

# **DIGEST OF ENVIRONMENT STATISTICS – 2007**

## **Foreword**

This is the sixth issue of the Digest of Environment Statistics prepared by the Central Statistics Office.

It presents in a single report detailed available data concerning the environment. Many of the statistics presented have been gathered from various institutions and thus some of the data may already be available in other publications. The digest covers a wide range of environmental topics in a readily accessible form to provide a handy reference.

The data provided in this publication and covering the period 1998 to 2007, wherever possible, are the latest available. These may be subject to revision in later issues. All data, unless otherwise stated, refer to the Island of Mauritius.

It is hoped that these statistics will prove useful to the public in general, particularly to planners, decision makers and researchers.

The digest has been prepared with the collaboration of the Ministry of Environment and National Development Unit and several other organisations. The cooperation and assistance of all these organisations are gratefully acknowledged.

**H. Bundhoo**  
**Director of Statistics**

**Central Statistics Office**  
**Ministry of Finance and Economic Empowerment**  
**Port Louis**  
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Contact Persons:

**Mr A. Sookun, *Statistician***

**Ms. S. Jacmohun, *Senior Statistical Officer***

Statistics Unit

Ministry of Environment and National

Development Unit

Level 4, Ken Lee Tower

Line Barracks Street

Port Louis

Telephone: 210-6186

Fax: 210- 5751

Email: [cso\\_envi@mail.gov.mu](mailto:cso_envi@mail.gov.mu).

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## TECHNICAL NOTES

### Introduction

The statistics presented in this report are divided into six main chapters corresponding to the following components of the natural environment: Flora, Fauna, Atmosphere, Water, Land and Human Settlements.

### Concept and coverage

The following United Nations manuals have been used as a basis for the compilation of the data on environment statistics.

- A Framework for the Development of Environment Statistics, Statistical Papers, M78, United Nations.
- Concepts and Methods of Environment Statistics, Statistics of Natural Environment, Studies in Methods, F57, United Nations.
- Concepts and Methods of Environment Statistics, Human Settlements Statistics, Studies in Methods, F51, United Nations.
- Glossary of Environment Statistics, Studies in Methods, Series F, No. 67.

The digest covers data for the period 1998 to 2007, wherever possible. Environmental data are collected over different time periods, ranging from decades in some major censuses to monthly, daily, hourly or even continual monitoring. Hence, in some cases, annual data are not available due to the periodicity of censuses and surveys.

### Sources

The tables and figures have been compiled with the help of the following organisations:

- Ministry of Environment and National Development Unit
- The Forestry Service - Ministry of Agro Industry, local production and Security
- National Parks and Conservation Service - Ministry of Agro Industry, local production and Security
- Albion Fisheries Research Centre - Ministry of Agro Industry, local production and Security
- Agricultural Research and Extension Unit (AREU) - Ministry of Agro Industry, local production and Security
- The Meteorological Services
- Water Resources Unit - Ministry of Public Utilities.
- Central Water Authority
- Central Electricity Board

- Statistics Unit – Ministry of Health and Quality of Life.
- Ministry of Local Government.
- Waste Water Management Authority

Data in tables where sources are not indicated have been extracted from publications of the Central Statistics Office.

## Concepts and definitions

### Environment

Environment is the totality of all the external conditions affecting the life, development and survival of an organism.

### Flora

*Flora*: A general term for all forms of plant life characteristic of a region, period or special environment.

*Protected Area*: Legally established land or water area under either public or private ownership that is regulated and managed to achieve specific conservation objectives.

*Silviculture*: Management of forest land for timber, including

- (i) Weeding : Weeding is defined as the removal of unwanted plants, particularly at seedling stage.
- (ii) Staking : Straightening of young plants bent during cyclones, using guava sticks.
- (iii) Recruiting: Replacement of dead seedlings at the initial stage of growth.

*Wetland*: Area of low-lying land where the water table is at or near the surface most of the time. Wetlands include swamps, bogs, fens, marshes and estuaries.

### Fauna

*Fauna*: A general term for all forms of animal life characteristic of a region, period or special environment.

*Marine Park*: Permanent marine reservation for the conservation of species. It constitutes an extension, to the undersea world, of the concept of the terrestrial national park.

### Atmosphere

*Greenhouse gases (GHG)*: These gases occur naturally and result from human activities (production and consumption) that contribute directly or indirectly to global warming. Some main GHG are Carbon Dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O). Other gases such as Carbon monoxide (CO), oxides of Nitrogen (NO<sub>x</sub>), non methane volatile organic compounds (NMVOC) and Sulphur dioxide (SO<sub>2</sub>), contribute indirectly to global warming. GHG act much like a glass greenhouse, trapping heat in the lower levels of the atmosphere and reflecting the heat back to the earth's surface, causing it to heat up.

