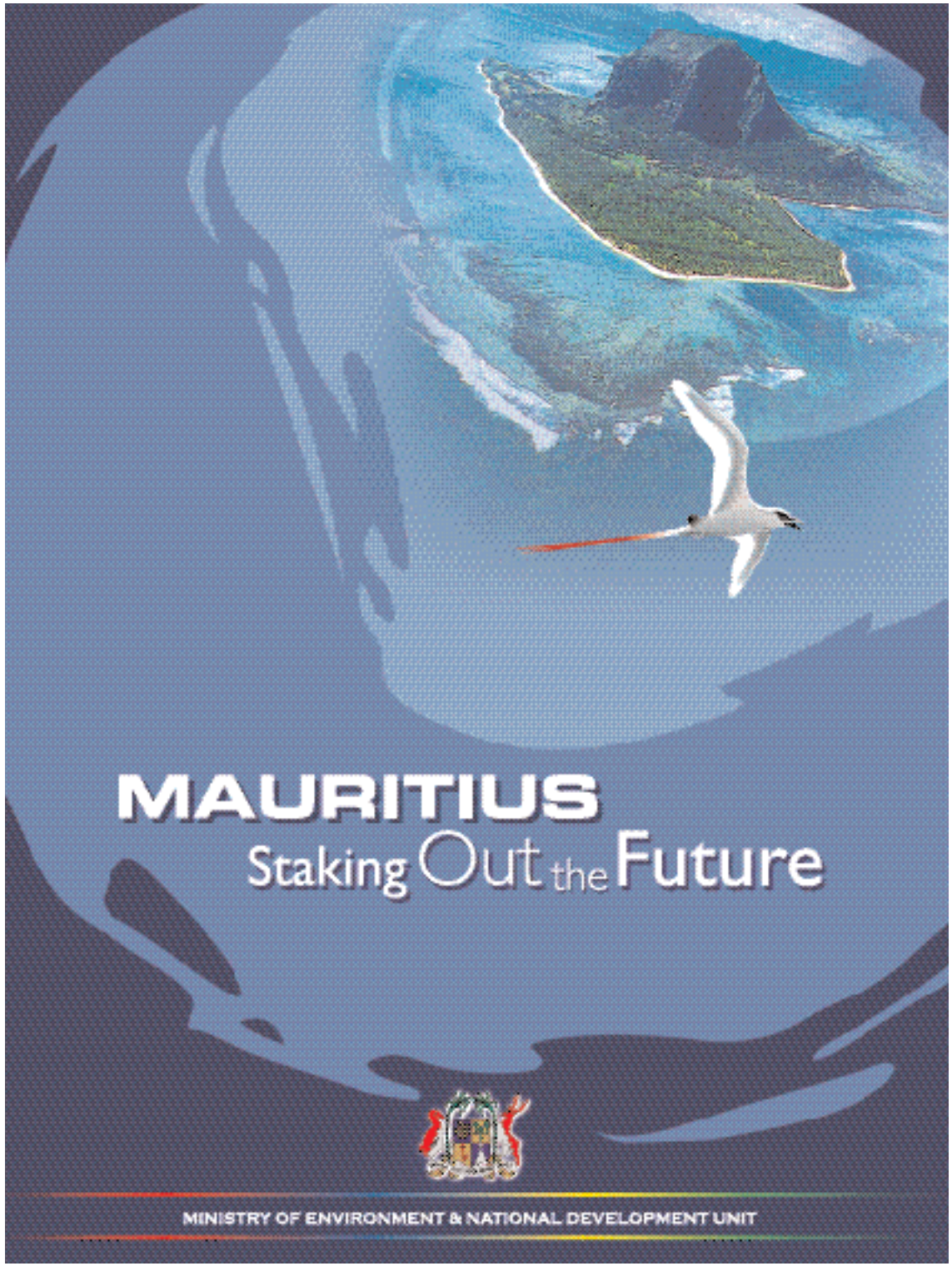
MAURITIUS
Staking Out the Future
MINISTRY OF ENVIRONMENT & NATIONAL DEVELOPMENT UNIT

Ministry of Environment and National Development Unit

MAURITIUS

Staking out the future

2005

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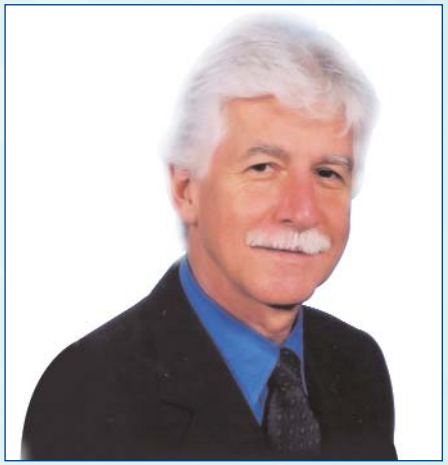
Acknowledgements

The Ministry of Environment and National Development Unit (NDU) would like to express its appreciation to all Ministries and Organisations which have contributed to the preparation of this report

Foreword



The Honourable Paul Raymond Bérenger, GCSK,
Prime Minister of the Republic of Mauritius

The Government of Mauritius is pleased to publish this report on the occasion of the International Meeting on the comprehensive review of the BARBADOS PROGRAMME OF ACTION for the sustainable development of Small Island Developing States (SIDS) to be held in Mauritius in January 2005.

This report maps out the road travelled by Mauritius in the quest for sustainable development and highlights the efforts made, the resources deployed and the constraints met. It gives an excellent overview of the various initiatives taken and being implemented, including by the private sector, within the ambit of a holistic approach to meet the goals of Sustainable Development.

The report addresses all the major issues contained in the Barbados Programme of Action as well as new and emerging issues which are very pertinent to Mauritius. On account of the changing international economic order and the rapid permutations affecting global trade and commerce, major reforms in a number of critical sectors including education and training, agriculture and the financial sector are being undertaken to enable Mauritius to meet the challenges ahead. The situation in Rodrigues and the Outer Islands have also been addressed in this report.

The document highlights in particular the sustained efforts made by Mauritius to build resilience to adapt to unfavourable national, regional and international conjectures as well as to the effects of climatic changes including cyclones, seasonal droughts and coastal erosion. These challenges have called for innovative approaches and this report gives us an indication of the strategies and actions taken to enhance our resilience in the face of these natural calamities.

Overall, it is to be noted that 2004 has not been favourable to Small Islands Developing States, many of whom have been struck by cyclones of extreme violence. The Small Island Developing States of the African, Pacific and Caribbean group have also been traumatized by the proposed 37% reduction in the price of sugar under the ACP/EU Sugar Protocol. There is no doubt that this proposed reduction will adversely affect their economies and result in job losses and increased pauperisation.

The International Meeting on Sustainable Development of Small Island Developing States to be held in Mauritius provides a timely opportunity for the international community to rededicate themselves to the cause of the sustainable development of these States and to establish a new agenda with full support for the effective implementation of its outcome.

Hon. Paul Raymond Bérenger,
Prime Minister
of the Republic of Mauritius

Preface

The Honourable Rajesh Anand Bhagwan, Minister of Environment & National Development Unit

The International Meeting on the comprehensive review of the BARBADOS PROGRAMME OF ACTION for the sustainable development of Small Island Developing States to be held in Mauritius from 10 to 14 January 2005 is being organised following a resolution of the UN General Assembly as a result of a call from the Johannesburg World Summit on Sustainable Development in 2002. It will undertake a full and comprehensive review of the implementation of the Barbados Programme of Action (BPoA) for the Sustainable Development of SIDS adopted at the Global Conference on the Sustainable Development of SIDS in 1994.

As an essential preparatory exercise for the International Meeting, Mauritius, like all SIDS, has itself undertaken a review of its implementation of the BPoA and has produced this Assessment Report. It highlights the successes and failures, the achievements and lessons learnt, the constraints and contributory factors, the challenges and opportunities, and the vision of the future. Our policies, programmes and projects are guided by national strategies in practically all major areas and link in a holistic manner economic, social and environmental considerations. The main theme running through the Report is Resilience.

There is no doubt that some remarkable progress has been achieved by SIDS during the last decade in many spheres, but at the same time, it must be conceded that there has also been a worsening of the situation in many others. The regional and inter-regional preparatory meetings of SIDS have identified those achievements as well as the constraints and the failures. There are also the new and emerging issues which have a significant influence on the sustainable development of SIDS and which cannot therefore be ignored in the further implementation of the BPoA.

Having undertaken the assessment review process, we are now in a position to submit concrete, practical and pragmatic proposals for consideration by the International Meeting. This will naturally involve the active participation of the whole international community and institutions. Indeed, without international cooperation, SIDS will not be able to successfully implement the BPoA, as already pointed out in the BPoA itself and confirmed in the Johannesburg Plan of Implementation.

As so aptly pointed out by the United Nations Secretary General, "Brighter horizons for Small Islands can mean brighter horizons for the World". The International Meeting will therefore be a unique forum to renew, at the highest political level, the commitments to honour promises already made at Rio, Barbados and Johannesburg. It will thus be, not just another international meeting but a meeting of hope for all SIDS and for the whole World.

Hon. Rajesh Anand Bhagwan,
Minister of Environment & National Development Unit

List of abbreviations and acronyms

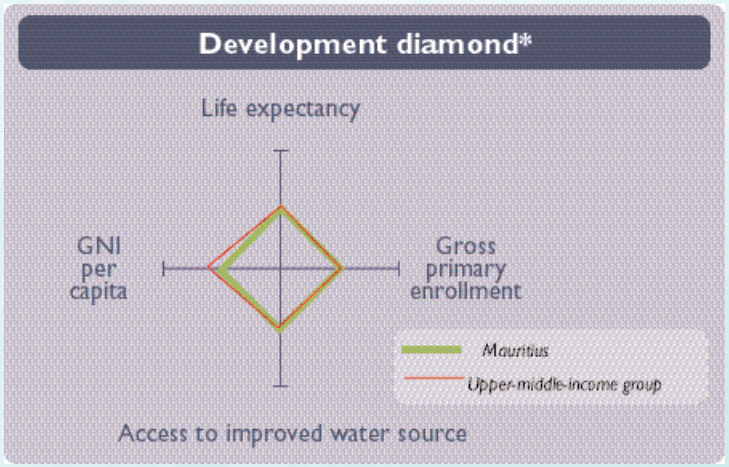
ACP	African Caribbean Pacific
ACT	African Computing and Telecommunications Summit
ADSL	Asymmetric Digital Subscriber Line
AEWA	African Eurasian Waterbird Agreement
AGOA	Africa Growth and Opportunity Act
AHRIM	Association des Hôteliers et Restaurateurs de L'Ile Maurice
AIDS	Acquired Immunodeficiency Syndrome
ARDA	Association Reunionaise de Développement de L'Aquaculture
BADEA	Banque Arab de Dévelopment Économic en Afrique: ABEDA - Arab Bank for Economic Development in Africa
BEDP	Bagasse Energy Development Programme
BOI	Board of Investment
BOO	Build-Own-Operate
BPML	Business Parks of Mauritius Limited
BPO	Business Process Outsourcing
BPoA	Barbados Programme of Action
B-T	Build-transfer
CAPAM	Commonwealth Association for Public Administration and Management
CAS	Computerized Attendance System
CBD	Convention on Biological Diversity
CEB	Central Electricity Board
CFC	Chlorofluorocarbons
CFL	Compact Fluorescent Lamp
CIB	Central Informatics Bureau
CISD	Central Information Systems Division
CITES	Convention on International Trade in Endangered Species
CMA	Conservation Management Areas
CNS/ATM	Communication and Surveillance / Air Traffic Management
COMESA	Common Market for Eastern and Southern Africa
CRHCS	Commonwealth Regional Health Community Secretariat
CSO	Central Statistical Office
CWA	Central Water Authority
DAI	Digital Access Index
DBM	Development Bank of Mauritius
DEOL	Distance Education and Open Learning
DoE	Department of Environment
EDI	Electronic Data Interchange
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIP	Environmental Investment Programme
EPA	Environment Protection Act
EPZ	Export Processing Zone
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GII	Global Information Infrastructure
GINS	Government Intranet Systems
GMO	Genetically Modified Organisms
GNP	Gross National Product
GOC	Government Online Centre
GRR	Gross Reproduction Rate
GWh	Gigawatt hour
ha	Hectare
HDI	Human Development Index
HDPE	High Density Poly Ethylene
HIV	Human Immunodeficiency Virus
HSC	Higher School Certificate
HWM	High Water Mark
ICAC	Independent Commission Against Corruption
ICAO	International Civil Aviation Organisation
ICBP	International Council for Bird Conservation
ICT	Information and Communication Technology
ICTA	Information and Communications Technologies Authority
ICZM	Integrated Coastal Zone Management
IM	International Meeting
INTSS	Integrated National Transport Sector Strategy
IOC	Indian Ocean Commission
IOC	Intergovernmental Oceanographic Commission
IO-GOOS	Indian Ocean Global Ocean Observation System
IOR-ARC	Indian Ocean Rim – Association for Regional Cooperation
IPPs	Independent Power Producers
ISO	International Standard Organisation

IT	Information Technology
ITES	Information Technology Enabled Services
ITU	International Telecommunications Union
IUCN	International Union for Conservation of Nature and Natural Resources
IVTB	Industrial and Vocational Training Board
KWh	Kilowatt hour
LDCs	Least Developed Countries
LPG	Liquefied Petroleum Gas
LRT	Light Rail Transit
MA	Masters in Administration
MCA	Mauritius College of the Air
MCML	Multi Carrier Mauritius Limited
MCSA & RA	Ministry of Civil Service Affairs and Administrative Reforms
MDGs	Millennium Development Goals
MEF	Mauritius Employers' Federation
MFA	Multi-Fibre Arrangement
MIE	Mauritius Institute of Education
MITIA	Mauritius IT Industry Association
MITT	Ministry of Information Technology and Telecommunications
MOBAA	Mauritius Offshore Business Activities Authority
MOHQL	Ministry of Health and Quality of Life
MOI	Mauritius Oceanography Institute
MPA	Mauritius Ports Authority
MPA	Marine Protected Area
MPL	Mauritius Posts Limited
MQA	Mauritius Qualifications Authority
MQI	Mauritian Quality Institute
MRC	Mauritius Research Council
MSB	Mauritius Standards Bureau
MSIRI	Mauritius Sugar Industry Research Institute
MSTQ	Metrology, standards, testing and quality
MT	Mauritius Telecom
MTSDP	Ministry of Training, Skills Development and Productivity
MUR	Mauritian Rupee
MWF	Mauritius Wildlife Foundation
MWh	Megawatt hour
NBSAP	National Biodiversity Strategy and Action Plan
NCB	National Computer Board
NCC	National Climate Committee
NCD	Non Communicable Diseases
NCG	National Coast Guard
NDU	National Development Unit
NEAP	National Environmental Action Plan
NEF	National Environment Fund
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NITSP	National IT Strategic Plan
NOSCP	National Oil Spill Contingency Plan
NPCC	National Productivity and Competitiveness Council
NPCS	National Parks and Conservation Services
NPDP	National Physical Development Plan
NQF	National Qualifications Framework
NSMP	National Sewerage Master Plan
NSWMP	National Solid Waste Management Plan
NTA	National Transport Authority
NTP	National Telecommunications Policy
OECD	Organisation for Economic Cooperation and Development
OLIM	Open Learning Institute of Mauritius
OTEC	Ocean Thermal Energy Conversion
PC	Personal Computer
PC	Productivity Committee
PER	Preliminary Environmental Report
PET	Polyethylene Terephthalate
PGR	Plant Genetic Resources
PKI	Public Key Infrastructure
PMO	Prime Minister's Office
PV	Photo Voltaic
R & D	Research & Development
RSA	Revenue Sharing Arrangements
SADC	Southern African Development Community
SAFE	South Africa Far East
SAMU	Service Aide Medicale Urgence
SARS	Severe Acute Respiratory Syndrome
SC	School Certificate
SCP	Sustainable Production and Consumption Patterns
SIDS	Small Island Developing States
SIL	State Informatics Limited
SIT	State Investment Trust
SITP	School Information and Communications Technology Project
SME	Small and Medium Enterprise

SMIDO	Small and Medium Industries Development Organisation
SSR	Sir Seewoosagur Ramgoolam
STAM	Societé de Traitement et d'Assainissement des Mascareignes Ltée.
STC	State Trading Corporation
TAC	Technical Advisory Committee
TB	Tuberculosis
TDP	Technology Development Project
TE	Teacher Education
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Commission for Trade and Development
UNDP	United National Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
UoM	University of Mauritius
US	United States
UT	Universal Time
UTM	University of Technology, Mauritius
VMS	Vessel Monitoring System
VRS	Voluntary Retirement Scheme
WHO	World Health Organisation
WMA	Wastewater Management Authority
WRU	Water Resources Unit
WTO	World Trade Organisation

Mauritius at a glance

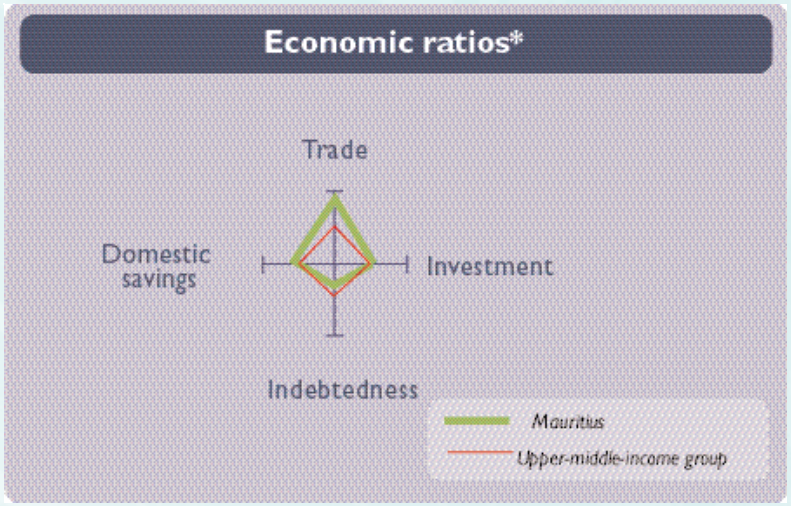
POVERTY and SOCIAL	Mauritius	Sub-Saharan Africa	Upper-middle income
2003			
Population, mid-year (millions)	1.2	703	335
GNI per capita (Atlas method, US$)	4,090	490	5,340
GNI (Atlas method, US$ billions)	5.0	347	1,788
Average annual growth, 1997-03			
Population (%)	1.1	2.3	1.2
Labor force (%)	1.4	2.4	1.8
Most recent estimate (latest year available, 1997-03)			
Poverty (% of population below national poverty line)	--	--	--
Urban population (% of total population)	43	36	76
Life expectancy at birth (years)	73	46	73
Infant mortality (per 1,000 live births)	17	103	19
Child malnutrition (% of children under 5)	--	--	--
Access to an improved water source (% of population)	100	58	89
Illiteracy (% of population age 15+)	16	35	9
Gross primary enrollment (% of school-age population)	106	87	104
Male	106	94	104
Female	106	80	104



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

	1983	1993	2002	2003
GDP (US$ billions)	1.1	3.3	4.5	5.2
Gross domestic investment/GDP	17.6	30.0	21.4	22.9
Exports of goods and services/GDP	46.5	58.7	60.7	59.7
Gross domestic savings/GDP	16.1	25.2	25.2	25.3
Gross national savings/GDP	14.9	28.5	26.5	26.8
Current account balance/GDP	-5.0	-1.3	5.2	2.7
Interest payments/GDP	2.8	1.4	0.8	0.7
Total debt/GDP	51.6	31.1	38.9	35.4
Total debt service/exports	21.3	7.4	7.0	6.5

	1983-93	1993-03	2002	2003	2003-07
(average annual growth)					
GDP	6.6	5.1	4.4	3.2	4.6
GDP per capita	5.7	4.0	3.3	2.2	3.6
Exports of goods and services	10.6	5.2	9.5	-6.4	3.1

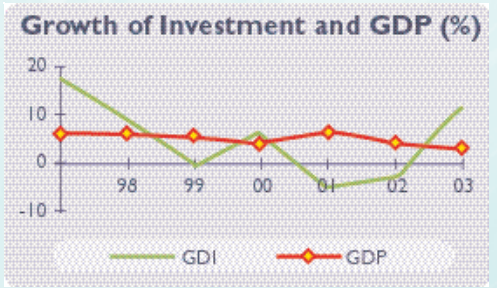


STRUCTURE of the ECONOMY

	1983	1993	2002	2003
(% of GDP)				
Agriculture	15.5	11.2	7.0	6.1
Industry	24.9	33.0	31.1	30.6
Manufacturing	16.3	23.5	22.9	22.0
Services	59.6	55.8	61.9	63.3
Private consumption	69.5	62.1	62.0	61.7
General government consumption	14.4	12.7	12.8	13.0
Imports of goods and services	48.0	63.5	56.9	57.3

	1983-93	1993-03	2002	2003
(average annual growth)				
Agriculture	1.0	0.4	6.6	-12.2
Industry	9.9	5.2	2.9	1.1
Manufacturing	10.0	4.9	2.3	-1.1
Services	6.1	6.1	5.6	6.2
Private consumption	6.8	5.6	3.1	3.2
General government consumption	4.4	4.8	4.5	5.4
Gross domestic investment	13.5	3.2	-3.3	12.5
Imports of goods and services	13.3	4.8	5.2	-3.0

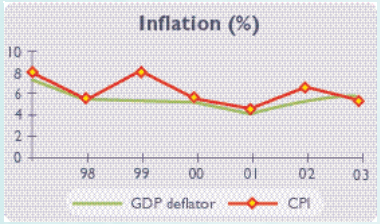
Note: Data are for fiscal year.
*The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

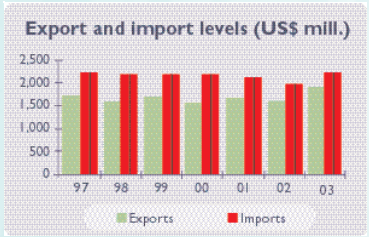


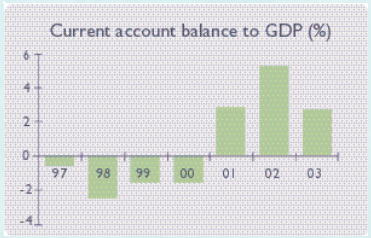
PRICES and GOVERNMENT FINANCE	1983	1993	2002	2003
Domestic prices				
(% change)				
Consumer prices	7.5	8.9	6.3	5.1
Implicit GDP deflator	8.5	8.0	5.0	5.6
Government finance				
(% of GDP, includes current grants)				
Current revenue	22.9	21.2	18.5	20.3
Current budget balance	-3.2	2.8	-1.9	-0.8
Overall surplus/deficit	-9.4	-1.9	-6.1	-6.2

TRADE	1983	1993	2002	2003
(US$ millions)				
Total exports (fob)	345	1,343	1,569	1,871
Sugar	212	363	283	267
Manufactures	107	861	1,101	1,240
Total imports (cif)	453	1,670	1,923	2,162
Food	127	219	316	345
Fuel and energy	82	126	184	195
Capital goods	45	378	456	512
Export price index (1995=100)	..	93	84	88
Import price index (1995=100)	..	95	89	93
Terms of trade (1995=100)	..	98	94	95

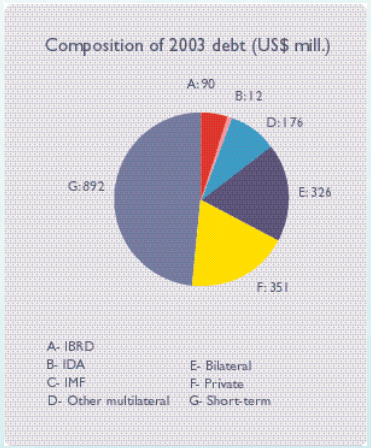
BALANCE of PAYMENTS	1983	1993	2002	2003
(US$ millions)				
Exports of goods and services	474	1,914	2,749	3,065
Imports of goods and services	516	2,068	2,577	3,005
Resource balance	-42	-153	172	60
Net income	-45	12	5	-2
Net current transfers	31	96	61	81
Current account balance	-56	-44	238	139
Financing items (net)	49	-11	5	180
Changes in net reserves	7	56	-243	-319
Memo:				
Reserves including gold (US$ millions)	39	823	1,018	1,398
Conversion rate (DEC, local/US$)	11.2	16.3	30.1	28.6







EXTERNAL DEBT and RESOURCE FLOWS	1983	1993	2002	2003
(US$ millions)				
Total debt outstanding and disbursed	572	1,029	1,766	1,847
IBRD	61	150	83	90
IDA	20	18	13	12
Total debt service	108	156	211	215
IBRD	9	33	20	19
IDA	0	1	1	1
Composition of net resource flows				
Official grants	0	-1	-1	-2
Official creditors	23	-6	5	16
Private creditors	-14	17	-49	-27
Foreign direct investment	1	-36	48	57
Portfolio equity	0	0	-19	-21
World Bank program				
Commitments	39	18	40	0
Disbursements	7	12	45	0
Principal repayments	4	22	17	18
Net flows	3	-9	28	-18
Interest payments	5	12	4	2
Net transfers	-2	-21	24	-20



Executive summary

The Challenges for SIDS

Background

In 1994, the Global Conference on the sustainable development of Small island Developing States (SIDS) adopted the Program of Action for the sustainable development of small island states. The Declaration of Barbados affirms that SIDS are particularly vulnerable to natural and environmental disasters and have limited capacity to respond to and recover from such disasters.

Many Small Island Developing States (SIDS), consist of not one but a number of small islands. This fragmentation increases their vulnerability which principally arises from their isolation, their small size, small population, ecological fragility, topography, narrow resource base, limited local capital for productive investment, and excessive dependence on imports. As island societies develop, raising living standards for growing numbers of people, so they are prone to deplete the fragile natural resources which are among their most valuable assets.

Policy Development

During the past ten years, there has been an increasing awareness of these problems common to island nations They were accepted formally in UNCED in 1992, the Barbados Programme of Action (BPoA) in 1994, and at the WSSD in 2002. One of the recommendations of the Johannesburg Plan of Implementation was that "a full and comprehensive review of the implementation of the BPoA for the Sustainable development of Small Island Developing States takes place in 2004, in accordance with the provisions set forth in General Assembly resolution S-22/2".

Mauritius is hosting the International Meeting (IM) in January 2005 to seek a renewed political commitment by all countries for the further implementation of the Programme of Action, thereby endorsing its validity. The review of the BPoA has provided SIDS with an opportunity to set out the challenges that they face, the progress made and the way ahead. This report provides a frank account of the Mauritius experience as a means of promoting discussion and exchange of ideas.

Building Resilience

Mauritius has developed rapidly at considerable cost to the quality of its natural resources. It has found ways to adjust to many external economic and environmental shocks. But the imminent major changes in global markets for sugar and textiles and the projected impacts of climate change on its coastal and marine resources, present major risks to its continued prosperity. Confronted with these threats, Mauritius has been steadily establishing its defences and building resilience. The review shows that Mauritius has made more progress with designing policies and plans but has more to do on implementation. The process requires new levels of commitment throughout the society. It is also technically complex. Time is required for laws to be devised, scientific assessment to be made and detailed pilot studies, across a wide range of problems to bear fruit before investment in national programmes can be justified.

The Republic of Mauritius consists of a main island, Mauritius, and a group of smaller islands and islets that make up to a total land area of 2040 km^2. The Exclusive Economic Zone(EEZ) is a marine area of approximately 1.9 million km^2 which is nearly a thousand times the size of the land area itself. The marine area has been largely unexploited except for the lagoon which has suffered severely from unsustainable fishing and land based pollution. One of the major concerns of land use planning in the country is to build on rather than to deplete the richness of the natural resources, resolving conflicts and reconciling present pressures with future needs.

Mauritius has diversified from a mono crop economy dependent on sugar cane by developing a textile industry, tourism, financial services and more recently a burgeoning ICT capacity. From 1970, the economy has grown by an average of more than 5% a year. Recent progress with achievement of the MDGs has been steady. But concern remains for the increasing trend in HIV/AIDS and the lack of progress in key areas of environmental improvement such as forest cover and reduction of CO_2 emissions.

National Strategy

Over the past two decades, the economic structure of Mauritius has been transformed from one based almost exclusively on sugar production for export to a broadly based industrial and serviced oriented economy. Industry, in particular, clothing and textile manufacture, no longer forms the corner stone of the economy, while rapid growth of tourism and financial services sectors during the past decades have helped to consolidate the country's economy.

Furthermore, Government is now giving high priority to the development of the Information and Communication Technology (ICT) sector, to transform the country into a cyber island. Indeed, the country has successfully sustained its economic growth with gross national product per capita estimated at US Dollar 3, 900 in 2003.

Security

As a remote island with a large EEZ, Mauritius is at risk from external threats such as money laundering, transnational organized crimes and illegal trade in wildlife. It could be an easy target for terrorists or a safe haven for terrorist funds. Government is aware of this threat and is well prepared to confront with any emergency situation.

Institutional Reform

Progress with the BPoA depends greatly on establishing new statutory duties and powers within a new institutional framework of public participation and ultimately the enforcement of law. But promoting social and economic change and even passing vital legislation requires commitment and time. In Mauritius, the Environment Protection Act, 2002 has enhanced the coordinating role of the MoE and established the National Network for Sustainable Development, a high powered consultative body of the public and private sectors and civil society. This promotes the involvement of the whole of the country in the pursuit of sustainable development.

Relationship with development partners

As Mauritius has progressed, it has over the years experience a significant decline in Overseas Development Assistance (ODA) from all sources. However a number of bilateral and multilateral development partners are involved in the environment sector (France, Germany, and UK, European Investment Bank.) China and India fund projects in the transport, agriculture and health sectors and the Cyber City. The UNDP has a program aimed at poverty alleviation.

Climate Change and Sea-Level Rise

Geographical and topographical characteristics of small island states limit their capacity to mitigate and adapt to future climate change and sea level rise. Such pressures in Mauritius already affect beach tourism, strategic infrastructure including hotels and restaurants, roads, power lines, water systems, sanitation and bridges, especially during cyclones and sea surges.

The National Climate Action Plan defines the system to monitor the progress of global warming and to prepare for measures for adaptation in line with the UNFCCC and the Kyoto Protocol. The Mauritius Meteorological Service has highlighted the need for further investigation, research and analysis as well as technical training and transfer of environmentally friendly technologies from developed countries to implement the UNFCCC. Training is being developed in specific fields such as photovoltaic technology and predictive computer modelling as well as in beach and lagoon protection. New guidelines have been prepared and enforcement has begun on coastal planning and coastal precautions against flooding.

More remains to be done for better adaptation to climate change and sea level rise, including comprehensive beach protection, withdrawal of facilities from exposed locations and the implementation of integrated coastline management schemes. Further adaptation will be necessary for protection of agriculture, including more green areas to absorb carbon dioxide. Fisheries are to be adapted to support the development of Mauritius as a regional sea food hub making the country more resilient to local losses of habitat and making better use of the large EEZ. SIDS partnerships in these activities are already an important part in sustaining social and technical progress.

Natural and Environmental Disasters

Mauritius is situated in the western Indian Ocean tropical cyclone belt and is therefore under the threat of tropical depressions which can build up into violent storms accompanied by heavy winds and rain with flooding of low lying areas. These cause physical damage to buildings, crops and livestock, especially in the more exposed parts of the country. Mauritius is well protected by an increasingly effective early warning and protective response system and by the robustness of the modern buildings constructed in stone blocks and concrete. But, global climate change can generate more frequent extreme weather conditions in Mauritius and bring about greater damage from more turbulent cyclones. Continued monitoring of global warming and preparing measures to adapt to its consequences is a priority.

Mauritius is on a main sea route and its only harbour in Port Louis assumed growing international importance in terms of trade. The airport now has services to 26 countries in four continents Precautionary measures and response to the risks of oil spills, fires, explosions, wrecks, air plane crashes and other security aspects, are the subject to detailed planning and emergency exercises. The increasing number of high rise buildings present new challenges for safety and fire-fighting. A National Disaster Committee coordinates preparedness and response in the event of any natural or environmental disaster.

Land Resources

Land degradation, increasing urbanisation and competition for land, are the principal concerns that are being addressed. Major progress has been made in wider ownership of land and in the provision of housing for all people. Over 85% of families live in homes which they own and which are predominantly robust and proof against cyclones. All homes are serviced by mains water and electricity.

The Land and Development Act 2004 provides an updated framework for land use planning and decision making at national and local level. The extension of national parks

has been a feature of development. The built up areas in towns and along roadsides are being landscaped with trees and shrubs that provide shade and a greener environment towards a future garden island. A new awareness is emerging for the value of architectural style, removing eyesores and promoting a built environment that is in harmony with the natural environment of the country. But much more needs to be done in terms of good planning and urbanisation.

Biodiversity Resources

Mauritius is high on the world's list of countries for plant and bird species threatened with extinction. In fact some 900 species of indigenous plants occur in Mauiritius. Out of which 300 are endemic and a further 100 or more are shared with other islands of the Mascarenes, Réunion and Rodrigues. A high proportion of native plants are threatened or endangered mainly due to introduced exotic plants which are out competing them in their natural habitat. Over the last decade there has been growing awareness for the conservation of the indigenous flora of Mauritius and tremendous progress has been achieved in this field.

Coastal and Marine Resources

Mauritius has a rich but vulnerable coastal and marine biodiversity including coral reefs, mangroves and wetlands. The establishment of the 200-mile exclusive economic marine zone has vastly extended the fisheries and other marine resources available. Its effective management is, however, a large and complex task demanding new forms of collaboration between the public and the private sectors as well as regional cooperaton. It includes building up industrial fishing skills and equipment, controlling fish stocks and exercising surveillance against illegal local and foreign fishing companies. But experience in this is growing.

Major initiatives to protect the coastal zone have been undertaken as part of integrated coastal zone management (ICZM), including the banning of sand mining, the development of methods for beach nourishment, a national sewerage programme and daily beach cleaning.

Further action is needed to increase training of professional and technical specialists and field workers and to improve quality standards and surveillance. Closer attention is being given to the many small uninhabited islets, popular with fishermen and tourists, whose quality has been depleted through uncontrolled waste and alien trees and shrubs and animals such as rats.

Tourism

Mauritius is a well established high class tourist resort. Tourism is the third pillar of the Mauritian economy and accounted for about 6% of the GDP in 2002. It is also an important source of employment and a major earner of foreign exchange. The majority of tourists come from Europe (about 66% of arrivals in 2002) and particularly France, followed by Réunion Island and South Asia.

The Government's policy has been to emphasise low-impact, high spending tourism so as to maintain the island's up-market profile.

Tourism depends on quality in the natural environment. It makes heavy demands on energy, water and coastal facilities. National guidelines are being developed to regulate leisure craft, water sports, water use and sanitation. Fortunately, the sector has responded positively to the demand complying with its environmental charter of guidance for visitors. Future plans include promoting more eco-tourism and activities with a low impact on the environment. Training for the hotel and restaurant trades has been long established in Mauritius.

Freshwater Management

Despite shortage of water for the growing population, safe water and sanitation for all has been a principal feature of development in Mauritius. Future plans include improving integrated management to ensure better supply and more effective use of water, especially in agriculture and in industry, the heaviest users. Steps have been made in recent years to increase supply, reduce water cuts, improved water quality, metre based charges and reducing pollution of water sources.

Energy Resources

Mauritius has stable electricity supply through a national grid system but with no scope for inter-country back-up. Keeping pace with an expanding demand from all sectors is a major challenge. Renewable energy sources contribute 23% of total production. Review is to be made of the potential for harnessing sea wave energy Ocean Thermal Energy Conversion (OTEC). More use could be made of solar energy by incorporating such requirements in planning guidelines and EIA assessments. The cost of the environmental impact of fossil fuels should be used in future economic evaluations of energy options.

Transport is one of the heaviest producers of carbon dioxide emissions. With rising numbers of vehicles and increasing road congestion pollution is becoming a growing problem, partially off-set by the introduction of lead-free petrol and effective compulsory testing of older vehicles. Resolving road congestion is a high priority for future urban planning. Technical support is needed to extend energy audit in the public and private sectors and to promote design of buildings with low energy-use.

Management of Wastes

The steady economic and social development of the country has increased the level of consumption and production of waste. The provision of a national purpose built landfill waste disposal centre, with peripheral transit facilities, has eased the problem and reduced the pollution from the previous uncontrolled waste dumps. The continued increase in waste, however, will exceed the capacity of the landfill earlier than was anticipated.

Mauritius has now a Solid Wastes Management Strategy and future plans include the development of separation of wastes, composting, re-cycling, reduction of waste at source and the possible use of waste for energy production. Public awareness programmes and education have reduced the extent of litter. The nation-wide provision of waste collection and the free distribution of standard waste-bins have proved popular and effective in reducing litter around commercial and residential property. Legislation provides for licensing waste collection services, penalties for littering and dumping. Enforcement has become more effective through the introduction of environmental police. Outstanding problems arise with disposal of motor vehicles and spare parts, engines, batteries, fridges, washing machines and computer components, all currently sent to the national landfill site.

Health

Mauritius provides free state health services throughout the country to all its people. The general state of health of the population of Mauritius is good and is improving steadily with the implementation of a series of reforms aiming at providing better health to all. From 1970 to date, life expentancy has increased from 63 years to 72 years and infant mortality fallen from 55 to 14 deaths in the first year of life for every 1000 live births. Another component of Government reform agenda is the improvement of health facilities to the rapidly aeging population and growing number of non-communicable diseases.

Promoting a healthier way of life in Mauritius involves programmes directed at both the production of healthier goods and services and changes in consumption and lifestyle. Fiscal policy has a role in this field regulating the price of tobacco and alcohol and promoting a healthier diet including more fresh fruit and vegetables.

The health services in Mauritius depend on a close partnership between the public and private sectors and joint collaboration with NGOs. Family planning, joint use of high technology services and tackling the small but growing problem of HIV/AIDS have been examples of such collaboration. Plans for the introduction of a family doctor service recognize the importance of strengthening primary care and the growing need for community services for disabled and elderly people.

Trade and Investment

From a mono crop economy, predominantly dependent on sugar, Mauritius has diversified its economic activities by developing a textile industry, tourism, financial services and ICTsector. The strong growth in the economy measured in traditional terms has been offset by increasing use of fossil fuels, increasing emissions of CO_2 and serious loss of forest and woodland cover and biodiversity. National accounts have not included economic estimates of this loss of natural capital. Environmental accounting is an underdeveloped aspect of national trade statistics.

Sustaining economic growth and reconciling it with the requirements of a high quality environment has become an emerging priority as the impact of development on the ecology has become more evident.. Making the shift to an integrated strategy is not easy. Conflicting interests have to be resolved.

Small size and insularity combine to make island economies highly dependent on external markets for imports. Agricultural and manufacturing activities are based on a very narrow range of goods intended mainly for export for revenue generation. Small economies have little influence over global markets, nor do they have a buffer against the effect of fluctuations in the price of key exports such as sugar and textiles, neither on the price of imports such as energy and food. The erosion of trade preferences and the rules of the WTO Agreement on Subsidies and Countervailing Measures are major challenges.

The country has taken a number of bold measures to build up resilience. These include increasing its export capacity, improving productivity in textiles and in container cargo handling, providing incentives for inward investment and for the local production of many high volume household consumer goods for local consumption. Encouragement is also being given to the formation of internationally competitive SMEs. ICT is a priority field for development in all industries. Mauritius is positioning itself to become a hub for trade and industrial development in the region.

Transport and Communication

Mauritius has overcome its problems of isolation by expanding its sea and air links. The sea port at Port Louis is now fully adapted to container systems and the airlines using the national airport provide regular direct services to 26 countries in four continents. This has increased its capacity for, as well as, provides a boost for its tourism industry. Better links abroad has also been a vital aspect of professional and technical development. The process of developing the sea and airport services however increases the pressure on the fragile ecology. This will become a more sensitive issue as access is opened up to the smaller islands of the country.

The steady rise in internal road transport has become a major problem with its impact on land use, traffic congestion, air pollution and injury. A strategy is being developed to respond to the heavy environmental, commercial and social costs of road traffic.

Information and Communication technologies

Mauritius has invested heavily in ICT and is considered to be ahead of most other upper middle income countries in terms of the network of mainline telephones, the use of mobile phones and the links of business, schools and families to the internet. But still, it has far to go to reach the levels common in the more developed countries of the world. Progress has been stimulated by the incentives offered to ICT firms to set up business. It has benefited also from quality technical support services including a submarine fibre optic cable link to South Africa, giving Mauritius access to the Global Information Infrastructure. The aim is to have a PC in every school and every home. This national programme is supported through a bold national ICT venture, 'The Cyber City,' which has strong international financial and technical backing.

The environmental impact of the surge into ICT is evident across the country in overhead power and telephone cables, mobile phone relay structures in every town, satellite dishes and the growing problem of computer waste. This is part of the new agenda arising from what is being seen as a new pillar of the future economy and social life of the country.

Education

The Education system has been reformed recently with the abolition of the Certificate of Primary Education (CPE) ranking and its replacement by the grading system which has eliminated in some way the excessive competition engendered by the ranking system. The merit of this reform aims at

- Providing an appropriate assessment mechanism,
- Introducing of the universal eleven years of compulsory education,
- Increasing access to quality education,
- upgrading of school curriculum with special focus on Information and Communication Technology (ICT) as a subject in primary schools in order to make pupils computer literate at an early age, and
- Increasing access to and enhance quality of tertiary education.

The knowledge-based economy commissioned by Government will require a critical mass of professionals at all times to support key economic sectors in this fast stabilized era. The educational reforms which Government has embarked upon also makes provision that new entrance into the labour market possess the skills, knowledge and expertise that employers require.

Training and Skills Development

Training is one of the principal tools for development. Mauritius now has a variety of vocational courses to meet the needs of business, industry, commerce and the public services. These facilities are accessible to other islands in the region and having limited capacities in this field. Training for new career pathways for adults, ICT training, and re-skilling are new ways for responding to major change in the economy. Fresh emphasis is being put on remedial training for early school leavers, new businesses and other public services. Public-private partnership is at the heart of the process and a computer based labour market information system helps both applicants and employers.

Improvement in productivity come both from market pressures and from national programmes on quality management, on efficiency at work, ISO programmes, the work of the Mauritian Quality Institute and the National Productivity and Competitiveness Council. These multi-sector partnerships build on the best ideas from the best companies and best practice world-wide. They aim to re-mould local enterprise and get quality products and services at the right price and the right time. The process is transforming management, customer satisfaction and promoting a greater pride in working well.

Reform of the State

One of the essential priorities to consider in pursuing sustainable development is a strengthening of national institutions and administrative capacities. This need is clearly spelt out in the Programme of Action for the sustainable development of SIDS. Mauritius, in spite of its limited means, has addressed all the above issue remarkably well.

Rodrigues and Outer Islands

The Government has been decentralized for Rodrigues, the largest of the smaller islands in Mauritius. It now has its own elected assembly and parliamentary procedure. It is still in the process of setting its own strategies for development and management of its domestic policies. It is gradually opening up to eco-tourism and future plans include direct international flights, extension of industrial fishing and strengthening its social services, business and commercial base.

The Way Ahead

Much of the past sustained progress in Mauritius has been built around basic education, improved health, the benefit of bilateral and multilateral trading agreements, the driving force of skilled entrepreneurs with capital to invest, stable democratic government and peace. Times are changing and so are policies and plans. Globalisation demands faster adaptation. The country is building new trading partnerships. It is

planning better and faster supply links abroad, and within the country. Skills are being updated. Jobs are no longer for life. New skills have to be more rapidly acquired. New products and services have to be provided to meet tomorrow's even tougher standards in the international market and the growing aspirations of the local people for a better way of life. No longer can Mauritius compete by using its spare capacity of semi-skilled labour. Neither can it survive by continually depleting its natural resources.

