objectives:
To help in the rapid identification of sites for specific industries with a view to facilitating investment while protecting the environment.

Brief Background:
To identify appropriate sites for the type of activities mentioned below so that investors can get an early indication where they can locate their enterprises. This will help in curtailing unnecessary delays for the setting up of enterprises and result in a more efficient use of land: (i) spinning and weaving plants; (ii) polluting activities such as dyeing; (iii) dry industries and (iv) light engineering industries.

Methodology: **-**

Resource requirements:

Financial US $25,000

Manpower 2 Man month consultancy

Equipment: -

Institutional Support: Information from all the ministries and departments

Time Frame: 3 months

Expected Results: Rapid implementation of projects, which will enhance our industrial and economic development

Beneficiaries: Investors and Mauritians at large

STRENGTHENING THE SOCIAL DIMENSION

5.7.1 LOW COST HOUSING POTENTIAL SAVINGS USING NEW BUILDING TECHNOLOGY

Objectives:
To use the American block construction technique to reduce the cost of construction.

Brief Background:
MRC research on blocks has shown at 29% saving on a grey building, which can be applied to very low cost housing.

Methodology:
Architectural design of very low cost housing & layout Engineers Drawings & Quantity Surveyor to price the proposal so that % cost savings can be shown in advance**.**

Resource requirements:

Financial:	Architectural Fees Structural Engineers Fees
Manpower:	Quantity Surveyor
Equipment:	-
Institutional Support:	-
Time Frame:	2 to 3 months
Expected Results:	There will be a saving in the construction time and cost of the building. The extent of the saving has to be ascertained.
Beneficiaries:	The Government of Mauritius as there is a program of construction of 5,000 units

5.7.2 PROVISION OF SOCIAL INFRASTRUCTURE AND AMENITIES IN EXISTING LOW COST HOUSING ESTATES

Objectives:
The main objective of the project is to identify the needs for social infrastructure and amenities, and social support systems in existing low cost housing estates, namely ex-CHA, NHDC and Sugar Camps housing estates

Brief Background:
As from 1960's, ex-CHA housing estates have been constructed across the island without the provision of basic infrastructure facilities such as roads, drains, water, sewerage and telephone. It is only after 1992 that the Ministry of Housing and Lands undertook to provide water, roads and drains and sewerage facilities in those estates. The provision/upgrading of such facilities are ongoing in certain estates. Further, with effect from 1992, NHDC had launched the construction of housing estates across the island, whereby same 8000 housing units have been constructed. While basic infrastructure facilities have been provided, there is the need to provide social infrastructure facilities in those NHDC housing estates. Finally, there is the feeling that Mauritians do not like to live in high rise apartments.

Methodology:
Identify through a survey, the needs for social infrastructure and amenities in low cost housing estates.

Resource Requirements:

Financial:	Rs. 800,000
Manpower:	Team to be led by a sociologist and of Social Research Assistants
Equipment:	-
Institutional Support:	University of Mauritius, Ministry of Housing and Lands, Trust Fund for the Social Integration of Vulnerable Groups and the NHDC Ltd.
Time Frame:	10 months
Expected Results:	Proper integration of the estates in the localities where they have been constructed. This would reduce social problems which are related to drugs, juvenile delinquency and riots. This would also help to reduce the resistance of Mauritians to live in high-rise apartments
Beneficiaries:	The residents of the low cost housing estates and the country at large.

5.7.3 IDENTIFICATION OF THE EFFECTIVE DEMAND FOR HOUSING FROM THE LOWER MIDDLE INCOME GROUPS

Objectives:
The main objective is to undertake research in order to identify the housing needs of those income groups who cannot be catered for directly by the Government's housing programme, but who encounter major financial difficulties in having access to land or a housing unit.