*Ozone depletion*: Destruction of ozone in the stratosphere, where it shields the earth from harmful ultraviolet radiation.

*Chlorofluorocarbons:* Inert, non-toxic and easily liquefied chemicals used in refrigeration, air-conditioning, packing and insulation or as solvents and aerosol propellants.

## **Water**

*Water balance:* The water balance is based on long term records of annual average rainfall and indicates how freshwater resources are distributed.

*Precipitation:* Rain falling from the atmosphere and deposited on land or water surfaces.

*Evapotranspiration:* Combined loss of water by evaporation from the soil or surface water and transpiration from plants and animals.

*Surface runoff:* The flow of surface water from rainfall, which flows directly to streams, rivers, lakes and sea. Runoff may cause soil erosion.

*Groundwater recharge:* Process by which water is added from outside to fresh water found beneath the earth surface.

*Ecosystem:* The interacting system of a biological community and its non living surroundings.

*Temperature:* This is a measurement of the intensity (not amount) of heat stored in a volume of water. It affects the solubility of many chemical compounds and can therefore influence the effect of pollutants on aquatic life.

*pH Value:* Measure of the acidity or alkalinity of a liquid. A pH value in the range of 0 to less than 7 indicates acidity, a pH value in the range of more than 7 to 14 indicates alkalinity, and a pH value of 7 signifies neutrality.

*Dissolved Oxygen (DO):* This is a measure of the amount of oxygen dissolved in water. DO is essential to the respiratory metabolism of most aquatic organisms. It affects the solubility and availability of nutrients.

*Conductivity:* This is the measurement of the ability of water to conduct an electric current. It can indicate saline intrusion or other sources of pollution.

*Total Dissolved Solids (TDS):* This is a measure of the amount of dissolved material in the water. High concentrations of TDS limit the suitability of water as a drinking source and irrigation supply.

*Turbidity:* This is a measurement of the suspended particulate matter in a water body, which interferes with the passage of a beam of light through the water. High levels of turbidity increase the total available surface area of solids in suspension upon which bacteria can grow. High turbidity reduces light penetration.

*Chemical Oxygen Demand (COD):* This is a measure of the oxygen required to oxidize all compounds in water. It represents the amount of organic matter in the media.

*Fluoride:* Fluoride may be present as the result of the natural decomposition of rocks.

*Chloride:* Chloride appears in the highest concentrations in natural fresh water systems. It is important in terms of metabolic processes. High Chloride levels can make freshwater unpalatable and unsuitable for various uses including agriculture.

*Sulphate:* Sulphate usually occurs in natural waters. High concentrations of sulphate can have a laxative effect on human beings.

*Nitrate:* This is a measure of the most oxidised and stable form of nitrogen in a water body. It is used by plants as a nutrient to stimulate growth. Excessive amount of nitrate can lead to eutrophication.

*Eutrophication:* This is the slow process during which a lake or estuary evolves into a bog or marsh and eventually disappears.

*Phosphate:* Phosphorus in the form of phosphate commonly occurs in all natural waters. It is a nutrient and is used by plants to stimulate growth. High concentrations of phosphate can cause eutrophication.

*Pesticide:* a product or substance used in the control of pests which may affect public health or attack resources of use to man.

*Waste water:* Used water typically discharged into the sewage system. It contains matter and bacteria in solution or suspension.

*Sedimentation:* Settling of matter to the bottom of a liquid or water body, notably a reservoir.

## **Land**

*Land use:* Land use refers to the main activity taking place on an area of land, for example, farming, forestry or housing.

*Built-up areas:* Built-up areas consist of land under houses, industrial zones, quarries or any other facilities, including their auxiliary spaces, deliberately installed so that human activities may be pursued.

*Nutrient:* A nutrient is a substance, element or compound necessary for the growth and development of plants.

*Solid waste:* These are useless, and sometimes hazardous, materials with low liquid content. Solid waste includes domestic garbage, industrial and commercial waste, sewage sludge, wastes resulting from agricultural and animal husbandry operations and other connected activities and demolition wastes.

*Landfill*: Final placement of waste in or on the land in a controlled or uncontrolled way according to different sanitary, environmental protection and other safety requirements.

*Environmental impact assessment (EIA)*: Analytical process that systematically examines the possible environmental consequences of the implementation of projects, programmes and policies.

*Preliminary environmental report (PER)*: This is a short form of EIA and this preliminary analysis is undertaken to identify the impacts associated with the proposed development and the means of mitigation

### **Human settlements**

*Human settlements*: Integrative concept that comprises (a) physical components of shelter and infrastructure and (b) services to which the physical elements provide support, that is, community services such as education, health, culture, welfare, recreation and nutrition.

*Gross Domestic Product (GDP)*: GDP is the aggregate money value of all goods and services produced within a country out of economic activity during a specified period, usually a year, before provision for the consumption of fixed capital.