As a Small Island Developing State, Mauritius recognises the dominating factor that the way ahead requires an educational system based on problem solving and project learning. Quality and productivity must be increasingly at the heart of every enterprise both in the private and the public sector. Human capital and the natural quality of the country are the ultimate resources.

The report shows that much progress in Mauritius has been made since the BPoA in reforming policy and creating a new framework of law and institutions to take forward fundamental changes. Mauritius participates in many regional and international organisations and is a member of a number of regional grouping including the Indian Ocean Commission (IOC), SADC, COMESA and the Indian Ocean RIM Association (IOC-ARC). In addition, it has adhered to the Economic Partnerships Agreement (EPA) for the purpose of increased trade and revenue generation. It sees all such regional cooperation and integration initiative as a powerful development strategy, to allow the countries to expand its economic space.

INTRODUCTION

Introduction

Since UNCED in 1992, SIDS, and islands supporting small communities, have been considered "a special case both for environment and development". The first Global Conference on Sustainable Development of SIDS in 1994, adopted the Barbados Programme of Action (BPoA) This has been an important blueprint for the sustainable development of SIDS recognising, the uniqueness of small islands, their vulnerability and specificity.

The World Summit on Sustainable Development in 2002 further reasserted the special challenges of Small Island Developing States and the relevance of the "special needs" of SIDS, was again stressed in the Millennium Development Goals. One of the recommendations of the Johannesburg Plan of Implementation was that "a full and comprehensive review of the implementation of the BPoA for the Sustainable Development of Small Island Developing States takes place in 2004, in accordance with the provisions set forth in General Assembly resolution S-22/2."

All SIDS are characterized by inescapable limitations: small domestic markets, isolation, narrow resource base and dependence on external trade. Mauritius has overcome many of these obstacles. But the advantages on which it has built its economic and social progress now constitute threats to its future prosperity. Its development has seriously depleted the natural environmental resources on which its future depends. This review presents the challenges that the country has addressed the progress that it has made and the way ahead on the pathway for sustainable development.

Mauritius is one of the Mascarene group of islands comprising of Mauritius, Rodrigues and Reunion; the latter being a French Overseas Department (See Map 1-2). Mauritius is a tropical island located at latitude 20° south and longitude 58° east, some 800 km from the south-east of Madagascar. The highest peak is 817 metres. It was formed through a series of basaltic lava flows. Before its discovery and colonization it was uninhabited. It has many areas of fertile land formerly heavily wooded and rich in endemic species. The main island has no continental shelf, the ocean depth reaching 3000 metres within 20 km of the coastline. The coastline of Mauritius island is almost completely surrounded by coral reefs, enclosing a lagoon area of 243 km^2. It has many sandy beaches, protected bays and calm lagoons. These natural resources have allowed for agricultural development, lagoon fishing and intensive capital development in tourism.

The Mauritian economy has done remarkably well over the past three decades. Since independence in 1968, it has experienced significant transformation from an economy that was almost entirely dependent on sugar cane cultivation and manufacturing to one that has benefited from an export led strategy. Industry, in particular, clothing and textile manufacture, constituted a cornerstone of the economy until recently.

The sugar sector has long benefited from guaranteed prices and preferential access into European markets under the Sugar Protocol, the Lome Convention and the Cotonu Agreement. However, with the phase-out of the protocol, Mauritius must now negotiate new agreements under the ACP/ EU partnership.

Despite its impressive performance, the Mauritian economy, like other SIDS, is confronted to a number of short and medium term challenges, in both the internal and external fronts. The main challenge of sustainability facing Mauritius today is to adapt to increasingly free trade in the global markets. In the wake of increased global competition from low-wage countries and limited future opportunities through preferential arrangements, the Mauritian economy becomes even more vulnerable. At the same time , the Government is faced with the rising costs of social obligations, unemployment and environmental pressure from conflicting demand for land use.

Since the Global conference, Mauritius has taken important initiatives to strengthen national institutions and administrative capacity covering environment policy, land use, legislation, education, transport and biodiversity. For example, in Mauritius a National Environmental Commission was set up chaired by the Prime Minister, with a broad membership including Ministries responsible for economic planning, finance, education, science, technology, natural resources, tourism, industry, health and justice. A key mandate of the commission is to ensure coordination and cooperation between public departments, local authorities and other governmental organizations engaged in environment protection policies.

In addition to the above, Mauritius has taken a number of measures aiming at interacting environment protection and development. These include:

- Adoption of new legislation to provide a sound and updated legal framework for the pursuit of sustainable development,

- Formulation of a National Environmental Strategy (NES) that provides a blue print for sustainable development.

No country is an island

Since the events of 11 September 2001, security has had to be taken more seriously. Resolution 1373 of the United Nations

Security Council imposes heavy responsibilities on all States to fight against terrorism. Security surveillance of the EEZ is a major challenge now as it was in the early days of development where Mauritius became a haven for pirates plundering the merchant ships passing from Asia round the Cape of Good Hope to Europe. Mauritius has passed new laws on terrorism, increased security in the sea and air ports and reinforced the National Coast Guard and Police surveillance within the country to combat these threats.

Despite their own efforts in taking action to secure their long term future, SIDS working alone will remain vulnerable to external pressures. If they are to survive, they need to use their collective strength for the benefit of their region. This new archipelago of SIDS across the world need not be trapped in isolation. With a total population of over 50 million it has trading and negotiating strength so far largely untested. This review sets out the story of one of these states in transition. The intention is to provide timely evidence that global thinking can be translated into local action in one of this new world association of small island developing states.

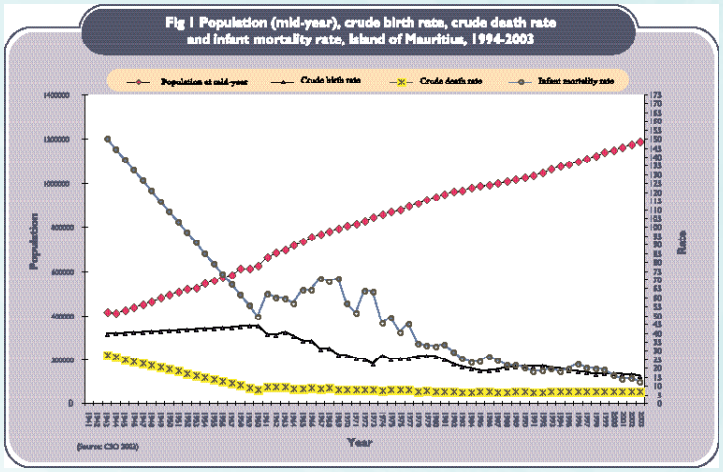


Figure 1 Mauritius: Demographic transition: Since 1994 the crude death rate, infant mortlity and the crude birth rate have declined; the population has continued to grow but rate of increase has declined to about 1% a year.

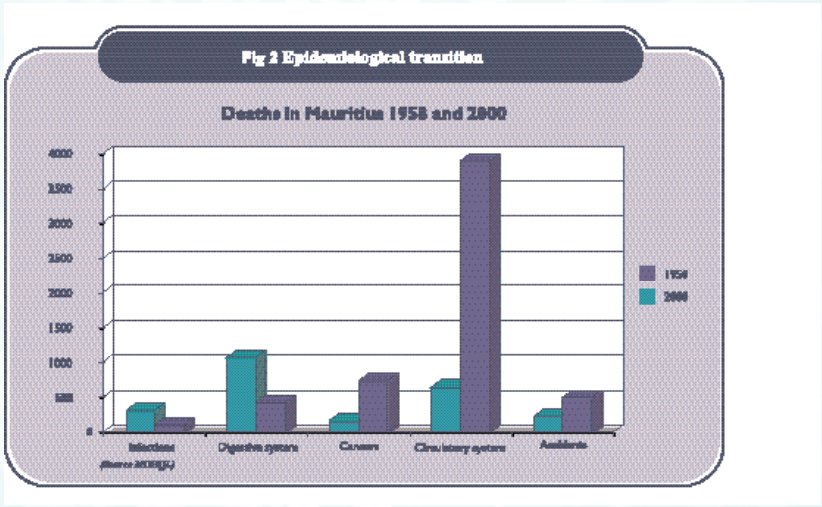


Figure 2 Mauritius: the Epidemiological transition. The pattern of disease has changed; deaths from infections and involving the digestive system have declined; non communicable diseases including heart disease, cancers and injuries have increased.

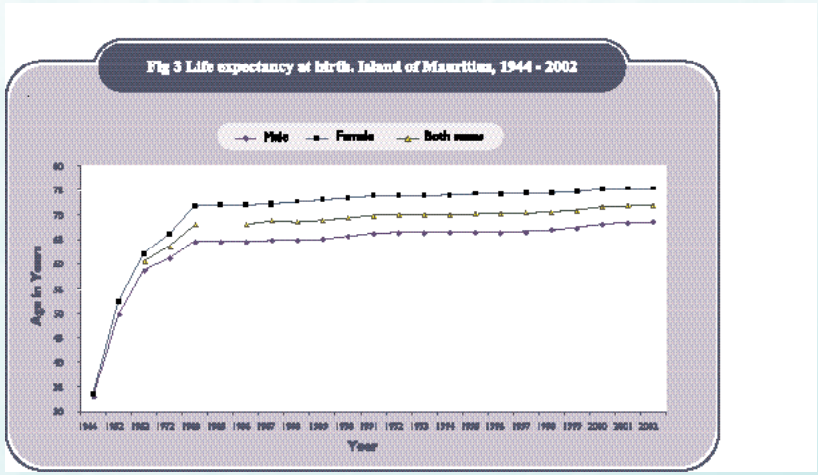


Figure 3 Mauritius: Expectation of life at birth. The very rapid increase in expectation of life at birth from 33 years in 1944 to over 60 years in 1968, has now changed to a slower but steady increase, reaching 72 years in 2003, with a substantial gap emerging between males and females, the latter living longer.

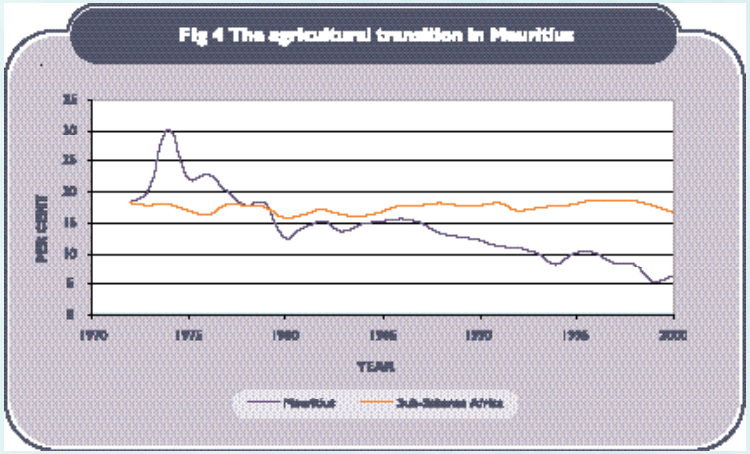


Figure 4 The agricultural transition in Mauritius
The percent contribution of agriculture to the GDP of Mauritius in the period 1970-2000 came to a peak of thirty percent and has fallen to 6%, whilst in the region of Sub-Saharan Africa in the same period the contribution of Agriculture has remained relatively constant.

Climate Change and Sea-Level Rise

The Challenges

Climate change and sea-level rise are issues of major concern for all small island developing States. Although SIDS emit only a very small proportion of the greenhouse gases that cause global warming, yet, these states are the ones that are the most vulnerable to sea-level rise and extremes of climate change.

Because of their small size, the whole of each small island developing state can be considered as a coastal entity and any localised consequences of a rise in sea level would be significant for the whole country. The coastlines provide the natural resources on which many livelihoods depend. Coastlines are at the core of much economic and social development in fisheries, tourism, agriculture, transport and communications.

For Mauritius climate change will have multiple adverse impacts:

- Climate change may increase the intensity of tropical cyclones,
- The rise in global temperatures will also have an effect on seawater temperatures and ocean circulation,
- Changes in ocean circulation will affect migratory paths of pelagic fish, disrupting the fishing industry,
- Rise in temperature will cause variability in rainfall among other impacts and will have severe social and economic consequences,
- Sea Level rise due to global warming will affect freshwater resources due to saline intrusion and further erosion of beaches and damage to coral reefs, and
- Higher sea-level, storm surges and higher tides will cause extensive coastal flooding and damage to vital coastal infrastructure on which tourism, transport and communications depend such as sea ports, bridges and roads.

Progress

The United Nations Framework for Climate Change Convention

Mauritius signed the United Nations Framework Convention on Climate Change (UNFCCC) during the UNCED conference at Rio and was the first member state to ratify it. Mauritius also ratified the Kyoto Protocol in 2001. Mauritius is reducing its emissions of greenhouse gases by implementing a number of projects on energy efficiency, alternative energy programmes and regular inventories of greenhouse gases. But Mauritius depends on international action to combat the problems of climate change and sea level rise and must rely on others to support the provisions of the Kyoto Protocol. The continued vulnerability of SIDS depends on the commitments, policies and programmes of industrialised nations. The recent support for the Kyoto protocol from Russia is a welcome step in reducing the global threat of irreversible damage to SIDS in all regions.

Action in Mauritius on Climate Change is shown in Boxes 1.1 and 1.2 and includes institutional, technical and regulatory interventions. Faced with the potential impacts of Climate Change on the economy, Mauritius is developing strategies and policies to address the problem of climate change and sea level rise in all related sectors, namely energy planning, agriculture, coastal zone management, transportation, fisheries, forestry, waste management and water resources. The successful implementation of the Action Plan will involve a multi-discipline and multi-sectoral team including the private and public sectors.

Box 1.1

Policy and planning under the UNFCCC

- 1991: The Prime Minister set up a multi-sectoral National Climate Committee (NCC) actively to involve all stakeholders in combating climate change,
- 1998: The Meteorological Services of Mauritius on behalf of the National Climate Committee, prepared the National Climate Change Action Plan with the financial assistance of the US Country Studies program,
- The Ministry of the Environment was designated the focal point for action to promote and coordinate climate change activities,
- 1995: Submission of a national inventory of sources and sinks of greenhouse gases, updated each year,
- List of programmes to reduce the negative impacts of climate change covering adverse impacts, measures for abatement and enhancing sinks for greenhouse gases, policy options for monitoring systems and for strategies for responding to the impact of climate change, and policy frameworks for implementing adaptation measures and response strategies,
- 2004: Preparation of a report on Technology Needs Assessment for Climate Change issues, and
- Mauritius is now considering the preparation of its second national communication report.

Box 1.2

Detailed Action under the UNFCCC

Ozone Depleting Substances

Since 1992, the Government has taken a number of policy decisions aiming at reducing the consumption of CFCs. Fluorocarbon emissions have declined by 69%.

Coastal Erosion

Since 1995, the Ministry of Environment has carried out some 3500 metres of coastal protection works using semi-hard structures in the form of gabions and groynes. A number of public beach sites have been earmarked as high priority for remedial actions. A pilot beach fill project along 600m of the public beach of Flic en Flac has already started. Plans for replenishment of other beaches are also being prepared (See Chapter 5).

Protection of Coral Reefs

Monitoring of the coral ecosystem is being done at selected sites to study the effect of increase in temperature on coral bleaching. Water samples from lagoons are also being collected at sensitive points for analysis.
Data on circulation changes in the lagoons as well as for fish stock assessment and sustainable yield depletion are being collected to assess adverse effects and results of remedial action.

Reforestation Programme

The Ministry of Agriculture is implementing a reforestation programme to increase green areas to absorb carbon dioxide.

Agriculture

The MSIRI is actively engaged in research on the impacts of climate change on sugar cane cultivation, on varieties of sugar cane tolerant to drought and to salt, and the length of growing season and optimal time for harvesting.

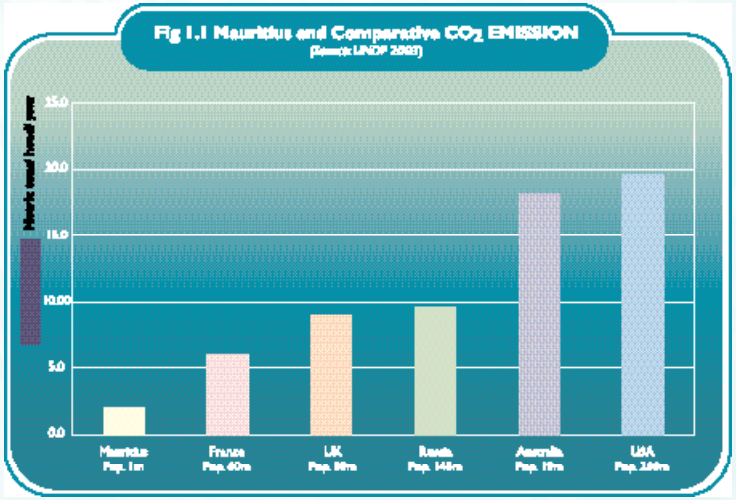
Energy Efficiency

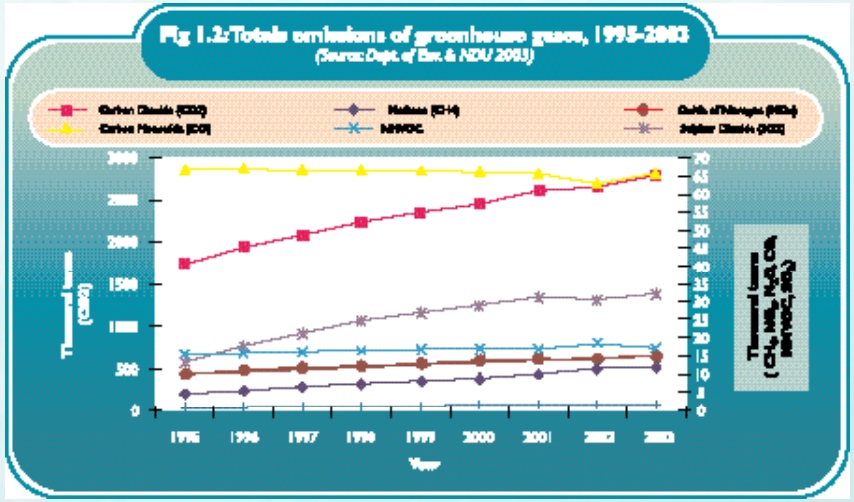
Action to improve energy efficiency includes energy conservation, switch to low carbon content fuels, use of renewable energy sources, and the introduction of non-conventional energy technologies.

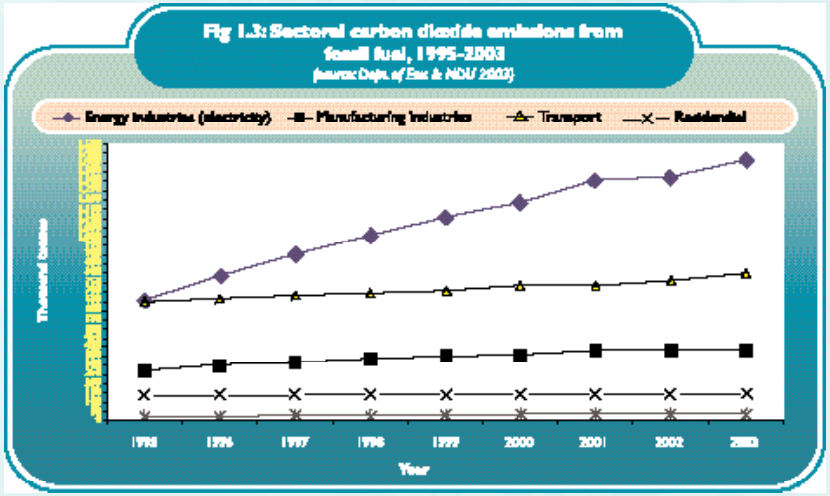
Capacity Building

Mauritius is preparing to implement the UNFCCC on Agriculture, Forestry and Land Use and is producing a new national greenhouse gas inventory. The National Climate Change Committee and NGOs organise awareness campaigns regularly to sensitise the population about the impacts of global warming.

Mauritius contributes a very small level of GHG emissions per head of population, by comparison with other countries (see Figure 1.1). The rate of increase since 1995 has been low and for Carbon Monoxide it is declining (see Figure 1.2). The levels of Carbon Dioxide, however, are increasing, the principal contributions being from electricity production using coal and oil and from transport (Figure 1.3).







Box 1.3

A worst case scenario: A sea-level rise of 1 metre in Flic en Flac

- It has been estimated that 26,000m^2 of beaches can be flooded,
- About 12725 m of main coastal road and 24475 m of secondary coast road would be affected by flooding, overtopping, cracking of pavement, and eventually submergence,
- Plantations, including several hectares of sugar cane and cash crops would be inundated and have to be abandoned, and
- Houses near the coast would be flooded.

Sources : Climate Change Action Plan, 1997

To reduce emission of local sources of greenhouse gases, Mauritius has a programme to diversify to renewable sources of energy to comply with commitments under the UNFCCC and the Kyoto Protocol. These measures also respond to the need to encourage sustainable consumption and production patterns (See Chapter 8, Energy Resources). Some progress is being made. But this has not kept pace with the substantial increases in energy consumption arising from the sustained rapid rate of development of the country as a whole.

Impacts of Climate Change in the Coastal Zone

The impacts of climate change and sea-level rise on coastal resources in Mauritius have been studied within the framework of assistance to Mauritius provided by the US Country Studies Program. Sea-level rise will however, have a big impact on coastal ecosystems in the Republic of Mauritius and the ecosystems which will be particularly at risk include sandy beaches, coral reefs, mangrove ecosystems and coastal wetlands. A scenario has been worked out to project the possible impact of climate change on the coastal zone.

Beach erosion can be aggravated by sea level rise

Use of Energy and Greenhouse Gas Emission

Mauritius relies predominantly on imported petroleum to meet its energy needs. But coal fired boilers, using imported coal from Africa and Europe, are also used because they are cheap methods of producing energy for industrial purposes. Replacement of coal by a cleaner fuel would significantly reduce emissions and future EIA assessments will take this factor into consideration.

Renewable sources of energy such as hydro, solar, wind and bagasse account for 23% of the electricity produced. Feasibility studies are being made, with technical assistance from Japan, to develop Ocean Thermal Energy Conversion (OTEC) technology for harnessing sea wave energy.

Mauritius has taken steps to promote changes in local energy consumption patterns (see Box 1.4).

Box 1.4

Changes in energy consumption to reduce GHGs

Introduction of Low Energy Consumption Bulbs

The Ministry of Environment together with the Ministry of Public Utilities is promoting the use of compact fluorescent lamp (CFL) in the rural areas and villages. In line with Type II partnership initiatives, Climate Care, an NGO based in the United Kingdom, has offered batches of such lamps for distribution in villages in Mauritius.

Use of Solar Energy and Photovoltaic lighting

Solar panels have been installed in the Government Centre on a pilot basis for lighting and air conditioning in the buildings. Photovoltaic lighting is also

used on a pilot scale for street lighting in some places in Mauritius, Rodrigues and Agalega. The units can be installed anywhere easily as they need not be close to the CEB grid; hence, remote un-electrified area may be provided with street lighting.

Introduction of Unleaded Petrol

Unleaded petrol has been introduced since September 2002 for cars. This enables the use of catalytic converters, which reduce noxious gases including Green House Gases emissions by about 90%.

Use of Liquefied Petroleum Gas (LPG)

LPG produces less air pollution and emits less GHG emissions and its use as alternative fuel in cars is being promoted in Mauritius. The DBM is providing a loan of up to Rs 25 000 (US$ 870) to enable car owners to buy a kit so as to use LPG in cars.

The Way Ahead

The Government of Mauritius is taking action for adaptation to the impact of climate change and to evaluate the results because it fears that the impacts could harm the country and the prospects of development for many generations. It cannot succeed alone. The vulnerability of SIDS to these risks and the related impact thereof is made more serious by the fragile ecology of the islands, their low adaptive capacity and the need for greater investment. In the first National Communication, a number of strategies were identified for Public Awareness, Education and Outreach. These include mounting of courses including Climate Change modules across the curriculum at the University of Mauritius. Further training is planned to build up local expertise in climate change issues as well as in-country projections and computer modelling of hazards. The need for a "Climate Change Officer" or "Climate Change Coordinator" in the appropriate institutions to coordinate activities and to prepare future national communications was underscored. This programme is now being prepared for implementation.

1. Climate Change and Sea Level Rise
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Implementation o UNFCCC and Kyoto Protocol.	• Preparation of National Climate Change Action Plan • Annual submission of national inventory of sources and sinks of Greenhouse Gases • Reduction of Greenhouse Gas emissions through the implementation of energy efficiency, alternative energy programmes and inventory of Greenhouse Gases.	• Training and improvement of skills of technical staff. • Strengthening capacity for proper coordination and preparation of national assessment communications.
• Assessment of Coastal vulnerability and impact of sea-level rise	• Pilot Projects for beach Improvement • Monitoring of the coral ecosystem • Monitoring of circulation changes in the lagoon and fish stock assessment and sustainable yield depletion.	• Further investment for beach improvement and lagoon monitoring
• Impact of Climate Change on agriculture and Fisheries.	• Reforestation Programme to increase green areas to absorb carbon dioxide • Research on impacts of climate change on sugar cultivation	• Setting up of food laboratory • Investment in research • Setting up of a Seafood hub.
• Effect of Climate Change on Natural Disasters	• Measures to enhance disaster preparedness through early warning system	• Develop SIDS-SIDS partnership to benefit from regional expertise and experiences

Natural and Environmental Disasters

CHAPTER 1

Natural and Environmental Disasters

The Challenges

Natural Disasters

SIDS by the nature of their size and isolation are exposed to extreme weather conditions and are particularly vulnerable to the threat of natural and environmental disasters and have very limited capacity to respond to and recover from such disasters. Some are in addition by their geology at risk from other natural disasters such as earthquakes. The volcano, however, that influenced much of the topography of Mauritius is now dormant.

Mauritius is situated in the inter tropical convergence zone and is thereby highly exposed to cyclones. On average one cyclone passes within 100 km of Mauritius each year. The official cyclone season covers the period between the 1st November and the 15th May. Wind gusts of 118 km per hour or more can then be experienced. With such strong winds and accompanying heavy rainfall, cyclones can cause flooding, and have a potential to produce physical damage with a serious impact on the environment and economy. The adverse effects of cyclones of this magnitude for island economies, if recurrent, are even greater. This results in reducing the country's capacity to re-activate the development process after the passage of the disaster.

The cyclone Gervaise in 1975 in Mauritius caused conditions for resurgence of malaria, which had been declared officially eradicated in 1973. Before the epidemic was finally controlled, there were over 2,500 reported malaria cases. Such cyclones of the past also caused extensive physical damage to property and vital infrastructure such as roads, bridges and power lines. Personal injury, deaths and homelessness were common, and recovery slow and costly in labour and materials.

After the passage of a cyclone

The threat of climate change and sea level rise present new challenges demanding a new level of response. Mauritius also needs to extend its capacity for surviving cyclones to even the remotest and least inhabited parts of the country, including Rodrigues and the outer islands, as these parts become more developed with industry and tourism.

Progress

Natural Disasters: Cyclones and Torrential Rains

Mauritius has adapted itself to cyclones with precautionary measures, early warning systems and disaster system programmes. Computer plotting of cyclones and their trajectories, early warning systems, and immediate and long term precautions, have transformed the capacity of the country to survive and continue working effectively.

Early warning and preparedness are of crucial importance for natural disaster management. Mauritius has made good progress in both fields.Overcoming the risk of cyclones has been a high priority for Mauritius in the past three decades. Government started by setting up a National Cyclone and Natural Disasters Committee, under the aegis of the Prime Minister's Office which also covers floods due to torrential rains or prolonged drought.

Precautions Against Cyclones

The objective of cyclone precautions is to reduce the risk of death, damage to property and infrastructure and social loss. The measures taken include general environmental protection, early detection of the direction, speed, expected intensity and duration of the cyclone, response and rescue services, selective environmental controls and public advice and information (See Box 2.1). The essential features of success in Mauritius are sustained government and regional financial support. This has insured the provision of high technology equipment and the recruitment and maintenance of professional, technical and administrative teams to implement the programme.

The Central Cyclone Committee meets each year to review and make necessary amendments to the Cyclone Emergency Scheme. This Scheme requires all organizations, including bus companies and other large employers, to have their own cyclone contingency plans. The Committee meets after the passage of each cyclone to assess the impact of the disaster and to decide upon prompt remedial actions. All relevant Governmental Organizations are called upon immediately after a cyclone to assess the action necessary to get the country back to normal as quickly as possible.

Flooding after torrential rain

Box 2.1

Public Early warnings of cyclones

Class	Criteria	Action advised
I	36-48 hours before the population is likely to be affected	Take preliminary precautions; checking food supplies, emergency lighting and fuel, security of moveable objects. Preparation of safe refuges and rescue services are put on stand-by.
II	36-48 hours before the population is likely to be affected	Closure of schools; securing of houses and other buildings, opening of refuges, advice to population on their location.Mobilization of rescue services.
III	As far as practicable, a lead time of 6 daylight hours before the advent of gusts of 120 km per hour	Closure of workplaces, public transport, restrictions on private transport.
IV	Gusts of the order of 120 km per hour have occurred and are expected to continue	Closure of all public places; public advised to remain indoors in safe buildings.
Aftermath	Following storm damage, flooding, dislocation of public services and energy systems, etc.	Identification of priorities for action, mobilization of services; special rehabilitation programmes with public and private mobilization of resources.

Note: These warning system classes are in use in the islands of Mauritius and Rodrigues

' Roberts J L (2004) Cyclone early warning systems in the Western Indian Ocean; and Malaria control in Mauritius; Chapters 11 and 12, in African Environmental Outlook, Vol. II, Case Studies, UNEP.

Airport of Mauritius Limited chairs the Airport Cyclone Crisis Committee at the Sir Seewoosagar Ramgoolam (SSRIA) and implements the airport cyclone procedures in preparedness for forecast cyclone conditions and subsequently in managing the impacts on airport operations.

Enhancing Resilience

Mauritius participates actively in the Indian Ocean Global Ocean Observation System, which provides for a permanent system of systematic, routine and long term ocean observation and forecasts climate variability and change. New tools include sensors on satellites, automated instruments that probe the depths of the ocean, powerful computers and the electronic distribution of data and information worldwide.

Government offers economic incentives to people to build cyclone-proof houses in concrete. In 2000, 87 % of houses were in concrete or stone blocks, power lines are carried on concrete and steel supports. Planning regulations for all buildings require robust structures against extreme weather conditions.

One benefit of accurate and rapidly transmitted forecasts is the capacity for reducing unnecessary implementation and duration of the maximum level of precautionary measures, which can paralyse social and commercial activity of a population by confining them to their homes or to specially provided refuges.

Mauritius has developed capacity to reconstruct and repair basic infrastructure to ensure that the economic machinery gets back on cruise as quickly as possible after a cyclone.

Drought

Water is scarce in Mauritius. 15% of the population has discontinuous supply due to shortages (See Chapter 7). Drought can create a critical situation. During 1998-1999, Mauritius experienced the most severe drought since 1904 recording only 538mm of rain which represents 38 % of the long term mean. Water scarcity was identified as a priority issue in the first National Environmental Action Plan (NEAP I) and in the second Action Plan (NEAP II). Investment in dams, reservoirs, irrigation systems and reforestation has been the key to success in combating drought. Climate change can lead to more severe droughts. Further steps in integrated management of water and increasing use of recycled water for agriculture and industrial use is envisaged.

Environmental Disasters

Challenges

Oil Spills

Mauritius is constantly faced with the risk of an oil spill as the Indian Ocean is one of the major oil tanker routes. Environmental resources are at risk including coral reefs, sea grass beds, mangroves, beaches, shorelines and seabirds. Economic activities including tourism, commercial fishing, and port operations can be severely affected.

The principal potential sources of oil-spill are set out in Box 2.2.

Drill operation for oil spill

Box 2.2

Potential sources of oil spills in Mauritius

Oil-related Activities

On-loading, offloading, and bunkering activities in the Port-Louis harbour, pipeline leak or rupture, overland transportation, and indiscriminate disposal of used lubricating oil

Marine Sources

- Discharge of oil during operations in Port Louis Harbour and of residues from tank cleaning,
- Improper operational procedures during bunkering of large fishing and other vessels in Port-Louis harbour,
- Increasing pleasure boat activities in tourist areas like Grand Baie contribute to minor accidental oil spills as well as to high concentrations of oil in lagoon waters,

- Margina weather conditions could result in collisions at sea, a leading coast of Oil Spills worldwide, and

- Severe weather conditions during the cyclone season raise the possibility of shipwreck close to the island with resulting spills in the medium or major category. Pipeline rupture could also result in large spills.

Airport Fuel Spills

- Fuel spillage during aircraft refuelling and fuel escaping from inland air crash or air crash in the lagoon during approach or take off from the airport.

Land Sources

- Oil storage tanks in Fort Williams, Port-Louis near the harbour and at Plaisance Airport. Both the tanks and associated pipelines are a potential source of spills. Improper disposal of oily wastes from tank cleaning is also a source of oil pollution at the tank farms,

- Indiscriminate disposal of used lubricating oil in filling stations, motor mechanic workshops, and various industrial plants, and

- Road accidents during inland transportation of petroleum products.

Oil spill caused by road accident

Progress

Oil Spills

Mauritius has strengthened its institutional and legislative framework to control oil pollution. The Department of Environment is responsible for oil pollution preparedness and response. It is also the focal point for receipt and transmission of oil pollution reports.

In line with the provisions of the Environment Protection Act 2002, Mauritius has prepared a Contingency Plan with support of the Indian Ocean Commission to respond to oil spills. The Plan applies to all oil spills, whether inland, on the adjoining shorelines or within the maritime zone. It ensures a national integrated Government and industry response capable of effective and prompt action. The Plan includes a data directory and a Coastal Sensitivity Atlas of Mauritius.

Capacity Building

Under the NOSCP, regular training programs and exercises for personnel likely to be involved in a response are carried out. In-house training is also carried out by the relevant organisations. These training programs are designed to enable Mauritius to have sufficient numbers of trained personnel to mount a credible and effective response to an oil spill accident. Regular drills are also organised every year to test the contingency plan.

Regional Cooperation

Mauritius is also party to the Regional Oil Spill Contingency Planning Project whose aim is to put in place a Regional Contingency Plan for ongoing collaboration amongst participating Nations to intervene jointly in cases of major spills, either in territorial waters of a single nation or in case of a transboundary spill affecting more than one party state. The beneficiary countries are Comoros, Madagascar, Mauritius and Seychelles.

Fire Outbreaks and Other Environmental Disasters

Risks of other Environmental Disasters include fire, explosion from supplies of oil and chemicals used in industry, airline crashes and terrorist attack. The increasing number of high rise buildings presents problems for safe evacuation in the event of fire and difficulties in fire fighting because of access and limitations of local fire-fighting equipment.

The risk of fire and damage can be associated with the following sites and situations in Mauritius:

- Town and village areas made up of old buildings such as the China Town of the capital city, Port-Louis,
- High buildings,
- Old wooden "colonial" style houses,
- Areas which are crossed by high voltage lines,
- Petrol stations,
- Transportation of petroleum products and Liquefied Petroleum Gas,
- The airport due to the nature of operational activities is also a potential site for fires, and
- Burning of sugar cane and its risk to houses and hotels.

The Fire Services ensure adequate fire fighting services in cases of fire outbreaks. The Jet A1 Aviation fuel tank farm at SSR International Airport is surrounded by a bund wall that has sufficient holding capacity to allow emergency response procedures to be implemented. Airports of Mauritius Limited (AML), Airport Rescue and Fire Fighting Service comply with the standard set by the International Civil Aviation Organisation and are supported in the event of an emergency by the Government Fire Services. Regular exercises of the Airport Emergency Plan are conducted, the most

recent full crash exercise being held in October 2004 involve all airport and civil emergency services in simultaneous land and sea simulated accidents.

Government is furthermore putting in place strategies as precautionary measures namely:

- Underground cabling of electrical wires in high risks areas such as tall buildings, passage of high voltage lines,
- All buildings need to have fire sensors, hydrants and circuit breakers,
- All residential buildings need to have circuit breakers installed (Such has not been the case until now),
- Setting up of Petrol Stations is controlled by a Preliminary Environmental Report (PER) which controls the storage and handling of fuel. Furthermore, it is now a policy not to allow for the siting of Petrol Stations in the midst of residential areas,
- Presently, trained and skilled manpower are preferred to "amateurs" for electrical installations at all level including for individual household installations, and
- Safe transportation of LPG and fuel is also an issue that need to be addressed and Government is preparing guidelines.

The large size of the Exclusive Economic Zone of the country increases its vulnerability in so far as security aspects such as terrorist threats are concerned. The relevant authorities are initiating and enhancing existing logistics and facilities to effect surveillance and control to ensure security. However, the country needs financial and technical assistance from the international community to meet its obligations towards the implementation of the new international Maritime Security Regime and the Security Council Resolution 1373.

The Way Ahead

Precautions and contingency plans against oil-spills, fires, airplane crashes and civil disasters are increasingly moving from the drawing board to meet the practical test of field trials. The continuing threat of climate change and sea level rise warrants further investment in local precautionary measures and more intensive advocacy and international negotiation to reduce the global risk through the implementation of the Kyoto protocol.

Precautionary measures against airplane crashes

Strengthening is needed in public and commercial awareness of fire risk and the implementation of more rigorous precautions for fire safety, prevention, fire-fighting and rescue systems. Legislation on terrorist attack has been introduced amidst concern to protect civil liberties and to preserve the country's record of openness and its friendly welcome to all visitors.

2. Natural and environmental Disasters
A Policy and Programme Progress sheet

Challenges addressed	Progress made	The way ahead
• Cyclones and floods	• Regional satellite early warning system • Public precautions • Building standards	• Monitoring climate change and sea level rise • Local precautions • International negotiations
• Oil spills	• Risk analysis • Contingency plans	• Development of technical capacity • Improvement in law enforcement • Training exercises
• Fires and explosions	• Fire safety regulations and inspections • Fire fighting capacity and equipment • Special risk contingency plans (chemical fires, Port Louis oil container risks)	• Multi-sector planning • Review of special risk areas (high rise buildings, sugar cane burning, dangerous chemicals)
• Airline crashes	• Risk analysis • Contingency plans • Airline regulations	• Further development of technical capacity • Learning from international experience
• Terrorist threats	• Legal provisions • Security monitoring	• Responding to international guidelines and experience whilst protecting civil liberties and the welcoming culture of Mauritius.

3 Land Resources

LAND RESOURCES

The Challenges

The land

Land is a scarce resource in SIDS, often fragmented across many widely separated islands with few modern transport links. Human development and natural forces put land under pressure. These pressures derive from size and isolation, from pollution from industry, from agricultural chemicals seeping into fresh waters and soils, from urban development, from traffic and from the domestic use of energy and services. The pressures are intensified by conflicting demands for access and use and also become critical with the impact of extreme natural events.

Like most SIDS, Mauritius has little land and a fragile ecology. The main islands Mauritius and Rodrigues and a group of outer islands and islets have a total area of about 2,040 km2. The main island of Mauritius is 1,865 km2 in area, volcanic in origin.

The coastline of Mauritius is 322 km long and almost entirely surrounded by a fringing coral reef enclosing a lagoon area totalling 243 km2. The freshwater bodies on the mainland comprise approximately 2000 ha of reservoirs, rivers, streams and creeks.

On the main island 43% of the land is used for agriculture, with 39% under sugar cane. 30% is forest and scrub land, 26% is built on with roads, houses and other buildings, and 1% is used for permanent grazing. Most land in Mauritius is privately owned, except for the coastal areas and other land which is held by the Government.

Mauritius was uninhabited until as late as 1598 and has been successively a Dutch, French and British colony, becoming independent in 1968. It is now, one of the most densely populated islands in the world with a density of 591 inhabitants per square km.

Urban sprawl in Mauritius

High quality land, particularly in prime coastal areas, is scarce and is sought after by a variety of competing users. Land planning failures in the past coupled with inadequate control of development have led to the admixture of incompatible developments, encroachment into environmentally sensitive areas and conversion of prime agricultural land.

Changes in Land Use

In Mauritius, a high population density and the spatial impact of multiple economic activities, including human settlements have given rise to major changes in land use.

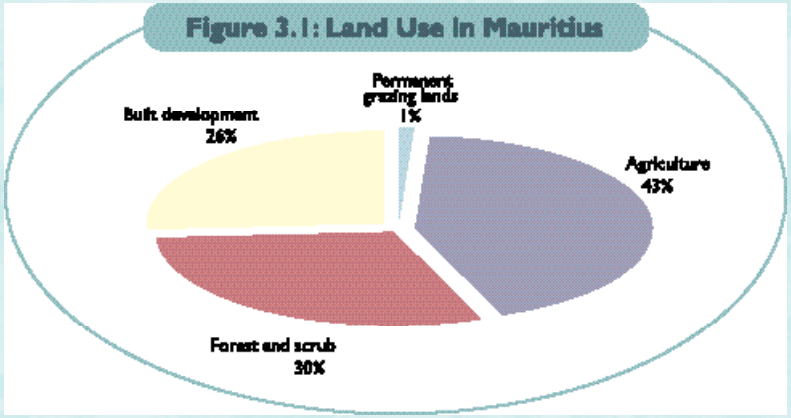
These changes historically included, clearing the natural forests for their timber, for fuel and for agriculture, selling off the ebony, importing new species such as sugar, tea and tobacco. This provided wealth to the land owners and colonists, and food and employment to the growing population. But at the same time they caused much irreversible environmental damage, including soil erosion and land degradation, depletion in biodiversity and an increase in the built environment of roads, bridges, housing, factories, shops and offices, bridges, power cables, water and sanitary systems.

Agriculture

The agriulture sector constitutes essentially of sugar production and has been the backbone of the Mauritian economy for long until the establishment of the Export Processing Zone (EPZ). Arable land devoted to sugar plantation is gradually decreasing. In 2002, its contribution to GDP was estimated at 6.4 % and in terms of export earnings, total sugar exports constituted 20 % of total domestic exports compared to about 70 % to decades ago.

The sugar industry has long benefited from guaranteed prices and preferential access into the european markets under the Sugar Protocol and the Lome Convention and now the COTONOU agreement. However, the

Figure 3.1: Land Use in Mauritius



protocol expires in 2006, and with duty -free access to the EU market for least deveoped countries' (Including SIDS) sugar taking effect from July 2009, the price Mauritius obtains for its sugar will fall significantly, this impacting negatively in the country's economy.

In anticipation of the unfavourable developments on the international scene, the Sugar Industry Efficiency Act 2001 was passed which provides for the conversion of former sugar land for urban development. In the same year, the implementation of the Sugar Sector Strategic Plan (2001-2005) that was embedded in the Act started. In parallel to reducing labour costs through a Voluntary Retirement Scheme (VRS) for the sugar companies, the centralisation of sugar factories is also being pursued to achieve economic scale. Goverment has made provision in the Act that such land conversion be properly planned and not ad hoc and to that effect, the Act makes provision for "land swaps" to facilitate the sensible location of development. The above changes has inevitably led to a decrease in land use for agriculture by approximately 5,500 ha. This shift is likely to continue over the next two decades as 6,200 hectares will be needed to accommodate the increase in population and expansion of the tourist industry.

The human impact in small islands is pervasive unless deliberate measures for protection of sensitive areas such as wetlands, forests and woodlands, lagoons, corals, sand dunes, beaches and mountains.