Brief Background:
The Government is committed to a long term housing programme for the poorer sections of the community. Yet, many wage earners including young salaried workers, fall above the threshold beyond which they do not qualify for special assistance. Yet the costs of buying land and building would be beyond the affordability of these families belonging to the lower middle income group.

Methodology:
Assess, through research and survey, the housing needs of the lower middle economic groups and the shortfall in satisfying the demand.

Factors to be considered:
(a) Affordability of the families;
(b) Their design expectations;
(c) The gap that needs to be addressed;
(d) Resource requirements; and
(e) Costs/benefits of proposal

Resource requirements:

Financial: Rs. 500 000 (Estimated)

*Manpower***:** 2 Planners, 1 Architect, 1 Engineer, 1 Statistician, 1 Sociologist and Research Assistants

Equipment: -

Institutional Support: Ministry of Housing and Lands, NHDC, MHC, CSO, University of Mauritius

Time Frame: One year

Expected Results: Satisfying housing needs of Middle & Lower Middle Income Groups.

Beneficiaries: Mauritian Society as a whole.

5.7.4 TYPE OF HOUSING ESTATES TO IDENTIFY FACTORS WHICH CONTRIBUTE TO THE PROPER INTEGRATION OF THE COMMUNITY OR THOSE WHO HAMPER THIS INTEGRATION

Objectives:
The main objective is to undertake research on types of housing estates to identify factors which contribute to the proper integration of the community or those which hamper this integration.

Brief Background:
There is ample reason to believe that people living in ex-CHA housing estates or NHDC housing estates are not fully integrated as a community. The syndics in certain NHDC housing estates are fulfilling their role marvellously while some estates the syndic is unable to operate successfully. Some have to resign as soon as they assume office.

Methodology:
Identify through a social survey with the collaboration of the Ministry of Housing and Land, where there has been a full integration of the community or those where such integration has failed.

Factors to be considered
(a) Location of housing estates;
(b) Types of houses and size of housing estates;
(c) Impact of the concentration of families;
(d) Existing social amenities; and
(e) Socio cultural factors

Resource requirements:

Financial:	Rs 800,000 (Estimated)
Manpower:	1 Sociologist, 1 Planner, 1 Architect and 1 Engineer and Research Assistants
Equipment:	-
Institutional Support:	University of Mauritius, Ministry of Housing and Lands, Trust Fund for the Social Integration of Vulnerable Groups and the NHDC Ltd.
Time Frame:	One Year
Expected Results:	Community Integration in all housing estates
Beneficiaries:	Residents of the housing estates

TOURISM

5.8.1 ASSESSMENT OF INFORMAL TOURIST ACCOMMODATION IN MAURITIUS

Objectives:
To carry out a complete audit of accommodation units available for rent to foreign visitors in Mauritius including bungalows, villas, guest-houses, boarding houses, campements, studios, apartments.

Brief Background:
Over the past decades there has been a mushrooming of informal accommodation units throughout the island. This sector currently captures about 30% of tourist arrivals, corresponding to about 200,000 tourists/year, in an illegal manner.

The level of service, hygiene, sanitation and the quality of equipment of these units are often substandard. This is tarnishing the image of Mauritius as a select tourist resort and clashes with government policy of targeting the upmarket tourist segment. In addition the sector does not generate acceptable returns to the country in relation to public investment in infrastructure, (airport, roads, beaches) leading to sub optimal utilisation of resources.

Methodology:
In order to have an accurate picture of the sector, an exhaustive survey of all the units in Mauritius is required. The following data should be collected for each unit:

Size, ownership, investment, level of furnishing, target market, services and facilities provided, number of employees, level of training, meal facilities offered, marketing channels and advertising, rates charged.

The study could also probe into incentives to be provided to these operators to enable them to upgrade their services.