*Primary energy requirement*: It is the sum of imported fuels and locally available fuels less re-exports of bunkers and aviation fuel to foreign aircraft after adjusting for stock changes.

*Energy intensity*: Energy intensity provides a measure of the efficiency with which energy is being used in production.

*Life expectancy at birth*: This is the average number of years that a new born child would be expected to live if subjected to the mortality conditions expressed by a particular set of age-specific death rates.

**ABBREVIATIONS AND SYMBOLS****Abbreviations**

Rs mn	Rupees million
Rs	Rupees
US\$	US dollar
LPG	Liquefied petroleum gas
%	Percentage
f.o.b	Free on board
c.i.f	Cost, insurance, freight
000	Thousand
n.e.s	Not elsewhere specified
Mm <sup>3</sup>	Million cubic metres
Gg	Gigagram (thousand tonne)
ktoe	Thousand tonne of oil equivalent
Toe	Tonne of oil equivalent
<sup>0</sup> C	Degrees celsius
mg/l	Milligram per litre
mS/cm	Millisiemens per centimetre
g/l	Gram per litre
NTU	Nephelometric Turbidity Unit
µg/m <sup>3</sup>	Microgram per cubic metres
ppb	Part per billion
ppm	Part per million
PM 10	Dust or Particulate Matter with a diameter less than 10 micrometer
TSP	Total suspended particles
EIA	Environmental impact assessment
PER	Preliminary environmental report
IUCN	International Union for the conservation of nature

**Symbols**

-	Nil or negligible
...	Not available

**Conversion factor** : 1 Square kilometre = 100 hectares

## **Environment Statistics, 2007 – An Overview**

### **1. Flora**

#### ***1.1 Forestry***

Preservation of forests is vital for the protection of the ecosystem. Table 1.1 shows the forest area by category of ownership for the Island of Mauritius. In 2007, total forest area was 47,176 hectares, of which 22,176 (47%) were state-owned and the remaining 25,000 hectares (53%) were privately-owned.

Out of the state-owned forest area, about 11,878 hectares (53%) were planted areas while the National Park and the nature reserves accounted for another 6,575 (30%) and 800 (4%) hectares respectively. Forest area under the category “Pas Geometriques” represented about 631 hectares or 3%.

Most of the privately-owned forest lands included scrubs and grazing land and they were estimated at around 18,500 hectares all over the island. Total reserves of the privately-owned lands accounted for 6,550 hectares.

#### ***1.2 Land Protected Areas***

The land protected areas as shown in Table 1.6 totalled to 14,854 hectares. The Black River Gorges National Park represented 6,574 hectares (45%), followed by the mountain reserves, 3,800 hectares (26%) and river reserves which are all privately-owned, 2,740 hectares (19%). The nature reserves constituting of the islets accounted for nearly 621 hectares (4%).

### **2. Fauna**

#### ***2.1 Livestock***

Cattle, goat, sheep and pig represented the major livestock in the country. As at June 2007, goats dominated the livestock population with an estimated population of 24,411 heads (50%), followed by pigs, 17,223 (35%), cattle, 6,540 (13%) and sheep, 1,101 (2%) (Table 2.1).

#### ***2.2 Agro-industrial production***

In 2007, production of beef was the leading contributor to the total livestock production (76%). The remaining livestock production comprised pork (21%), goat meat and mutton (3%). Poultry accounted for some 40,000 tonnes and milk production amounted to around 3.5 million litres (Table 2.3).

### **2.3 *Fish catch and production***

Table 2.4 shows a steady decline in fish production from 9,786 tonnes in 1998 to 5,983 tonnes in 2007. Compared to 2006, a decrease of 33% was noted in the fish production for the year 2007.

In 2007, fish production through coastal (artisanal) fishery amounted to 640 tonnes. Basket trap accounted for 39% of the total catch, followed by line (27%) and large net (21%) (Table 2.5).

In 2007, the mean catch per day per fisherman (coastal) was 4.4 kilogram (Table 2.8).

### **2.4 *Marine Protected Areas (MPA)***

The 7,216 hectares of marine protected areas consist of marine parks, fishing reserves and wetland. In 2007, the area occupied by the fishing reserves was about 6,350 hectares (88.0%), followed by the marine parks, 838 hectares (11.6%) and wetland, 26 hectares (0.4%). (Table 2.17).

## **3. *Atmosphere***

### **3.1 *Air quality***

The Ministry of Environment and National Development Unit has both stationary and mobile air quality monitoring stations that are operational since 2001.

The main pollutants under investigation are Dust (PM 10), Ozone, Sulphur Dioxide, Nitrogen Dioxide, Carbon Monoxide, Total Suspended Particles and Lead.