Mauritius has about 57,000 ha of forest, 60% of which is privately owned. Only 6,000 ha of the private lands are protected by law as mountain or river reserves. All native state-owned forests have been converted into National Park and nature reserves, but private forest lands are gradually being lost to other land uses.

Sixteen Nature Reserves have been declared since 1951. The reserves cover 2.5% of the island and range in size from the 1.5 ha Perrier Nature Reserve to the 3,611 ha Maccabé– Bel Ombre Nature Reserve. The first National Park was established in 1994 – the Black River Gorges National Park. Despite these initiatives native biodiversity is now mainly confined to the south-western region of the island together with a few other remote areas on mountain ridges and on offshore islets. Three key land use trends have been identified:-

(i) The continued urbanisation of the conurbation by growth of housing, retail, commercial and industrial development

(ii) The dispersal and decentralisation of building to the urban fringe and to other countryside locations where new housing is being developed through the various land conversion schemes

(iii) The continued expansion of tourism and hotel resorts mainly on the coast

Land degradation is one of the major environmental problems of Mauritius. Only 1.5% of the original native vegetation covers remains today. The many mountains, no longer covered by trees, aid the process of soil erosion leaving barren gullies on the mountain slopes. The problem is further compounded by long periods of droughts which hinder re-forestation.

The demand for housing is the single largest pressure on the future use of land and could involve conversion of 5,000 ha by 2020. 800 ha of land could be needed for new business parks and industry including SMEs. 400 ha may be needed for new schools, colleges and universities and other institutions, in addition to the current major school construction programme. To this should be added, current proposals and possible growth in demand for integrated resorts, leisure complexes, public transport, highways and utilities including the LRT and new dams.

Some 66% of industry in Mauritius is located in the central urban zone. Almost half is confined to industrial zones, but in some cases, poor initial planning and expansion of residential and industrial sites has led to a mixture of housing and industry.

In many coastal areas, rapid development of housing and commerce has outstripped the rate of provision of environmental services and community facilities especially waste management and sewerage. Many coastal settlements do not conform to the planning guidelines for set back, sea defences, access to the beach and height of buildings. This can be seen at Flic en Flac in the west and in Grand Baie in the north.

The effects include a reduction in scenic attractiveness and amenity value of the coastline, restricted public access to the beach, pollution of coastal waters with sewage and solid wastes and beach erosion inhibiting better development of the beach resource, without large-scale reconstruction.
The Tourism Development Plan for Mauritius (2002) predicts that provision for tourists will expand from around 9,000 rooms in 2000 to 20,000 in 2020, hence the construction of more hotels. Current proposals received by the Ministry of Housing and Lands for Integrated Resort Schemes (IRS) may require around 2000 ha of land.

Estimates made by the Department of Environment indicate that some 20% of wetlands have been filled in the Northern tourist zone, 50% in the western area of Flic en Flac and 50% of the remainder are under pressure, including the new Belle Mare tourist zone on the east coast (NES , 1998)

The principal effects of building on wetlands include a reduction of the biological habitat and of the amenity value of natural areas. Building has increased pollution of the lagoon

by affecting the important functions of the wetlands such as reducing nutrient loads and retaining sediment.

The concentration of business, industry and residences in the Port Louis and central area of Plaines Wilhems has put acute stress on both infrastructure and resources. Land use patterns have a direct impact on the traffic intensity. These heavily built up areas, coupled with a lack of adequate planning, give rise to serious problems of traffic congestion, concentrated along the main routes to the capital city. The impact includes localised episodes of poor air quality and its effects on the health of the urban population and delays in travelling around the island and consequent higher transport and operating costs for business.

The main challenge facing the land resources in Mauritius is to ensure that land is readily available for the economic development objectives of the nation, while taking into account environmental concerns and social needs.

One solution is to concentrate future major development in and around strategic growth clusters in the conurbation including Cyber City, and in existing major settlements elsewhere, where a critical activity mass has already been built up or can shortly be envisaged.

This could include promoting an urban renaissance, particularly in key town centres in the conurbation and enabling rural regeneration and tourism development in and around other settlements and in the countryside and on the coast.

Old retail shop

New shopping complex

Development should be planned so that wherever possible, it minimises the need to travel and facilitates safe and convenient movement on foot, by cycle and by public transport. Development that generates large numbers of passenger movements should be located close to sites including Urban renaissance Zones which provide or have the potential to provide for convenient access by public transport, by cycle and on foot. There should also be proper planning so as to make best use of existing transportation networks and have regard to strategic priorities. This will all require more attention from professionals, skilled in land development and urban planning, which the country lacks at present. The aim would be to manage development in ways which enhance and protect the environment and provide better quality of life for the people.

Progress

Policies

The Government has developed new laws and new institutional arrangements to plan and manage better use of land. The objective has been to strike a new balance between the national interest and competing commercial interests, to reach decisions more quickly and to apply agreed strategic principles for a better future. This has meant sweeping away old laws and procedures and establishing a new framework for management.

The National Physical Development Plan and the National Development Strategy

The National Physical Development Plan (NPDP) approved in 1994 has been replaced by a new National Development Strategy approved in 2003. The NES makes provisions for a series of planning guidance, which will be enforced by the local authorities with the support of Ministry of Housing and Lands. They are important instruments for environmental protection. These design guidance on sectoral development have been finalised and outline schemes have also been revised.

Institutional Reform- The Environment Protection Act (EPA)

The EPA was passed in 1991 has been repealed and replaced by EPA 2002 which provides for more vigorous control over land use planning and development by:-

(i) Institutional Strengthening

- Environmental Police for the enforcement of environmental laws,
- National Network for Sustainable Development as a consultative forum including the public sector, private sector and NGOs chaired by the Minister of Environment,
- ICZM Committee involving the public sector, private sector and NGOs in coastal management,
- New procedures for processing schemes,

(ii) Strengthening of the existing enforcement mechanism, including 'stop orders' and fixed penalties

(iii) Establishment of standards or guidelines for built- up environment and landscape.

New Planning Law

Strategic plans to fulfil these aims and the National Environmental Action Plan have been incorporated within a cohesive legal framework. A key component is the Planning and Development Act 2004. This follows the principles of Agenda 21 and the BPoA. Formerly, the focus was on development control. The new Planning and Development legislation of 2004 paves the way for integrated planning of land use. It moves from environmental protection to sustainable development. The new 2004 law provides for integrated physical and land use planning and management. It seeks to minimise conflicts and achieve efficient trade offs, linking social and economic development with environmental protection. (See Box 3.1).

Box 3.1

Land Development Permits

The main permits/clearances required for the land development permitting processes are as follows:

- The Development Permit under the Town and Country Planning Act,
- The Building Permit under the Building Act,
- The Land Conversion Certificate under the Sugar Industry Efficiency Act,
- The Morcellement Permit under the Morcellement Act,
- Modification of zoning when the area intended to be developed is not zoned for such either in a Scheme that is approved or under preparation under the Town and Country Planning Act, and
- EIA licence under the Environment Protection Act.

Each of the above laws operates under different legislative policy and intent. The Town and Country Planning Act sets out the principle of development - i.e. it provides, through technical documents that are transmitted through appropriate safeguarding procedures set out by the law, zoning information (and other relevant criteria) as to what land use may be allowed and under what conditions at any given time.

The main policy intent behind the Building Act is to provide for structural safety.
The Building Act overlaps with the Town and Country Planning Act on matters like setback and parking standards.

The main policy intent behind the Sugar Industry Efficiency Act is the necessity to ensure that sugar production level is sufficient to meet the commitments of the country, preserving agricultural land and optimising in agricultural land.

The policy intent behind the Morcellement Act is to ensure that no land is subdivided and sold for any development purpose unless the requirements of relevant authorities are satisfied e.g. proper planning including issues like community development criteria, traffic safety, no risk of flooding and all infrastructural requirements such as roads, drains, waste disposal, and electricity are met.

The purpose of the EIA licence under the Environment Protection Act is to ensure that specific undertakings (as set out in the Schedule to the Act) which fail to comply with environmental requirements cannot go ahead and that those, which are approved comply with specific mitigative measures.

On top of the above licences under the above Acts, there are other legislation controlling the use of land, like the Pas Geometriques Act and the State Lands Act (which control the use of State land), the Finance Act (which provides special provisions for HDC projects); some of the permits would also be dependent on clearances from other Authorities like CWA, CEB and the Ministry of Energy.

Professional Development

The Professional and technical skills needed to operate the new planning system are in short supply. This capacity needs to be built up for:

- Land use planning,
- Enactment and enforcement of laws,
- Establishment of guidelines,
- Environmental Impact Assessment and EIA monitoring,
- Environmental protection of Environmentally Sensitive Areas, and
- Strategic planning for transport networks and outlines schemes.

Dealing With Sensitive issues

One aim of the planning system is to deal with the many sensitive issues that arise in land use management. These include land rights; tourist carrying capacity and the protection of the interest of local residents; the extension and improvement in basic infrastructure of roads, bridges, power, lighting and sewerage systems; sustainable mobility; and the promotion of style and aesthetic values in environmental planning.

Land ownership is a critical aspect of policy for sustainable development and social cohesion. It is also closely linked to poverty relief and conservation of land quality. Decent housing for all is a priority for social and economic

progress and for maintaining environmental value. Public housing schemes have not succeeded in reaching the poorest people. There is a backlog of around 20,000 on the list for new housing. Whilst over 85% of families live in owner occupied property in Mauritius, and most of that is cyclone proof, poverty relief through decent housing for poor people remains a continuing challenge.

The recent structural changes in the sugar industry, which have led to the release of lands for other purposes, will have potentially far-reaching effects on the future disposition of land use in the countryside. 4 600 ha of sugarcane land has so far been committed by Government for conversion, mainly for housing in private plots. Over the next 20 years or so, a further 24 000 ha of sugarcane land could be released for other agricultural and non-agricultural purposes. The new planning legislation allows the Government to promote styles of development that match the scenic beauty of the island and avoid eye-sores that have blighted the building practice and infrastructure development of earlier times.

The Way Ahead

Mauritius is characterised by the inherent environmental vulnerabilities of Small Island Developing States. Environmental degradation can become a serious impediment to economic and social progress if appropriate measures are not taken to reconcile current pace of economic growth with sustainable management of the environment.

In the next phase of development, there will be increased demands on land in line with economic and social change. IT and business parks will require more land. Tourism development will require more land in coastal areas with high risks of encroachment on environmentally sensitive areas. New housing however will dominate the picture. This is necessary to meet the needs of a still growing population, to meet the needs of poor people for decent housing, and the changing patterns of family life. To operate the new planning system new technical tools have to be developed. These include:

- Guidelines and the means to enforce them,
- Technical skills at local level,
- Better information system including basic data and monitoring to translate planning policies into detailed schemes, particularly to protect environmentally and ecologically sensitive areas,
- Clearer Institutional Responsibility, and
- Adequate public awareness and participation to enable them to contribute effectively.

Management of land resources in Mauritius is presently at the cross-roads. The aim is to establish a comprehensive plan of land management. The 2004 legislation is a starting point. Judicious management will be needed to ensure that this scale of change in land use projected can be accomplished within the spirit of the new planning framework. One answer may be to include the principle of the garden city within the guidelines for the future. Mauritius cannot be returned to its former pristine state, before the imprint of man has irreversibly transformed it. But the future could include the promotion of Mauritius as cultivated garden state in which every built development plays its role in promoting and protecting the quality of the habitat.

Sale of locally produced vegetables in covered market

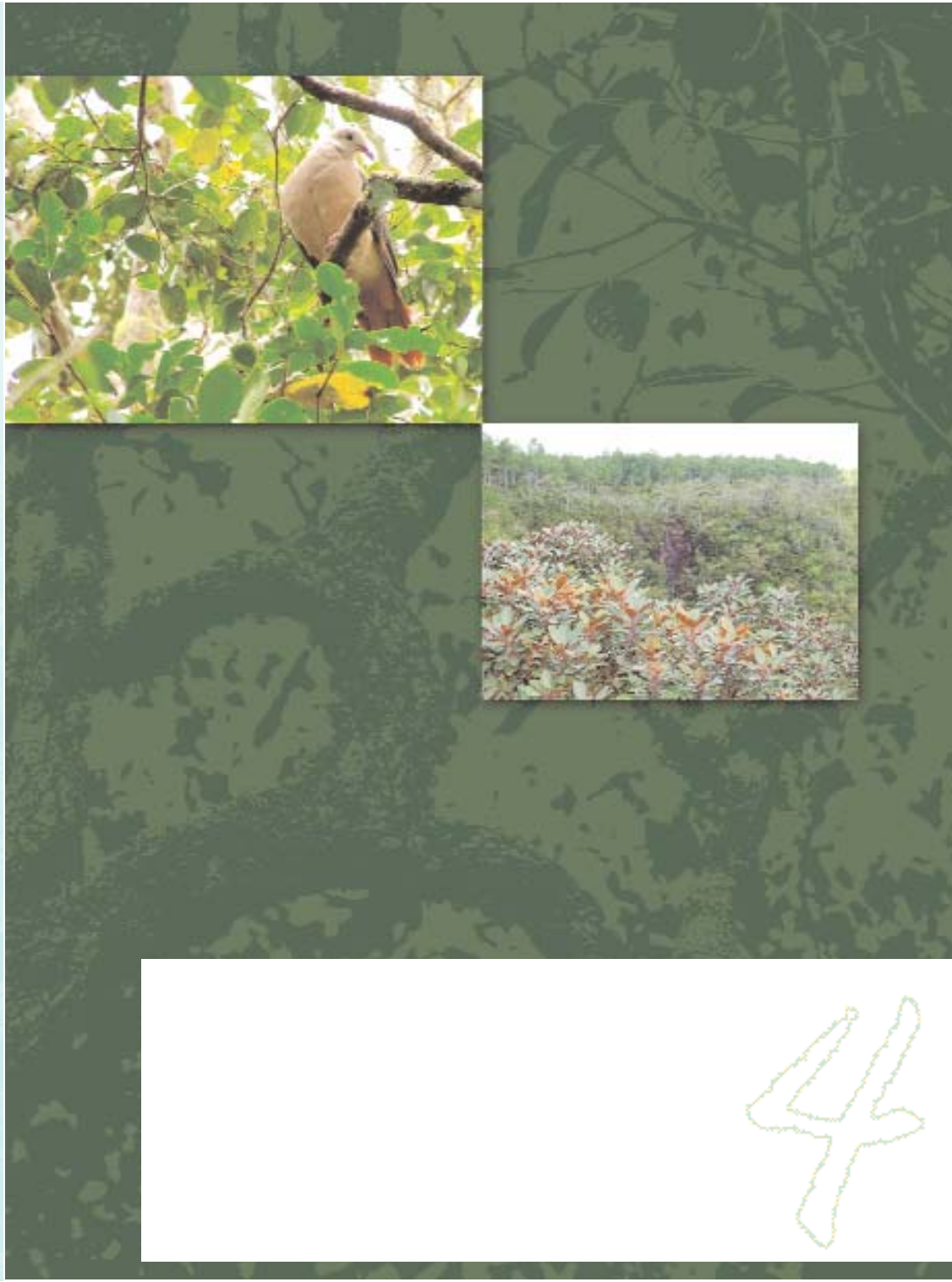
Enhancing Resilience

No national land development programme can be sustainable unless it incorporates a strong element of social justice and redistribution. There is a need to ensure that the housing programme remains 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.

Food security can only be achieved through increased, planned and efficient agricultural production. As transport costs increase, so more attention has to be given to local food production. This is a new area for regional co-operation and technical exchange. The size of SIDS and their topography make them a special case for agricultural development especially in market gardening.

3. Land Resources
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
Land degradation	• Environmental protection Acts 1991 and 2002 • National Development Strategy 2003 and design guidance for sectoral development • Environment Impact Assessment • lanning and Development Act 2004 • Institutional strengthening • Strengthening of existing enforcement mechanism • Environmental policies • Identification of sensitive hot spots for management • Reducing soil erosion	• Strict enforcement of laws and guidelines • capacity building of local staff • Adequate coordination and information exchange between ministries in planning activities • Adequate basis data and monitoring • Public participation • Clear institutional responsibility
Urbanisation and industrialisation	• Environmental protection Acts 1991 and 2002 • National Development Strategy 2003 and design guidance for sectoral development • Environment Impact Assessment • Planning and Development Act 2004	• Judicious land management under the new planning framework • Enforcement of new legislation
Rapidly increasing coastal development with expansion of tourism and hotel resorts	• ICZM Committee • Environmental protection Acts 1991 and 2002 • National Development Strategy 2003 • Environment Impact Assessment	• Capacity building • Adequate basis data and monitoring • Clear institutional responsibility
Traffic congestion	• National Development Strategy 2003	• Closer integration of land use and transport planning
Deforestation and reduction of biological habita	• Conservation • Reforestation programmes • National parks • Education and awareness programme	• Promoting the garden island principle • Safeguarding scenic attractiveness and amenity value of natural areas • Reforestation
Conflicting uses	• Planning and development Act 2004 • Environmental protection Acts 1991 and 2002 • National Development Strategy 2003 • Environment Impact Assessment	• Resolving conflicting use of land resources



Biodiversity Resources

The Challenges

The islands of Mauritius and Rodrigues were uninhabited until the 16th century. The climatic, geological and topographical regimes resulted in the evolution of diverse biota with a high degree of endemism, further promoted by the age and isolation of the islands. But with development, this biodiversity has been adversely affected, especially by human habitation, direct exploitation and the invasion of alien plant and animal species.

Some of the damage such as the species extinction (most famously the dodo), the destruction of vital habitats and the impact of invasive alien species, is irreversible. Nevertheless both islands have been the host to significant international and local programmes of conservation to help protect indigenous biodiversity resources. These are being recognised as making important contributions to world heritage, to the attraction of eco-tourism and for medicinal and other uses.

Fortunately Agalega and St Brandon are almost pristine and are very important for marine diversity and tropical seabirds. St Brandon has had little formal development, and according to a recent World Bank report, it should be kept this way to allow nature to remain untouched.

The principal challenges being addressed by Mauritius are to protect and restore the wealth of biodiversity being lost for future generations, to promote valuable economic and social uses for these natural resources, and to strengthen regional and international collaboration essential to the success of such specialist activities in SIDS.

Invasive alien species arrived in Mauritius and Rodrigues with the first boats landing on the islands. Rats, deer, pigs, monkeys, cats, mongooses all destroy the native fauna of the island, and eat seedlings and seeds of the native flora. Many exotic plant species are naturalised and dominate areas that should be native forest. These pose an enormous problem for the survival of the forest – the plants out-compete the natives by stealing space, nutrients and sunlight.

There are 49 islets present around Mauritius with area ranging from 253m^2 to 253 hectares. Some of them are highly degraded while others have been actively restored to protect their unique biodiversity. Because the islets were less badly affected by IAS, they still contain fragments of the native biodiversity now extinct on the mainland Mauritius and its islands harbour a relatively wide variety of endemic plant species that are used in traditional medicines. Many of these plants, have been classified as endangered.

Plants

As with many isolated islands Rodrigues and Mauritius harbour a unique collection of some of the rarest plants and animals on the planet. Mauritius has about 680 native species of plant remaining – of which about 70 are already thought to be extinct. About 300 of these species are endemic to Mauritius. Almost all of the remaining species are threatened to some extent through habitat loss, invasive alien species and exploitation. In Mauritius 79 species are represented by less than 10 individuals in the wild, and several of these by a single individual.

Although conservation activities began some 25 years ago, the World Conservation Union (IUCN) has rated Mauritius as the third country in the world after Hawaii and Canary islands to have the most threatened plant species

Trochetia boutoniana, endemic and National flower

Birds

The bird life on the islands is equally threatened, although species recovery programmes for Mauritius kestrel, pink pigeon and echo parakeet, have saved many species on the brink of extinction. The International Council for Bird Conservation (ICBP) has classified Mauritius as first among the 75 forests of major importance for threatened birds in the African Region.

Native Forests:

Native forests cover less than 2% of Mauritius, and are restricted to the south west area where much is protected within the Black River Gorges National Park, the south eastern Bambous mountains (mostly privately owned or leased) and isolated mountain ridges (e.g. Le Morne, Port Louis Range, Corps de Garde) and islets such as Round Island and Ile aux Aigrettes.

Conservation of the forests involves intensive management of critically endangered species in specialist nurseries, restoration of forests by weeding predator control and replanting.

Progress

- ***National Biodiversity Strategy and Action Plan (NBSAP):*** Mauritius has already produced a draft National Biodiversity Strategy Plan which includes the following thematic sectors: Forest biodiversity;

Terrestrial Biodiversity; Agro Biodiversity; Freshwater, Coastal and Marine Aquatic Biodiversity; Biotechnology and Sustainable ecotourism. Furthermore, the Ministry of Agriculture has produced a Non-Sugar Sector Strategic Plan 2003- 2007 and one of its objectives is to promote the conservation of natural biodiversity and fostering sustainable utilization of natural resources. Progress in conservation of native flora has been made with support from NGOS and Government and with external funding.

- ***Flora Conservation***

Flora conservation works:

- Plant prospection to increase knowledge of distribution and abundance of threatened species
- Update of the IUCN red data list
- Propagation of critically endangered plants and ferns through specialist nurseries
- Conservation of plant genetic resources through field genebanks
- Trial of different methods of forest restoration
- Proclamation of Black River Gorges National Park in 1994
- Development and maintenance of conservation management areas – intensively weeded and fenced areas within the National Park to allow the native forest to regenerate.
- Restoration of offshore islets such as Ile aux Aigrettes and Round Island
- Inventory and Study of Medicinal and Aromatic Plants

Funding has come from the Government and NGO's and others including the World Bank Global Equity Fund, UNDP Global Equity Fund Small Grants Project, and private donors

- ***Conservation Management Areas:*** Setting up of conservation management areas by the NPCs for the protection of endangered bird species including echo parakeets and pink pigeons.- to date 10 CMAs cover a total area of 40 hectares.

- ***Forests Management:***

The State owned forestlands are governed by the Wildlife and National Parks Act 1993 but the privately owned forestlands have no legal protection. With a view to cope with the challenges of forest management, a number of actions were taken. These are:

- Setting Up of a Biodiversity Unit at the Forestry Service Department in 1997
- Creation of a Greenhouse Unit in 1999 to support the Biodiversity Unit
- Setting up of a Tree Seed Centre for plantation species under the SADC Regional Cooperation
- Producing one million seedlings of plantation species annually in the six forest nurseries of Forestry Service to support the reforestation and National Tree Planting Campaign.

- ***Recording System***

A computer based plant recording system has been set up for recording information on monitoring plants in the wild and in nurseries.

- ***Herbarium Collection***

A herbarium located in the Mauritius Sugar Industry Research Institute, has been set up containing over 25,000 specimens with species from the Mascerene islands and islets.

- ***Botanical Gardens for Conservation and Tourism***

The SSR national Botanical Gardens have an area of 60 acres planted with 500 plant species and a national collection of native plants of Mauritius. It is the most visited tourist site of the country. It also includes a medicinal plant garden

- ***Wetland reserve***

In 1999 a wetland reserve was established and designated as a Ramsar site in 2001. It occupies an area of 26 ha, near the capital city of Port Louis, and consists of mud flats and muddy sand, with over 1000 migratory birds and some vagrant species. –

- ***Marine Diversity***

Marine parks and aquatic biodiversity projects are being promoted including projects on coral spawning and a field guide on coral species was published in 2001. A mangrove propagation project has recorded a success rate of 85% from seedlings planted in the 1990s.

Two marine parks have been set up have been set up in Mauritius, one of 350 ha at Blue Bay and the other of 480 ha in Balaclava.

To prevent poaching in the Blue Bay Marine Park and protect the rich biodiversity therein a special unit, the Blue Bay Marine Park Patrol, has been set up in 2004.

- ***Fish Reserves***

Six fish reserves have been designated to protect and preserve habitats which serve as nurseries for juvenile fish.

- ***Fauna Diversity:***

The Mauritian Kestrel, the Echo Parakeet and the Pink Pigeon are the three threatened endemic birds that have been saved from extinction due to extensive conservation work have been carried out in captivity and in the wild by internationally funded NGOs

Box 4.1

Progress with Promoting Animal Biodiversity

Kestrel: Out of a population of only 4 birds in 1974 including a single breeding female, the Kestrel population in 2004 is estimated to be about 600 to 700. It is thought that the population will stabilise around 800 individuals. Low-level monitoring and further research work will then be required to maintain this population.

Echo Parakeet: Of the known 20-25 individuals of the Echo Parakeet in 1987 the population has been increased to about 230 birds at the end of the breeding season 2003-2004. The forecast by the end of the breeding season 2004-2005 is that the total world population may reach about 300 individuals. The echo parakeet was considered at that time as the rarest parrot in the world. In fact, the Mauritian echo parakeet rescue programme is perhaps the only parrot project where known management techniques are applied.

Pink Pigeon: From a population of 12-20 Pink Pigeon in the late 1970's the number of bird has now reached 380. It is expected that, if additional releases are conducted, the population should reach over 500 within 3 years,

Fruit Bat: Of the three species of fruit bat which existed in Mauritius now only one species remains. A captive breeding programme is under progress to protect the remaining species.

Mauritian Fody: Currently there are about 120 pairs of the Mauritian fody in the wild. A trial; release was made in 2003 on Ile aux Aigrettes with a high survival rate of 50% and there has been one successful breeding and fledging.

Seabirds: Ringing study is being carried out on sea birds Round Island namely red-tailed tropic bird, white tailed tropic bird and wedge tailed shearwater. The breeding and nesting success of the Round Island Petrel is being studied as well.

Reptiles: The outer islets of Mauritius namely Flat Island, Round Island, Serpent Island , Gunner's Quoin and Ilot Vacoas harbour some of the rare and threatened endemic reptile species including the primitive boa, the telfair skink, the gunther's gecko and Nactus sp. Prospecting surveys are carried out on a regular basis in order to make an inventory of species and this has led to the recent discovery of a Nactus spp. on Flat Island. Further studies are being carried out on these reptiles in a view to reintroduce them in certain appropriate places.

Microchipping of the Round Island boa is being carried out in order to estimate the population and to study their ecology. As far as the Nactus competition between introduced and native geckos is being studied.

Insects: Under the Darwin Initiative funding has been obtained to carry out studies on insect. A post doctoral study is being carried out on ants is Mauritius, the different species, their ecology and the competitive effects of introduced species. At present only eight ant species endemic to Mauritius are known. There are also several projects on pollination of native species in the upland forests to determine whether exotic pollinators are preventing successful seed set.

Land snails: It is believed that about 130 land snails are native to Mauritius, out of which 30% have become extinct and another 30% are endangered due to habitat destruction and predation by introduced species.

- ***Islets Biodiversity Management:***

In 2001 the Government of Mauritius set up a task force to propose remedial measures for the restoration and protection of the islets. The task force has classified the islets into the following categories: strict nature reserves, open nature reserves, tourism and recreational and passive reserves. One of the recommendations of the task force is the creation of Islets National Park. On 5 June 2004, 8 islets: Rocher des Oiseaux, Pigeon Rock, Ilot Vacoas, Ile D'Ambre, Ile aux Oiseaux, Ile aux Fous, Ile aux Fouquets and Ile aux Flamants, were declared as National Parks.

Round Island which is one of the small islets close to Mauritius, harbours eight species of reptile which are all endemic to the Mascarene Islands and four of the above species (including a giant skink, a gecko and a snake) occur only on Round Island and nowhere else in the world. These species survive here because the island never had any rats. The island has been under active management due to funding by a grant from the World Bank GEF to restore the native vegetation cover, eaten to extinction by introduced goats and rabbits, and monitor the reptiles and the sea bird colonies and to prevent any new invasive alien species reaching the island through a strict quarantine system.

Ile aux Aigrettes is a Nature Reserve islet which has been leased to the Mauritius Wildlife Foundation, and considerable conservation activities have been carried out there. The island contains the last fragment of coastal ebony forest and much effort has been put in to control the invasive plant species and restore the forest. The island is also a safe haven for pink pigeons and Mauritius fodys.

Serpent Island is an important habitat for a wide range of animal species which include two lizards species, Nactus serpensisula and Gongylomorphus bojeri, one undescribed tarantula spider, centipedes, the only colony of masked boobies in the Mascarene, very high densities of common noddies, tesser noddies and sooty terns.

- ***Aquatic Biodiversity:***

In 2002 a study on ' The Inventory of Freshwater Fish and Macrocrustaceans of the main rivers of Mauritius' was carried out by a group of French Scientists from L' Association Reunionaise de Développement de L'Aquaculture (ARDA) in collaboration with some local counterparts. The study has established the rich biodiversity of our rivers namely the presence of 18 species of fresh water fish and 10 species of crustaceans respectively. The species were grouped into three categories: endemic, indigenous and exotic. Three of the endemic crustacean species are the *Cardina mauritii, Cardina spathulorostris* and *Cardina richtersi* (petite chevrette). However, most of those species are few in number. Presently a management plan is being drawn for the conservation of the fresh water fish and macrocrutacean.

Box 4.2

Management of biodiversity Initiatives

- Preparation of a management plan for rivers, canals and streams,
- Further initiatives funded by the Ministry of Environment under the second Environment Investment Programme (EIP2),
- Placing of two release cages at Bel Ombre and Combo for the Pink Pigeons,
- Setting up of two conservation management areas of 4.9 hectares each at Petrin and Belloguet for the protection of endemic plant species (such as ….),
- Construction of a captive breeding centre at Black River for endangered birds, and
- Implementation of a National Pest Control Strategy in the Black River Gorges National Park.

- ***Biotechnology:***

Biotechnology is an emerging technology in the Mauritian previously mainly limited to sugar cane. The power of biotechnology as a tool for industry is increasing rapidly with the creation of a wide range of materials such as biodegradable plastics, bio pesticides, genetically engineered organisms and biocatalyst. (See Box 4.3).

Box 4.3.

Biotechnology

The Objective of present biotechnology research in agriculture in Mauritius should be to refine the kinds of policies and strategies that would enable biotechnology to contribute to more efficient approaches to crop protection and production, for example drought and pest resistant cash crop and food crop varieties adapted to the local agro-climatic ecosystem, with less environmental risk. This programme includes a process of product patenting, bio-safety ethics, product commercialisation and intelligent marketing targeting a new class of modern agricultural farmers producing to meet both local and export markets. The development of biotechnology will provide an answer to meet the challenge of the alternate use for the 7,000 acres of land released from sugar cane cultivation. A new type of fertiliser is being produced by the fertiliser plant of Mauritius which produces better output.

In Mauritius the Animal Health Laboratory produces vaccines against Newcastle Disease and Fowl Pox in small amounts basically to meet the needs of small and medium breeders. The private sector is involved to a very limited extent in the commercial propagation of horticultural plantlets. In the field of plant biotechnology the focus is on the propagation of sugar cane plantlets by tissue culture. The micro propagation of endangered endemic plants, confined to some endemic orchids for the time being is also ongoing. Biotechnology research development perspectives for the sugar cane industry are strong as Mauritius has an excellent infrastructure and laboratory facilities for modern biotechnology methods for sugarcane improvement, and use of by-products for commercialisation.

Apart from Genetically Modified Organism Act 2004 there is an absence of specific legislation covering Bio safety and Bio-ethics. The same applies for intellectual property rights with respect to patented rights in the field of genetic engineering, biomedicine and animal vaccine.

The Eco Parakeet Rescue Programme: a successful conservation project

- ***Medicinal Plants:***

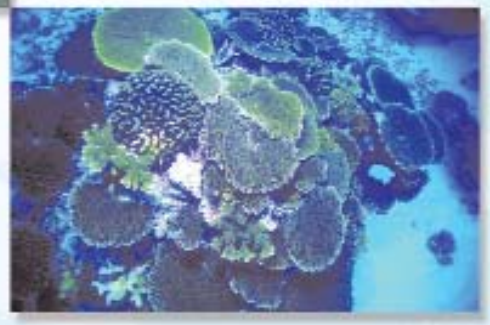
Preliminary research work conducted at the University of Mauritius on a number of endemic species has already shown the presence of the under-mentioned classes of compounds. A survey on Medicinal and Aromatic Plantswas carried out recently under the aegis of the Indian Ocean Commission, a regional association and funded by the European Union. This study reported on the use of several endemic/indigenous species in the traditional pharmacopeia. In Mauritius and Rodrigues alone, 634 species are reported to have been used traditionally.

Table 4.1
The medicinal value of plant resources in Mauritius

Plant resources	Medicinal Properties
• Secondary metabolites • Terpene derivatives • Polyphenol compounds	• Antibacterial • Anti-inflammatory • Antiviral • Anti allergic • Antitumoral • Antifungal • Cardioprotective • Antioxidant • Free radical scavenging

4. Biodiversity Resources
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Protect the richness of biodiversity of the islands	• Implementing treaty obligations • Creating national parks and protected areas • Tree planting projects • Clearing invasive species • Ex situ conservation projects in natural and laboratory settings	• trengthen education programmes. • Legal biodiversity protection on private land. • Empowering ngos in biodiversity management. • Greater priority for wetlands • Identification of environmentally sensitive development • Large scale restoration
• Promoting economic and social uses of the natural resources	• Linking projects to tourist and educational activities (Botanical gardens, nature reserves, wildlife projects) • Supporting medicinal studies and therapeutic uses for endemic species • Promoting biotechnology innovation	• Guidelines for recreational use of marine and coastal areas (water sports, diving, leisure craft, mooring, reef fishing • Adaptation of EIA and other procedures to meet the challenges of development in the most fragile ecological sites
• Promoting regional and international co-operation in biodiversity and science	• Sustaining and extending collaborative scientific studies • Supporting regional and international science projects	• Promoting gene banks for security of conservation of species • Strengthening regional and international networks for research and teaching. • Development of professional and technical human resources and institutions to meet the growing needs in biodiversity programmes.



5 Coastal and marine Resources

Coastal and Marine Resources

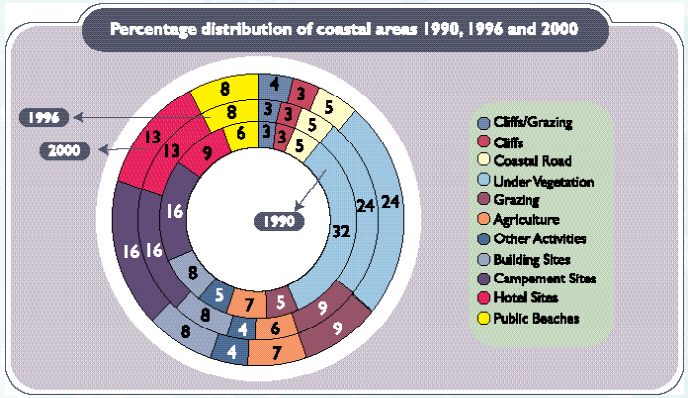
The Challenges

Coastal and Marine resources of small island states are of vital importance to their socio- economic development. These resources have suffered from the process of development and are at risk from internal and external threats including climate change and sea level rise. Action to protect these resources is a high priority for current and future plans. The coastal zone of Mauritius is defined in the EPA Act 2002 as any area which is situated within 1 km or such distance as may be prescribed from the high water mark, extending either sides into the sea or the inlands. It includes:

- Coral reefs, reef lagoon, beaches, wetlands, hinterlands and all islets within the territorial waters of Mauritius and Rodrigues.
- Any estuary or mouth of river
- The islands of Agalega and St Brandon and outer islets

Table 5.1
Information on the Coastal Zone of Mauritius

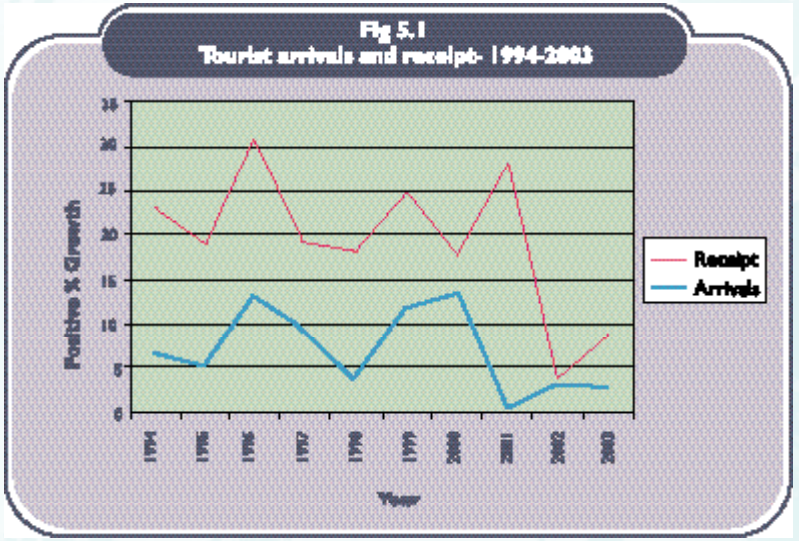
Length of Coastline	322 Km
Marine Exclusive Economic Zone	~1.9 million km^2
Continental Shelf Area	75, 0000 km^2
Lagoon areas	243 km^2
Length of coral reefs	150 km
Area of coral reef	300 km^2

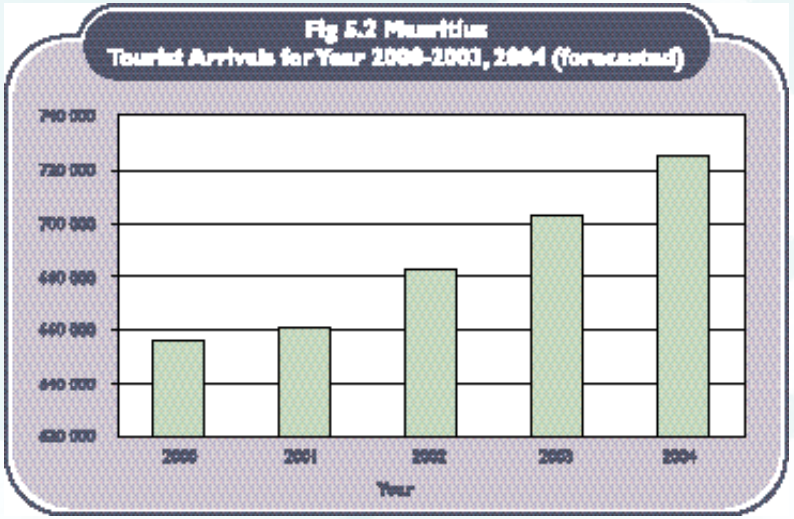


Coastal ecosystems such as coral reefs protect the land from the erosive forces of the sea providing a calm extensive lagoon. Mangroves, sea grass beds, estuaries and wetlands are essential to SIDS because of their many roles for example they serve as nursery ground to commercial fish, birds and other animals, protection of shorelines from storms, provide a natural mechanism for sustaining water quality and much more.

In the period 1990-2000 there has been: a decrease in the area under vegetation, and an increase in the area of hotels, public beaches, grazing on the cliffs and elsewhere, and coastal roads.

In the past decades, Mauritius depended heavily on its textile and its sugar cane industries but the focus is now shifting to coastal and marine resources and their contribution to tourism and a rejuvenated fisheries industry. Tourism, primarily attracted by the white sandy beaches, the lagoons and coral reef accounts now for 13 % of the total GDP. The Government is already committed to a target of one million tourist arrivals by the year 2005. As shown in figure 5.1 and figure 5.2, the number of tourist continues to increase but the rate of growth both in arrivals and in receipts is declining. Steps are being taken to ensure the natural resources on which tourism largely depends are properly conserved and not irreversibly depleted.





Coastal Degradation

The coastal zone is under growing pressure from both sea based and land based activities. Increasingly over the last thirty years, with the development of international tourism through long-haul jet airlines, the coastal zone has experienced very rapid development and mounting ecological pressure. Most of the pristine coastal sites have been exploited and now hotel planners are examining areas less touched by the imprint of change.

Beach Erosion

Development associated with the expansion of tourism has resulted in the construction of a large number of jetties, slipways, piers, breakwaters around the island for fishing boats, pleasure boats and yachts. Numerous groins and sea walls have been privately built in front of beachfront hotels and private villas to protect the beaches from erosion. But evidence suggests that these structures promote rather than inhibit beach erosion, leaving uprooted trees, exposed roots and visibly narrowing beaches.

Beach erosion is an increasing problem faced by Mauritius and has led to the loss of beach space and biological impacts through the loss of habitats. According to the Baird's Report, a study commissioned by the M/Environment on coastal erosion in Mauritius, approximately 7 km of beach is known to be significantly affected by erosion exacerbated by hard structures on the beach.

Lagoonal sand mining used to be extracted at the rate of 800 000 tonnes a year for use by the local construction industry.

Uprooted trees caused by beach erosion at Flic-en-Flac

Seepage contaminations

Following cabinet decision in October 2001, this practice was stopped. The mining of sand and sand dunes have seriously reduced the supply of sand on beaches where it serves to protect the coast from the erosive action of waves. Moreover, this may lead to an increase in water turbidity starving the coastal areas of oxygen and creating an inhospitable habitat for fish, shellfish and most marine life.

Pollution of The Lagoons

Monitoring of the lagoon water was started in early 90's by the Ministry of Fisheries and is still ongoing. Reports have indicated that lagoon water quality is degraded in certain localised areas:

- In 1996, five cases of red tides associated with high nutrients levels were reported at Trou aux Biches-Mon Choisy area,
- The beaches at Palmar have been suffering from bulk accumulation of algae for many years. This has been mostly attributed to seepage arising from animal farming in the region, and
- Industrial pollution at Baie du Tombeau. and Pointe aux Sables.

The National Environment Action Plan (1999) has mainly attributed the reduction in the lagoon water quality to the four short sea outfalls, namely Baie du Tom beau, Pointe Aux Sables, Bain des Dames and Pointe Moyenne that release untreated effluent into the sea, the discharge of industrial and agricultural pollutants directly into the sea or via surface water and sewage seepage from the shore side residences. Raw sewage including industrial effluent from Port-Louis and Roche-Bois was being discharged at a sewage outfall approximately one metre off the shoreline at Mer Rouge till the end of 2001.

Progress

Restoring beaches

Technical studies for evidence based conservation projects

Legislation and guidelines for coastline development have had to be revised and strengthened to increase protection for these

ecologically fragile areas of the country. The Ministry of Environment has implemented in the past several projects of coastal protection by placing gabions. However this technique has been found ineffective. Consequently, the Ministry of Environment conducted a study on coastal erosion in Mauritius in November 2002. The study was completed in September 2003 and the consultants have made a series of recommendations which represent a blueprint for Integrated coastal Zone Management. These recommendations were approved by the Government on 10 October 2003 and will form part of the Integrated Coastal Zone Management Plan for Mauritius. The three pronged strategies cover: (1) Prevention (2) Non-Structural Intervention and (3) Structural Intervention (See Box 5.1).

Box 5.1
The principal elements of coastal zone management in Mauritius

Policy

1. Prevention

(i) Setback

- Reduce impact of development,
- Protect the dune-beach-lagoon ecosystem,
- Provide an environmental buffer for habitat and wildlife, and
- Preserve public access to beaches.

(ii) Relocation

- Remove and relocate facilities to set back line or elsewhere

2. Non-structural Intervention

(i) Shore and Beach Management

- Controlled access of vehicles and pedestrians,
- Onshore grading,
- Restoration of native coastal vegetation enhancement,
- Dune protection and restoration, and
- Vegetation and bioengineering to stabilize the slope surface.

(ii) Beach Nourishment/ Beach Fill

Artificial placement of suitable beach material onto an eroding or sediment deficient beach area in order to replenish, maintain / enhance the beach width

3 Structural Interventions

- Groynes,
- Artificial headlands,
- Detached breakwaters, and
- Shoreline armouring (e.g. revetments and seawalls).