Resource requirements:

Financial:	Rs. 800,000
Manpower:	Statistician, experts in tourism, field workers
Equipment:	-
Institutional Support:	The study should be carried out in collaboration with CSO and Ministry of Tourism
Time Frame:	6 months

Expected Results:
- Will assist in better planning of tourism in relation to total room capacity.
- Will help to define incentives and facilities to be provided to entrepreneurs to assist them in professionalising their services.
- Will help in projecting a better image of Mauritius in line with government policy.

Beneficiaries:
Informal sector, foreign visitors, employees, local community, tourism industry, government.

5.8.2 IDENTIFICATION OF NEW INLAND TOURIST/LEISURE SPACE FOR MAURITIANS/VISITORS

Objectives:
The objective of the project is to provide alternative leisure facilities in Mauritius with a view to reducing the load on public beaches. The concept of theme-based leisure activities centred around themes like traditional values, socio-cultural values and nature will be introduced. Children will be targeted to induce a harmonious interaction and fusion of cultures.

Brief Background:
Mauritius is endowed with some inland natural sites of exceptional beauty which are currently not being exploited. Potential sites which could be exploited include Valleta and Dagotière lakes and the River at Belle Rive, which could be landscaped for recreational and picnic areas.

Mountain sites include the Crève Coeur region which could be converted into a kind of ranch with a set-up recalling the Paul and Virginie period. The ranch could also include typical Indian huts with thatched roofs and typical "cases créoles" where traditional Indian and Creole dishes could be served. Orchid gardens and butterfly parks could complement the ranch which could be extended to the viewpoint of Malenga.

Other areas with a rich cultural/heritage include La Gaulette/Rivière Noire, Souillac and Ecroignard/Flacq. The Jardin de la Compagnie could be transformed into a high profile recreational area with well-managed food stalls serving traditional local dishes.

Methodology:
- Island wide survey of potential sites centred around specific themes.
- Preliminary feasibility study for the sites and investigation of the availability of the land for development.
- Prioritisation of the sites for development based on feasibility.
- In depth study of a few selected sites for short term implementation.

Resource requirements:

Financial:	Rs. 1, 000,000
Manpower:	Historian, Sociologist, Town and Country planner, Ecologists, Cultural centres.
Equipment:	-
Institutional Support:	Ministry of Housing & Lands, Ministry of Arts and Culture, Ministry of Tourism, AHRIM
Time Frame:	One year
Expected Results:	The implementation of the projects identified are expected to encourage community participation and local entrepreneurship. There will be an impact on the regions developed through cultural and economic effervescence.
Beneficiaries:	Residents of the housing estates

5.8.3 STUDY OF DEVELOPMENT POTENTIAL OF OUTER ISLANDS AND ISLETS AROUND MAURITIUS

Objectives:
To carry out research on the potential for development of outer islands while conserving and enhancing their ecological values.

Brief Background:
An exhaustive inventory of land masses, lagoons, flora and fauna of outer islands including identification of rare and endangered species is needed to establish a baseline for protection and conservation.

This basic data will enable the estimation of the carrying capacity of these islets for ecotourism projects and the development potential for plantations. Historical sites like the quarantine Centre on Flat island could be refurbished to receive visitors.

A passport type access could be implemented whereby a "passport" sold to the visitor would be stamped each time the person visits an island, each island having its own stamp. The passport would be a token of the eco-friendly behaviour of its holder.

Methodology:
Carry out a systematic and scientific study of the potential for sustainable development, conservation and value addition to outer islands. An integrated approach should be adopted to exploit the natural, social, cultural and historical heritage.

Resource requirements:

Financial:	Rs. 1, 000,000
Manpower:	A team consisting of ecologists, academics and Consultants
Equipment:	-
Institutional Support:	National Heritage Trust Fund, Ministry of Environment, Ministry of Tourism, Private Sector, Mauritius Oceanography Institute.
Time Frame:	One year
Expected Results:	Value addition to outer islands, creation of leisure facilities for tourists and locals. Enhancement of the Mauritian tourism product.
Beneficiaries:	Government, local operators, Mauritian Society at large.