Actions

- A setback of a minimum distance of 30 m from the HWM is set out as one of the conditions in the EIA licence for coastal construction and for all new leases,
- Levelling and removal of sand dunes to be prohibited and included as part of the coastal zone setback policy
- Beach nourishment implemented in pilot project being evaluated (Flic en Flac),
- To restore corals in the lagoon at Flic en Flac, a pilot project consisting of arrays of concrete blocks fastened together were deposited in the lagoon. It is expected that within six months corals will settle on these blocks,
- Outline Policy presently being amended,
- Development plan for extension of lessons learned from pilot scheme to other beaches, and
- Technical review of experience from other SIDS.

Further Developments

- Develop schemes for relocation,
- Identifying construction for relocation,
- Guidelines for coastal construction to be developed,
- Integrated Coastal Zone Management Plan,
- Beach Management Plan,
- Plan for coastal erosion Protection,
- Private Sector to be encouraged to remove unnecessary structures or implement beach fill projects in place of structural approaches to erosion protection,

Banning of Sand Extraction.

Following the cessation of lagoon sand mining in 2001, compensation was paid to those engaged in activity and adequate substitute materials are now available for the construction industry derived mainly from rock sand, as rocks are removed from fields for increasing mechanisation of agriculture and in the preparation of building sites. Banning sand extraction from coastal areas is expected to have a significant beneficiary impact in the rehabilitation of the lagoons and in preventing beach erosion. Monitoring of the ex-sand mining sites is being carried out by the Ministry of Fisheries and Ministry of Environment. Results show that the ex-sand mining sites are slowly recovering from the stress of sand mining. New corals and colonies of sea grasses have established themselves.

Improving Water Quality in The Lagoons

Action is being taken to implement the National Environmental Action Plan for redressing the declining lagoon water quality affecting certain coastal areas (See Box 5.2).

Box 5.2

Action on water quality in coastal waters

A broad strategy for improving water quality of coastal waters is now being put in place.

Problem

- Discharge of untreated effluent into the lagoon,
- Discharge of agricultural pollutants directly into the sea or via surface water, and
- Major industrial pollutants resulting from dyeing, printing, tanning, battery-making and paint manufacture end up in lagoon.

Progress

Set up of Wastewater Management Authority

- Has the responsibility to maintain and manage all existing public wastewater systems, regulate construction of private sewers and more importantly to expand the new sewer network systems in order to provide house connections to all properties domestic, commercial and industrial.

National Sewerage Master Plan

National Sewerage Master Plan prepared in 1994 provides a complete scheme for the development of wastewater sector in Mauritius.

- Plan seeks to connect 50 % of the population to the public sewerage system by 2010/2012
- On completion of the NSMP most of the existing effluent will be disposed of to sewer
- Funding has been secured for several of the projects namely Montagne Jacquot, Grand Baie, Baie du Tombeau, St Martin and Plaines Wilhems Sewerage projects comprising of the NSMP

New Sewerage Plant at Baie du Tombeau

- In January 2002, the new sewage outfall came into operation at Baie du Tombeau. It caters for wastewater from Port Louis North, Fanfaron, Plaine Verte, Abercrombie, Cite la Cure, Cite Roche Bois, Cite Mer Rouge, Cite Ste Croix, Dockers Flat, Camp Firinga, Camp Florida and Camp Florida. As at June 2003, there were approximately 3,300 households (including those located in the housing Estates) connected to the Baie du Tombeau Wastewater treatment plant.

New regulations to reinforce framework of WMA have been made or are being made and awaiting promulgation

- Standards for discharge of industrial effluent into the public sewers (expected shortly),
- Effluent Discharge permits under EPA-2002,
- Bill passed in Parliament on 10th August 2004, with reference to the following:
  (a)the disposal of wastewater and effluent through the public sewer-(Compulsory House Connection,
  (b) the levying of wastewater fees from ground water users the waiver of fees, surcharge on wastewater claims, and
- Cesspool emptying regulation (expected shortly).

Further Development

- Government to implement regulations to ensure all coastal development is properly serviced for wastewater,
- Smaller establishments to have septic systems and larger developments to have treatment systems,
- All systems should be inspected regularly with a requirement to produce an annual certificate of worthiness, and
- Continued enforcement and improvement of controls from industry and agriculture.

Establishment of Mauritius Oceanography Institute

Mauritius is a party to the United Nations Convention on the Law of the Sea which commits the country to adhere to international policy on conservation of living resources of the high seas. The coastal and ocean territory of Mauritius holds an immense potential for development which could play a vital role in the future economic well being of the country. Recognising the importance of the marine development, Mauritius called for a strong oceanographic institute to capitalize on this development potential. With this objective in mind, the Mauritius Oceanography Institute (MOI) was officially established in January 2000. One of the major responsibilities of the MOI is to monitor the marine environment around Mauritius and the Outer Islands and advise Government on policies that will maintain the health of these coastal and oceanic waters (See Boxes 5.3 & 5.4).

Box 5.3: Objectives of Mauritius Oceanography Institute

- Formulate, implement and coordinate of scientific programmes relating to the protection, exploration and development of marine living and non-living resources in the maritime zones of the Republic of Mauritius,
- Provide support services to stakeholders of the fishing industry including those involved in aquaculture,
- Provide advice to policy makers on matters related to the management and development of marine resources and the conservation of marine environment including creation of marine parks and reserves in accordance with the provisions of the Fisheries and Marine Resources Act 1998 & EPA 2002, and
- Act as focal point for collaborative research and management as regard to regional and international research.

Box 5.4: Projects initiated by Mauritius Oceanography institute

- Lagoon and Reef Watch Movement,
- Bio prospecting Mauritius waters,
- Coral Recruitment,
- Inventory of the Coral Fauna of Mauritius,
- Study of Short Period Sea Level Oscillations Geo-spatial Information system for Coastal Vulnerability Mapping of Mauritius, and
- Geo-spatial Information system for Coastal Vulnerability Mapping of Mauritius.

New projects starting

- Study of the lagoon-beach interactions at specific sites around Mauritius for a better control of coastal erosion,
- Modelling and mapping oceanic processes of South West Indian Ocean: a satellite-based approach, and
- Database of marine organisms of the Mauritian maritime zone.

Mauritius Claim for an Extended Continental Shelf

The continental shelf area is the most productive area for fishing and covers 75,000 km^2. Under the provisions of the United Nations Convention Law of the Sea, Mauritius has the opportunity to extend its marine jurisdiction beyond the 200 nautical mile EEZ. This extended zone, known as the Extended Continental Shelf could provide additional resources for our economy. In this regard, the MOI has the important task to formulate a claim to the UNCLOS Commission on the Limits of the Continental Shelf for the extension of the marine jurisdiction of the Republic of Mauritius.

Extension of Marine jurisdiction

The project is on schedule for the formulation of the technical submission to the UN Commission on the limits of the Continental Shelf so that the Government can submit this claim well before the 2009 deadline.

Action taken

- MOI contracted three cruises which provided the vessels and geophysical equipment to undertake the bathymetry and geophysical surveys necessary to substantiate this claim,
- Already acquired over 12,000 km of multibeam bathymetric data on the Mascarene Plateau, Chagos Ridge and the Central Indian Ridge. These data will define the foot of slope points upon which the claim for an Extended Continental Shelf is predicated, and
- Seismic refraction and seismic reflection data on the Saya de Malha and Nazareth Banks acquired.

Next Steps

- Work is now focussed on the processing and interpretation of the data,
- The National Coast Guard is active in the surveillance of the EEZ. However, because of the size of the Mauritian EEZ, there is a lack of effective round the clock monitoring, control and surveillance of the EEZ, and
- A Vessel Monitoring System (VMS) is projected to be operational in early 2005 for surveillance.

Marine Ressources Management

The local fishing industry provides livelihood for about 10,000 persons, plus support to the fishing as an adjunct to tourism. Fishing yielded Rs 4 billions (US$ 139 million) as export earnings in the year 2003. The exclusive economic zone, of marine waters, of 200 nautical miles, is to be further developed for commercial fishing. It is planned that this element of the country's natural resources should play an increasing role in the economic and social development of Mauritius. To respond to this challenge, more resilience is needed to maintain the quality of these resources and to make best use of them.

Improving Fisheries Resources

Fish is a traditional part of the local diet and a key element in food security. Fishery catch has decreased significantly during the last 10 years with a catch of 19, 690 tons in 1993 to 9, 334 tons in 2002. Catch from the banks has also decreased from 4, 707 tons in 1992 to 3, 159 tons in 2003.

The coastal waters have faced a loss in productivity mostly due to the following:

- Reduction in water quality,
- Overexploitation,
- Physical damage to fish breeding and feeding grounds (careless anchoring, traps, boat poles, reef walking, damage by divers and shell collection),

- Alien species, and
- Destruction of wetlands and mangroves.

Whilst the supply of fish from the lagoon has decreased consumption of fish is increasing. This has put increasing pressure on fish suppliers over the past decade to exceed sustainable levels of exploitation of the available resources. More and more intensive lagoon fishing has damaged the coastal habitats through the breaking of coral areas by anchoring and poling of boats and dropping and dragging basket nets. In addition to increased fishing pressure, fisheries are directly influenced by pollution.

Mauritius is conscious of the delicate balance necessary to conserve the marine ecosystem and maintain sustainable fisheries while taking into account the interest of the fishing community and stakeholders of the fishing industry. Transforming this downward spiral of unsustainable practice a new policy is being developed. This includes better enforcement of existing laws, reorientation of local fishing to the deeper waters and rejuvenation of the lagoons as protected areas to re-establish habitats and breeding grounds.

Over the past few years, a number of measures to protect the marine ecosystems with a view to maintain sustained fishery development have been taken (See Box 5.5).

Box 5.5

Action to Improve Management of Marine Resources

Progress made

Legislation

A new Fisheries and Marine Resources Act provides the framework for implementing national policies and measures for sustainable management and development of fisheries and conservation of marine and living resources.

Industrial effluents will be treated to conform to published standards before discharged into the aquatic environment.

Banning of Sand Mining

Sand mining has been banned and those involved have been compensated and offered training for other jobs
Results of monitoring of ex-sand mining sites carried out by Ministry of Environment and Ministry of Fisheries have shown that the ex-sand mining sites are slowly recovering.

Mangrove Propagation Program

Mangrove propagation program ongoing since 1992 for the enhancement of marine habitats.

Protection From Anchor Damage

A pilot project has been started at Grand Baie and Pereybere to protect dive sites from anchor damage through the installation of Permanent Mooring Buoys. 20 other sites have been identified around the island for the project.

Controls on Fishing Methods

- Use of small-mesh sardine nets is prohibited,
- Very tight control on the import, storage and utilization of dynamite to prevent its use in fishing is being exercised, and
- A closed season for net fishing has been reintroduced.

Surveillance and Protection of Marine Resources:

Close and effective surveillance is being carried out by the National Coast Guard and the Fisheries Protection Services.

Alternative Fisheries

A management strategy was developed in 1996 to reduce the number of nets in operation
A package of incentives is proposed to net owners and fishermen to surrender licenses and nets voluntarily
Fishermen are being encouraged to move out of the lagoon and restrictions have been imposed such as banning spear fishing, a closed season for net fishing and restrictions in catching undersized fish
Off-lagoon fishing is being encouraged through incentives such as loans for purchase of offshore boats, training and technical assistance, trials of new methods of fishing and waivers of import duties on equipment.
Fishing practices such as large net and basket trap fishing should be urgently reviewed.

Further Development

- Further guidelines to be developed to carefully regulate any activities that damage or remove lagoon corals including the creation of ski lanes and swimming areas,
- Guidelines to be developed to prohibit removal of coral unless they are replaced elsewhere in the lagoon to maintain sand supply,
- Marine protected areas and marine parks to be established adjacent to places where coastal ecosystem has a high ranking such as Belle-Mare. This will set a leading example for resource production, and
- Removal of coral rubble from beaches to be stopped.

Opening of Fisheries Training and Extension Centre.

The Fisheries Training and Extension Centre at Point aux Sables is pivotal to the development of the fisheries sector which will help in capacity building of a new generation of fishers with intensive knowledge in conservation of marine environment and sustainable use of the resources.

Proclamation of Two Marine Parks

A major step to safeguard marine ecosystem has been the proclamation of two marine parks at Balaclava and Blue Bay in October 1997 as part of the Environment Investment projects and a long term monitoring program is under way for their management. To prevent poaching in the Blue Bay Marine Park and protect the rich biodiversity therein a special unit, the Blue Bay Marine Park Patrol, has been set up in 2004 consisting of officers of the Ministry of Fisheries, the National Coast Guard and the Police de L'Environnement. A Visitor's centre was inaugurated on the 5th June 2004 to create awareness and sensitize visitors about the need for protection of the existing species.

Fishing Reserves

Six fishing reserves have been proclaimed as Marine Protected Areas in June 2000 under the Fisheries and Marine Resources Act 1998. The main objective of setting up the MPA's is to protect and conserve its habitats, which are ideal nursery ground for juvenile fish.

Coral Reef Monitoring

Coral reefs are among the most important and extensive ecosystems in SIDS and without reefs most of the beaches in the tropics would not exist. Under the Indian Ocean Commission (IOC), a Coral reef monitoring project was initiated and is on-going. The overall objective of the project is to contribute to the conservation and sustainable management of coral reefs in the Western Ocean Region by providing decision makers in the region with reliable data on reefs dynamics and evolution over a period of time.

Environment Impact Assessment

Environment impact assessment encourages promoters to take into consideration environmental issues at the stage of conception and planning. It also stimulates developers to compare alternative technologies and adopt pollution prevention and control strategies. Many coastal activities such as hotels, dredging, building of walls and other hard structures are now regulated through the EIA mechanism.

Conservation of Islets

Mauritius is surrounded by 49 islets. Some have very rare flora and fauna while others such as Ile de La Passe and Ile Plate have historical importance. Action is being taken to conserve them against the increasing threat of degradation arsing from neglectful development. (See Box 5.6)

Box 5.6

Action to conserve the islets

The challenge

Prevailing deterioration of biodiversity of several important islets has been the focus of new policies and actions to conserve these important elements of natural resources which are part of the global heritage, scientific research and have potential for eco-tourism. Pilot work is being carried out on Round Island, Ile aux Aigrettes, Ile aux Vacoas, Flat Island, among others. The principal problems arise from invasive alien species and from pollution from unregulated use of the islets by the local population and tourists causing damage and leaving waste.

Progress

Task force set up 2001:

- Assessed the causes and extent of degradation,
- Proposed short and long-term remedial measures for restoration and protection of the islets,
- Strategic and operational management plans for 16 islets, and
- Non conflicting multiple uses of some of the islets for conservation, education and research, recreation and ecotourism through proper zoning and management plan.

Islets National Park.

- Proclamation of the « Islets National Park » comprising of the following islets : Pigeon Rock, Ile D'Ambre, I'le Aux Flammants, Rocher des Oiseaux, Ile aux Fouquets, Ile aux Vacoas and Ile aux Oiseaux on 5th June 2004 (World Environment Day),
- The Mauritius Wildlife Foundation actively involved in the restoration of Ile Aux Aigrettes and Round Island for conservation research, training and eco-tourism, and
- Regular cleaning of islets effected by NPCS, NCG and Ministry of Environment.

Conservation Zone at Virginia-First of Its Kind

The coastlines of islands are one of their finest natural resources and part of the global heritage. Economic and social development of the past has adversely affected many of the natural features and as a result many species of native flora and fauna have become extinct, threatened or endangered.

However for the past decade, there has been a growing awareness and willingness to protect land and sea habitats. Provisions have been made in the National Development Strategy and the Outline Schemes to designate conservation zones. The Ministry of Environment and NDU is of the view that it is urgent to start a conservation project on the littoral so as to preserve the natural scenery. A new policy of conservation is being established with the demonstration projects focused on the areas of special natural beauty. The first such zone is in the area of Virginia found in the southern part of Mauritius.

Virginia

Stakeholders

- Ministry of Environment and NDU
- National Park Conservation Service
- Beach Authority
- Mauritius Wildlife Foundation (NGO)
- SIT Land Holdings

Objectives

- Restoration of the site through planting of indigenous and endemic species,
- Protection of last remnants of natural areas from encroachment by development projects including urbanisation,
- To enhance coastal biodiversity conservation, and
- To enhance capacity building and involve community participation in habitat restoration works.

ICZM Unit within Department of Environment

In order to manage the coastal zone in an integrated and holistic manner, the Ministry of Environment has recently, in accordance with the recommendation of the National Environment Strategy (2000-2010), set up an Integrated Coastal Zone Management Division within the Department of Environment. It is expected that this body will play a key role in coordinating the various stakeholders in coastal zone planning and management. To reinforce this division the project for the creation of an ICZM framework has already been initiated (See Box 5.7).

Box 5.7

Functions of the ICZM Division

- Develop and implement an integrated coastal zone management plan,
- Access and monitor coastal resources including wetlands,
- Control of beach erosion,
- Islets and outer islands management,
- Develop guideline for coastal construction, and
- Identification and mapping of Environment Sensitive Areas (ESAs).

The ICZM Committee

Following the creation of the ICZM Division, the ICZM Committee has been set up at the Ministry of Environment in the year 2003 under section 50 of the EPA 2002. This committee involves all the governmental Institutions as well as NGO's, parastatals and private organisations which are important stakeholders of the coastal zone (See Box 5.8).

Box 5.8

Objectives of ICZM Committee

- Develop an integrated management plan,
- Coordinate regional and international projects,
- Monitor coastal water quality and coastal resources including wetlands,
- Conduct and recommend studies on Beach Erosion and propose measures for its control,
- Make recommendations for the upgrading of recreational facilities,
- Coordinate the management of islets and outer islands,
- Make recommendations on guidelines for coastal construction,
- Propose oil spill contingency planning and sensitivity mapping, and
- Generally make recommendations to the Minister on the Management and protection of the coastal zone.

The Way Ahead

Creating a balance in areas of conflicting interest is a major aspect of the future development in policy and management of the coastal zone. The MOE in accordance with the recommendations of the NES has set up an ICZM Division within the Department of Environment.
The DOE has the task of coordinating the actions of different ministries responsible for the coastal zone. These agencies in the coastal zone mainly through the Environmental Impact Assessment process (Part IV of EPA) pending the preparation of the ICZM plan.

Integrated Coastal Zone Management Plan

The 1991 State of Environment Report recognised the need for a more comprehensive approach to coastal zone planning in Mauritius, in the form of an Integrated coastal Zone Management Plan to address the increasing incidence of coastal problems, resource use conflicts and the increased understanding of the intricate nature of the coastal environment.

Professional and Technical Development

Although an ICZM Division has been created within the Department of Environment, the staff of the ICZM Division need to be reinforced to establish the required expertise. Training needs to be established to sustain the skills and numbers of experts to cover the country as a whole at national level and local levels.

Foreign technical expertise will continue to be required and improvements in data and information systems are essential.

Key Strategies to address the oceans and coastal management challenges

Government has identified some key strategies to address the oceans and coastal management challenges namely:

- Land based pollution control and solid waste management,
- Promotion of sustainable tourism and ecotourism,
- Promotion of offshore fishing,
- Contingency planning for oil spill,
- Enhancement and establishment of Marine Protected Areas,
- Mitigating impacts of climate change,
- Mangrove and coral reef management and protection,
- Coastal erosion control and rehabilitation,
- Selective mariculture development,
- Strengthening the management, monitoring, control and surveillance capacity, and
- Control of motorised boats, particularly water scooters.

Blue Flag Status

The Blue Flag is awarded to beaches with good environmental management. Beaches have to meet 27 criteria covering water quality, beach management, safety services and facilities, environmental education and information. With more than 2750 beaches in 24 countries participating, the Blue Flag is a well recognised and respected eco-label in Europe. It is a symbol of high environmental standards as well as good sanitary and safety facilities at the beach.

Mauritius being dependent on tourism as an important source of income is considering the implementation of a Blue Flag program for its beaches. To maintain a privileged place in the highly competitive, luxury tourism market, a pristine coastal zone will be essential. A Blue Flag initiative in Mauritius could possibly serve as one measure of the success of the overall integrated coastal zone management efforts.

Resolving Conflicting Pressures on the Coastal Zone

Creating a balance in areas of conflicting interests is a major aspect of the future development in policy and management. Different coastal uses often conflict with or adversely affect each other. The two major types of conflicts related to coastal resources are:

- Conflicts among users over the use of the coastal areas, and
- Conflicts among government agencies that administer programs related to the coastal zone.

Some typical manifestations of conflicts among users of the coastal zone of Mauritius are:

- Competition for coastal space, and
- Effects of one use such as hotel development on another use. For example the conflict between hotel and public caused by the reduction of public beaches space. In regions where there are hotels or extensive bungalow developments, people have to walk long distances to find access to the beach. The problem becomes acute when it concerns the passage of fishermen from their residence to the sea.

5. Coastal and Marine Resources
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Sustainable use of lagoon and marine zones	• Integrated beach management policy with setback control on structural intrusion, beach fill and beach cleaning. • Development of deep sea fishing • Conservation of lagoon fish stock protection and promotion of coral growth. • Extending the Exclusive Economic Zone under UNCLOS	• Training and development of professional and technical staff • Review of carrying capacity for further tourist development • Development, surveillance and protection of marine resources for commercial fishing etc
• Better management of the coastal zone	• Mapping most vulnerable places • Implementation of EIA as a management tool	• Promoting quality standards for existing developments not subject to EIA • Implementing set back and coastal management policy • Developing professional management systems
• Reducing damage to natural resources and promoting conservation	• Ban on sand mining with compensation and retraining for workers in deep sea fishing • Conservation of islets • Beach nourishment pilot projects • New conservation areas • National environmental education and awareness programme	• Development of public private partnership for cost-effective beach conservation building on results from pilot studies • SIDS-SIDS partnership in beach management technology
• Improving water quality and beach conservation.	• Statutory controls on river and marine pollutants	• Cleaner vessel management programme • Further development of response to marine oil spills • Implementation of national sewerage programme
• Promoting monitoring, evaluation and research.	• External technical assistance for beach assessment • Extension of R & D programme for biodiversity conservation linked with training and eco-tourism	• Re-enforcing international network on R & D through SIDS-SIDS links • Extension of monitoring and evaluation to Rodrigues and the outer islands • Improving ecological models of intervention

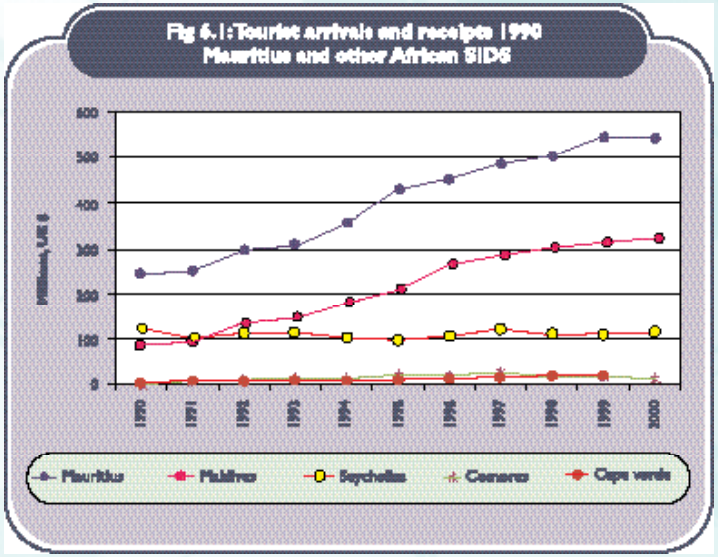
TOURISM RESOURCES

Tourism Resources

The Challenges

Tourism has contributed much to the development of Small Island developing States and based on the value of an increasingly scarce natural resource on global term, if sustained will continue to be very important for their future growth. The tourism sector has evolved as the third pillar of our economy and contributes significantly to the economic growth and development, mainly in terms of employment and export earnings. Developing tourism as a robust and vibrant industry has always been a top priority of the Government agenda. Much effort is being directed by all stakeholders to realise the vision of Mauritius to becoming the top Tourism Business Hub in the region, offering high quality at a competitive price. But the world competition is fierce and Mauritius has to continue to offer world-class services to justify the long haul flights. The shocks of global terrorism, SARS and the prospects of climate change and sea level rise present major challenges to this sector.

The main challenge faced by the Mauritian tourist industry is to avoid excess capacity and degradation of the quality of the tourist label. The main policy is to promote quality within an agreed carrying capacity and explore further elements in the tourist experience.



Progress

Enhancing Resilience

Despite the unfavourable international environment characterised by economic sluggishness in major source markets, wars and terrorist attacks and the recent SARS disease, the Mauritius tourism sector has shown continued resilience by maintaining positive growth rate in tourist arrivals and gross receipts in the past decade.

This resilience has been achieved by:

(i) maximising low- impact, high-spending tourism policy;

(ii) promoting high quality standards for an exclusive destination

(iii) emphasising safety and security of the destination- the issue thus provides a competitive edge.

(iv) maintaining low health risks and sound health services.

(v) increasing competitive long hand airfares from a wide range of countries (e.g. UK, France, Germany, Australia, Emirates, India, Russia, South Africa, USA, etc.)

Box 6.1

Resilience in tourism facts under pressure from global threats (2003/4)

- 35% increase in gross receipts,
- 1.5% increase in employment,
- 3.0% increase in total room capacity,
- No. of bedplaces for year 2003: 19,727, and
- Tourist arrivals expected to be 710 000 in 2004, compared to 702 000 in 2003

Policies, Plans and Projects

Tourism is holding its growth in Mauritius at a time when price for sugar is falling and our textile industry is facing competition with emerging market operators like Bangladesh, Madagascar, China, Kenya and Sri Lanka. However, if not properly planned and managed, tourism could significantly degrade the environment through pressures on the coastal and marine ecosystem on which it is so dependent.

The main challenge faced by the Mauritian tourist industry is to avoid excess capacity and degradation of the quality of the tourist label. The main policy is to promote quality within an agreed carrying capacity.

Surveys have shown that the main reason for visiting Mauritius is for beach holidays, so that the pressure of this growth is felt almost entirely in the coastal areas. With a view to maintaining Mauritius as an attractive and desirable tourist destination and to address the above considerations, several policies and strategic plans for tourism development have been prepared (See Box 6.2).

Box 6.2

Tourism Vision for 2020

- A scenario document based on long-term policy, anticipating a continuing growth in net tourist receipts, but with a restriction on growth of tourist development, and therefore on the number of arrivals.

Strategy

- Set sustainable growth rates,
- Focus development in the three tourist zones (East, West and South), while reducing development pressure in the northern tourist zone,
- Minimise further new built development on the beaches,
- Protect tourism's natural environment resources,
- Prevent overbuilding of hotels and proliferation of informal visitor accommodation,
- Diversify into ecotourism with the sensitive use of Rodrigues and outer islands, and
- Develop within the region multi stop tourism to attract demand from those not warranting only beach tourism.

Moving on from the strategic vision of the later 1990s a national tourism development plan was prepared (See Box 6.3)

Box 6.3

Tourism Development Plan

- Provides a twenty year vision which

- foresees growth of tourist industry
- ensures that environmental and social issues are addressed to the benefit of the people of Mauritius.

Action Plan

- A five-year action programme that will provide a framework for the implementation of the first stage of the Tourism Development Plan,
- The Plan proposes:

- $700 m of private sector investments in tourist accommodation, tourist attractions, and ancillary facilities
- $25 m of public sector investment in tourism support programmes (e.g. roads, car parking, water and sewage schemes)
- $18m on infrastructure and critical tourism product improvements, diversification and innovations
- $7m for human resource development/social projects and environmental management support.

Two of the priority development projects identified under the TDP are:

- Grand Baie Waterfront

Revitalisation of Grand Baie is one of the major goals of the Government. A continued and concentrated effort is required to improve and maintain a physical setting which is visually interesting, distinctive, comfortable and inviting for tourists and local residents, to maintain Grand Baie's place on the tourist map, (See Box 6.4).

Box 6.4

Sustainable development for a tourist resort

Revitalising Facilities	Infrastructure	Protection of Environment
• development of a waterfront • coastal walkway • a floating casino • a marina	• upgrading of road network • embellishment of the village • community development • Links to sugar museum, botanical garden, ecotourist islets.	• rehabilitation of the lagoon

- Trou d'Eau Douce Community Action Plan

Another approach to development is being tried in different part of Mauritius with an emphasis on community particpiation (See Box 6.5)

Box 6.5

Trou D'Eau Douce Community Action plan

Enhancing natural resources for tourism

- ***Objectives***

To create an environment for visitors and local residents which generates an ambiance reflecting the areas existing historic, cultural and landscape character

- To enable the local community to realise an income from their natural and cultural heritage assets through tourism

Features

- La Pelouse Tourism Centre to provide tourist information,
- Facilities for guides/boat trip sales, handicraft market,
- Cafe/restaurant and an area for events,
- Bassin Belle Isle Harbour for a new fish landing stage,

- Main Street Enhancement with new pavements, well designed,
- Street furniture and landscaping, and
- A coastal trail for the linkage of Bassin Belle Isle Harbour and La Pelouse Centre.

Tourism Environment Charter

To promote high standards in tourist facilities and to respond to the changing needs of clients the Association des Hoteliers et Restaurateurs de L'Ile Maurice (AHRIM) have produced a charter partly funded by the National Environment Fund and UNDP (See Box 6.6)

Box 6.6

Tourism Environment Charter

Objectives

- To make the protection of the environment an integral part of the day-to-day management of hotels and the other operations of the tourism industry,
- To show the commitment of hoteliers and the other stakeholders of the tourism industry to bring about sustainable tourism development,
- To create better awareness among the population of the actions initiated in the tourism industry to minimize the effects on the environment caused by the operations of hotels and the other tourism-related activities, and
- To encourage hotels and other stakeholders in the tourism sector to work towards attaining the appropriate environment certification standards.

Promoting Eco-tourism

Golf Development Strategy

To diversify the Mauritian product, a study was carried out in 2002 on the strategy for future golf course development on the island. The study confirmed the potential of Mauritius as a golf destination and has provided a golf map for its development.

Eco-tourism

Eco-tourism, linking areas of high ecological value to low-impact tourism, may present important and environmentally sustainable opportunities for tourism development in SIDS. Eco tourism includes visits to national parks, wildlife refuges, botanical gardens and islets to see ecological projects in progress, diversifying the tourist product and meeting the educational interests of tourists.

Box 6.7

Chamarel Integrated Development Project

This project was initiated with a view to involving local people in small tourism projects that would economically be beneficial to them. The project comprises training on handicraft, table d'hôte, nature trail, physical upliftment, embellishment of the village, construction of a handicraft centre and an amphitheatre and eco-tourism activities. So far the project has introduced:

- Two restaurants
- A craft shop at Indian Resorts Hotel as a sale outlet for craft workers of Chamarel
- Organic farming and eco-tourism guide projects have been funded by theUNDP/GEF.
- Private nature trail horse riding and Adventure Park.

Offshore Islets

Many of the islets around Mauritius, are tourist attractions, but also need to be preserved. It has been observed that the biodiversity of several important islets have deteriorated. A task force was set up in 2001 under the NPCS to assess the causes and extent of degradation and to propose short and long-term remedial measures for restoration and protection of the islets. The task force recommended the creation of an Islet national Park comprising of 16 islets and a comprehensive long term planning and management of the islets for their optimal utilisation. Certain islets with high ecological value would be devoted solely to conservation whereas other could be used for eco-tourism and recreational activities.

Green Ceiling

Due to the environmental vulnerability of the island, the country has to place a "Green" ceiling to restrict the maximum number of hotels to be constructed on the island and more particularly, to reduce the number of hotels near the sea. The TDP proposes that Mauritius should achieve certified "Green destination" status by the year 2020. This will involve, eliminating unsustainable environmental practices throughout the island, in hotels, businesses and the local community.

Diversification of Tourist Market

National tourism policy will continue with selective tourism, targeting at niche markets. The marketing strategy has been geared towards creating and sustaining an image of excellence. Future tourism policy will include:

- Focus on scheduled air-links,
- Better land use,
- Integrating of hotel and leisure development projects, which cover tourist activities and environmental improvements outside premises,
- Diversifying the tourists to include historical, cultural, educational and nature-based activities, celebrity marketing, honeymoons and weddings, golf and diving,
- Improving local recreational needs through the provision of public areas in integrated projects and quality amenities on public beaches,
- More links with other sectors such as handicrafts, agricultural products, sports, etc,
- Regulating the informal or non-hotel sector, and
- Maintaining safe health status of the country by vigilant health surveillance to protect against importing or spreading infectious diseases (During the SARS epidemic flights from at risk sources to Mauritius were cancelled; all visitors are checked against the risk of importing malaria and air cabins are sprayed to eliminate any mosquitoes being carried).

Investment Facilities and Incentives

Incentives are given to investors in hotel projects. The Ministry of Tourism also encourages investment in tourism related projects such as leisure parks, aquaparks and aquariums. In 2004 private investment mainly in the hotel sector is expected to be over Rs 5,000 million (US$ 175m) an increase of 6% on the previous year.

To attract investment in quality leisure projects, Government has extended the Development Certificate Scheme to tourist projects. This provides a range of financial incentives such as Corporate tax of 15% instead of 30%; dividends received by shareholders are Income Tax free; remission of customs duty is granted subject to the approval of the Ministry of Finance; there is free repatriation of invested capital, profit and dividends subject to approval by the Bank of Mauritius; term loans and overdrafts at preferential rates from Commercial and Development Banks in Mauritius.

Capacity Building

A hotel and catering school operates in Mauritius. This provides specialist support to the tourist industry. A study is being undertaken to assess training needs for the tourism sector. National parks are being supported with trained technical guides for visitors.

Marketing Strategy

The overall aim is to create a 'Destination Mauritius' brand logo and slogan, which must be an integral component of competitive positioning for both destinations and commercial enterprises. It includes more options for Rodrigues and the outer islands which are less developed and offer more opportunities for eco-tourism and less densely populated parts of the country.

The Way Ahead

Future tourism development will have to take account of the limits of carrying capacity, the demands on infrastructure such as roads, water, energy and sanitation the impact on the natural asset of the island that have made the country a top tourist resort. The direction of policy is towards sustainable development of the sector integrating environmental protection and the added value of a variety of natural, social and cultural assets. Net gains will derive from increasing investment in quality.

This will involve:

- The continued pursuit of excellence and resilience to market trends,
- Continued focus on scheduled services,
- Diversify into niche markets for eco-tourism, and educational and cultural activities involving more the local community,
- Develop Mauritius as a destination for business tourism and to support business ventures in other sectors, and
- Maintaining and continually upgrading the high standards achieved (e.g. future development of the EU Blue Flag schemes for beaches is being considered).

Promoting Haut de Gamme Hotel

6. Tourism
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Responding to global competition	• Focus on quality • Diversifying into new forms of tourism which build on the natural assets of the country • Managing within the carrying capacity	• Continued pursuit of excellence • Development of Mauritius destination brand image • Extending the global range of direct flight airlines serving the country
• Responding to global threats of: -terrorism -SARS and other health threats -Climate change and sea level rise	• Increasing security in line with international standards • Reinforcing health surveillance and precautionary measures • Long term locational planning to reduce exposure of tourist infrastructure on the coast.	• Maintaining vigilance • Developing epidemiological surveillance • Networking with international expert centres • Monitoring and evaluation of health status • Development of beach health standards; the Blue Flag scheme
• Expanding the tourist package	• Development of eco-tourism, education and cultural packages • Resort and community improvement projects	• Further integrated resort development • Regional linked packages • More options with Rodrigues and the outer-islands
• Coping within the carrying capacity of the country	• Restriction on further hotel development • Safety regulation of water sports • Restriction on air travel	• Capping the level of arrivals • Further development and enforcement of standards • Promoting tourist environmental partnership
• Enhancing the natural resources of the country with low impact tourism	• Managed use of national parks • Environmental charter for tourists	• Further development of educational options • Professional training and accreditation for technical guides

Freshwater Management

The Challenges

Pressure on Water Resources

Scarcity of freshwater is a common problem in SIDS. Water is a vital element for development, for residential use, for agriculture and industry. As SIDS develop demand for water increases but the long term supply will be constrained by external factors such as climate change and sea level rise placing further pressure on water management.

Mauritius has a high annual rainfall of 3,900 mm^3 on average. It has a well developed network supply with many river sources, bore holes and aquifers and reservoirs with a capacity of nearly 100 million cubic metres.

Box 7.1

Water resources

Mauritius has a well developed network of water sources including:

5 main aquifers

25 major river basins

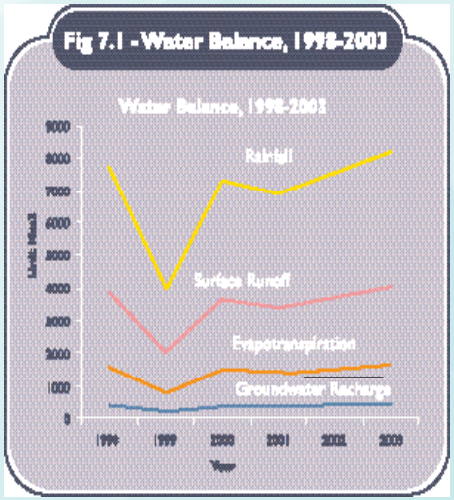
21 minor river basins

350 boreholes (with annual water mobilization: 514 Mm^3) of which

- 110 used for potable water,
- 112 for industries, and
- 128 for agriculture

11 Man made reservoirs; Gross capacity: 92.87 Mm^3.

But because of its topography and tropical location Mauritius suffers from rapid run off and evaporation and there is little natural water storage since 90% of the rain water is lost (see Figure 7.1) However the rainfall and rock formation means that aquifers recharge each year.



Access to freshwater is also complicated by seasonal and geographical variability in rainfall and the different climatic areas of Mauritius. There is a wide variation of rainfall across the island ; 4000 mm in the super-humid zone on the central plateau, about 1500 mm on the eastern coastal plain and only abou 800 mm on the leeward north-western coastal plain. Most of the rainfall occurs in the upland areas and is heaviest and most frequent and prolonged during the months of December to April, after which Mauritius experiences periods of water shortages. These dry spells and periodic droughts in Mauritius force water rationing especially in coastal areas, such as the north of the main island which also has a concentration of heavy users in agriculture and tourism sectors and is furthest from the main reservoirs.

Impact of Climate Change on the Hydrological Cycle

SIDS are extremely vulnerable to climate change. The projected sea level rise will increase salt water intrusion into land sources of freshwater and climate change is also expected to reduce water supply. The hydrological cycle is affected by the climate system as changes in climate result in changes in the basic climate elements, such as rainfall and temperature. This will in turn affect how much water can be captured. Several models suggest than downpours will become more intense. This will increase runoff while reducing the ability of water to infiltrate the soil. Climate change will therefore represent an additional stress on the availability of freshwater.

Long-term Pressure on Water Resources

The high population density of Mauritius, the heavy use of water for irrigation and the increasing demands from industry and tourism, place growing stress on water resources.

The total consolidated demand which is presently of the order of 260, 000 m3 (0.26 Mm3) per day is forecasted to reach 266, 000 m3/day (0.266 Mm3) by the end of Financial Year 2004/2005 and 307, 500 m3 by the year 2020. According to National Environmental Acton Plan (NEAP), if more effective management is not introduced, demand threatens to outstrip supply within 50 years.

Table 7.1 shows the present water utilization. A large proportion of water (48 %) is used for irrigation. Without improvement in agricultural efficiency predicted increasing demand will place more stress on the water resources in the short and medium

Table 7.1

Water Utilisation (Million Cubic Metres per year)

Purpose	Surface Water		Ground Water	Total	%
	River run offtakes	Storage			
Domestic, Industrial & Tourism	38 (1)	72	114	224	22
Industrial (Private boreholes)			10	10	1
Agricultural	370	97 (2)	24	491	48
Hydropower	131	174		305	30
Overall Utilisation	539	343	148	1030	100
Total water mobilization	514	275	148	937	

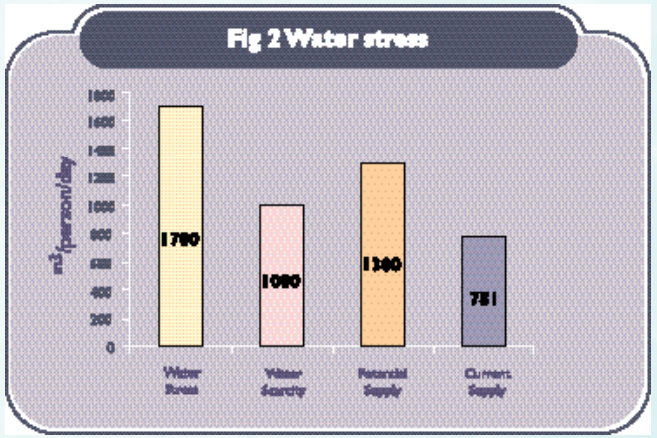
1. Includes 25 Mm3 used for power generation at Reduit H.E.P.S (Hydroelectric Power Station)
2. Includes 30 Mm3 used for power generation at Tamarind Falls and Magenta H.E. P.S
3. Includes 39 Mm3 used twice(14 Mm3 at Le Val and Ferney and 24 Mm3 at Tamarind Falls and Magenta H .E. P. S

Hydroelectricity uses 305 Mm3 water annually without recycling (See Table 2). Twenty years ago, hydropower was a major component of electricity production in Mauritius. In the year 2003, hydroelectricity generated about 117.8 GWh or 6 % of the total production for the year. The generation of hydroelectricity is competing with other uses for water.. The trade-off in obtaining 305 Mm3 of water annually is losing 117.8 GWh of energy needs to be re-assessed.

Mauritius- In Water Stress and Water Scarcity

The present usable freshwater potential has been estimated at 1 300 Mm3 per year, equivalent to 1 083 m3 /person/year, which puts Mauritius within the class of countries suffering water stress and water scarcity (defined as a supply of less than 1 700 m3 /person /year and 1000 m3/person/year, respectively(UNDP 1998[1]). By 2040, total demand for water is projected at 1 200 Mm3 per year. This is in excess of projected supplies and close to the utilizable renewable freshwater potential of 1 300 Mm3 per year. Though the potential yield from existing water sources is achieved, this would still leave the country in water stress by UN standards.

Africa Environment Outlook. Past, Present and future perspectives. UNEP 2002.



These conditions of water stress and scarcity restrict economic and social development and pose a serious overall challenge for water management. In addition there remain problems of uneven distribution for water. Whilst the current water services, in principle, cover the whole country, there are certain existing inequalities in provision, including premises with no piped water inside the premises for drinking and for flush sanitation and in certain areas, premises with only intermittent supplies. (See Table 3) There are thus 180, 000 people in Mauritius without drinking water and flush sanitation inside their houses, and 168,000 people who have problems of interrupted supply. In addition there is poor or variable quality of drinking water supply in remoter places such as Rodrigues and the outer islands.

Table 7.2

Water Utilisation (Million Cubic Metres per year)

Distribution	Total
• Population having access to piped drinking water within their premises	119 5200 (99.6%)
• Population having piped drinking water inside their houses	102 0000 (85%)
• Population having piped drinking water outside their houses	180 000 (15%)
• Population having uninterrupted supply	1032 000 (86%)
• Population having interrupted supply	168 000 (14%)

In order to sustain economic development and improve quality of life, water management will become an increasing challenge, made worse by climate change and sea level rise. Moreover, droughts are already a continual challenge for the provision of water in parts of the country. Inadequate and insufficient storage facilities, outdated infrastructure and leakage, remain as constraints for the development of this sector.

Although water supply networks have been extended they are not expected to fully meet the forecast increasing demands for water. There will be a need for substantial investment in the rehabilitation and renewal of old distribution mains in towns and for some provision of new resources, treatment capacity, storage facilities and water mains to provide an acceptable year round service to all population particularly those at the extremities of the current system, in the east and west of the island and to properties on higher ground.

Progress

There has been considerable improvement in water supply in the last decade and there are many plans for the future to improve water management.

Progress in Water Management

Increasing Storage

1. Construction of run-off diversion schemes and extra storage dams

- The Water Resources Unit worked out an integral plan for harnessing additional water resources to meet the water requirements of the various sectors of the economy up to the year 2040. Development of ground water, construction of run-off-river diversion schemes and a number of storage dams,

- Contrustruction of the Midlands Dam with a capacity of 25.5 Mm completed in 2002 and recent extensions to the La Nicoliere Water Treatment Plant works cater for the water needs in the North of the island,

The Midlands dam

- The water needs for development in rhe central part of the island are expected to be met with the doubling of the treatment capacity at La Marie Treatment Works, and

- Four other storage dams are planned to be constructed by 2020 which will cater for the water needs in different regions of Mauritius.

Maintenance of Network

2. Rehabilitation of existing water infrastructure

- Existing as storage dams, feeder canals etc have been rehabilitated,

- Seven dams are being rehabilitated to enhance their safety and useful life and to minimize seepage losses,

- The largest storage dam for drinking water was completely rehabilitated in 2000. Rehabilitation of La Nicoliere reservoir, the Municipal dyke and Riche en Eau Dam is in progress,

- The Municipal Dyke for water for the capital city was rehabilitated in 2003 and two feeder canals in 2002 to 2003.

3. Replacement of old and obsolete potable water infrastructure

- Old and obsolete drinking water infrastructure is being replaced and provides more treatment capacity, a better distribution network and better water quality,

- Pipelines less than 30 years old are replaced . Old ones having low capacity and insufficient cover are replaced if found necessary, and

- 83 Km of pipelines is being relaid as it is at insufficient depth to withstand the present traffic load.

4. Reduction of Unaccounted for water

- CWA has embarked on an aggressive project for the reduction of UFW and aims to reduce the level of non-revenue water to 25 % of the volume throughput by 2007.

Research

5. Hydrological Studies are being undertaken to:

- Increase development of groundwater potential,

- Increase the number of boreholes to reduce the problem of areas in water stress, and

- To ensure the development guidelines within the vicinity of boreholes are strictly adhered so as to harness groundwater in a sustainable manner.

6. Hydrographic Survey

- A hydrographic survey has been undertaken of four storage reservoirs to determine their effective storage capacity and to make better use of them,

Increase Supply

7. Elimination of Blackspot Areas

- Prior to 1995, the definition of Blackspot areas, were those localities which received less than four hours supply daily. By 1995 some 110 such localities classified as Blackspot areas had their supply improved At present, less than ten hours daily water supply is the exception. But 168,000 people have interrupted water supply.

Increase Efficiency of Use

8. Better irrigation Techniques

- More efficient methods of irrigation are now being adopted,
- Area under surface irrigation and overhead irrigation are being greatly reduced by using overhead and drip irrigation respectively, and
- The present area under irrigation is about 21,000 ha and same is expected to increase to about 33,000 in 2050. However, the total water requirement is expected to remain the same as being presently utilized with the introduction of more efficient methods of irrigation.

9. Water Metering.

- Metering water has been started in Mauritius but covers only 50% of the water in the public sector. Water sources on private land is not controlled centrally. A programme to increase water metering is under way This will span over five financial years starting 2004 through 2008, when non revenue water will be brought down from the present 50% to 25 %.

Water Quality

Treatment of Water

Ground water is chlorinated prior to injection in the distribution system. Surface raw water is treated at six water treatment plants having a total treatment capacity of 248,000 m^3day. Treatment capacity which stood at 168 000 m^3 in 1983 has been extended to 248 000 m^3 by end 2003. With the commissioning of the La Marie Treatment Plant by mid 2005, total treatment capacity will be of the order of 308 000 m^3.

Monitoring of Water Quality

Two water quality laboratories have been set up to monitor drinking water samples to ensure compliance with the national and international standards and to monitor the quality of raw water resources and trade effluents discharged into aquifers and watercourses. A map polluting industries has been produced and action taken to protect water quality.

In addition, Health Quality and Agricultural Water Quality Laboratories and the National Environmental Laboratory which are all involved in monitoring of pollutants in water have been set up.

An ongoing implementation of a water quality monitoring programme for surface, ground and wastewater is being carried out by the CWA and WRU since 1993 for several water courses and for over hundred different sampling stations over the island. Although the majority of major watercourses on the island are routinely monitored, the main focus is for watercourses where industrial discharges are made to those rivers that are harnessed for abstraction for potable water.

Threats to Freshwater Resources

The major areas for environmental and public health concern are those of pollution of the surface water, groundwater and lagoons by industrial waste water, domestic waste, agricultural and urban runoffs. The rate of application of fertilisers in Mauritius is very high. Since 57 % of our domestic water comes from groundwater resources, the impacts of agrochemical need to be given serious consideration.

However, several reports from the MSRI indicate that although major herbicides may be detected in surface waters and ground waters, they rarely exceed the recommended permissible limits set by the USEPA. Following a study on "Agrochemicals in Sugar Cane and their impact on Water Quality", MSIRI reported in April 2001 that agrochemicals used in sugar cane plantations do not represent any risk to human health and that the general perception on pollution caused by agrochemicals is totally unfounded. However, the island of Mauritius being volcanic in nature, its geology is characterised by highly fissured lava with relatively high permeability. Hence leachates easily find its way into our water bodies in case absorption pits are not well located.

The major sources of water contamination are summarized in Box 7.3.

Box 7.3

Sources of contamination of water resources

Industrial Effluent and Domestic Sewage

- Sewerage systems are confined to parts of Port-Louis and Plaines Wilhems districts only,
- Presently only 21 % of the whole island is sewered. The remaining 79 % either disposed of their liquid waste in the absorption pits or via septic tanks. The island of Mauritius being volcanic in nature, its geology is characterised by highly fissured lava with relatively high permeability. Hence leachates easily find its way into our water bodies in case absorption pits are not well located,

- Where sewerage systems exist, illegal connections between the storm and sewerage systems and direct leakage cause contamination of adjacent watercourses, and
- Un-sewered industries discharge effluent directly to surface water often with little or no wastewater treatment. The sectors most polluting are the sugar industries and animal food processing industries.

Spills

In case of spills, under section 29 of the EPA Act, it is stated that the pollutant must prevent, eliminate or reduce the adverse effects of the spill and restore the environment to the state it was prior to the spill and under section 33 of the EPA Act, the pollutant must also bear all cost and expenses incurred as a result of any clean up or removal operation. A case of diesel oil discharge was reported at Ebene River where the polluter was instructed to restore the river at his own expense.

Waste Water Systems

Since the original sewerage systems were installed in Port-Louis, Curepipe, Beau Bassin and Rose-Hill at the beginning of the 1900, there has been little expansion, development or maintenance of the infrastructure. The lack of progress is reflected in the Census results that show that in 1990, 19.9 % of the population was connected to a sewer, yet by 2000 the proportion has increased to 20.6 % an increase of only 16, 550 properties over 10 years.

NEAP 1 recognised these threats to water quality and the National Sewerage Master Plan was prepared in 1994 which provides a complete scheme for the development of wastewater sector in Mauritius. The plan seeks to connect 50 % of the population to the public sewerage system by 2010/2012. On completion of the NMSP most of the existing effluent will be disposed of to sewer. The NMSP identified nine priority projects referred to as the National Sewerage Plan. Funding has been secured for several of the projects namely Montagne Jacquot, Baie du Tombeau, St Martin and Plaine Wilhems sewerage projects

The NSMP target a 100% connection to the sewerage system by the year 2030. The WMA is currently installing new sewerage systems and constructing new sewerage treatment facilities in the Port Louis, Baie du tombeau, Plaines Wilhems and Grand-Baie areas.

Management of Wastewater Sector

For an effective and efficient management of the Wastewater Sector, a Sector Policy Letter was agreed in 1998 in the context of the implementation of the Environmental Sewerage and Sanitation Project. The SPL reiterated government commitment to catch up on the delays for the development and extension of wastewater facilities in the country. The SPL was guided need by the need to achieve the following objectives:

- Halt and reverse the trend of wastewater pollution on the island and its coastal zone,
- Improve health and sanitary conditions of the population, and
- Provide the technical, legal, institutional and financial framework necessary for sustainable development of the sector.

Institutional Reform

The Wastewater Management Authority has been established as a corporate body under the WMA Act proclaimed on 31st August 2001. The WMA has the responsibility to maintain and manage all existing public wastewater systems, regulate construction of private sewers and more importantly to expand the new sewer network systems in order to provide house connections to all properties domestic, commercial and industrial. Government has also entrusted to the WMA the overall responsibility for the implementation of all projects under the National Sewerage Plan.

Water Quality Management

The following standards have been promulgated by the Ministry of Environment and NDU for environment protection:

- 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, and
- Industrial Efflent Discharge into the Public Sewer Regulation 2004.

Environmental Impact Assessment

Under the 2002 Environmental Protection Act all industrial, commercial and agricultural developments are required to conduct an EIA to ensure no adverse impacts on the environment. Licenses depend on these assessments, environmental conditions being met and approval given by all relevant authorities.

The Way Ahead

Water is an increasingly scarce resource in Mauritius. Development has brought increasing demand nearly outstripping the increased capacity for supply. The country is in water stress and water scarcity by international standards. Better integrated water management is a priority both for demand and supply.

Reuse of Effluent

At present recycling of water is not a common practice in Mauritius. Only a few hotels are using recycled water for irrigation. However, given that water is an increasingly scarce resource in Mauritius, the reuse of effluent for agricultural needs to be promoted for selected crops and subject to established use criteria. By making the most efficient use of effluent for irrigation it will be possible to utilize ground and surface water resources currently used for irrigation for potable use and thereby defer some of the need to develop expensive new sources including new dam sites.

Further Development

Plans are being made for:

- More control on the release of industrial effluents by an industrial permit system and systematic monitoring. Comprehensive industrial standards need,
- More detailed standards for pollutants to protect water sources whilst ensuring that manufacturing sectors remain competitive,
- Consolidating laws on Rivers and Canals Act (dating back to 1863),
- Preparing a Water Resources Authority Act and a Water Act to provide for the integrated management of all water resources of the country,
- Reducing the cost for treatment of effluent,
- Better demand management with greater efficiency in use and the development of recycled water for industrial and agricultural use,
- Increasing public and corporate education and awareness,
- Better water quality especially in remoter areas poorly served,
- More qualified professionals in the water sector,
- Project team for detecting leaks on performance related contract, and
- Enforcement of Environmental Effluent Discharge Regulations.

Way Ahead

- Mobilisation of additional water resources,
- Construction of 5 dams up to horizon 2040,
- Water demand management,
- Use of treated waste water for irrigation purposes,
- Optimization of the abstraction of water from the environment, and
- Consolidation of institutional and legal frame work.

Major Projects 2003-2007
Table 7. 3 Harness water resources in a sustainable manner.

Projects	Details
La Marie New Rapid Gravity Filter Plant.	• Cater for domestic needs of Plaine Wilhems and part of the south and Black River Districts.
Identification and repairs of Invisible Leaks	• A feasibility study has been carried out to determine the best options to cater for the new demand and for improving water in general in the Eastern area. • Detailed engineering studies are completed and the projects in different stages of procurement
• Master Plan For The Distribution Network	• The objective of the study is to equip the Authority with an updated model of its network from source to main supply points and actions required to be taken on a five year basis in order to sustain potable water supply to the population and to all potable water consumers up to year 2040.
• Production Meters and Telemetry	• The project consists of the design and implementation of an appropriate SCADA System meeting the requirement of the CWA for a Tele Surveillance system for pumping stations, service reservoirs, water treatment plants and nodes in the distribution network.
• Re-Routing of pipelines prone to pilferage and elimination of clandestine connections	• CWA has reason to believe that certain vegetable growers and industrialists are resorting to pilferage. Substantial volumes of water are thus being illegally abstracted. • To attend to above, CWA proposes to :
• Renewal of Trunk, Service and Distribution mains and phasing out of AC pipelines	• Re-Route 15 km of pipelines prone to pilferage. • Setting up of Policy Unit to track down all illegal water users. • Setting up of Anti Faud Unit to track down all illegal water users and better meter security practices so as to minimize tampering of meters. Since out of 3,500 km of pipelines, some 13 % are above 30 years; it is planned to: • Access their conditions for replacement. • Replace a total of 83 Km of AC, GI and CI pipelines

7. Freshwater management
A Policy and Programme Progess Sheet

Challenges addressed	Progress made	The way ahead
• Water stress and water scarcity	• Assessing needs • Increasing supply and storage • Managing demand	• Integrated water management • Extending supply
• Water for all	• Extending supply to remoter areas and black spots • Reducing interrupted supply	• Improving plans and systems for remoter areas including Rodrugues and the outer islands
• Improving water quality	• Extending laboratories for better testing of water quality • Reducing pollution of water sources • Extending and improving sewerage and sewage treatment • Water quality laboratory • Agricultural Water Quality Laboratory • Health Water Quality Laboratory	• Reducing leaks • Revised legislation and regulations for better enforcement of controls on pollution
• Cost effectiveness of water use	• Extending water metres and charges • Education of public and corporate bodies	• Water use audit
• Research and development	• Hydrographic studies • Studies of water pollution	• Studies for water recycling • Studies to tap into 90% of water not collected • Review of total sector and public private partnership in water management • Economic review of water management
• Professional and technical development	• Training and development for professional and technical staff	• Review of human resource needs and promotion of professional development at regional level, training, accreditation, standards, new syllabus

ENERGY RESOURCES

ENERGY RESOURCES

The Challenges

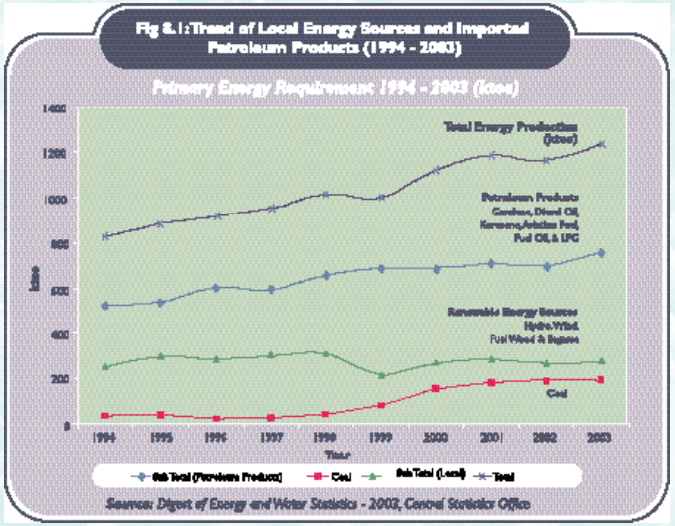
Limited or scarce indigenous commercial energy resources and difficulties in securing energy supplies increase the many constraints in economic and social development of SIDS. Mauritius imports all its fossil fuels, which is the main source of primary commercial energy. The cost, source and usage of energy have become major concern for SIDS and warrants careful energy planning. In 2003, 77% of the total energy requirement was met from imported fuels, while the remaining 23% was supplied from indigenous sources, hydro and bagasse principally. Programmes for expanding renewable energy sources are not keeping pace with increasing demand. Energy management in SIDS must include increasing effiency of energy used as well as an examination of indigenous energy resources.

Conscious of the strategic role energy plays in economic development, Mauritius completed its National Rural Electrification Programme in 1981, when Chamarel became the last of a long list of about 153 villages and housing estates to be electrified. However in the recent years, electricity demand has risen sharply due to sustained economic growth and a general improvement in the standard of living. It is projected that the total electricity demand will increase to 2,690 GWh by 2012 compared to the 1,627 GWh energy consumed in 2003, representing a mean annual growth of 6% over the next ten years. The transport sector is the largest and growing user of energy in the country with resulting increases in air pollution.

Progress

To date almost the entire population enjoys the benefits of a stable and continuous electricity supply and 348,850 customers are connected to the electricity grid. Although the country is regularly visited by tropical cyclones, electric power supply is restored relatively quickly. For instance, after the passage of cyclone Dina in 2002, electricity service was restored to 90% within 7 days and to the entire island within 10 days. This capacity for resilience has been achieved by robust electrical system, which are cyclones resistant coupled with improved emergency maintenance services.

Power generation in Mauritius is based on a diversity of fuels, a mix which has evolved with time; the biggest change over the recent years being a gradual shift from diesel to coal and the increasing contribution of bagasse.

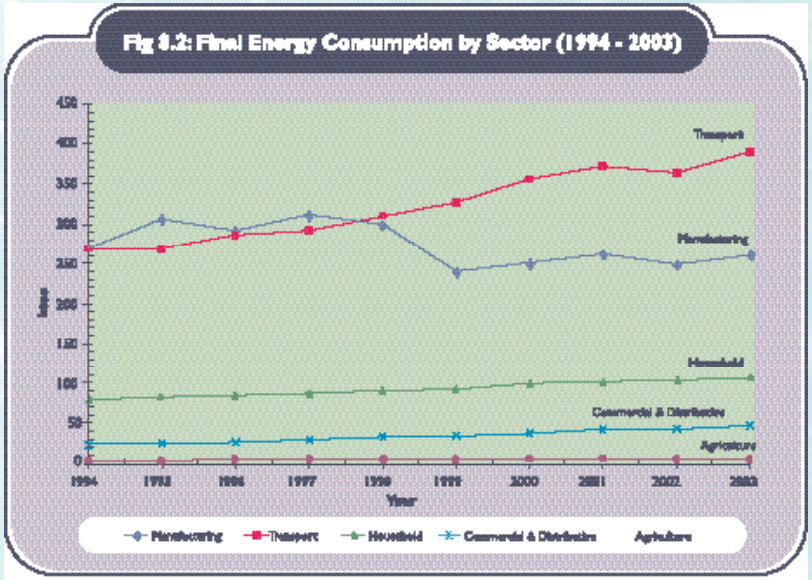


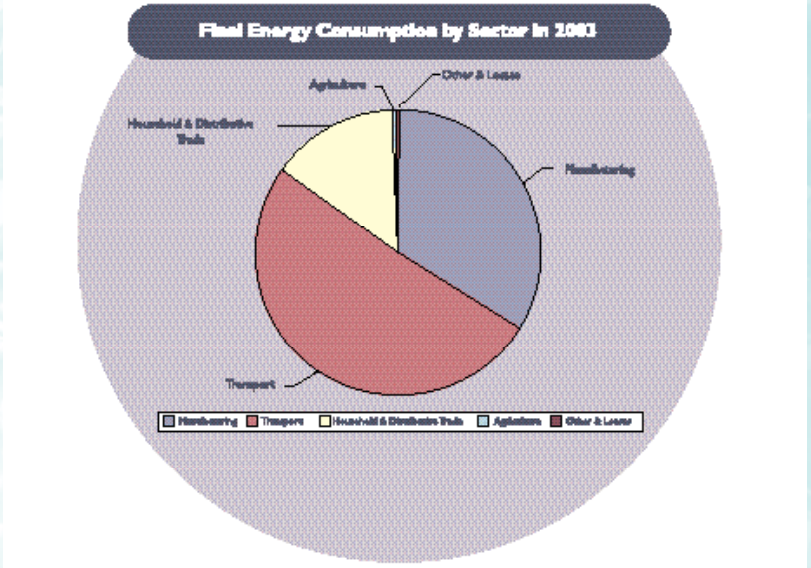
Energy Management

The Ministry of Public Utilities is responsible for the design and implementation of energy policies and oversees the power utility, the Central Electricity Board (CEB). The latter under the CEB Act is empowered to carry out development schemes with the objective of promoting, co-ordinating and improving the generation, transmission, distribution and sale of electricity. With the publication of the first Integrated Energy Plan (2003 - 2012) for the island, the CEB aims to guide Mauritius to a more stable electricity future and to contribute to economic growth and prosperity for the country.

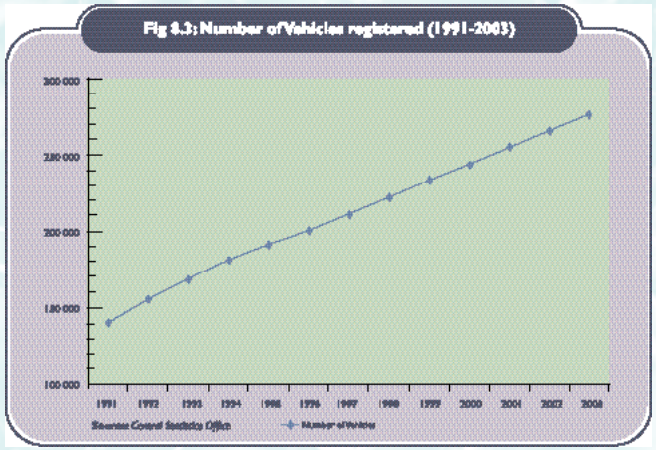
On the other hand, the State Trading Corporation (STC) under the aegis of the Ministry of Commerce and Cooperatives is responsible for the imports of all petroleum products.

Energy management covers energy supply and energy demand. Sectoral use of energy (See Figures 8.2 & 8.3) is dominated by the growth in transport with its impact on air pollution (See Figure 8.4). In the past, emphasis has been on expanding and maintaining supply and diversifying the sources of supply. The focus is now shifting to promote more effective and efficient use of energy and the better management of the demand side. There is significant opportunity for energy savings through conservation and increased energy efficiency. In this line, the CEB is committed to continuing with customer forums and community information programmes to encourage energy awareness.



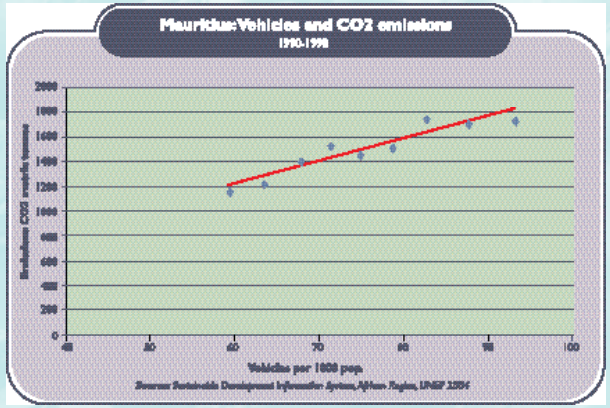


Source: Digest of Energy and Water Statistics – 2003, Central Statistics Office
Figure 8.2: Relative use of energy by various sectors of the economy (1994 - 2003) and energy consumption in various sectors of the economy in 2003



Energy in the Transport Sector

The pattern of use of energy has been changing in the past decades with increasing use for road and air transport. The transport sector is the heaviest energy consumer, accounting for 48% of total energy imports. Transportation and its subsequent demand and usage of energy have progressed dramatically over the past decades with the massive importation of Japanese and European vehicles. The increase in vehicles is also associated with the increase in CO_2 emissions, more traffic congestion and longer travel times. In 2003, for example, the fleet of motor vehicles stood at 276,371 compared to 180,884 in 1994, representing an increase of 35%. With the total road network of 2015 km, there are 137 vehicles for each kilometre of road, amounting to 7.2 meters of road per vehicle.



Switching to Renewable Sources

The history of electrical power generation from renewable sources in Mauritius dates back to the early years of the 20th century, when hydro power started to be harnessed. In the 1950's, the first diesel generating sets were introduced, while sugar factories exported surplus of energy generated from bagasse to the CEB grid.

From the early fifties up till now, electric power generation has evolved remarkably and even today, electricity generation is provided by both utility (i.e. CEB) and non-utility (i.e. Independent Power Producers - IPPs) sources. The sources that are being tapped include solar power, wind power, hydroelectric and biomass. The Ocean Thermal Energy Conversion (OTEC) technology is being explored. However, further investigation is required to assess the full potential of wind, solar and OTEC in Mauritius.

Box 8.1

Progress with renewable energy resources

Resource	Policies	Progress	Future development
Solar	Low interest loans for solar water heaters	• 8% of households covered • New incentives to encourage use (loan ceiling raised from Rs. 15,000 (US $ 520) to Rs. 25,000 (US $ 868), interest rate lowered to 6% and repayment capacity extended to 7 years)	• Ministry of Public Utilities will continue to promote the use of solar water heaters
	PV street lighting projects	• 125 solar powered street lighting PV units installed in Mauritius, Rodrigues and in Agaléga • A 76.8 kWh grid-tie PV system implemented at the New Government Centre • Low penetration in industry • 75% success rate • Prone to damage from cyclones and vandalism	• Ministry of Public Utilities is not envisaging to install another grid-tie PV unit and is even investigating the possibility of transferring existing PV units to Agaléga, where there is an urgent need for street lighting • economic appraisal of renewable energy to include externalities
Wind Power	Wind turbines	• 3 'Vergnet' 60 kW wind turbines installed in Rodrigues – amounting to 4% of total electricity generated	• Mauritius will benefit from technical assistance of India in terms of appropriate studies for the setting up of wind farms in Mauritius and Rodrigues • A feasibility study for the setting up of a 5 – 10 MW wind farm will be undertaken under a public-private partnership scheme
Hydro	Hydroelectric power plants	• 8 hydroelectric power plants with a combined installed capacity of 59 MW. • But with the construction of Midlands Dam in 2002, hydroelectric production has been to some extent reduced • 117.7 GWh electricity was contributed from this sector in 2003	• Lack of natural sites with favourable topography for future hydro developments
Biomass	Bagasse	• Currently, 3 IPPs export electricity to the national grid on a year-round basis	• ß There is the potential for 4 additional coal-bagasse fired power plants in the near future.
OTEC Technology		• Government is actively working on 2 initiatives for the application of this technology locally	• A Memorandum of Understanding has been signed with the Government of India and the Mauritian Government • The Japanese Government has proposed to set up a 3 MW OTEC plant to generate electricity and potable water. The study to the tune of US $ 40,000 will be entirely financed by Japanese Government. • The Mauritian Government will provide 2,500 m2 of land along the shore to accommodate the plant and its ancillary facilities.
Fuel Ethanol Development	Substitution of gasoline with ethanol	• This is an avenue that is being currently considered by government	• It is envisaged to commercialise a gasoline-ethanol blend (80: 20) as from 2005 • It has been agreed that the help of Brazil will be sought for technical cooperation.

Ethanol Production in Mauritius

Box 8.2

BAGASSE ENERGY DEVELOPMENT PLAN

Conscious of the country's burdening dependency on petroleum products the Mauritian Government launched the "Bagasse Energy Development

Programme (BEDP)" in 1991, with the assistance of the World Bank.

Through such policy directives, it was the Government's aim to promote the use of bagasse for power production, to diversify the country's energy sources and to formalise the participation of the private sector– the Independent Power Producers (IPPs).
The latter produce electricity from bagasse during the sugar cane harvesting season (approximately 5 months) and from coal the remaining of the year. Coal has been chosen as complementary fuel, as it can be burned in the same boiler as bagasse and also because it provided an opportunity to further diversify the country's energy base with the added advantage of being more available from less volatile markets than oil.

After consultation with all stakeholders, 10 different Power Purchase Agreements were signed with sugar factories and all bagasse generated from sugar processing on the island is burnt for electricity generation and co-generation purposes. Currently, three IPPs export electricity to the national grid on a year-round basis with a total installed capacity of 123 MW. These are: FUEL Steam and Power Generation Company Limited, Consolidated Energy Limited and Compagnie Thermique de Belle Vue Itée.

With the implementation of the BEDP, bagasse energy has increased from 70 GWh in the 1990's to the actual 300 GWh, more than four folds increase. An audit carried out by PB Power (South Africa) has indicated that bagasse-coal used for electricity generation was the cheapest and most economic in the local context.

Two modes of energy production:
Fort George Thermal Power Station + Centre Thermale de Belle Vue

Unresolved Issues

The principal unresolved issues in sustainable energy management in Mauritius are:

- ***Increase in the Price of Fossil Fuel***

The major events taking place on the international front, especially war against Iraq has affected the domestic economy directly by significant rises in petroleum prices. As a small island developing state, Mauritius is highly vulnerable to the volatility of prices of oil products, which eventually raise the cost of other products and services in the national economy.

- ***Increase in Demand from Road Transport***

Today the challenge is to provide Mauritians with sustainable mobility through reliable, energy-efficient, environmentally friendly and fairly priced transport with remedies for road congestion.

- ***How to Increase the Output From Renewable Resources?***

The exploitation of indigenous sources of energy is limited to wind, hydro, solar and biomass mainly. While wind and solar are coming within the range of cost effectiveness, the use of other renewable technologies can only be considered when the initial investment costs of these start to decrease.
This also acts as structural barrier to investment in renewable technologies, which remain at present more expensive than conventional generation technologies.

- ***Pricing Energy to Reflect the Full Production Cost, Maintenance and Environmental Costs***

On the other hand, for the electricity sector the efficient delivery and use of electrical energy is the most important question to be addressed. However, the fact that subsidies exist in the current tariffs of the CEB means that some customers do not see the true costs of producing electricity.

The Way Ahead

Mauritius has shown keen interest to promote the development of new indigenous and renewable sources of energy and in so doing, will focus on a few options that have proved to hold promise from a technical, economic and financial point of view.

- ***Extending Supply***

Under the forthcoming Electricity Act, Government will be able to achieve its policy objective goals with respect to renewable energy.

Government will also be putting emphasis on bagasse and wind, while for the long term, in addition to resorting to the cultivation of new varieties of sugar cane with higher fibre content to generate more bagasse for conversion into electrical energy, other options such as OTEC technology are being kept in view.

Government is keeping track of progress in these technologies in terms of their development and cost. Even though the OTEC technology is still at a stage of Research and Development, the Mauritian Government is actively working on 2 initiatives for the application of this

technology locally. In 2000, a Memorandum of Understanding was signed by the Indian and Mauritian Governments for cooperation in the field of Ocean Science and Technology. On the other hand, in the context of the establishment of an Institute of Ocean Studies at the Saga University in Japan, the Japanese Government has submitted a proposal for the setting up of a 3 MW OTEC plant.

With the progress achieved worldwide in the design of wind turbines, it is Government's policy to encourage the exploitation of wind energy, to substitute as far as possible imported oil. In this regard, an assessment of the wind regime will be carried out by the Ministry of Public Utilities and the Meteorological Services Department at various heights at two of the best sites.

Moreover, with the acquired experiences in electricity generation from bagasse, Government will also pursue the second phase of the BEDP.

Managing Demand

Moreover, there is still room for improvement in the efficiency of fuel utilisation in various sectors of the economy – transportation, manufacturing, residential including hotels and commercial. Per se, an Inter-ministerial Committee under the chairmanship of the Prime Minister has been set up to look at our energy mix and to prepare a National Energy Plan to improve our resilience to face the increasing prices of petroleum products.

As shown in figure 8.2 transport fuel constitutes the dominant share of the energy use pattern. The production of ethanol from molasses as a substitute for gasoline in automobile engines and as an alternative to petrol is an avenue that is currently being considered by Government to reduce to some extent gasoline imports. It is expected that gasoline-ethanol blend in a ratio of 80:20% will be available by the end of 2005.

The culture of energy management to improve energy efficiency must also be widely encouraged and vigorously pursued. A number of issues of strategic importance should also be addressed in line with sustainable consumption patterns. These are:

- Energy planning,
- Energy audit in the public and private sector to increase energy efficiency,
- The efficiency of energy utilisation in all sectors of the economy,
- Reform of transportation and physical movements to reduce energy use and pollution, and
- The establishment of performance indices, guidelines and regulations to optimise energy use in new and in old buildings. and
- Carbon credit.

Additionally, with the support of the international community, Mauritius can promote the dissemination and application of SIDS-appropriate energy technology as well as strengthen existing mechanisms. It is also important that more energy related physical infrastructure at national level be provided to enable the desired economic growth that will maintain the position of Mauritius as an economic leader in the region.

8. Energy Resources
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
Extending supply	Comprehensive, stable electrification	Promoting the use of renewable energy
Managing demand		Energy planning and audit
Cost-effective renewable energy	Use of bagasse, solar, wind and hydro Production and export of ethanol	OTEC Implementation of new wind farms on the main island Local use of ethanol
Research and Development	Comprehensive, stable electrification	Development of guidelines, performance indices and regulations Development of economic appraisal methods

C H A P T E R 8

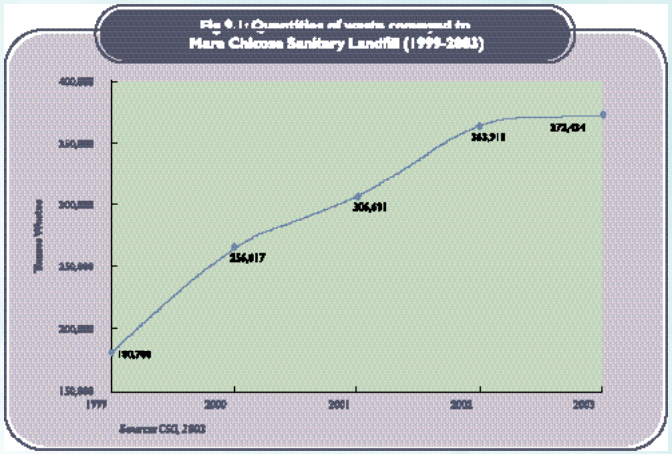
MANAGEMENT OF WASTES

The Challenges

Worldwide SIDS face similar problems related to waste management predominately because pressures are growing and sustainable and effective frameworks need strengthening. In addition, the unique social, economic and environmental characteristics of SIDS, such as high population density, limited availability of land space and lack of human and financial resources, reduce the appropriate options for the sound management of wastes.

In Mauritius, rapid economic growth achieved through industrialisation and urbanisation, coupled to a general improvement in the standard of living, have contributed significantly to the quantities of wastes being produced (see Figure 9.1).

Mauritius recognises that the solid waste management practices of the 80's and 90's were no longer compatible with the changing quality and quantity of wastes produced. In the 80's and till the early 90's, some 24 official dumpsites were operational and better security and management were needed. There was no controlled landfill site, no waste separation and little recycling and waste management was the subject of increasing attention. In Rodrigues and the Outer Islands waste management strategies were even less developed and initiatives are being taken to bring these up to the national standards.



Today waste management deals with:

Current waste production:

- 1,200 tonnes solid waste daily,
- 1 kg waste per capita daily,
- 372, 434 tonnes of solid waste a year (2003),
- 8,000 tonnes of hazardous waste a year (2003),

Current cost of municipal waste management:

- MUR 550 million (US $ 19 million) a year for the collection, transportation and disposal of refuse waste,
- MUR 1548 (US $ 54) per average household, and
- MUR 387 (US $ 13) per inhabitant.

Facing these challenges, Mauritius developed a new policy to adopt an integrated wastes management approach extending through waste prevention and minimisation, storage, collection, transportation, treatment and environmentally friendly disposal of waste.

Progress

The 1988 and 1999 National Environmental Action Plans (NEAP I and NEAP II) and their related Environmental Investment Programmes (EIP) have identified the waste sector as a priority area for financing. Today waste management constitutes an important sector of the society and strategies and plans, services and projects have been developed covering new landfill sites, education and awareness, new legislation, law enforcement, field investigations and specific studies (see Box 9.1).

Box 9.1:

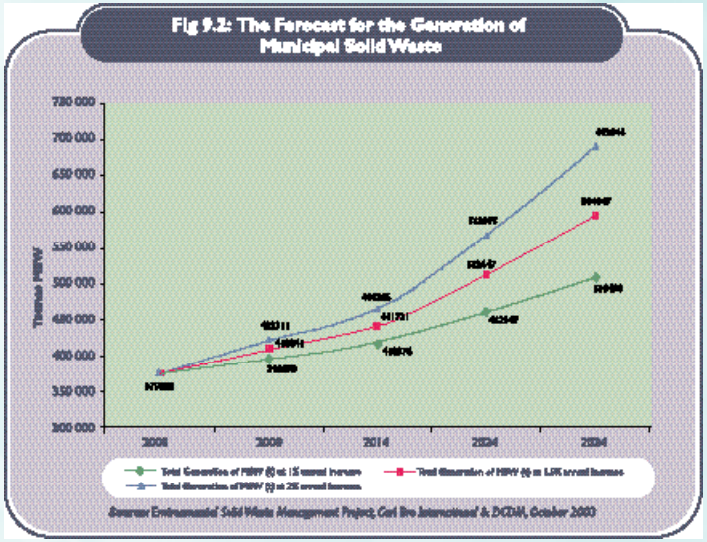
Studies on waste management carried out from 1989 – 2003

Study	*Recommendations & Implementation*
Jackson, 1989	• Establishment of sanitary landfills as main method for solid waste disposal, supplemented by composting • Improvement and modernisation of transport fleet and distribution of dustbins for domestic waste collection • Levy of charges for the collection of commercial and industrial wastes • Implementation of a 10-year National Solid Waste Management Plan

Study	Recommendations & Implementation
Binnie & Partners, 1992	***Site identification study for landfill establishment*** • 2 sites were identified: • Mare Chicose (South) • Mare d'Australia (North)
Scott Wilson & Kirkpatrick, 1994	***National Solid Waste Management Plan*** • Implementation of 2 sanitary landfills along with a network of 7 transfer stations • Issue of 75-litre bins to some 240,000 households • Modernisation of collection vehicles and re-organisation of collection labour force • Review of legislation, standards and regulations • Identification of recycling opportunities • Setting up of a composting plant *The National Solid Waste Management Plan was partly implemented as a component of EIP 1 and was co-financed by Government and the World Bank* • *Only one sanitary landfill was constructed at Mare Chicose in 1997 and the landfill project at Mare d'Australia was abandoned. The construction of Mare Chicose Sanitary Landfill led to the closure of all open dumps and the conversion of some to transfer stations and the rehabilitation of others.* ***Revision of the National Solid Waste Management Plan*** • Incineration was recommended as the main disposal option • 2 waste-to-energy incinerators be constructed on Build-Operate-Transfer (BOT) and Build-Own-Operate (BOO) schemes • The plants could supply about 106 GWh/year of electricity and same could be sold to CEB

Study	Recommendations & Implementation
Brown & Root, 1998	• Reservations expressed by the Ministry of Environment and World Bank as a waste characterisation exercise was not carried out based on the following essential criteria for incineration: • Waste composition • Calorific value • Moisture content ***Feasibility study and an institutional, legal and cost recovery study for an environmental solid waste management programme for Mauritius and Rodrigues*** • 6 scenarios were proposed for solid waste disposal in the short, medium and long term including landfilling, incineration and composting
Fichtner GmbH, 1999	• Based on 2 of the 6 scenario proposed, Government decided that the following actions be adopted: • Immediate extension of the Mare Chicose Sanitary Landfill and a National Action Plan for solid waste minimisation • Consideration for the implementation of a waste-to-power project on a BOO scheme
Carl Bro, 2004	***Feasibility study for the management of municipal solid waste and hazardous waste & identification of a site for a new municipal solid waste landfill*** • Preparation of a build, own and operate bidding document for a sanitary landfill for municipal solid waste and hazardous waste, a pre-treatment and incineration facility for hazardous waste and a waste-to-energy facility for municipal solid waste. • Current waste characteristics do not render waste incineration with energy recovery a suitable waste treatment method as the low calorific value of waste was due to a large portion of green wastes from yards and kitchens. As a result, incineration cannot be sustained without an auxiliary fuel.

Forecast for solid waste produced in Mauritius show an increasing burden and the current facilities will be insufficient to cope much sooner than anticipated (see Figure 9.2).



The National Solid Waste Management Strategy of April 2002 therefore aimed to promote the reduction of wastes and an increased capacity for handling it (see Box 9.2). This strategy includes composting, separation and recycling.

Box 9.2

NATIONAL SOLID WASTE MANAGEMENT STRATEGY

The National Solid Waste Management Strategy aims at reducing the generation of waste and the environmental impacts associated with their disposal as well as ensuring that the socio-economic development of the country, the health of its people and the quality of its environmental resources are not affected by an uncontrolled and uncoordinated waste disposal system.

The thrust of the National Solid Waste Management Strategy focuses on a multi-pronged approach to waste disposal through:

- ***Waste Minimisation (Composting, Recycling & New Regulations)***

- **Awareness Campaigns**

  Emphasis is given to waste minimisation since it is the most sensible manner to decrease the amount of waste to be disposed of, thus reducing pressure on Mare Chicose Sanitary Landfill. Ongoing sensitisation campaigns in the media and to different target groups are carried out.

- **Composting**

  2 pilot composting plants are to be constructed in the North and South of the island.

- **Recycling**

  Regulations have been promulgated to encourage waste reduction and re-use. For instance, plastic carry bags below 50 micrometers have been banned and regulations have been made to control the thickness of these. With regards to PET bottles, Government promulgated the Environment Protection (Polyethylene Terephthalate (PET) Bottle Permit) 2001, regulations to develop 'product responsibility' among bottlers for the proper management of bottles, after they have been sold.

- ***Construction of Civic Amenity Centres for Bulky Wastes***

  These will enable households to dispose of their bulky wastes that are not usually collected by local authorities, hence reducing illegal dumping and promoting recycling.

- ***Extension of the Mare Chicose Sanitary Landfill***

  A geotechnical investigation of the proposed extension site at Mare Chicose has been carried out, and the site is considered suitable for development as a landfill, if engineered with a robust lining system and appropriate standards. The construction of an additional cell has been entrusted to the present landfill operator in October 2003.

- ***Incineration/Landfill/Hazardous Waste Complex***

  A draft feasibility report on the above has been submitted by Carl Bro International. However, the consultants claim that landfilling will remain the main disposal option for Mauritius for the foreseeable future and that waste incineration is not a sustainable waste treatment method for Mauritius due to the current waste characteristics and prohibitive cost.

- ***Construction of a Landfill in the North/North East***

  A complete feasibility study needs to be undertaken for the identification of a potential landfill site in the North/North East.

- ***Construction of New Transfer Stations and the Upgrading of Existing Ones***

  A new transfer station which will cater for the eastern area of the island is presently under construction at La Laura. Tenders for the upgrading of Poudre d'Or Transfer Station has already been awarded and the tender for the upgrading of Roche Bois Transfer Station is under preparation.

- ***Energy recovery from Mare Chicose Sanitary Landfill***

  With about 1 million tonnes of waste already landfilled at Mare Chicose, the recovery of energy from landfill gas is being envisaged. The assistance of the Prototype Carbon Fund will be sought for the implementation of the energy recovery project

Reform of the law and of the institutional framework for management has been an essential part of development in this field (see Box 9.3).

Box 9.3
Institutional and Legal Framework

Institution	*Regulation*
	Environment Protection Act 2002
Ministry of Environment & National Development Unit	• Make legislations, formulate policies, draft and enforce standards, issue waste management operations through EIA licences ***Environment Protection (Standards for Hazardous Wastes) Regulations 2001*** • Under these regulations, the responsibility for storage and collection of hazardous wastes generated by industrial and commercial units lies with the generators.
	• Moreover, the generators are also required to prepare an inventory of hazardous wastes that are being generated, on a quarterly basis and submit it to the enforcing agency (Ministry of Local Government and Solid Waste Management).
Ministry of Local Government & Solid Waste Management	• Enforcing Agency for solid waste management, under EPA (2002) • Charged with the responsibilities for overall coordination, planning and operation of the solid waste management system: ◦ Waste collection and disposal ◦ Operation and management of transfer stations and landfill ◦ Implementation of hazardous wastes regulations
Local Authorities	**Local Government Act 2003** • Address the collection of wastes (sometimes addressed by commissioned private contractors) ***Local Government Dumping and Waste Carriers Regulations 2003*** • Covers transport of waste, issue of licences and various other penalties for non-compliant waste carriers

Box 9.4

Waste Management System

Collection of Wastes

- Collection is done at least once weekly in residential areas and more regularly in commercial districts.
- Wastes from industries and hotels are collected separately on the initiative and at the expense of enterprises but, the majority of small commerce and many small enterprises are served by the service running for households.

Waste Transfer and Disposal

- All the wastes are either disposed of:
  - At Mare Chicose Sanitary Landfill or
  - To transfer stations where they are compacted to be eventually transported to the landfill.
- There are 4 transfer stations:
  - La Brasserie,
  - Poudre d'Or,
  - Roche Bois and
  - St. Martin
- All are equipped with weighbridge for registration of incoming and outgoing wastes.

Sanitary landfill at Mare Chicose

Recycling and treatment of waste have been essential steps in reform, but these are so far in their infancy (see Box 9.5).

Box 9.5

Waste recycling and treatment

The level of waste minimisation and recycling of wastes is very low and only very few companies are involved with the recycling of glass, paper, plastics, textile wastes and scrap metals. Recycling activities are carried out solely by the private sector.

- Plastic waste recycling is carried out by the *Plastic Recycling Ltd.* situated at Riche Terre. The waste, which consists mainly of polyethylene and polypropylene, is collected throughout the island by a contractor, which sells it to the recycling company. Approximately, 2 tonnes of plastic wastes are processed daily.
- *Dakri Paper Products* and *V.P Handmade* carry out paper recycling activities. Products such as recycled paper, carton boxes, gift boxes and folders are sold to the public.
- The Mauritius Glass Gallery recycles glass bottles, mainly from breweries and produces a wide variety of creative glass objects, which are sold to tourists and the general public.
- There are a few companies involved in the collection and export of scrap metals and in 2003, the following companies (Steel Scrap Ltd, G. Runghen & Co, The Samlo Group and Scrap Supplies Ltd) with collaboration with the Ministry of Environment, were involved in the removal of vehicle carcasses around the island.
- With regards to textile wastes, Soge International Co. Ltd, Lagtex CO. Ltd, Recycling Industries (Mtius) Ltd and Giant International Trading export thread, fabric and yarn wastes.

Collecting PET bottles

The management of hazardous waste is being especially addressed in Mauritius. Provision is made for different types of wastes including solids, liquids and medical wastes. The dedicated cell on the national landfill site is designed to avoid leaching of hazardous wastes into the local environment. It is recognised that controls need to be strengthened to ensure that all hazardous wastes are properly managed.

A Hazardous Waste Management Information System is currently being developed at the Ministry of Local Government and Solid Waste Management, whereby a database of hazardous waste generators with corresponding waste streams and quantities will be established.

Box 9.6

Hazardous waste management

As at March 2003, the number of industries operating in Mauritius and Rodrigues amounted to 2410. Out of the industrial category, 792 industries have been rated as being hazardous waste generators. Therefore, potential hazardous wastes generators account for about one-third of the total number of industries in Mauritius.

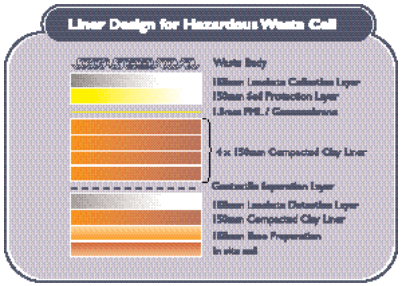
Under the Environment Protection (Standards for Hazardous Wastes) Regulations 2001, the responsibility for storage and collection of hazardous wastes generated by industrial and commercial units lies with the generators.

A number of different practices are currently in place in Mauritius such as:

- Solid hazardous wastes are not collected separately but discharged with non-hazardous wastes,
- Liquid hazardous waste is discharged with the sewage water or disposed of to the environment,
- Some hazardous waste is stored at the premises of the industry due to the lack of disposal facilities,
- In hospitals, hazardous waste is collected and incinerated on-site,
- Internal collection systems of waste generators do not meet the requirements for safe handling and disposal of hazardous waste, and
- A very small quantity of hazardous waste is disposed of at the hazardous waste cell at the Mare Chicose Sanitary Landfill.

The only existing possibility for hazardous waste disposal is offered at the dedicated landfill cell at Mare Chicose landfill. Hazardous wastes that could lead to leaching of toxic components are not accepted at the landfill without pre-treatment. For instance, expired solid products are only accepted if encapsulated in impermeable material. Liquid hazardous wastes with water content higher than 70% as well as acids, pesticides, biocides, chemical and petroleum wastes are not accepted at the landfill site. landfill without pre-treatment. For instance, expired solid products are only accepted if encapsulated in impermeable material.

Liquid hazardous wastes with water content higher than 70% as well as acids, pesticides, biocides, chemical and petroleum wastes are not accepted at the landfill site.



Cleaner Production in Industry

At the level of the industries, some of them have recognised that application of Cleaner Production could result in a win-win strategy so as to decrease the waste stream, hence improve industrial efficiency, increase productivity and bring financial benefits to the enterprise. Cleaner Production has been implemented mostly in food –manufacturing industries namely: Britannia Sugar Factory, Moroil, Maurilait Production Ltée, but few have been successful due to lack of management commitment, perception of risks and not willing to invest.

Among the hazardous waste generator industries, Cleaner Production has been implemented in only one chemical-producing industry with the aim of reducing the water consumption. The option of recycling, re-using or recovering the hazardous wastes was not on the agenda of the management.

The move from the use of waste dumps, many illegal, to the establishment of a properly constructed national landfill site and transfer stations, has been a major aspect of reform. In addition, the new system operates through a partnership between the public and private sector. The Ministry of Local Government and Solid Waste Management and Local Authorities carry responsibility for coordinating the system within a national policy. Operational management of the national landfill site and the transfer stations is privatised. Funds for the collection of domestic and commercial wastes, beach cleaning and road cleaning are managed by Local Authorities, who either directly manage services or contract these to private companies.

Box 9.7

National sanitary landfill
Mare Chicose

The Mare Chicose Sanitary Landfill, located in the south of the island is currently the only operational landfill. The site started its operation in 1997 and at present receives all the wastes from the island. The site is a controlled landfill with the later cells designed with an in-situ clay liner of 1.3 meters of thickness. The site was developed in relatively small cells in accordance with the waste inflow.

The design capacity of the landfill is 1,844,000 m^3 (about 1,475,000 tonnes) and Mare Chicose Landfill was originally planned to receive 300 tonnes wastes per day, but is actually receiving 1,200 tonnes daily. At this rate, the life span of the landfill has been dramatically reduced from 19 to 8 years, i.e. up to 2005.

Currently, there are two storage ponds and a leachate treatment plant, which has however stopped its operation since September 2002. Leachate from the landfill is transported on a daily basis to Roche Bois. Moreover, landfill gas is collected and flared and it is estimated that last year 3,424 Nm^3/hr of methane gas was produced, with a collectable production of 2,739 Nm3/hr or 80%. Furthermore, the Ministry of Local Government and Solid Waste Management intends to look after the feasibility of establishing landfill gas powered generators to supply electricity to the local grid.

The Way Ahead

Further efforts are needed at all levels to implement the actions, policies and measures to achieve an environmentally sound waste management system. The aim is to provide decent sustainable waste management for local people and for businesses. This will be developed by improving the scope, content and quality of local services and by the continual examination of the opportunities for extending the management of demand and increasing the volume of supply.

Further emphasis will be given to recycling, environmental education and the enforcement of laws against illegal disposal of wastes. An important part of enforcement is better control of hazardous wastes and the continued practice of illegal disposal through storm drains and sewers. As part of development, there has been a steady increase in the disposal of motor vehicles, engines, e-wastes and domestic appliances. Better provisions need are being envisaged.

Sound waste management is an important element in the national strategy to develop the service sector to international standards and to support high class tourism and to attract foreign investment.

9. Management of Wastes
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
Increase in waste output	• Education • Introduction of environmentally friendly packaging	• Integrated planning for recycling and extending services to meet needs • Environmental education • Promoting reduction of wastes at source
Poor systems	• Strengthening of institutional and legal framework	• Further legislation • Increase in environmental enforcement
Safe disposal of waste	• Sanitary landfill for waste disposal • Dedicated landfill for the disposal of hazardous wastes	• Better provisions for the disposal of motor vehicles, engines, e-wastes and domestic appliances • Provision of appropriate means of final disposal to meet future requirements
Waste as a resource	• Recycling	• Electricity generation from CH_4 capture • Composting plant for green wastes

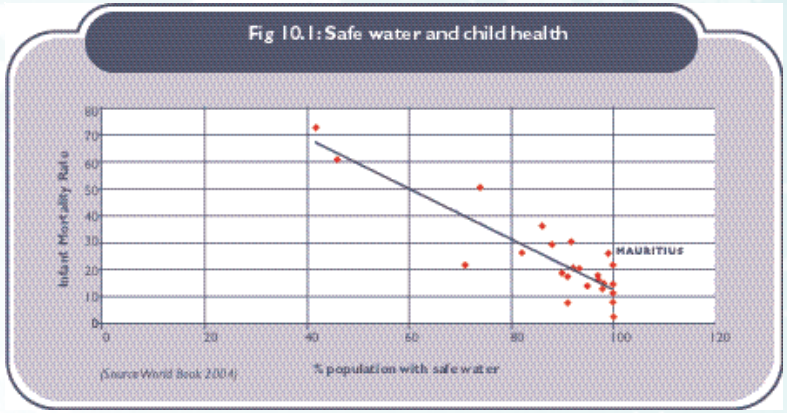
C H A P T E R 9

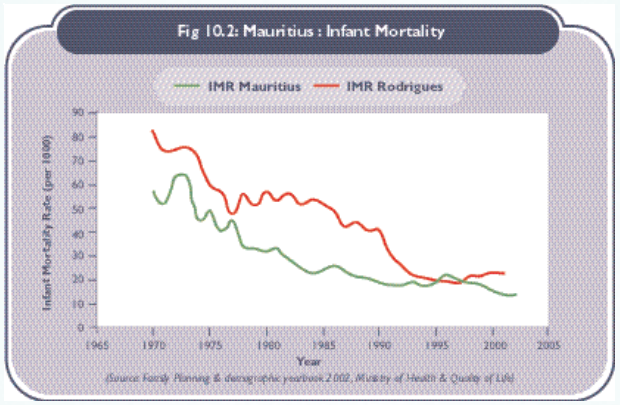
Health

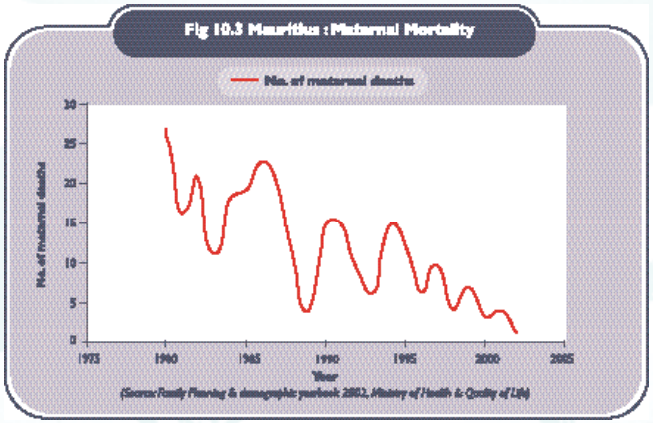
The Challenges

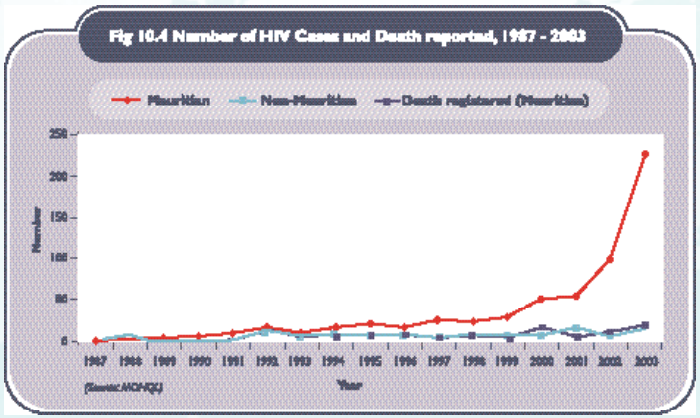
In all SIDS the health of the population is an essential requirement for sustainable development. Health and economic development are strongly associated in SIDS . But for most SIDS, their isolation, their small size and their fragmentation across many islands, puts health at risk, presents obstacles to the delivery of coherent and effective medical services and of those other services, on which health vitally depends, such as water, sanitation, decent housing and education. Child health, for example, one of the most sensitive health indicators, is closely linked to the provision of safe water in SIDS (See Figure 10.1)

In Mauritius, since 1944 expectation of life has risen from 33 years to 72 years.(See Figure 3, Introduction) In the last thirty years, infant and maternal mortality have steadily improved (See Figure 10.2-10.3). But the gains made from the virtual elimination of common infectious diseases and from the eradication of malaria and polio, have been offset by a growing prevalence of non communicable disease and accidents (See Figure 2, Introduction) notable circulatory disease, cancers , diabetes, mental illness and road accidents. There is also a small but growing reported number of cases of HIV/AIDS (See Figure 10.4). There are in addition inequalities in health across the islands with a higher level of infant mortality in Rodrigues for example (See Figure 10.1). This is possibly linked to differences in economic and social development of the islands.









In Mauritius heart disease is responsible for 50% of deaths in the country. In the population aged 30 years and above, 20% are diabetics and 30% are hypertensive. Prevalence of smoking, obesity and alcoholic abuse are also significant risk factors especially in men.

By comparison with other developing states, health in Mauritius is good and health services well provided (See Box 10.1). But the achievement of the millennium development goals remains a challenge, although the trends are mostly in the right direction. (See Chapter: 18).

Reducing the impact of non-communicable diseases and containing the growing risk of HIV/AIDS are important priorities. For better health is vital for sustained development in Mauritius. The current health problems are having a growing impact on the quality of life and productive capacity of people of working age and producing heavy levels of dependence in the increasing population of elderly people.

Box 10.1
Clinical services delivery

Clinical services are delivered throughout the country with:

- One primary health care unit per 9 000 heads with an average of 2.6 attendances per person per year,
- 2.2 hospital beds in regional and district hospitals per 1 000 population,
- Average of 2.5 out patient attendances at hospital per person per year. The hospital system of the country forms a significant part of the socio-economic activities of the nation, with more than 75% of the health budget allocated to public hospitals,
- Average of 0.9 physicians per 1 000 population of whom 63% work in the public sector and 245 are registered specialists,
- Average of 2.2 qualified nurses per 1 000 population,
- 1.2 dentists per 10 000 population,
- 2.3 pharmacies per 10 000 population, and
- SAMU emergency ambulance service in every region

Drugs, in the public health sector are supplied, free of direct charge to patients including ART for people with HIV/AIDS.

This challenge is being taken up both within the health services and in the country as a whole. The White Paper on Health Sector Development and Reform, 2002, set clear targets for better health and better health services and for consumer values (See Box 10. 2). and these have been re-enforced in the commitment to the MDGs. But the response to these challenges involves changing the pattern of consumption and production in the country and making better use of natural resources for health.

This will require new investment and a fresh focus on the promotion of health and the quality of life Success depends not just on the efforts of the MOHQL but also needs support from other departments of government, the private sector and the population at large. The health promotion strategy is to make the healthy choices in daily living, in consumption and in production, the easy choices for the country.

Box 10.2
Health Sector targets

Source: White Paper on Health Sector Development and Reform 2002

Health targets

- Increase in expectation of life to above 75 years,
- Reduction in infant mortality to single figures, and
- Reduce tobacco use, alcohol abuse, obesity and increase exercise and dental health.

Service targets

- Save 500 lives a year from end stage renal failure (a complication of diabetes), and
- Provide a 24 hour family doctor service.

Consumer targets

- Ensure effective quality care for all those with non-communicable disease (especially those with diabetes and hypertension)

Achieving these targets will require more investment and the Government White Paper reviewed options for alternative sources of funding to supplement existing financial commitment, including health insurance, health taxes on tobacco and alcohol, incentives for expansion of the private sector, and service charges within the pubic sector.

Progress

The Ministry of Health & Quality of Life has been increasing the emphasis on prevention and treatment of NCDs in recent years through a national integrated programme covering clinical and community activities. This includes:

- **The Health Information, Education and Communication Unit** for influencing the knowledge, attitude, beliefs and practices of the Mauritian population and to bring about desirable health related behavioural changes.

- **The National AIDS Control Programme** coordinates AIDS prevention activities (See Box 10.3).

- **The Health Inspectorate Unit** carries out activities in order to keep proper control on the introduction of communicable diseases and also to maintain sanitary standards.

- **The Nutrition Unit** sensitises the population on healthy nutrition and lifestyle.

- **The Environmental Health Unit** monitors the quality of drinking water and controls air, noise and odour pollution to safeguard and promote public health and the environment.

- **The Malaria Eradication Programme** which includes environmental controls on mosquito breeding, selective spraying of the airport, seaport, ships, and planes, the follow-up of travellers from countries with endemic malaria, and free preventive drugs for Mauritian travellers visiting these countries.

- **NCD Mobile Service,** popularly known as "Caravane de Santé" for screening and detection of high blood pressure, elevated blood cholesterol, diabetes, obesity, visual problems, breast and cervical cancers. By March 2004, 200 000 persons had been screened, including 42 000 women for breast and cervical cancers. Out of these, 3.5% were diagnosed as having cervical cancer and 3.2% with breast disorders.

- New framework of legislation to promote protection for health and for human rights of patients

- Action to make better use of natural resources for health including use of sea and of land pathways in villages for exercise, conversion of land from sugar cane and tobacco for growing fruit and vegetables for a healthier diet, land for growing medicinal plants for health remedies, building on indigenous culture for healthier life style, including stress relief through meditation and relaxation methods, aerobic movement, and through community facilities for sport for all.

Promoting healthy life style

Box 10.3

Partnership to contain HIV/AIDS

Whilst HIV/AIDS affects less than 1 per thousand of the adult population, there is an upward trend in the high risk groups and a risk of spread to the wider population.

The first case of AIDS was detected in 1987. A cumulative number of 866 HIV/AIDS cases have been reported as at end of June 2004. Out of these, 104 were non-residents and 762 residents and among the residents, 111 have died, which leaves a presumed number of 651 people living with HIV/AIDS in Mauritius. There is a slow but a definitely rise in the incidence rate of HIV. The prevalence rate among pregnant women is around 0.07% as compared to 8% and 6% among the sex workers and prison inmates respectively. The HIV epidemic in Mauritius can be considered as "concentrated" since the prevalence is less than 1% in the population in general and more than 5% in the sex workers group.

Mauritius is supporting the implementation of the SADC HIV/AIDS Strategy Plan, particularly in the tourism sector where we are taking the lead. Needs for assessment in that sector is being carried out in SADC countries. A Memorandum of Understanding has been signed between the Member States of Indian Ocean Commission and the UN Agencies regarding HIV/AIDS.

In that context, projects have been submitted to the WHO for funding under the Programme Accelerating Fund. As regards the Global Fund, a country coordinated programme has been worked out by key stakeholders from Government Institutions, NGOs and the private sector. The overall goal of the programme aims at reducing by year 2010 new HIV infections among the most vulnerable groups, that is, the Commercial Sex Workers, the injecting drug users and the youth.

The strategy for tackling HIV/AIDS includes:

- A national mechanism for policy review and an Action Plan,

- Multi-sectoral policy committee chaired by the Prime Minister,

- National HIV/AIDS Strategic Plan 2001-2005,

- other key Ministers and representatives of NGOs and of the civil society,

- A multi-sectoral Technical Advisory Committee plans action within the strategic framework and advises the NAC on issues relating to HIV/AIDS,

- Information, education, counselling,and testing services are provided in the regional and local health facilities,
- A national hot-line service is operational to answer to queries of the population,
- Epidemiological and behavioural surveillance is undertaken for HIV and other sexually transmitted infections,
- All blood donations are screened for HIV, Hepatitis B and C and Syphilis,
- Post exposure antiretroviral prophylaxis for 4 weeks is provided to those accidentally exposed to HIV including victims of rape,
- The primary prevention of mother to child transmission starts with HIV information and education of girls of childbearing age and women in social welfare centres, women's centres and workplaces,
- Pregnant women attending health centres and hospitals are counselled and tested with their consent,
- HIV positives women and their newborns are treated with AZT (antiretroviral treatment),
- Babies are given powdered milk free for 2 years. This protocol reduces the risk from 30% to 2%, and
- Since 2002, AZT is provided to all persons who need it.

The most striking feature in the health profile of the country has been the eradication of major infectious diseases. The prevention of their re-emergence and protection against newly emerging diseases are continuing areas of investment. No cases of Severe Acute Respiratory Syndrome (SARS) and Avian Flu have been recorded in Mauritius.

The present expanded programme of immunisation (EPI) covers 100% of the targeted population, including BCG Vaccine against tuberculosis, DPT Vaccine against diphtheria, whooping cough and tetanus, Hepatitis B Vaccine, OPV against poliomyelitis, MMR Vaccine against measles, mumps and rubella, and Tetanus (2nd or higher dose) for pregnant women.

Box 10.4
Legislation

As part of health sector reform new legislation includes:

- Environmental Protection Act 2002; MOHQL the enforcing agency for quality of drinking water and control of odour and noise,
- Medical Council Act of 1999, for the regulation of the medical and dental professions,
- Food Safety Act of 1999 for improvement of food hygiene,
- Mental Health Act of 1998 for the reform of mental health services to promote better prevention, treatment and rehabilitation in mental health and protection of civil and human rights of patients,
- Dangerous Chemicals Control Act 2003 to prevent damage to health and the environment from dangerous chemicals,
- Occupational Safety, Health and Welfare Act. to improve health and welfare at work, and
- Human Tissue Bill to regulate the use of human tissue and organs.

Partnerships and Networking for Sustainable Development

The effectiveness of health programmes depends on a multi-sectoral approach within government, with the private sector and NGOs. It involves substantial development of legislation (See Box 10.4) The MOHQL works in close collaboration with other ministries in the fields of education, disability, elderly people, mother and child health, youth and sport. It also works in partnership with the private sector health services in specialist care of diabetics, in nurse training, and specialist service development. and with NGOs on reproductive health, HIV/AIDS, traditional medicine, , tobacco control, and alcohol abuse. Some of the "hotel services" of hospitals are contracted out to private firms.

One indicator of progress in Mauritius has been the decline in assistance from donor agencies as Mauritius no longer qualifies for assistance because of the increasing per capita income and declining infant and maternal mortality rates in the country. UNICEF and UNFPA have ceased their operations in Mauritius. The main donor agency is the World Health Organisation. Multilateral loans include loans from the Arab Bank for Economic Development in Africa (BADEA) and the African Development Bank, for the implementation of capital projects at Victoria Hospital and Dr. A. G. Jeetoo Hospital respectively. But these loans are now on less concessional rates.

To overcome geographical and professional isolation, the support of foreign medical visiting teams has been stepped up for technical policy review and for training especially in complex high technology clinical procedures. The Mauritius Institute of Health, which operates under the aegis of the MOHQL, works in close collaboration with foreign training institutions, for example, the University of Bordeaux II, for the more accurate detection of serious illness and its treatment, high technology services have been developed (See Box 10.5).

Box 10.5

High Technology Services

Diagnostic Services

CT scanners and MRI: to support treatment of ncds and trauma.

Nuclear medicine: with equipment for diagnostic exploration of internal organs with radioactive materials to provide clearer images of abnormalities

Ultra-sound and echography equipment: for diagnosis and surveillance of unborn babies.

Treatment Services:

Endoscopy and colposcopy services: with fiber optic equipment in all regions for enhancing gynaecology

Hyperbaric services: comprising a pressure chamber, for treatment of accidents related to deep sea diving; can also be used in the treatment of non-healing leg ulcers

Haemodialysis: More than 40 sets of equipment for treatment of patients with kidney failure, principally as a result of long term diabetes.

Specialised Cardiac units: for diagnosis and treatment of heart diseases

Cardiac surgery: with equipment for open heart surgery and invasive cardiology.

Organ transplant services: including kidney transplant and cornea transplant.

CT Scanner

The MOHQL also participates in activities organized by the SADC Health Sector on technical development and policy review. The Commonwealth Regional Health Community Secretariat (CRHCS) and the World Health Organisation provide in-service training, through workshops and seminars. Sector-wide National Health Accounts are being developed for the first time in Mauritius with the support of the CRHCS and the World Health Organisation.

Other action on improving health includes:

- Strategy on Diet, Nutrition and Physical Activity; National Dietary Guidelines are being implemented.
- Action Plan on Physical Activity
- Action Plan in consultation with all stakeholders concerned, for the prevention and control of smoking and other tobacco related products.
- Introduction of a family doctor service

The Way Ahead

Implementation Plan for the Health Sector

An Action Plan has been developed as part of the pilot stage for introducing Programme Budgeting, Results Based Management and the Medium Term Expenditure Framework for the country. It includes major structural reforms in the health sector to achieve higher levels of efficiency, effectiveness and responsiveness to patients, with nine programmes, covering: Curative Services, Primary Health Care, Public Health, Non-Communicable Diseases and Health Promotion, Asset Management, Central Support Services, Education and Training, Management, and Rodrigues and the Outer Islands. The estimated cost of implementing the Plan is Rs. 13.2 billion (US$455 million) over a three-year period.

In Mauritius development and industrialisation have led to major alterations in employment patterns, hours of work, leisure patterns and use of time. Much of the improvement to health in the past has been dependent on the provision of basic facilities for decent living, which is a prerequisite for community health. Further development of these facilities requires new investment and a fresh focus on those parts of the country, which are relatively deprived, including Rodrigues and the outer islands.

Priority programmes of investment for better health include better:

- Water supplies and sanitation to remoter parts of the country,
- Housing for poorer people in relatively deprive areas,
- Power and communications for basic facilities for healthy living for all people,
- New, safe and cleaner technologies to reduce pollution,
- Promotion and incentives for a healthier lifestyle,
- Coherence in delivery of clinical services and services for prevention and treatment of ncds, and
- Research and evaluation to guide programmes for better clinical services and public health.

10. Health
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Rise in non communicable disease and accidents	• Integrated clinical and health promotion programme	• Family doctor services • Development of community and domiciliary care • Multi sector action to reduce injuries
• Small but growing threat of HIV/AIDS	• Multi sector national programme • Prevention, treatment, counselling and education	• Further strengthening of integrated community and clinical services with strong national leadership and active ngos
• Professional and management development	• Public private multi-national partnership in professional training and development • Management development, efficiency and quality improvement	• Strengthening continuing education and role of professional bodies • Further support for public private partnership • Re-enforcement of international networking • Reform of management structure and culture
• Infrastructure development	• Asset management programme for development and maintenance of buildings, equipment and estate • New buildings and equipment for better range and quality of services	• Implementing master plans for site development • Planned preventive maintenance • Cyclical replacement and development plans for whole estate
• Financial commitment	• Increased investment in buildings, equipment, staff and community support	• Review of forms of financing • Continued extension of public and private sectors • Development of fiscal policy to promote healthier consumption patterns and cleaner technology in industry

TRADE AND INVESTMENT 11

Trade and investment

The Challenges

SIDS are vulnerable to rapid changes in global trade and investment. This arises from their small size, the narrow range of their products and services, and their isolation from alternative markets. To adapt, an economy needs to acquire new trading partners, new sources of raw materials and new technical assistance. That takes time: It is more difficult for SIDS and the outcome is uncertain.

Mauritius is a small and open economy and despite its economic diversification in recent years, remains vulnerable to global developments as its export sector relies on a few products and services and on preferential access to specific markets in the European Union and United States.

For a small island like Mauritius, trade is not only an instrument to promote economic growth. It is an indispensable means to overcome the lack of resources at local level and to satisfy the needs of its population in basic commodities. With a population of 1.2 million, Mauritius relies on external markets for its economic viability in agriculture, manufacturing, financial services, tourism and major parts of social services such as specialist health services and tertiary education. Small islands have small domestic markets . For producers to benefit from economies of scale, they have to export the surplus. The income from exports finances the imports necessary for domestic consumption.

The major challenge for the competitiveness of the country's industry is the constant rise in the local cost of production. Its distance from major commercial centres in Europe, Africa and Asia means high transport costs. The high degree of foreign content in the local production process makes some of the exports ineligible to some markets, depending on the specific rules of origin that apply in each case. In garment manufacturing the cotton and wool are all imported. If trade preferences are eroded rapidly, sugar, tuna, textiles and clothing will face major challenges from global competition.

It is also difficult for Mauritius to conduct international business with larger states on a genuinely level playing field. Its relatively high GNP per capita denies it the continued advantages of the flexible WTO provisions that are normally available to the low income countries, in particular the LDCs. Income per head, does not give a true reflection of the vulnerable situation of Mauritius arising from its size, the few advantages of economies of scale and its heavy reliance on imports.

Since the first WTO Ministerial Conference held in Singapore in 1996, Mauritius has been advocating a special case for SIDS in the WTO system. Indeed, while the WTO has recognized the principle of differentiated approach to countries at each level of development, it does not yet have special provision to respond to the specific needs of the SIDS. The preferential trade agreements being phased out under WTO rules and the intensified competition from China and other Asian competitors, are continuing economic threats for SIDS in general.

Economic Diversification

If the future looks uncertain the past Mauritian experience has revealed that a small economy, characterized by a number of permanent disadvantages can respond effectively with the right set of policies, commitment and entrepreneurial skill. Diversification and specialisation has been a key response in all sectors.

Agricultural diversification was not aimed at replacing sugar cane, since Mauritius had a secure and guaranteed market for its sugar under the Sugar Protocol operating under the Lomé and Cotonou Agreements. It was rather to enlarge the agricultural range to produce more fruits and vegetables for the local market, plants and cut flowers for the tourist sector. But more importantly, the shift was to achieve a more efficient and intensive use of land and labour, which are both limited resources in a small island like Mauritius. The contribution of agriculture to the economy has been declining and the sector as a whole is facing serious threats from global competition and the loss of preferential trading arrangements. But it retains a continued resilience in the face of pressure, by increasing efficiency and by diversification.

Non sugar agriculture now represents 50% of the total agriculture output with the contribution of this sector as a whole, declining and now under 10% of GDP compared to 30% in the mid 1970s. In sugar itself responding global pressures, Mauritius has increased mechanization in the sugar fields, centralized sugar processing, invested in continual research to optimise the yield and moved into container transport of the final products. The contribution of the agricultural sector to GDP is expected to grow by 4.7% in 2004, compared with 1.7% in 2003 with a higher growth in the sugar cane than in other agriculture.

The Export Processing Zone (EPZ)

The industrial strategy of Mauritius was initially oriented towards import substitution at the time of Independence, in 1968. The new government, however, adopted an export oriented strategy with the enactment of the Export Processing Zone Act in the early 1970s. Taking advantage of the EU trade preferences under the Lomé Conventions, the EPZ became a major mechanism for growth within the manufacturing sector, contributing greatly to economic development. In 2003, the EPZ contributed over 21% to GDP and provided over 27% of total employment in the country. Domestic manufacturing accounted for nearly 50% of the contribution of manufacturing to GDP in 2003.

The domestic sector has now to contend with increasing competition from countries abroad such as Egypt at the level of COMESA and South Africa in SADC. Trade liberalization at the multilateral level under the NAMA and EPA initiatives are the other challenges the sector has to face.

In 2003 the EPZ contribution to GDP within the manufacturing sector, was 46%, and this constituted nearly 10% of total GDP. The number of workers in the EPZ in 2003, represented nearly 60% of total employment in the manufacturing sector in Mauritius.

The dominant components within the EPZ are textiles and clothing, which account for 54% of all the EPZ enterprises, 86% of total EPZ employment and 80% of total direct EPZ exports See Box 11.1). The major export items from this EPZ sub-sector, are pullovers, shirts, t-shirts and trousers, which together accounted for about 90% of the total textiles and clothing exports from Mauritius in 2003.

A texile unit

Box 11.1

Challenges in the textile and clothing sector

With the phasing out of the Multi-Fibre Arrangement (MFA) in December 2004, the quota system for international trade in textiles and clothing sector will finally disappear. This will bring fundamental change in the development of trade in this sector. The MFA, which is in operation since 1974, has provided the basis on

which industrialised countries have been able to restrict imports from developing countries. However, a number of developing countries like Mauritius have been able to export to EU market without any quota restriction by virtue of the preferential arrangement governed by the Cotonou Agreement (the successor for Lomé Convention). The USA also has recently extended preferential access to the textile and clothing products emanating from the Sub-Saharan Africa. These preferential arrangements (which are generally duty-free and quota-free) have given the preference-dependent countries a significant competitive advantage over those developing countries restrained by quota restrictions.

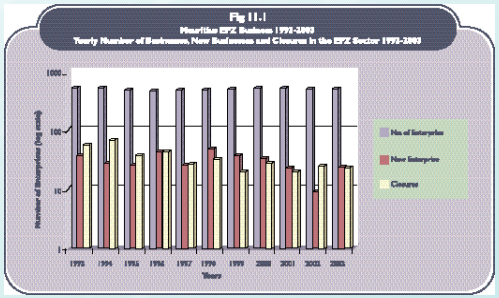
From 2005 textile giants like China, India and Pakistan will trade in a quota free environment and will be in direct competition with preference-dependent countries like Mauritius whose margin of preference and degree of competitiveness will be significantly eroded. The main export markets for textiles and clothing are the EU and the USA absorbing 65% and 27% of total EPZ exports respectively in 2003. Exports to the EU have declined since 2001. Exports to the USA have been declining since 2002 due mainly to closures of major firms in the EPZ that have been serving the USA market.

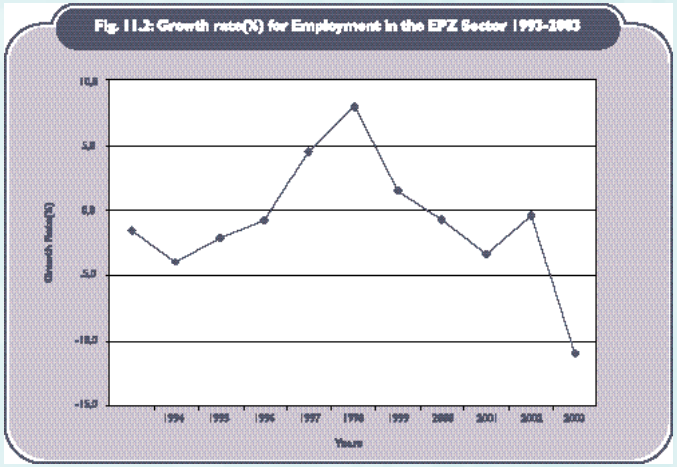
The textiles and clothing sector is a highly important source of employment for women in Mauritius, being the largest employer after agriculture. Women make up more than 67% of the total labour force in the Textile and Clothing sector. The sector has not only contributed to women's income but has also had positive effects on their educational attainment.

Growth in the EPZ has slowed over the past few years. Mauritius' competitiveness is being tested by the emergence of new low-cost competitors. Bilateral agreements signed by EU with ACP competitors such as Morocco, Chili, Egypt and Mexico constitute additional threats to Mauritius.

Mauritius is one among those developing countries that will be severely hit by the end to the MFA. A deceleration of growth in the textiles sector is already occurring in anticipation of the quota-phase out. Employment in the textile industry which rose from 15,000 in 1978 to over 91,000 in 1999 declined to under 78,000 in 2003.

In 1993 number of enterprises operating in the EPZ was 536; by 2003 it remained above 500, with a yearly crop of between 9 and 48 new starts and between 20 and 60 closures. Whilst closures tend to attract publicity the number closed in 2003 was the second lowest number in the 11 year period. (See Figures 11.1 and 11.2)





Tourism

The tourism sector has developed into a big foreign exchange earner as well as a big growth and employment contributor. It also has stimulated expansion and improvement of the island's infrastructure, with the construction of new roads, communication, electricity networks and leisure facilities of benefit to other sectors and to the local population. The contribution of hotels and restaurants to the economy has grown from 3.9% in 1990 to a projected 6.4% in 2004. Private investment in hotels is expected to be over Rs 5,000 million (US$ 183 million) in 2004 (See Chapter 6).

WTO Negotiations

Mauritius is dependent on import tariffs for the generation of a large part of government revenue and it will inevitably suffer from the WTO's move to accelerate tariff liberalisation and to phase out its export incentives and fiscal subsidies. Moreover, the trade preferences which have been a vital element in the economic development of Mauritius are not only being eroded but are being challenged by the WTO rules.

Another major problem faced by Mauritius is that the cost of doing business is high due to overhead costs, limited ability to exploit economies of scale in production, high transport costs, associated with insularity, distance to markets, small cargos and high dependence on imported raw materials and industrial supplies. Mauritius, therefore, has to make setting up new business easier, safer and more profitable to attract and retain investment.

Mauritius wants to negotiate changes in the WTO approach, and looks to partnership in multilateral and regional level for this purpose. The SIDS with a total population of over 50 million are more likely to succeed together than as single isolated states. Like many SIDS, Mauritius faces severe constraints, in terms of human and financial resources in participating in trade negotiations. Participation in the negotiations is the only possible way for Mauritius as well as for the SIDS to influence to advantage the rules, their interpretation and their implementation.

Progress

The Government of Mauritius has put in place a set of policy packages in terms of trade preferences, industrial support programmes and investment incentives that are geared to attract and retain investment.

In order to foster domestic investment and Foreign Direct Investment (FDI), Government is investing massively in infrastructure and utilities, and is conducting an aggressive campaign in service sectors like tourism and ICT. Packages involving generous incentives, a stronger regulatory and institutional framework, a permanent resident scheme and the integrated resort scheme targeted at expatriates.

Mauritius also possesses a very liberal policy in respect of investment and investors can invest in all sectors of the economy through the various investment schemes. These are grouped under the Investment Promotion Act (2000). Additionally, in order to streamline all applications for investment, the Board of Investment (BOI) was set-up as a form of one-stop shop with fast-track procedures in place, to reduce waiting time, provide for greater predictability and fast track procedures, and eliminate overlapping.

Government has also introduced a series of measures to encourage the development of Small and Medium Entreprises (SMEs) to generate employment in the country. SMEs are presently creating five times more jobs than large firms. The Small and Medium Industries Development Organisation (SMIDO) which was set up in 1993 to promote entrepreneurship at grass root level for self employment is now taking major steps to accelerate the growth of SMEs through enhancement of their competitiveness and development. The Organisation is further exploiting economic opportunities by encouraging Mauritian entrepreneurs to enter into joint ventures with overseas' partners to benefit from their know-how and access to their markets. In the same context, it is providing facilities to benefit from the African Growth & Opportunity Act (AGOA) , the Cotonou Agreement and the SADC/COMESA among others. SMIDO is also encouraging foreign direct investment in SMEs for both regional and global markets. This action has also helped to bring more women into business and improve the quality of life of families by the additional household income.

Capacity Building

Mauritius has devised as series of measures to improve the technical and managerial capacity of businesses. Workshops and training sessions by WTO and UNCTAD, have stimulated local action. The National Productivity and Competitiveness Council (NPCC),has provided emergency support to enterprises that are registered with the Council in the textile and garment industry. The NPCC makes an initial assessment in a business, identifying weaknesses and core areas that need urgent attention in order to improve enterprise productivity. The NPCC has also promoted Gemba Kaizen workshops for greater efficiency in local businesses and in the public sector. Since its creation in 2000, the NPCC has been promoting innovation as driver of productivity growth and competitiveness. Its work is based on a close partnership between business and government and its work has proved both popular and effective.

The Textile Emergency Support Team helps businesses to restructure and the National Equity Fund-Textile Sub Fund provides flexible terms and conditions of financing equity and debt. The Mauritius Research Council, set up in 1992, promotes and coordinates Government's investment in research. It advises Government on Science and Technology issues and funds research projects in areas of national priority and encourages strategic partnerships.

Government is committed to further expand the country's infrastructure that responds to International standards in terms of quality, reliability and affordability. The country is enhancing ways and means to guarantee security of modern business services as it competes globally for investment by major developments in ICT (See Chapter 13).

Regional Cooperation

Since its independence in 1968, Mauritius has actively participated in regional organizations including the SADC Trade protocol, COMESA, the Indian Ocean Rim- Association for Regional Cooperation and in Indian Ocean Commission, (IOC). These organizations encourage cross-border trade and investment in the region. They attract foreign investment in both the manufacturing and services sectors. They also provide a stronger capacity for international negotiation. Mauritius has an evolving legal and institutional framework to help companies wishing to use Mauritius as hub for region-wide business and a safe haven for company headquarters with its security and financial and ICT capacities.

The Way Ahead

Developing Resilience

The past strength of Mauritius in international trade is based on the following factors:

- Political and macroeconomic stability which reinforce reliability in the business environment and promote confidence in international trading,
- Availability of low-cost labour in the EPZ sector,
- Preferential access to markets in Europe and United States under the Cotonou Agreement, Sugar Protocol and AGOA, and
- Expansion of its market base through COMESA and SADC.

Further development depends upon the capacity to make use of the competitive advantage of the country in the evolving market, making its geographical position and attractive natural environment, a strength not just for tourism but for other business too.

Mauritius is getting better at exploiting its strategic location in the Indian Ocean for Freeport activities. It is enhancing the efficiency of its domestic industries by exposing them to global competition. But to progress it has to secure wider market opportunities. Its priorities are therefore to promote further innovation and develop trade in services and IT-based economic activities.

A key element is the role of SMEs in the economic development of Mauritius. As the MFA agreement is nearly approaching, there is a need to redefine the national strategy to ensure faster product turnaround, shorter delivery times and more competitive prices. Niche products, emerging export markets, improving on quality rather than quantity are the further challenges to meet. At local level, another potential market could be the 700,000 tourists who visit Mauritius annually. Some Mauritian entrepreneurs are already restructuring and innovating to target this market. A few of the large groups in the textile and clothing industry have taken action to meet the challenge ahead and on the SMEs side, the prospects are good.

Whilst industrial competitiveness is of key importance for all Mauritian enterprises, their environmental performance should not be disregarded. Government and the Business sector should develop a package of voluntary codes and policies to reduce the environmental impact of industries whilst enhancing efficiency. Government already has a stated policy to establish a National Cleaner Production Centre; it remains to be implemented.

In the current WTO negotiations, the strategy of Mauritius is targeted towards:

- Securing a special terms for the SIDS under the WTO Work Programme on Small Economies,
- Seeking exemption from tariff reductions for both agricultural and industrial products,

- Providing adequate level of protection to the sensitive sectors,

- Preserving the margins of preferences for its exports, particularly sugar, textiles and clothing, and

- Maintaining subsidy schemes in order to compensate for its inherent cost disadvantages in attracting investment.

Developing niche products

Shifting the Balance of the Economy

The main priority for Mauritius is to shift the economy towards service development. This offers an important new opportunity for long term growth for many SIDS. It includes the development of the offshore sectors including financial services and information and communication technology (ICT). The banking, insurance, Freeport and stock exchange sectors are part of this process. These are high value–added economic sectors that can help to overcome the problems of size and isolation through their use of modern communications technology. The resources required for this shift in the balance of the economy include good governance, security, the natural geographical and environmental assets of the island, direct air links to the major trading partners, sound development of ICT, ease of access for inward investment and business operations, and a resilient local population, well educated and responsive to a changing world.

The challenge for Mauritius is not only to increase its share in world trade but more importantly to have enough leverage to shape the WTO rules to its advantage such that it can have policy spaces and conducive international environment to pursue its development goals. Mauritius supports the initiative to launch SIDS-SIDS cooperation aiming at the elaboration of a strategy for international trade negotiations. It will seek to play an assertive role on international front fully supporting the advocacy of SIDS.

Freeport development

11. Trade and investment
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Globalisation	• Developing SIDS advocacy networks • Renegotiation of trading agreements • Diversifying the economy • Investing in education and training	• Strengthen SIDS negotiating capacity in SIDS coalition • Negotiation longer grace period for tariff cuts for items with long standing protection where livelihoods are at risk (sugar, textiles) • New technology; less dependence on low labour costs
• Narrow economic structure	• Shift to non sugar cane production (Fruits, vegetables, horticulture, fisheries, bagasse) • Managing the rise and decline of textiles and clothing • Growth in tourism • Rise in service industries	• Intensify diversification and innovation building on indigenous assets, protecting environmental and intellectual rights Continued diversification • Promotion of SMEs and innovation •Research and development in order to find new niche areas.
• International and regional co-operation	• Multi regional co-operation (with Africa, Asia, Indian Ocean, Indian Ocean Rim; bilateral with EU, USA, Australia, India, China etc), EPA.	• Secure longer term diplomatic partnerships for trade • Extend access facilities (setting up and doing business, airline connections, regional entry points) • Ensure high level negotiating teams in major international instances.
• Further diversification	• IT • Financial services • Offshore business sector • Medical/Pharmaceutical hub • Knowledge hub	• Extend R& D • Reduce barriers to trade and movement of labour, capital and materials • Tighten financial regulation and probity • Enhance IT capacity • Promote facilities as a regional centre for business conferences, regional offices • Promote environmentally friendly standards for service • developments, energy efficient and suited to the ecology.

TRANSPORT AND COMMUNICATIONS 12

Transport and Communications

The Challenges

Isolation and size present SIDS with major challenges for developing efficient transport and communications. Distance from other main centres of life and commerce can result in SIDS becoming cut off from the rest of the world, depressing their capacity for economic and social progress and placing heavy costs on trade.

In addition within each country, fragmentation across many smaller inhabited islands can result in incoherent development, inequality of access for trade, and inadequate support of specialised services and emergencies.

But economic development in SIDS can rapidly bring traffic congestion and the severe environmental impact of pollution from motor vehicles, airplanes, sea port traffic and their infrastructure requirements and support systems.

In Mauritius the principal aims for transport and communications have been in overcoming the impact of physical isolation on trade, on human development and on coherent government across the country as a whole. This has created challenges in developing the means of transport and communication and in protecting the country from its adverse environmental and social impact. Increasing road, sea and air traffic requires space, imposes pollution of the air and the land and disturbs the tranquillity that has been a key benefit of isolation itself. Increased contact with the out-side world also presents risks to physical security and to health, which demand new forms of vigilance, not necessary in past times. This imprint of development of transport is now being extended to even the most ecologically untouched of the islands, such as Agalega.

The demands of strategic military transport have involved the forced evacuation of the people from the most remote of the islands in the country, the Chagos, creating an unresolved international diplomatic and human rights issue.

Road congestion and accidents are now a growing problem, deaths from which far exceed the annual sum of all deaths from HIV/AIDS, TB, malaria and all other infectious diseases, in Mauritius.

Mauritius has had international sea links since its discovery in the 17th century and is strategically placed on the main shipping lanes linking Africa, Asia, Australia, Europe and the Far East. Port Louis harbour is the only commercial port for the country. It plays a key role in handling 99% of the country's external trade. But its position and growing activity present major challenges to sustainable mobility in a congested capital city.

Progress

Air Transport

Mauritius now operates its own air-traffic control system with satellite technology within an air-space of 9 million square km. The control system is part of the latest development by the International Civil Aviation Organisation (ICAO) and the Communication and Surveillance/ Air Traffic Management (CNS/ATM). This enables Mauritius to operate with its own fleet, of 15 aircraft, through Air Mauritius, with flights to 26 destinations in 4 continents. In addition Mauritius is used by other airlines with regular scheduled flights from South Africa, UK, France, Germany, the Emirates, Austria, Singapore, Madagascar, Seychelles and Réunion Island. No charter flights operate to Mauritius

The air service started in 1972 with one twelve-seat plane. Traffic has grown steadily since then to an annual total of over 2 million air passengers. Tourism is a major driver for air services, but business demand is increasing.

New levels of security have been adopted in the face of rising international concerns since 11 September 2001, including passenger and freight screening, in-flight security and protection of the integrity of the airport itself.

The airport in Rodrigues provides for daily flights from Mauritius but does not yet take international traffic. The small airstrip in Agalega is used only by the National Coast Guard for limited government and emergency purposes. Expansion of these facilities presents a challenge for environmental protection

Air transport has played a vital role in the development of Mauritius. It has promoted Mauritius as an upmarket tourist destination and provided necessary air cargo facilities for the manufacturing sector.

Sea Transport

In the last twenty years Port Louis has been transformed by the provision of container facilities increasing the capacity and productivity of the harbour. The container terminal covers 26 hectares with three ship-to-shore post panamax gantry cranes.

The customs systems have been reformed with increased security and probity in their operations. With competitive tariffs, smooth industrial relations, high security and ease of access for refuelling and supplies, the capital port attracts regional as well as local business, for freight and as a cruise destination for liners. Smaller craft use the adjacent marina for ocean going yachts, which is becoming a fresh aspect of the Caudan water front development.

The capital port has installed security systems to comply with international standards including a Safety, Health and Environment System.

The Mauritius Ports Authority (MPA) operates the port, which lies within the city limits of Port Louis. The Port handles 99 % of the country's imports and exports. The number of vessels entering and leaving Port Louis has been increasing at over 4% a year; by weight goods unloaded are increasing by 7% a year and goods loaded are increasing by 11% a year.

Since 1984 the port facilities have been extensively upgraded and they are now of the most modern in the region. Cargo facilities are forecast to grow steadily but the present facilities should cope with this demand. The yearly road traffic generated by the port is expected to more than double by the year 2015 (from 645,000 vehicles to 1,400,000).

This will add to the existing congestion within central Port Louis and the roads serving the ports, unless major improvements are made to accommodate both the increased volume and the increasing weight of the loads, especially carried by container lorries.

Road Transport

Roads are the only means of internal transport in Mauritius, which now has no railways nor inland waterways. In pace with general economic and social development, since 1993 there has been an increase of 64% in registered vehicles. But the increase has been predominantly in private vehicles rather than in public transport. (See Figure 12.1). In this period buses and taxis have increased by 34% but private cars by 76% and the numbers of dual purpose vehicles and vans have both more than doubled.

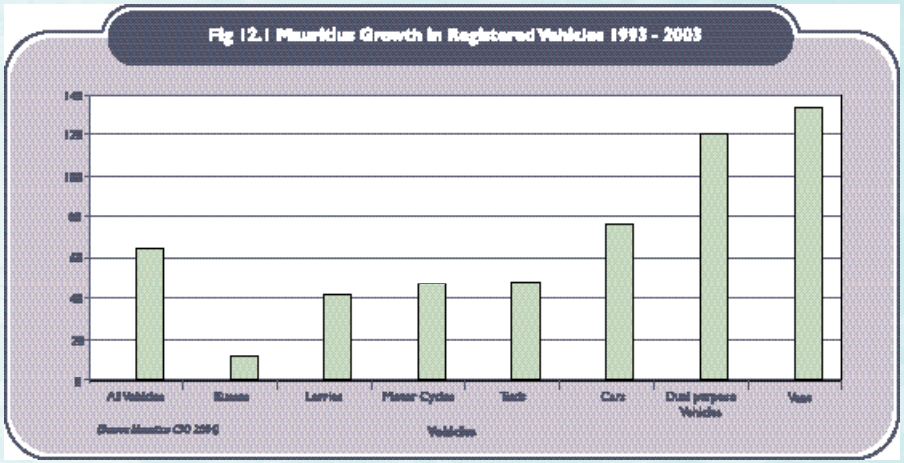


Fig 12.1 Mauritius Growth in Registered Vehicles 1993 - 2003

Buses and taxis together constitute 3% of the motor vehicles on the roads; cars, dual purpose vehicles, vans and motor cycles are 82% (See Figure 12.2). During this period there has been a major road expansion and improvement programme. 98% of all roads are now paved and since 1999 the length of roadway has increased by 5%, largely through the construction of new motor ways from north to south of the main island. But this expansion of roads has not kept pace with the increase in vehicles using them in that period. Now for each registered motor vehicle in Mauritius there is an average 7.3 metres of roadway. With 1km of road now for every one square km of land, road systems are approaching the limit of the carrying capacity of the available land in the country.

There are over 1,800 licensed buses in Mauritius and nearly 6,000 taxis. 77% of the buses are five years old or more. On average each bus covers 150 km a day with average gross receipts of MUR 900 (US$205). The style of service offered is basic with little concession to consumer values. Common concerns are over reliability, frequency, travel time, cleanliness, safety, lack of evening and week-end provision, lack of information and of coordination between services. There are no published timetables or lists of routes covered and locations of stops.


The motorway: facilitating movement of traffic

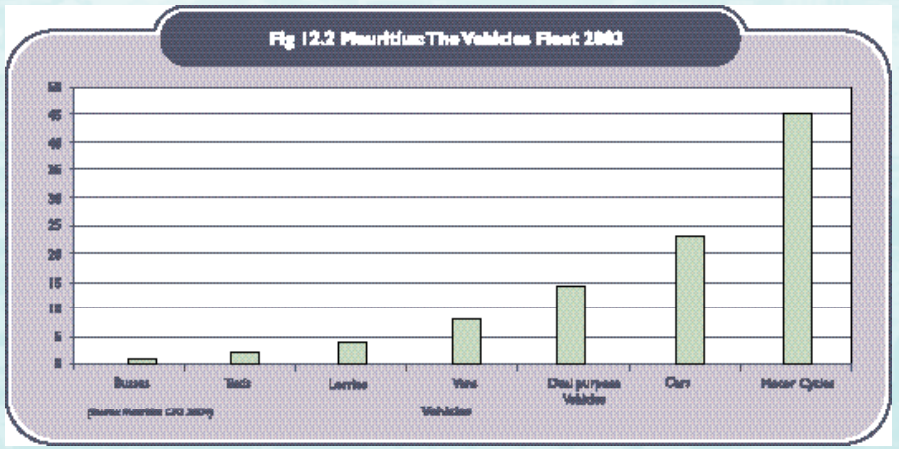


Fig 12.2 Mauritius: The Vehicles Fleet 2003

The dominant transport problem is the severe traffic congestion within the conurbations and especially entering Port Louis from both directions, particularly in the south, during the morning and evening peaks. Journeys of 15-20 km by car typically take one hour during peak periods and one and a half hours by bus. The peak congestion problem has become acute in the last 5 years as more people have had access to private cars and use them to go to work. This is leading to deterioration in safety and environmental conditions. In the period since 1993, the number of road traffic accidents has increased by 32% and the number of fatalities per 100 casualties has risen by 26%. As a result, today wearing of crash helmets for motorists and seat belts for motor vehicle drivers is compulsory. CO_2 emissions from vehicles continue to rise and constitute 29% of the total CO_2 emissions in the country. Routine checks are effected by the Police de l'Environnement and the NTA to enforce the Road Traffic (Control of Vehicular Emissions) Regulations and regular vehicle safety inspections are carried out at vehicle examination centres.

Another important aspect of urban congestion relates to parking in town centres and the policies adopted for its proper management. Convenient parking is essential to the life of a city and the supply of parking must be restricted and controlled if the city is to function efficiently. This calls for a sophisticated parking policy and government has already taken some initiatives for example, by raising parking tariffs in the capital and by providing peripheral parking at the edge of the capital city with shuttle-bus facilities to the centre.

Congestion during peak hours in the capital

The Way Ahead

The Civil Aviation

The SSR International Airport is planned to expand to take over 3 million passengers a year, with the construction of a commercial office precinct, a private corporate aircraft area and a major fuel depot. It is envisaged that the airport in Rodrigues will be extended to take international flights. The airstrip in Agalega will be upgraded for domestic passenger flights in accordance with international standards.

Current airport planning is based on the "New Master Plan for Airports in Mauritius", a plan with a horizon date of 2025. The medium scenario forecast in the Master Plan envisages the annual number of passengers handled by SSR International Airport growing from 1.7 million in 2000 to 6.5 billion in 2025 with 5 million under the low scenario and 8 million under the high. In order to accommodate this growth, the Master Plan proposes the following major improvements:

- Construction is a new Emergency Runway parallel to the exiting one, plus improvements to taxiways, or alternatively, possibility of a replacement runway,
- Additional parking stands,
- Expansion of the existing passenger terminal to the south and west, together with new prices,
- Construction of a new cargo terminal to the north of the passenger terminal, and
- Future improvements include the relocation of the existing fuel depot to a new site to accommodate greater fuel reserve capacity to meet increased number if aircraft movements and an area dedicated to hangar and maintenance.

The current Master Plan is also being updated to respond to changes in aviation activities and take account the dynamics of the industry.

These developments are seen as key parts of the expansion of tourism, trade and commerce, allowing Mauritius to become increasingly a regional centre for business access to Africa and to the Asia.

Sea Port Developments

Port Louis is planning to be developed as a port for regional maritime operations and business. Future projects include an oil terminal, extension of the container terminal, and a dedicated cruise terminal with back up passenger and freight facilities.

In 2002, the MPA adopted a revised Port Master Plan which covers the period up to 2025. The main improvements proposed in the Master Plan include:

- Improving safety by relocating oil tanker facilities for petroleum and LPG away from the main port area,
- Expansion of Container Terminal facilities adjacent to the existing Mauritius Container Terminal, and
- Construction of a dedicated cruise terminal and associated commercial development at a new site away from the main cargo port on reclaimed land near Fort William.

Container Terminal Facilities in the port

In the long term, the Port Master Plan proposes that a section of the coast between Pointe aux Sables and Albion lighthouse be reserved for port-related projects, such as, handling and storage of hazardous liquid products, when the current port area reaches saturation.

With the opening of Agalega to international tourism, new marine facilities are needed. The opportunities for establishing industrial fishing add to the case for establishing a container port there. This can only be done in-land because of topographical constraints. Such innovations will allow for rapid economic and social development on the islands. But they carry the risk of substantial ecological impact. Close public private partnership is necessary to ensure these initiatives can be taken forward with proper attention to environmental concerns. Both tourism and industrial fishing depend on using natural resources in a sustainable way. New monitoring systems will be required to ensure this goal is attained.

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The current Master Plan is also being updated to respond to changes in aviation activities and take account the dynamics of the industry.

Road Transport

A combination of optimising use of existing and planned transport infrastructure together with support for more sustainable modes of travel is thus a cornerstone of future transport policy. Complementary land use and transport strategies are required to sustain urban and coastal tourism growth in the future, as well as help provide new opportunities for employment in rural areas, which can reduce the need to travel.

To provide the basis for future transport investment, Government commissioned the Integrated National Transport Sector Strategy study (INTSS), which is a major step forward in the planning and management of the transport sector in Mauritius. The study objectives were to formulate an integrated strategy from which plans, policy statements and an investment programme could be devised (See Box 12.1).

Box 12.1

The integrated transport sector strategy

The main elements of the INTSS are:

- Implementation of an alternative mode of transport between Port Louis and Curepipe in order to relieve the chronic traffic congestion in this corridor,
- Discouraging car trips to the town centres along the Port Louis – Curepipe corridor through controls on the supply of parking spaces,
- Improving the quality of bus services by restructuring the bus industry, letting fares rise in line with costs, and revising the regulatory framework so as to encourage operators to be more demand-responsive,
- Increasing efforts to improve amenity and traffic circulation in town centres by means of traffic management schemes,
- Emphasising maintenance and management of the road network, and relatively less provision of major new roads, and
- Building some new roads to improve access to economically important areas and take through traffic out of towns and villages.

One of the centrepieces of the integrated transport system for Mauritius is the implementation of a Light Rail Transit system (LRT), to improve north-south movements and facilitating park and ride to the north and south of the capital (See Box 12.2). Mauriitus has had no railway system since the original wood fuelled passenger and freight train network was dismantled in the [1950]

Box 12.2

Light rail transit

After several studies, including a World Bank led multi-criteria analysis, Government is considering the LRT option. The INTSS proposed 13 access points or stations along the 25 km route, most of which are in town centres.

The aim is to provide a fast, comfortable service which will be attractive to car users. Access to stations will be by an integrated system of efficient feeder buses and pedestrian networks.

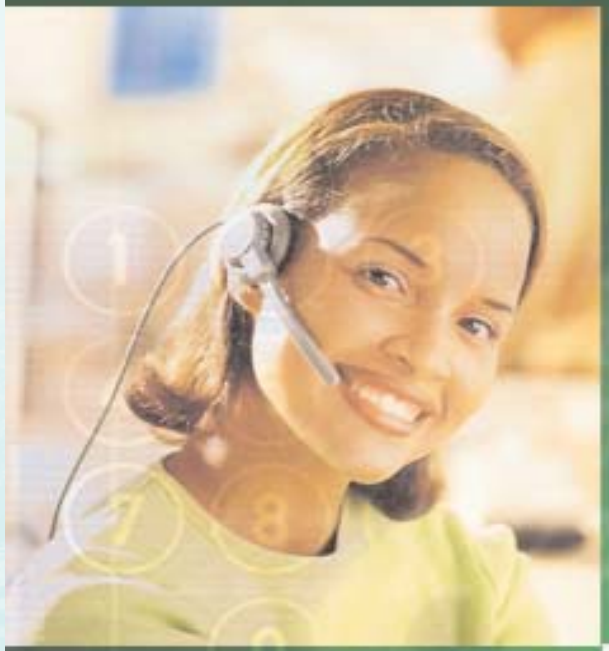
Although the LRT will not solve traffic congestion on its own, a series of strong public transport policies and traffic restraint measures in the main urban centres will emanate from its implementation. In fact, the integration between all the modes of transport and the LRT will be the key vision of this challenging project for the development of Mauritius. The project is planned to enter operations with 93,000 passengers daily.

Operating characteristics of the LRT system:

- Length of line: 24.9 km,
- Running speed: 55 – 75 kph,
- Average time of stops: 20 seconds,
- Number of stops: 13 stations,
- Journey time one-way: 32 minutes,
- Vehicle capacity: 250 per unit (500 per train),
- Vehicle length: 30 m per unit (running 2 units), and
- Total vehicles required: 31 units.

12. Transport and Communication
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Isolation	• International air links to 26 countries and 4 continents • Container port in capital city, for domestic and regional passenger and freight business	• Expansion of international links for tourism trade and commerce
• Security, health and safety	• International standards for security and health surveillance in air and sea ports • Seat belts and crash helmets compulsory in road transport	• Continued development and implementation of international standards • Integrated review and improvements in road safety and road transport management
• Inter-island transport	• Daily flights to second island (Rodrigues) and weekly sea transport • Emergency and government air link to outer islands, six monthly sea transport	• International air links to second island (Rodrigues) • Domestic passenger air link to Agalega • Container ports in Rodrigues and Agalega
• Environmental impact	• Waterfront development for environmental enhancement • Environmental protection against pollution and from risk of air and sea port disasters • Road congestion and traffic pollution a growing concern especially in access to the capital city; use of lead free petrol compulsory	• Sensitive EIA assessment for air and sea ports especially in smaller islands. • Strategic review of the future of the capital city to relieve congestion and its adverse environmental, social and economic impact



C H A P T E R 12

Information and Communication Technologies (ICT)

The Challenges

The Global Conference on the Sustainable Development of Small Islands Developing States specifically mentioned telecommunications and its importance to this group of countries. This is so because SIDS suffer from isolation. The impact of SIDS isolation on social and economic development can be reduced by the development of telecommunication with ICT to assist the provision of services in Government, business and the community.

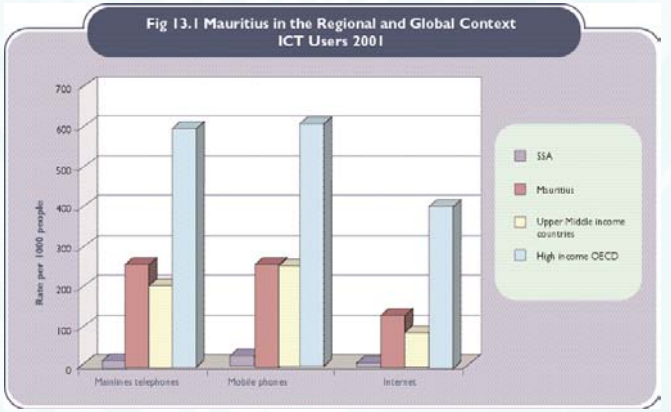
This transition requires skill, advanced equipment, finance and commitment in all sectors. It is not an easy process. It requires a shift from traditional labour-intensive industries to capital-and technology-intensive industries. The task for Mauritius was to develop these complex new capacities, building on its strong human-resource capacity, good information infrastructure and the required commitment from Government.

Mauritius has been active in the promotion of ICT in every sector through a policy of establishing the core technologies and investing in critical projects in key sectors. The principal challenge has been to promote penetration of the technology throughout the country in government, public services, the private sector and through the education system and to ensure a growing awareness and development of the necessary skills within the community at large. In this endeavour the country needs to focus on relevant capacity building world-class information and communication on infrastructure and the enabling policy framework with the highest level of Government commitment.

Progress

Progress in the development of ICT in the past 8 years has been rapid and has moved Mauritius well into the league of upper middle income countries in this field, but it has some way to go to reach the levels attained by the high income OECD countries (See Figs 13.1)

Cyber Tower at Ebène



The ICT sector was open to full liberalization in 2003. A new licensing framework was introduced which has resulted in new services and new technologies such as broadband and wireless, paving the way for new generation computer linked mobile phones. New services range from back office operations, contact centres, disaster recovery and software development. 3000 new jobs have been created and investment in this field has now reached more than MUR 1 billion (US $35 million). The international telecommunication service has attracted new operators, resulting in a high degree of competition and as a consequence a fall in call prices of about 80%.

The National Telecommunications Policy (NTP2004) was introduced in 2004. It sets out a vision for making ICT a fifth pillar of the Mauritian economy. It outlines the strategies to be adopted and the methods to be used to ensure fair, effective and sustainable competition. It also paves the way for convergence of IT, broadcast media, Telecom and consumer electronics.

Mauritius is creating a well structured digital network and offers up-to-date telecommunication facilities. The SAFE (South Africa Far East) submarine fibre optic cable has a local landing point that enables Mauritius to connect to the Global Information Infrastructure (GII). This high speed link (130 Gigabits) has boosted opportunities for e-commerce for the country, using the internet for business and consumers.

Computers in Government

Computerization of various governmental agencies dates back to 1989. This has been achived through both reform of legislation and of the institutional framework for development in this sector (See Box 13.1). So far 55 Government departments have operational systems and 45 major projects are underway, with investment of MUR 750 million (US$ 26 million).

Government projects include: systems at the Customs Department, Video Conferencing System for the Judicial Department and the National Pension Payment System at the Ministry of Social Security

Box 13.1

ICT

Law and institutional reform

The following legislation provides the framework for ICT development in Mauritius

- The Copyright Act 1997,
- Information Technology (Miscellaneous Provisions) Act 1998,
- Telecommunications Act 1998,
- Electronic Transactions Act 2000,
- ICT Act 2001,
- The Computer Misuse and Cyber-crime Act 2003, and
- Data Protection Act 2004.

Major players in ICT

Government institutions, include: Board Of Investment (BOI), Central Information Systems Division (CISD), Central Informatics Bureau (CIB), Information and Communications Technologies Authority (ICTA), Ministry of Information Technology and Telecommunications (MITT), National Computer Board (NCB).

Government owned companies

Business Parks of Mauritius Ltd. (BPML), Mauritius Posts Ltd. (MPL), Mauritius Telecom (MT), Multi Carrier Mauritius Ltd. (MCML), State Informatics Limited (SIL),

Private sector

ACT alliance, Mauritius IT Industry Association (MITIA)

There are currently 31 licensed private operators in the ICT sector. They offer services ranging from fixed telephony, mobile telephony, international telephony and internet services. There are over 150 private computer services companies operating in Mauritius providing computer accessories, computer cabling, consultancy services, consumables, computer games, hardware, networks, program design services, software, training, and time recorders.

Computers and Business

The Business Parks of Mauritius Ltd. (BPML) was set up in 2001, to spearhead the development of technology parks and telecoms. A national computer centre – the Cyber City – has been established, offering fibre based facilities with direct international linkage. The parks and the Cyber City have attracted several international companies, which use Mauritius as an information hub. The growth of mobile telephony has also accelerated over the last few years as the number of providers has increased. In order to increase IT penetration, financial assistance at concessionary rates is available for individuals to purchase their own personal computers (PC). The goal is to ensure that every household will have a PC by 2005.

The Government has increased private sector participation through schemes such as build-transfer (B-T) and revenue sharing arrangements (RSA) in major information infrastructure building and has set up several training institutes to cope with the retraining and upgrading of the workforce. Projects such as the Mass Computer Awareness Program and the introduction of IT in the school curriculum are expected to forge this new culture among the working population. The Board of Investment has developed terms for attracting investors in ICT to Mauritius. Businesses investing in the island can benefit from:

- Low corporate tax of 15 per cent,
- Free repatriation of profits, and
- Exemption of customs duties on equipment and raw materials.
- A Green Visa Concept, which will allow IT firms investing in Mauritius to employ foreigners with the required skills.
- An Intensive Skills Training Programme to provide a pool of IT semi-skilled and skilled workers in the short term to help the industry overcome constraints in some specific fields.

Mauritius has a sound legal framework supportive of the development of e-Government and e-Business and strong and friendly relations with the West as well as with India and the countries of southern and eastern Africa. Mauritius has invested heavily in infrastructure.

The Way Ahead

The rapid development of technology and its use within the country have brought new challenges. The skills training for professionals, needs to be increased to keep pace with the proliferation of hardware. More effective use should be made of PCs. The implementation of projects needs to be speeded up and there is a need for strengthening monitoring and evaluation of the application of IT to the requirements of different users.

An e-Government Master Plan has also been elaborated with the assistance of the Commonwealth Secretariat. The Ministry of Information Technology and Telecommunications is pressing all Ministries and Departments to develop their own e-business plans, to focus on the electronic delivery of their services.

To meet the challenges from international competitors, Mauritius has taken steps to boost productivity, quality, and technology. It has implemented a program to introduce productivity measurement at both the company and sectoral levels, along with productivity awareness campaigns. It has also set up the Mauritius Technology Diffusion Scheme, a demand-responsive means to promote private sector delivery of technology services. To ensure quality, the Government has developed an integrated MSTQ (metrology, standards, testing, and quality) strategy for execution by the Mauritius Standards Bureau.

Mauritius is looking at a single smart card that will allow the public to hold their driver's license, small amounts of funds that can be used for small transactions, and their health and other social security information.

Mauritius is strongly developing ICT in both the public and private sectors. New ISP licenses will be granted to promote the expansion of the Internet Community and encourage competition in this sector. Long-range plans include the development and export of financial, consulting, trade, communications, education, and other information-intensive services.

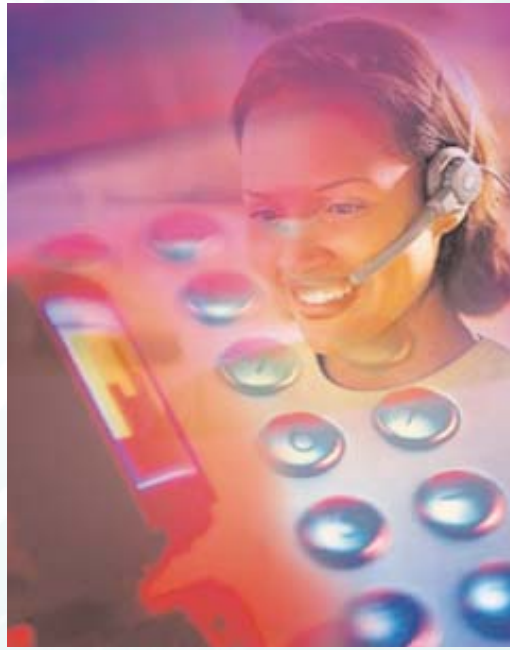
The way ahead for Mauritius hinges on exploiting its strategic position in the Indian Ocean to realise its ambition to become an ICT hub in the region. To meet the increasing expectations and demand from business and community users, Mauritius is:

- Promoting a computer in every home, and Banks are offering soft loans for purchasing equipment,
- Setting up Community Access Points for people at public places, such as Post Offices,
- Setting up a Universal Service Fund to promote wider national access at local level, and
- Promoting easy and affordable access to telecommunication, especially through the internet.

The e-Government programme is being further developed to provide access to and within Government departments and to provide computer support to the delivery of their services, with Government On-line Centre (GOC), Government Intranet systems (GINS) and Public Key Infrastructure (PKI).

The success of the strategy will depend greatly on rapid development of trained professional and technical staff in the public and private sectors. The University, and training centres are extending the range and number of courses to meet the increasing demand. This is being supported through the computer education and training in schools, public training in computer literacy and job related schemes for the benefit of school leavers (See Chapter 15).

The environmental impact of ICT is evident in the extension of overhead power cables, the erection of mobile phone relay structures, satellite dishes, the use of mobile phones in the street, and illegally by drivers of motor vehicles, and the disposal of computer waste. These present fresh issues to be addressed.



13. ICT
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Technology development in public and private sectors	• Law reform and institutional change • Physical networks • Industrial base • Government projects • Business support and incentives	• Development of regulatory framework with licensing, guidelines and monitoring systems
• Human resources development	• Recruitment of experts • Education and training	• Further professional development and training
• Community access	• Access in schools and colleges • Mobile service • Service through Post Offices	• Extension of educational development programme • Target for a computer in every home
• Environmental impact	• Power lines • Mobile phone relay structure • Computer waste	• Review of environmental impact • Recycling programme

C H A P T E R 13

14

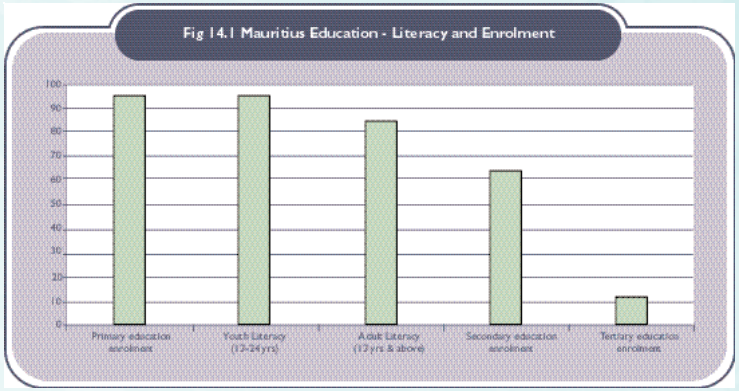
Education

The Challenges

Small islands have a major challenge in adapting education in pace with technical and social change. They lack the advantages of economies of scale in producing teachers, and in specialization both in schools and in tertiary education. An educated population of young people and of adults, is an essential requirement for sustainable development. It is a vital element in promoting resilient adaptation to the shocks of natural and other global events and processes, to which small islands are specially vulnerable. Science based education for all, provides a sound basis for understanding the links that bind the survival of people to the quality of their environment.

Progress

Educational development has been a key component of economic and social growth progress in Mauritius. Government expenditure on education has risen to 12% of GDP. The Youth literacy rates (15-24 years) is now 94%. 95% of children of primary school age go to school. But only 64% of those of secondary school age continue in school and only 11% are in tertiary education (See Figure 14.1). This presents a substantial challenge to the country for the future; how to increase secondary and tertiary education to the levels being achieved in the more developed countries. For example, whereas only 11% of young people are in tertiary education in Mauritius, in Bahrain there are 25% and in Barbados 39%. The rapid development of the economy with more specialisation and more dependence on technical content demands an increasing level of education which the facilities have not been able to supply.



The key factors in past achievements have been based on a number of factors including public and private partnership in school and community based developments and the maintenance of strong professional links with centres abroad (See Box 14.1).

Box 14.1

Key facilities in progress of education

- National primary education for all,
- National secondary education up to age 16 years,
- Building programme for new secondary schools to meet the new commitments,
- Partnership between in primary education provides for 75% public sector and 25% in jointly funded or private funded schools,
- 6th Form Colleges for all with abilities,
- Expansion of tertiary education to include university and vocational training,
- Specialist education for disabled students,
- Priority zone investment to promote better school performance in disadavantaged and remoter parts of the country,
- The University of Mauritius working closely with business and commerce generates 15% of its income from non government sources,
- Use of broadcast media for adult education and distance leaning,
- Health and progress monitoring for students,
- Youth programmes beyond school and college on civic responsibility, environment, health and social action,
- Tertiary education, training and professional development abroad, for exchange programmes and links to centres of excellence,
- The Mauritius College of the Air (MCA), a parastatal body under the Ministry of Education and Scientific Research, was set up in 1985 to promote adult education, arts, science and culture, generally through mass media and distance education methods. It aims at providing equity in education and supporting teaching and learning and improving access, and
- The Mauritius Institute of Education, now over 30 years old promotes:educational research and curriculum development; advanced learning and knowledge in education; teacher education responsive to the social, linguistic, administrative,

scientific, agricultural and technological needs of Mauritius; a programme on Pre-Vocational Education for teachers; An MA in education in collaboration with a UK university; In-service skills training for teachers,

- The National Inspectorate has a unit of Pre-Vocational Inspectors who provide advice and run in-service courses to harmonize teaching strategies around the new curriculum, and
- Evaluation and adaptation of innovations in the light of experience.

Promoting Science in schools

The reformed educational system in Mauritius is aimed at developing a well-educated, skilled and mobile labour force for a greater economic dynamism and to increase the capacity of the country for the management and use of knowledge to enhance social, cultural and technical resilience. The motivation behind the reform and development of all aspects of education and learning, is the country's determination to face the social and economic challenges of the 21st century, to meet the requirements for a competent and skilled workforce and to make further advances in social and cultural development. This has required reform of the scope and content of the syllabus and the process of learning (See Box 14.2)

Box 14.2

Reform of the scope and content of education

- The primary syllabus now covers citizenship, art, information technology, history and geography, health, physical education, including environmental issues and 2 hours a week on remedial literacy and numeracy to overcome multi-language challenges of disadvantaged groups,
- The new development of national compulsory secondary education for all will promote equal access to secondary education for all parts of the country, and ensure better quality of teaching and performance review backed up by continuous professional education programme for teachers and university degree requirement for secondary school teachers,
- Literacy and numeracy strategy with extra tuition in all schools to achieve higher standards,
- Pre-vocational education for those not pursuing an academic syllabus,
- Joint planning with the non government sector,
- Tertiary education opportunities include the University of Mauritius, The University of technology (commerce, business, management, technology, linked to government, business and industry), IVTB, Medical School and Dental School, Schools of Nursing, School of Catering and hotel management, business schools, a variety of courses for specific vocational training (See Chapter 15), plus national and private sponsorship for education and professional training abroad,
- Use of mother tongue for remedial students,
- ICT programme with facilities for all schools and tertiary institutions, and
- Continuous education programme for teachers and a new focus on quality standards.

Newly built secondary school at Palma

The Way Ahead

Despite past achievements and recent major reforms that are being introduced, much remains to be done to match the educational capacity to the future needs and aspirations of the country. Further key developments that are planned and underway cover further development of physical facilities, improvements in support facilities, and in quality assessment (See Box 14.3).

Box 14.3

Further sustainable developments for education

Developments planned or already being undertaken include:

Assessment at key stages through a National Assessment Framework

School Information and Communications Technology Project (SITP)

To promote the usage of ICT as a supporting and enabling tool for education and for e-learning with the construction of a new IT laboratory in each school and establishing as a first phase IT laboratories in 50 primary schools around the island every year.

Improving School Management and Leadership

Training provision for prospective heads of schools prior to and after selection.

Use of Mother Tongue as language of Instruction

One factor identified as the cause of low achievement at primary level is the use of a foreign language as the medium of medium.
The use of mother tongue as the medium of instruction in lower primary will be piloted in two primary schools.

Type of Secondary Education

A new system of post 'O' level polytechnic education is being planned for those students, after the completion of 11 year schooling, would rather opt for a different type of education that is closer to the world of work.

Tertiary Sector

- A White Paper on Tertiary Education is being prepared to pave the way for increasing access to the Tertiary Level,
- New ventures for online and distance education through an Open Learning Institute of Mauritius (OLIM), and
- Private sector developments in medicine, dentistry, business studies and management, hotel and catering.

Quality Education and Key Role of Teachers

- Quality assurance mechanism inbuilt in all Teacher Education (TE) programmes,
- Opinion surveys as the basis for the improvement of forthcoming TE programmes,
- Reform of pre- and in-service education with greater emphasis being placed not only on the development of professional skills and values but also at promoting more autonomy, innovation, reflection and career-long development,
- Voluntary career-long professional development with distance education and open learning (DEOL) for capacity building,
- The minimum qualification for primary school teachers is now 'A' levels rather than the previous 'O" level requirements, and
- At the secondary level an all-graduate profession, (59% of the current secondary teachers are graduates).

Mauriitius is also playing a pivotal role in regional education and educational development, through new forms of partnership involving the public sector, the private sector, local and international ngos and civil society. These include (examples to be added; e.g medical and dental education, ICT, specialist professional training and development, University linkages with Australia, UK, France, India etc). The freer movement of labour across the region and through global partnerships will promote this trend. The ease of doing business with Mauritius is a key factor in attracting and sustaining such co-operation.

Education and Development

The role of education should be to build a Mauritian Society made up of self reliant individuals able to take control of their own lives, to make their own choices and fulfil their own potentials. Being a relatively young nation, with its human resource being its only key asset, Mauritius had no other choice but to heavily invest in education in order to gradually emerge from an isolated pin-point in the midst of the Indian Ocean to become a respected partner on the regional scale. With the current ongoing reforms, it is the aim of the country to now fully prepare itself to new international challenges and create the appropriate conditions conducive to lifelong learning.

The concept of education must embrace the whole of society. Those at school and college, those of working age in paid employment or elsewhere, and seniors. A knowledge based society needs continually to expand the culture of learning, to cover new and indigenous knowledge, work and leisure activities. Health and environmental education is an essential part of life-skills for promoting a greener safer and sustainable environment for future generations; a key to adaptation of damaging patterns of consumption and production. Mauritius, to overcome its geographical and professional isolation, has a growing practice of sharing knowledge with other SIDS, through centres of excellence, through networking and exchange programmes. This has become part of the normal pattern of development.

14. Education
A Policy and Programme Progress sheet

Challenges addressed	Progress made	The way ahead
• Primary education and Overcoming illiteracy	• Primary education for all country-wide • Remedial support in mother tongue	• ICT programme • Further support for disadvantage and remoter communities
• Secondary education	• Secondary school entrance by exam • Secondary school for all (From 2004)	• Polytechnic programme • Further development of distance learning
• Tertiary education to meet the needs of development	• Scholarships abroad • University of Mauritius • Industrial and Vocational Training Board	• White Paper on Tertiary Education • Open learning facilities (OLIM)
• Improving quality and professional standards	• Mauritius Institute of Education • Inspectorate • Continuing education programme for teachers	• New assessment systems • Management training • Opinion surveys
• Working with the private sector	• Private professional education : medicine, dentistry, business studies, and remedial therapies	• Joint planning • New developments in religious schools • New ventures in continuing professional education

Training and Skills Development

The Challenges

SIDS have common constraints to rapid adaptation of technology through skills training, because of their small size and isolation. Training is becoming recognised as a vital tool for securing sustainable development in Mauritius, both within the public and the private sector.

Over the past thirty years, Mauritius has achieved sustained economic and social development in a competitive and ever-changing world economy. This has not been easy. But Mauritius has adapted its sectoral structure, established new patterns of production and service delivery, incorporating major technological changes and new means of communication. These have been accompanied by changes in Mauritius in social values, attitudes and inter-relationships and also in social tensions and challenges. This process can only be continued with increased capacity for adaptation of people, not only to the current changed structure but for continual adaptation in the future.

Unemployment is a growing concern in Mauritius. Workers and employees are no longer secure for life in any job whether in the public or the private sector. Partly this is an outcome of a decline in demand for unskilled labour in agriculture, an increase in demand for better educated people and for those with new skills in manufacturing industry, construction and in services and a lag-time in the response of the labour market. But, it is also an indicator of adaptability of the economy itself. No developing country can survive without structural change and that increases the risk of unemployment. The resilience of the labour market to change is a key to resolving this social and economic problem. The principal tools are training and raid redeployment resources into innovative enterprises. People have to become multi skilled and sectors have to be quicker in responding, to keep up to date with new technology and ideas.

Progress

The new orientation of education and training policy and programmes developed in the past decade aims to meet this challenge. It provides people, of all ages, with more appropriate skills and experience to meet changing patterns of work.

With jobless growth in an economy through increasing automation and labour productivity, training must also provide skills that enable many people to become self-employed and to set up their own businesses. Starting up businesses is being made easier and investment in promising new ventures faster and more sustained. In brief, Mauritius is now providing the climate for a more alert and responsive market. This is a formidable task in any country, but there is some success to report from Mauritius which demonstrates a new resilience to the changing pressures of the world economy.

Training is fast becoming a key component of action in all sectors. It is a vital tool for Mauritius to enhance its economic performance and compete in the global setting .The Ministry of Training, Skills Development and Productivity (MTSDP) has a key role to play in the achievement of the Government's economic and social development objectives and could maximize its contribution. The role of the MTSDP is to set national human resource development and training policy.

Over the period 1970 to 1995, the economy of Mauritius grew by an average of 5.6 per cent a year - a remarkable achievement. Between 1995 and 2020, the National Long-Term Perspective Study envisages a rate of economic growth that is equally fast, or even faster. The training plan aims to:

- Combine training programmes with work experience,
- Provide training with work placements
- Allow employers to vet potential employees on the job, and
- Provide job-specific training to give added value to the employers.

Box 15.1

Training and skills development responding to the market

Initiatives in progress which respond to the training needs of the emerging sectors and to develop a versatile and skilled work-force, include:

- **On the job training** for one year for graduates, those with diplomas and school leavers with HSC: 279 unemployed degree holders and 83 diploma holders were placed on the scheme for 2003 - 2004.
- **Promoting creativity** and innovation in local business through NPCC Productivity Committee (PC) comprising representatives from some twenty public and private sector institutions.
- **Hotel and restaurant trades** Mauritius training for the hotel and tourist sector with special skills in management, professional and technical skills, with class room, practical and on the job training.
- **Training for the financial services sector,** for offshore financial services

through the Mauritius Offshore Business Activities Authority (MOBAA) for accountants, lawyers and tax specialists to perform to international standards.

- **New pathways for training for entry,** exit and re-entry, through new National Qualifications Framework (NQF) promoted by The Mauritius Qualifications Authority (MQA), with emphasis on proper assessment and certification of courses, and a system of quality assurance.

- **The setting up of the IVTB School of IT** at Ebène the Cyber-city.

- The IVTB pilot programme for computer awareness among households as a pre-operational training incentive.

- **A mobile training unit** known as "Caravane de la Formation" by the IVTB with the Trust Fund for Social Integration of Vulnerable Groups

- **IVTB training programme for re-skilling** of the ex-sand extractors, following Government decision to cease extraction of sand from the lagoon

- **Special training courses in IT:** for the unemployed HSC holders: A 300-hour "Information Technology -E-Business" course, 930 registered; Call Centre Operations course for school certificate holders; Diploma Course in IT ; a National Training Programme for the training of 5,000 SC and HSC holders over the next two years in skills related to call centres and BPO activities.

Hotel School of Mauritius

A New Framework For Training, Skills Development and Productivity

Progress is being built on the following key elements

- Institutional framework: Government, training bodies, employers and trade unions,

- Human development: Skills and competence, ranking and competition at an early age, continuous assessment, opportunities for repeats, 'remediation' and switches of stream to help late developers; .The emphasis will also shift from learning facts by note to learning to think, analyse, explore, and develop the originality and creative talents, and also the technical skills, and

- Legal framework: sound regulatory framework for the development of the training & employment sector, covering vocational training provision, financing by levy, skills assessment, accreditation.

Lessons Learned

The conclusion of most evaluations of training programmes for unemployed youth is that more needs to be done to make the impact of training more positive to raise incomes and job offers after training. New mechanisms are needed to overcome the risk of training programmes just increasing expectations without creating new jobs. The introduction of free voluntary secondary education in 1976 has now been made compulsory with a major development of new secondary schools and six form colleges. The IVTB was set up in 1989, to deliver training only in skill areas identified as being of national importance but where no provision was available. The intention was to encourage other providers to take over such training, but this has not happened and seems unlikely to happen in the future. The main stakeholders in training in Mauritius argue that there should be a separation of policy and training delivery, with more being left to market forces which can respond more effectively to the signals of changing demand. Fixing this is a major challenge. The market may not provide adequate data and may not rapidly adjust, sustain and co-ordinate the overall pattern of training activity.

During the past quarter of a century, government policies in many countries have moved away from rigid, restrictive education and training systems with limited access, clearly defined pathways and few cross linkages. Most developed economies are striving to adjust the structure, organization and content of education and training to the rapidly and constantly changing demands of the economy and society. As a result, they are moving away from state run centralized systems to new more fluid integrated systems to offer:

- increased variety and flexibility,

- postponed choices,

- multi-point entry and exchange,

- overall policy making and coordination, and

- A strategy to improve opportunities through formal partnerships and collaboration with delegated authority downwards and accountability upwards to achieve a highly adaptable, versatile and up-to-date labour force.

The way ahead will be charted by divesting activities from the State where better value

for money can be obtained by transferring them to the private sector. The public organisations that can be run along commercial lines will be given more autonomy and made to operate under sound business practices. The proceeds of any sales will then be available for much needed investment in economic and social restructuring - for example, in skills and Information Technology (IT) development and physical infrastructure such as better road links, environmental protection and safety.

Reform in training, will require teachers to adopt major changes in attitude and methods and entail major additional investment in the public and the private sector. There will be more scope for part-time and flexi time working, giving more opportunity for work to suit individual needs and preferences. For increasing numbers of people with jobs based on IT, there will be opportunities for telework, enabling them to work from their own homes, or local business premises on contract without the time, cost and environmental problems associated with daily journeys to and from centralized places of work.

But these fruits of a sharper focus on technology and higher productivity in a fully competitive economy have to be earned. It means learning faster and working smarter than our competitors. Economic integration within an ever-widening framework of regional associations, the offshore sector, the Freeport and the exploitation of our Exclusive Economic Zone will certainly provide increasing opportunities. Such opportunities are not, however, just there for the taking; we must develop the capacity to identify them in time and to implement projects and programmes successfully in the world market.

Mauritius has come a long way; but has far to go. Mauritius has already made an impact on the region far beyond its size - as a responsible world citizen and as an impressive example of rapid economic growth, effective environmental preservation, and steady social progress in a multicultural society, all in the context of free democratic institutions.

It will play a still more impressive role in the future through 'economic diplomacy', extending the scope of its economic growth through extra-territorial development projects, expansion of higher education, research and regional headquarters, increased entrepot activity through the Freeport and active participation in the various regional trade and economic groupings.

However, we cannot predict the future, at least not in detail or with certainty, but we can do much to shape it for the better, by thinking clearly and acting early - analysing longer-term developments, identifying future threats and opportunities, clarifying the kind of future we would like and can realistically hope to attain, and working out the means for helping bring it about.

The economic infrastructure will be upgraded. Greater efficiency in management will be secured through setting out clear, measurable objectives and monitoring their attainment, while greater efficiency in use will be achieved through the phased introduction of more realistic charging regimes. There will be investment to provide further expansions in major areas such as water supply, sewerage and waste disposal, electricity, telecommunications and air, sea and road transport. One thing's for sure: the future will be no mere extension of the past. We'll need quicker reflexes to survive in the changing times; more and better training is a good bet for that.

The way ahead

To be successful world competitors as a SIDS in a rapidly changing global economy, Mauritius, must go for world-class standards. Literacy and numeracy is not enough. A modern state depends on building up a top quality labour force, with results-based innovative managers, building up knowledge based businesses, with enterprising and well qualified workers with high skills, high motivation and pay that is linked to results. Such training delivered by the IVTB is funded by a levy on wage bills which gives sharp cutting edge to the design and delivery of the courses.

Reforms in the education and training sectors will promote greater resilience in the labour market. These include:

- Remedial training programmes for disadvantaged groups, including the poor, to improve skill levels and employability,
- New courses designed to improve the relevance, flexibility, accessibility and reach of the mainstream training system,
- Competency-based training, involving the recognition of knowledge and skills acquired through practical experience to improve access to further training of people who learned informally through practical work,
- Matching people's education, training and preferences to the jobs that are in fact available,
- Career guidance, both for students and for adult workers,
- New work experience programmes, and
- A computer-based labour market information system to enable employers and employees to match their needs on a comprehensive national basis.

15. Training, Skills Development and Productivity
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Structural change in labour market	• Incentives for retraining • Mechanisation • Specialisation • More employment of women • Fewer jobs for life	• Faster response to continued development
• Institutional development	• IVTB • SMIDO • NPCC • ISO • HRDC • MQA	• New more flexible contracts for trainers • Continuous professional education and updates • Further institutional development
• Public private partnership	• Work-experience programmes • Private sector financing of training courses	• Private sector training schools • Professional and technical schools
• Monitoring and evaluation	• Labour market information system • Continual assessment	• Results based management • Medium term expenditure framework

Reform of the State

The Challenges

People in Mauritius and in other SIDS want the State to do more and costs less. The State has to be resilient to the changing needs of the country. Greater economic interdependence, the opening up of economies and the growing importance of international relations, put pressure on the State to reform. It is moving. It is becoming more responsive to the needs of customers in the public and private sector, to the electorate, to the views of NGO's, to the opportunities of the global market, to international law and global commitments. It is seeing its role more as a facilitator of development, a stimulus to the private sector, a regulator to deal with market failure and a provider of governmental support and essential services. These innovations have come about as part of a long process of integrated change, responding to opportunities and pressures. They have not been part of a predetermined and evaluated master plan. But this does not deny their scale nor their significance as milestones in the reform of the state.

The challenge is how far this process of reform can sharpen the focus on sustainable development as more of the key sectors move away from direct control; and how far new instruments for promoting environmental priorities will achieve the aims of a greener and more sustainable development .

Progress Made

The shape of the State and its role in the country are being transformed. The services run by the State have become fewer, better, faster and more efficient.

The reform of the State in Mauritius has been in three parts:

- **Cutting the size and scope of State run activities,** by privatization, transferring operational services to leaner more managerially competent parastatal bodies, promoting more joint public-private sector initiatives, wider involvement of people in private sector partnership through businesses and the private property market

- **Reform within the State sector,** with a focus on results, cost-effectiveness, consumer satisfaction, speed and quality, less constrained by the unsuited inheritance of bureaucratic centralised government procedures

- **Transforming the interface between the State and the world beyond,** reducing the barriers to inward investment, with free movement of capital and labour, greater transparency and probity in cross border financial transactions and security against fraud and money laundering, the promotion of a virile offshore sector for trade and finance, and better regulation of the private sector and financial institutions

Box 16.1
Cutting the size of the state

The scope and content of state activities in Mauritius has been cut by two main mechanisms privatisation and transfer to parastatal bodies.

The principal new corporate bodies created in this process include

Privatised former state functions such as:

- Air Mauritius,
- Mauritius Telecom,
- Mauritius Post Office Ltd,
- MBC; broadcasting,
- Mauroil,
- CEB: electricity supplier, and
- Private 'bus companies.

Para-statal bodies carrying out former state functions and new functions for the state but not part of the civil service, such as:

- University of Mauritius,
- IVTB; providing vocational training,
- Waste management,
- Office cleaning,
- SMIDO: promoting small and medium sized business,
- National Transport Authority,
- Financial Services Authority,
- National Economic and Social Council,
- Mauritius Oceanography Institute,

In addition there have been developments in the private sector which provide services competing with the state services or alternatives in terms of their form of delivery or location, plus private services on contract to the state, the wider promotion of joint public-private sector initiatives and the greater participation of people in private property ownership, savings and capital investment. These changes include:

- Private medical services,
- Private schools,
- Private construction services,
- Private security companies,
- Consultancy and technical advisory services,
- ICT developments, and
- Expansion of private ownership of property and businesses.

Box 16.2

Reform within the State Sector

The principal objectives of the reforms, promoted through the Ministry of Civil Service Affairs and Administrative Reforms are:

- More effectiveness and efficiency,
- Faster and better quality services for the public,
- Better skills and aptitudes, and
- A better deal to attract and retain the best for the public services.

Mechanisms for achieving these objectives include:

- Total Quality Management Framework,
- ISO standards, and
- The Gemba Kaizen principles of better quality service at the workplace. Improvement of counter services,
- Citizens' Charters for a more customer-oriented approach,

The reforms are promoted through a Steering Committee chaired by a Private Sector representative. Reform ideas from home and abroad are reviewed by Task groups of senior officers, trade unions and the private sector. Activities are organized by the Ministry of Civil Service Affairs and Administrative Reforms in collaboration with the Mauritius Standards Bureau, the Mauritian Quality Institute and the National Productivity and Competitiveness Council.

Public and Private Sector Developments

The promotion of the reform of the civil service has gone hand in hand with developments in better management in the private sector. New ideas and institutions contributing to both public and private sector improvements have been a key part of this development process and are described below. The state is also playing a significant role in transforming its interface with the private at home and abroad. Progress has been made in opening doors to inward investment with new schemes of incentives. The role of corporate financial regulation has been enhanced with more ministerial leadership to achieve greater probity and transparency (See chapter 11).

ISO Standards

ISO standards have been adopted widely in the private sector. Now they are becoming a core element in the Public Sector. These principles aim at: strengthening the system and work processes in a consistent and standardized manner

- Reviewing re-engineering existing practices by streamlining the procedures and establishing performance standards,
- Promoting transparency,
- Enhancing team spirit, and
- Pursuing a quality culture in the organization.

Twelve organisations including one specialised hospital have so far been ISO certified and twelve other organisations covering a wide array of government functions and targeting different types of customers are implementing these principles.

A Ministerial Steering Committee promotes and monitors the projects and momentum is maintained with a Public Service Quality Association of those who have been ISO certified. The independent Mauritius Standards Bureau is the certification body to ensure that the systems put in place meet objective standards and make a real difference in the quality of services.

Gemba Kaizen Principles

The MCSA & AR, working with the National Productivity and Competitiveness Council (NPCC), are promoting improvement in performance at the workplace through the vehicle of the Gemba Kaizen approach imported from Japanese management practice. The aim of the approach is to motivate and support workers at the place of work itself, to identify, reduce and eliminating, those aspects of their work and the workplace which provide no added value to the services or products they produce (the waste or the mudas). The approach revolves around five core methods in which the workers directly participate with the stimulation of trained motivators:

- seiri (sorting),
- seiton (arranging),
- seiso (cleaning),
- seiketsu (maintaining), and
- shitsuke (self-discipline).

Some 900 public officers followed the sensitisation programmes and training workshop sessions on Gemba Kaizen principles, ranging from 3-5 days, covering 21 Ministries and Departments including three Regional Hospitals.

The results appear to have been remarkable, popular and immediate. They aim to produce:

- Less waiting time,
- Better counter services,
- Better patterns of work, and
- Better service to customers.

Longer term evaluation is needed to assess how far the impact produces sustainable results extending the methods of efficiency review beyond the pilot schemes to the culture of whole organisations.

Customer Friendly Services

A variety of initiatives have been implemented to improve customer satisfaction and to respond to the challenges of globalisation and the growing demand by knowledgeable customers for quality, timely and cost-effective public services. There have been a number of other influences on this process. Developments in the private sector in Mauritius have changed the pattern of doing business in banks, superstores, private clinics, private schools and places of leisure and entertainment. Images of life in private advertising have had their impact on values and aspirations. The standards adopted in the tourist industry, a major employer in the country, have also had their knock-on effect in forming a vision of what can be done.

These changes now affecting the public sector as well include:

- Better physical facilities for customer services,
- Training in customer care,
- New Counters for staff giving direct services to the public,
- Customers'/Citizens' Charters, setting out standards customers' rights and responsibilities, and
- Code of Ethics for Public Officers, with a training programme.

Performance Management

Performance Management is being promoted to improve management in the public sector. The system which is in its pilot stage is providing essential information for monitoring and evaluation. It is reinforced by a results-based budget system, and a Medium Term Expenditure Framework with a three year perspective. This gives emphasis to:

- programme planning,
- cost-effectiveness,
- bench marking,
- Performance indicators
- outputs, and
- productivity.

ICT Training Programme for Public Officers

E-Government Initiatives are being developed in all Ministries. to create a critical mass of staff to sustain the E-Government project. So far 5000 public officers have received training.

Training Needs Analysis

A Training Needs Assessment for the whole Civil Service. is being undertaken with technical assistance from India.

Personnel Management Manual

Personnel management is being strengthened in the public sector. Innovations include:
A comprehensive Personnel Management Manual to provide guidelines and procedures that ensure standardisation in the application of rules, regulations and conditions of service in the public sector. It aims to help personnel staff to increase the effectiveness of the service and avoid anomalies.

The Ministry has developed a system to computerise the personnel system for all officers of the civil service. The Centralised Personnel System (CPS) is an online interactive system designed to enhance human resource management. Implementation of this system will result in better monitoring of the work force, processing of letters and readily available reports such as staff lists.

A Computerised Attendance System (CAS), for the recording of attendance through the use of personal magnetic cards, an electronic time recorder equipped with a proximity card reader linked to a central computer. This is aimed at promoting a new work culture in the organisation characterised by more self-discipline, and a new attitude towards shouldering responsibilities.

Shifting from a procedure-based approach to establishment control and making the leap into more proactive management of human resources in the public sector, remains a major challenge ahead. The development of a management culture, performance related pay, merit awards, promotion on quality of achievement and potential rather than seniority, accelerated development of 'high flyers', graduate recruitment, recruitment from the private sector and from abroad, short term performance linked contracts and other managerial approaches to human resource development, widely adopted in more developed countries, have been under active discussion for some time, but are in their infancy in Mauritius,

Occupational Safety and Health

In 1999, an occupational Safety and Health Unit was set up in the public sector to ensure compliance with the provisions of the Occupational, Safety and Health and Welfare Act

- promote the safe and healthy work environment of public officers in the Civil Service,
- provides training to different target groups, and
- carry out site visits and investigations.

Major challenges for health at work are in reducing accidents and injury at work, including road accidents amongst professional drivers, and in promoting health in the face of the growing problem of non-communicable diseases in Mauritius, especially heart disease, diabetes, mental illness and the risk factors at work which contribute to these problems. Creating a healthier physical and psychological environment at work is becoming a criterion of the best employers; the public sector aims to be in the forefront of development.

Industrial Relations

The primary objective of the Industrial Relations Unit is the maintenance and promotion of good and harmonious industrial relations within the public sector with new understandings between management and staff representatives.

A consensual approach is adopted to find solutions to problems by way of effective communication, and dialogue through the processes of negotiations, consultations, mediation and conciliation.

Civil Service Library

A modern public sector library now widely used by civil servants has been set up to provide up-to-date materials for reference including books, periodicals, reports, audiovisual materials on latest trends in management around the world, internet and photocopying facilities.

Law Reform and the Public Sector

Radical reform of the public sector is inhibited by the existing laws based on the colonial system. Law reform is underway through the work of a high level Committee. whose task is to design to define the statutory basis for public sector reform.

Code on Corporate Governance for Mauritius

In line with the provisions of the Code on Corporate Governance for Mauritius, worked out at by the Committee on Corporate Governance work is being undertaken to promote the highest norms of corporate behaviour are complied with in state owned enterprises, to improve effectiveness, and probity and to protect the public interest

Mauritian Quality Institute (MQI)

The Mauritian Quality Institute is promoting a Total Quality Culture in the Public Service through a joint venture with government set up in 2002. .
Action includes:

- A Task Force on Quality Management,
- The Excellent Customer Service Award Scheme in the Public Service,
- Training for public officers in Customer Care, and
- Outstanding Achievement Public Officer Award.

NEPAD and Public Sector Reform

Mauritius is actively involved in reform initiatives being undertaken in the African region under the auspices of NEPAD especially in the context of the Stellenbosch Declaration. Mauritius participated attended the 4th Pan-African Conference of Ministers in 2003 whose objectives were:

- to develop a common understanding of the challenge of public sector reform in Africa,
- to define the long-term agenda, and
- to develop a reform programme.

Mauritius with Rwanda now represents the Eastern Region on the Committee of Ministers to provide leadership, guidance and oversight over the implementation of the programme on Governance and Public Administration adopted by Ministers who attended the conference.

CAFRAD

Through the African Training and Research Centre in Administration for Development (CAFRAD) established by African governments with the support of UNESCO, the following initiatives are underway:

- Charter for Public Service in Africa,
- Africa Day of the Civil Service and Administration, and
- 'e-Africa' initiative for good governance.

CAPAM

Mauritius is a member of the Commonwealth Association for Public Administration and Management (CAPAM). This organisation is dedicated to strengthening public management and consolidating democracy and good governance throughout the Commonwealth. In 2004 with CAPAM Mauritius organized an International Seminar on "Implementing a Public Sector Performance Management System" in Mauritius.

Commonwealth Secretariat

A Commonwealth Technical Adviser has been assisting Mauritius in the development of a road map for administrative reform strategies for the period 2001 – 2003.

The Way Ahead

Mauritius has been modernising the Public Sector, reducing its size through selected cases of privatisation, creating new corporate bodies for major operational services, and shifting the rest of the public sector into a new managerial gear for faster better quality services for the public. Much is being done to enhance the image of Mauritius abroad as t a secure and profitable business hub for the region.

Mauritius aims to attract the big players and for them to see the country as an efficient, lively business and financial centre of probity where it is good to wet up business. On the domestic front, the large utilities have more work ahead to develop a customer friendly style which reflects the growing consumer orientation of the people, looking for value for money and courteous and efficient customer relations. The private sector is showing a strong lead in this field. Progress has been made in state services. This is a start. The road ahead is long.

16. Reform of the State
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Cutting the size of the state sector	• Privatisation • Parastatal development • Joint public-private sector initiatives	• Further institutional development for state run operational services • Sharpening the management of parastatal bodies • Promoting wider participation in private investment
• Reforming the civil service	• Results based management • Quality and efficiency improvements • Promotion of customer friendly services	• Performance related contracts • Benchmarking and service related resource allocation • Evidence based service development
• Transforming the interface between the state and the outside world	• Opening the door to inward investment • Corporate financial regulation to promote probity and transparency • One stop shops for business starts	• Freer movement of capital and labour within the region • Consumer based regulation of utilities • Further streamlining of permits for business starts

RODRIGUES & OUTER ISLANDS 17

17. Rodrigues and the outer islands

The Challenges

Isolation is a common feature of SIDS, especially in the remoter separated parts of each island state. Separation and isolation can give rise to major challenges in resolving local concerns on governance, equality of opportunity, inequalities in social development, health, security and service provision. The Republic of Mauritius consists of three populated islands each with its specific challenges (See Box 17.1). There are also a number of uninhabited islands and islets.

Box 17.1

Rodrigues and the outer islands

Rodrigues

Size and Location: One island 104 sq km; 650 km NE from Mauritius island
Population: 36,000
Communications: daily scheduled passenger airline; weekly sea links; local radio and TV.
Principal challenges: Diversification from largely subsistence agriculture and fishing, through development of market gardening, eco-tourism and deep sea industrial fishing. Consolidation of newly decentralised government with local planning responsibilities. Undertaking major improvements in basic infrastructure and public services including water, sanitation, power, education, health, roads, air and sea ports, ICT.

The Cargados Carajos islands, called St. Brandon

Size and Location: Consists of 28 islets 450 km north north east of Mauritius, some of which are leased to a private fishing company
Population:
Communications
Principal challenges: Maintaining and developing fishing industry. Providing basic social amenities

Agalega islands

Size and Location: An atoll of two islands, 1,000 km north of Mauritius, linked at low tide by 1.3 km shallow bank. The islands cover 2,600 ha, with coral fringe reef
Population: 300, living in three villages
Communications: Sea links twice a year; emergency air link by NCG plane; Satellite TV in community centre
Principal challenges: Improvement in basic services (water sanitation, waste management, sea and air transport, power, education and welfare), to support new economic developments of tourism and deep sea fishing. Development of island community representation.

These remoter islands have 3% of the population of the country and cover 6% of the total land area.

Rodrigues island

Rodrigues

Rodrigues is exposed to extreme climatic conditions including frequent cyclones, droughts, and floods which cause damage to infrastructure and economic and social activity. Its vulnerability has rested on a series of factors including; isolation from the national centre of commerce and government, narrow economic base, (mainly subsistence agriculture and fishing, livestock breeding, handcrafts small scale local tourism); its fragile ecology; underdeveloped public services including water and sanitation, education, health; and a small traditional business sector with little technical development. These factors have been holding back progress and discouraging investment.

Key challenges are the diversification of the economy with developments in eco-tourism and industrial fishing and private business opportunities for overcoming the heavy dependence of Rodrigues on national support. Water, sanitation and soil conservation are major targets for environmental improvement.

Progress

Rodrigues

In 2002 a directly elected regional assembly was established in Rodrigues giving powers for local planning and management of the island's economy. A National Development Plan has been agreed for better land use, improvement in services, better communications and transport, the attraction of inward investment and the diversification of the economy.

The vision of the Regional Assembly is to build on the largely unspoilt natural resources

of the island making Rodrigues an ecological centre for the achievement of sustainable development. The programme of development already in hand includes:

- Protection of natural resources especially in the main valleys, the coastline and extensive lagoon,
- Reforestation, propagation of endemic species, establishment of nature reserves for arresting erosion,
- Improvement of waste management with separation at household level, collection of plastic bottles and metal and composting,
- Integrated coastal zone management, with marine protected areas for development of sustainable fishing and eco-tourism,
- Improvement in water management and water quality (Water is supplied through boreholes, with a new dam being constructed),
- Eradication of poverty and social integration of the most vulnerable segments of the population, and
- Improvement in human resources development through better education, health services and training (Rodrigues has, 13 primary schools, 5 secondary schools and places reserved on the main island for tertiary education). It has its own hospital and health centres providing primary care and specialist services and health promotion.

The Way Ahead

Rodrigues

The Executive Council of the Rodrigues Assembly is preparing a Strategy and Action Plan for sustainable development in Rodrigues. This will give greater coherence to policies and local programmes. The aim is to mobilise local people, attract inward investment, promote new jobs, reduce poverty, enhance living conditions, consolidate and protect the fragile ecology, building on the natural resources of the island for economic and social progress.

Major Projects Under Way in Rodrigues Include:

In Rodrigues, further strengthening of protection against natural disasters is envisaged including safer housing, beach protection, reinforcement of standards of infrastructure for roads, bridges, power and telephone networks. Improvements are also under review for safe refuges and organisation of rescue, recovery and response systems. Reinforcement of pubic health surveillance and security systems will be necessary as the island opens up to more direct international links by air and sea.

Eco-tourism has been identified as a key sector for the future. Plans include establishing international air routes to the island for inter-island, multi-centre and regional tourism and improving the sea port for passenger and freight traffic.

Box 17.2

Biodiversity in Rodrigues.

Rodrigues has 134 native species of which 37 are endemic and among which are three endemic animals (the Rodrigues fody, Rodrigues warbler and the Rodrigues fruit bat). There are also two reserves, one for upland forest at Grande Montagne and the other for coastal forest at Anse Quitor. These fragments of native forest are rich in biodiversity, although this is highly threatened by alien invasive plants which overwhelm them in their natural habitat, by exotic animals which prevent their regeneration and by development projects such as roads, hotels and the airport. The Café Marron which has medicinal properties is an example of a highly threatened native plant.

Conservation is carried out at several different areas, native reserves and coastal zones. Plants are propagated by NGOs and, Government run nurseries and manage a highly successful project funded by the EU using village nurseries and employing the villagers to grow the plants.

A dedicated community educator working with the NGO Mauritian Wildlife Foundation, visits the primary schools regularly, raising awareness in environmental issues and in the importance of conservation. Local communities on the island regularly help with restoration work and planting in the forest areas.

A recent project funded by the UNDP GEF SGP "Sustainable use of Rodriguan Endemic plants" established areas of plants used for medicinal and artisanal purposes to provide material for villagers for traditional practices. There has also been a study on the use of different types of Vacoas, an important plant used in the handicraft sector.

Endemic Fauna

Only three endemic animals remain – the Rodrigues fody, Rodrigues warbler and the Rodrigues fruit bat. All three were close to extinction in the 1970s when an afforestation policy was begun to protect watersheds. This provided habitat for the species and populations have now increased dramatically.

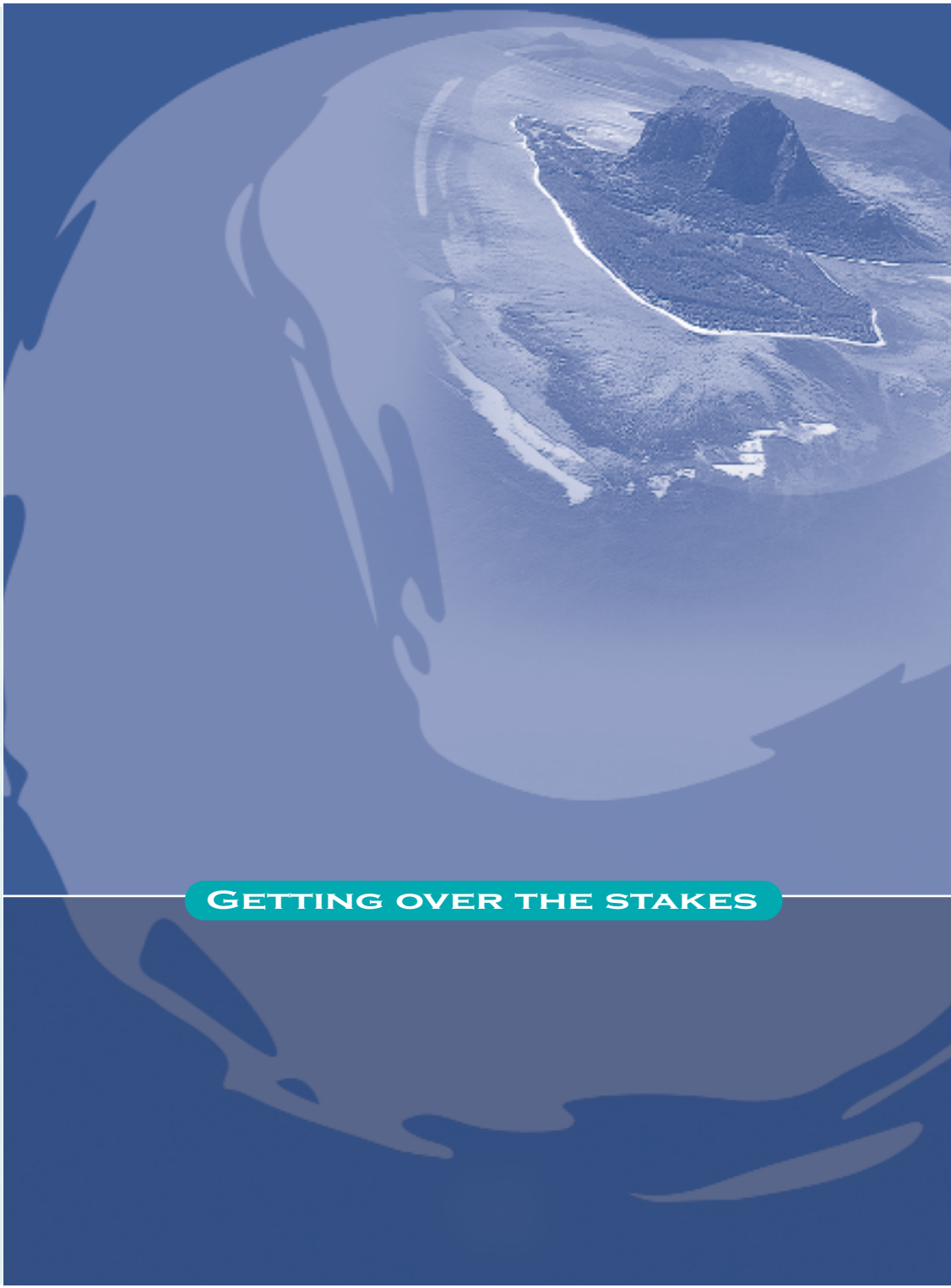
The Outer Islands

Inequality in services and of opportunity is a common feature of isolation and remoteness from the centre of political and social life in a country. The size and distance of the outer

islands, and their small populations present special challenges for delivering basic services and in promoting development. The very fragile nature of their ecologies makes them of special interest for research and for monitoring the impact of changes being planned, especially in Agalega.

17. Rodrigues and the Outer islands
A Policy and Programme Progress Sheet

Challenges addressed	Progress made	The way ahead
• Isolation	• Increase in air and sea links • Development of ICT and more open airwaves	• International air and sea links to Rodrigues; new air and sea links to Agalega.
• Depletion of natural resources	• Reforestation • Protected land and marine parks • Public education	• Implementing Vision of regional ecological centre in Rrodrigues and ecological protection in all islands
• Strengthening basic services and infrastructure	• Water and sanitation improvements in all islands • Safer waste management	• Extra water supply through further dams and by desalination • Better waste management in outer islands
• Security	• Public health surveillance increased to combat importation of infectious disease.	• Reinforcement of housing and infrastructure to withstand cyclones • Strengthening of physical and public health security with advent of more direct international air and sea links
• Business Investment	• Increase in tourist capacity • Increase in smes	• More international air and sea links for business and tourism • Development of market gardening • Extension of fishing into the EEZ • Promotion of ICT • Better support and training for smes development
• Coherent participative government	• Regional assembly with sectoral commissions in Rodrigues • Agalega Island Council	• Rodrigues Strategy and Action Plan 2005



GETTING OVER THE STAKES

GETTING OVER THE STAKES

THE CHALLENGES

60 years ago in Mauritius expectation of life at birth was just 33 years; today it is 73 years. Since 1985 income per head in Mauritius has tripled. Adult literacy stands at 84% and all children now have access to secondary schooling (See Chapter 14). One in four people in Mauritius have use of mainline telephones and have mobile phones; one in ten people can use the internet at home (See Chapter 13). Mauritius has come a long way: but it has further to go to reach the level of economic development of some SIDS (See Figure 18.1) and it has major challenges to tackle. For example:

- Air-pollution is increasing,
- HIV/AIDS though low is rising fast,
- Traffic congestion is getting worse and so is road safety, with more accidents each year and a rising rate of fatalities in the number of injured persons,
- Probity in society is under a new shadow of international concern: but appearance differs greatly from the reality (See Box 18.1), and
- The threat of extinction of species puts Mauritius in a world class: bronze medal position by IUCN for threatened plant species; gold medal position by ICBP for threatened bird species.

Progress

Since the Rio summit of 1992 progress with the commitments to Agenda 21 has been positive but at times halting. The pattern of development in each of the key areas is set out in the chapters themselves. It is summarised at the end of each chapter in the specific progress assessment tables. Below is an overview of the achievements in each of the areas of concern, classified in terms of certain key stages of the process of change. These stages of transition are reform of policy, of institutional structure, of planning, of law; of international partnerships, managerial, professional and technical reform, development of information and monitoring systems, and establishment of Research and Development capacity for each of the key areas (See Table 18.1)

Mauritius has become greener in its policies but there are pale green areas to be attended to and still patches of red where much more needs to be done to strengthen the implementation of the vision of sustainable development.

Mauritius has made substantial progress but the pattern is uneven. More has been achieved in policy development and planning than in implementation. In all the key areas for action, policies and the institutional framework for promoting reform, have been put in place. In a large majority of key areas strategies have been agreed and action plans set out. These are now being put within the new medium term financial framework for results based budgeting, which is being established in the public sector in Mauritius.

But Mauritius is less well advanced in other vital elements in the reform to achieve sustainable development. The 1991 environment Protection Act has been repealed and replaced in 2002 to incorporate new international principles relating to environmental governance such as openness, public participation, accountability, effectiveness and coherence. The Environment Appeal Tribunal acts as watchdog to safeguard those principles. The Government has also recognised that a high quality environment is essential for the sustainable development of the country and for the health and welfare of its people and this principle has been the driving force behind regulating standards for air, water, noise, solid waste, hazardous waste, effluent limitation and plastic bag. The Ministry is striving hard in establishing norms and policies to regulate and manage the environmental assets of Mauritius and make a fair balance between the concept of development and the concept of environmental protection. This is indeed a challenge for all Small islands Developing States. In many areas developing effective management and the new professional and technical support relevant to each specialised area has taken longer than anticipated. Establishing and sustaining specialisation is a common problem for SIDS.

Current information and monitoring systems need to be reformed and strengthened to provide the basis for evaluation of programmes and the identification of variation in responsiveness to intervention. Much needs to be done to bring these in line with the requirements of policies and strategic goals.

Few centres of expertise are available to provide the R & D input to establish and maintain a scientific evidence base and for promoting innovation and evaluating outcomes. More co-ordination of the different bodies involved in R & D is required to get the best results.

Box 18.1

Achieving greater transparency in public life

The Reality

The new broom of transparency.

The Independent Commission Against Corruption (ICAC) is steadily promoting a new transparency in high places.

The Financial Services Authority supervises the probity of the fast developing finance sector. The Central Tender Board awards contracts on value for money protecting the state from bribery from dubious suppliers, and the Public Service Commission appoints people in the public sector strictly on merit.

The perception of bad old ways may still linger, but the reality is that the culture and practices of the country are changing fast. Greater efficiency and effectiveness go hand in hand with greater probity in all aspects of life. The customs houses are being swept clean. The police are looking fitter for their task of enforcing the law.

Could Do Better

The key areas of the BPoA for priority attention in Mauritius in the years ahead are:

- **Energy resources;** with cleaner technology, more use of renewable sources; greater economy in use; more buildings designed for minimum energy use, more audit of energy use
- **Reform of the state;** with further decentralisation, more hiving off of state run operational services; reform of the civil service; more evident transparency
- **Transport and communications:** with reduced traffic congestion, more road safety, better transport and communications to Rodrigues and the outer islands
- **Training and skills development:** in the public and private sectors for managers and professional and technical experts involved in sustainable development and environmental protection
- **Freshwater management:** with sustained supply of safe water to all, to increase efficiency of supply and reduction of leaks, with better management of demand, including charging and recycling; and extension of the sewerage network.

Doing Well

Most progress in Mauritius has been made in the following key areas from the BPoA:

- Information and communication technology,
- Climate change and sea level rise,
- Natural and environmental disasters,
- Coastal and marine resources,
- Biodiversity,
- Tourism, and
- Trade and investment.

Millennium Development Goals (MDGs)

Under the UN system of MDGs many of the targets set for each country require further improvement on the level of achievement in 1990. As Mauritius was well developed in 1990, some of the targets in the MDGS are particularly tough to reach even by the deadline of 2015. The latest position (World Bank figures 2004) is set out below. It shows the many goals and specific targets that have been achieved in Mauritius or which are achievable; those towards which Mauritius is moving; and those few from which Mauritius is moving away. (Also see Fig 18.2)

Mauritius has thus achieved, can achieve or is moving towards achievement of most of the goals and the specific targets identified in the UN MDGs. The health targets on child and maternal health are very tough. The level set for Mauritius for example on the under five mortality rate, is the level achieved by high income OECD countries; and that for infant mortality is below that for OECD countries as a whole. These may not be achievable in Mauritius by 2015.

But Mauritius is moving away from the specific targets on HIV/AIDS and on certain environmental targets as a result of continued loss of forest area and the increasing levels of CO2 emissions, affecting air quality. These warrant greater attention in the way ahead.

SIDS Partnership

As part of the SIDS network Mauritius recognises the opportunities for achieving a steadier progress towards sustainable development through partnership on:

Protection Against the Economic and Social Impact of Globalisation

- Moderating the speed of transition in the global market,
- Advocating compensation for the loss of preference in trading agreements,
- Promoting proper representation of SIDS in WTO negotiations, and
- Evaluating the technical methods used and the results achieved by adopting a vulnerability index for guiding the process of participation in market liberalisation.

Protection from Global Environmental Threats

- Seeking support to overcome the global pressures from climate change and sea level rise whose impact on small islands can be less easily absorbed than on countries of greater size and with less coastline
- Protecting the rich biodiversity of the islands from further threats

Advocacy

- Strengthening the voice of SIDS through civil society and youth in building consensus and developing ideas for policy

Technical Exchange

Environmental Improvement

- Developing more environmentally friendly systems for waste management,
- Evolving more efficient water management systems,
- Protecting coral reefs, lagoons and beaches from erosion and ecological decline,
- Securing sustainable tourism within the carrying capacity of the economies and the environment,
- Exploiting alternative sources of energy, with an economic framework that takes account of environmental benefits and costs, and
- Protecting and enriching biodiversity.

Commercial and Business

- Promoting small and medium sized industries,
- Protecting fish stocks and implementing the law of the seas in the EEZs, and
- Promoting environmental businesses.

Improvement of Public Services and Quality of Life

- Collaborating in early warning systems, robust design of buildings and infrastructure better suited to the quality and the nature of the islands,
- Developing more cost-effective health services, and
- Securing sustainable mobility for work and leisure whilst protecting the fragile environment from the pressures of increasing the transport of goods.

Professional and Technical Skills

- Developing environmental accounting in the public and private sectors for appropriate evaluation of services and initiatives and economic incentives for promoting achievement,
- Developing more effective use of planning tools such as guidelines and EIAs for promoting environmentally friendly design of residential, public sector, commercial and industrial buildings and infrastructure and for enhancing the style and quality of the built environment in the context of the natural beauty of the islands, and
- Developing specialisation in all sectors.

Enhancing Resilience

SIDS are vulnerable to economic and environmental shocks. But they learn to respond and overcome these events by means of adaptation, involving measures of protection, precaution and those that build directly on the natural resource. Examples of how Mauritius has responded to aspects of its vulnerability, identified in the chapters, are summarised below (See Table 18.2)

Table 18.2

Enhancing resilience

No.	Vulnerability	Action taken to enhance resilience
1	Isolation	• Global links by frequent air and sea passenger and freight transport • Technical international networking for expert support • ICT development (Internet, mobiles, etc) • Liberalisation of airwaves
2	Small resources base	• Diversification of economy • Easy access for inward investment • Local production of wide range of consumer goods • Implanting new industries (e.g. Textiles, ICT, international conferencing) • Promotion of SME's
3	Climate change and sea level rise	• Support for international action on greenhouse gases emission • Coastline protection, adaptation and mitigation measures • Renewable energy programme (Solar, hydro., bagasse, wind-farms) • Cyclone warning and protection system • Agriculture adaptation to climate changes
4	Land	• Reducing use of hazardous chemicals • Decentralisation of industry and commerce • Strengthening villages and towns • Integrated planning system • Land development planning strategies • Reforestation

No.	Vulnerability	Action taken to enhance resilience
5	Coastal and marine	• Banning of sand mining in lagoon and islets • Technical support for deep sea fishing • CZM strategy • Oil spill contingency plan • Conservation measures for lagoon fishing • Effluent discharge control
6	Water	• Integrated water management plan • Reservoir, water and sewage treatment network • Water leaks control scheme • Water quality monitoring • Irrigation management and use of recycled water for hotel grounds and gardens
7	Biodiversity	• National land and marine parks • Threatened species conservation programmes • Reforestation
8	Visitors and tourists	• No charter flights; high quality standards • Limit set within national and local carrying capacity • Diversification of tourist product (Eco-tourism, resort and community planning) • EIAs for new schemes • Licensing and enforcement of environmental and public health standards
9	Security	• Anti-terrorist law and security system • Public health security controls (SARS, malaria, re-emerging epidemics) • Strict control on guns • Air-safety system and crash contingency plan • Sea port security system and emergency plan • National coast guard surveillance against illegal trafficking
10	Mobility	• National road improvement scheme • Subsidised public transport • High import tax on vehicles, reducing demand and indirectly road congestion

Mauritius presents this assessment on its progress in sustainable development and the stakes and challenges ahead as a means of promoting discussion and exchange of ideas. The stakes are high for all SIDS. It is hoped that this report can be useful as a frank assessment of problems and progress in one small island state in reaching out towards the vision of a greener future for the planet. The concept of a greener land is changing. The imprint of man is inescapable. Adapting to this imprint is the challenge. Mauritius cannot return to the time of the Dodo. But it has now in its polices and practices more respect for nature and its threatened species than hitherto.

The increasingly urban environment is becoming more a cultivated garden. The countryside has more protected space for people to see and enjoy the rich inherited biodiversity. There is more concern for protecting the pink pigeon than eating it.

The future of Mauritius is at stake. The past is gone, But the new vision sees the natural resources of the island as its greatest asset. With high speed communication technology, peaceful isolation is all the more to be treasured in a turbulent world..

Figure 18.1 SIDS and GDP per capita at purchasing Power Parity

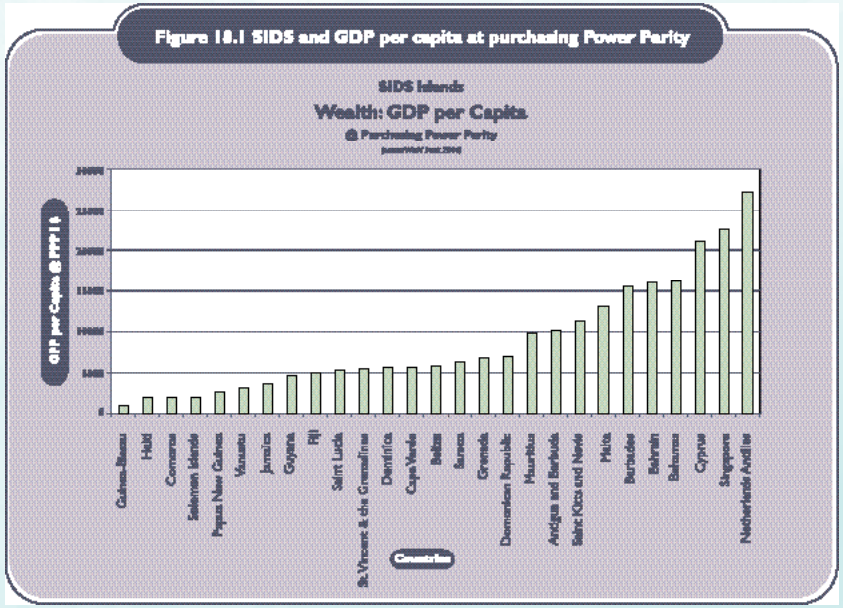


Table 18.1 Greening Mauritius

Issue.	Aspects of Reform and transition							
	Policy.	Institutions	Strategy and plans	Laws	International Partnership	Management, professional and technical development	Information and monitoring systems	R&D
1. Climate change and sea level rise								
2. Natural and environmental disaster								
3. Land resources								
4. Biodiversity resources								
5. Coastal and Marine resources								
6. Tourism								
7. Freshwater management								
8.Energy resources								
9. Management of wastes								
10. Health								
11. Trade and Investment								
12. Transport and communications								
13. Information and communication technologies								
14. Education								
15. Training and skills development								
16. Reform of the State								
17. Rodrigues & Outer Islands								

Well developed In hand To be strengthened

INDEX OF KEY DOCUMENTS

Index of key documents

Legislation

Computer Misuse and Cyber Crime Act, 2003
Copyright Act, 1997
Dangerous Chemicals Control Act, 2003
Data Protection Act, 2004
Electronic Transactions Act, 2000
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Mauritius Progress Towards

Millenium Development Goals