The results for all the pollutants under study at the four monitoring stations showed that the levels of ambient pollutants for the 24 hour averages were well below the norms (Standards for air quality). This implies that the overall quality of the ambient air in the monitoring areas is at a good and permissible level (Table 3.5).

### **3.2 *Greenhouse gas (GHG)***

Mauritius as a party to the United Nations Framework Convention on Climate Change (UNFCCC) is updating periodically the inventory of anthropogenic emissions and removals of greenhouse gases using IPCC (Intergovernmental Panel on Climate Change) guidelines. GHG are gases occurring naturally and resulting from human activities which act much like a glass greenhouse, trapping heat in the lower levels of the atmosphere and reflecting the heat back to the earth's surface, causing it to heat up.

### **3.2.1 Total GHG emissions and removals**

Table 3.6 shows the total emissions and removals of greenhouse gases of which carbon dioxide (CO<sub>2</sub>) constituted 96%. The data indicate a rise in net CO<sub>2</sub> emissions from 3,156 thousand tonnes in 2006 to 3,226 thousand tonnes in 2007. Net emissions take into account the removal of CO<sub>2</sub> by forests which act as 'sinks'.

### **3.2.2 Greenhouse gas inventory**

The national inventory of greenhouse gas emissions by source categories for the years 2006 and 2007 is given in Table 3.8. Carbon dioxide with an emission of 3,349 thousand tonnes in 2007 was the major greenhouse gas injected in the atmosphere. Most of this gas was produced as a result of fuel combustion activities such as electricity production, transport and manufacturing processes.

#### **3.2.2.1 Carbon dioxide emissions from fuel combustion activities.**

Carbon dioxide emission resulting from fuel combustion went up from 3,347 thousand tonnes in 2006 to 3,448 thousand tonnes in 2007 (+3%), driven mostly by a 8% increase of CO<sub>2</sub> emissions from the energy industries.

The energy industries remain the principal source of CO<sub>2</sub> emission in the atmosphere. They contributed around 60% of the emissions, with 2,068 thousand tonnes in 2007. They were followed by the transport sector which contributed 23% of the total emissions and the manufacturing industries with 12%.

#### **3.2.2.2 Non-CO<sub>2</sub> emissions**

Non-CO<sub>2</sub> emissions were minimal and in 2007 they were distributed in thousand tonnes as follows: carbon monoxide 65.4, sulphur dioxide 35.1, non-methane volatile organic compounds (NMVOC) 17.1, oxide of nitrogen 16.6, methane 12.6 and nitrous oxide 1.3.

### **3.3 Ozone-depleting substances**

The consumption of ozone-depleting substances increased by 13% from 139 metric tonnes in 2006 to 157 metric tonnes in 2007. Around 99% of the ozone-depleting substances constituted of the hydro-chlorofluorocarbons (HCFC's).

## **4. Water**

Freshwater resources are of vital environmental and biological importance, since water is a basic support element for human life and ecosystems.

#### **4.1 Water balance**

The water balance is based on long term records of annual average rainfall and indicates how fresh water resources are distributed.

In 2007, the island of Mauritius received 3,644 million cubic metres (Mm<sup>3</sup>) of precipitation (rainfall). This was 2.0% higher than in 2006 when 3,571 Mm<sup>3</sup> were obtained. Surface runoff accounted for 60% of the water balance, while evapotranspiration and ground water recharge accounted for 30% and 10% respectively (Table 4.3).

#### **4.2 Water utilisation**

In 2007 the total water demand was estimated at 884 Mm<sup>3</sup>. The agricultural sector accounted for most of the water utilised with 423 Mm<sup>3</sup> or 48%. Utilisation for the other purposes was as follows: hydropower 254 Mm<sup>3</sup> or 29%, domestic, industrial and tourism 201 Mm<sup>3</sup> or 23% (Table 4.4).

Around 82 % of the total fresh water abstracted came from surface water (reservoirs, rivers and streams) and the remaining 18 % from groundwater (Table 4.5).

#### **4.3 Water consumption**

The domestic consumption of water went down from 167 to 162 litres per person per day from 2006 to 2007 (Table 4.11). Consumption was at its lowest in 1999 at 149 litres per person per day, due to the severe drought prevailing during that year.

### **5. Land**

#### **5.1 Land use**

Urbanisation and the development of industries and infrastructure have led to a loss of agricultural land.

Table 5.1 shows data on land use for 1995 and 2005. During that period, the proportion of land under sugarcane decreased by 6%, tea plantations declined by 82% and forestry by 17%. Land used for other agricultural activities increased by 33% while built up areas expanded by 28%.

Between 1995 and 2005, the proportion of land under agriculture dropped from 48.2% to 46.4%, and that of forestry from 35.1% to 30.6% whilst built-up areas increased from 13.4% to 19.5% (Table 5.1 and figure 16).

The effective area under sugarcane has gradually shrunk to 68,523 hectares in 2007 from 70,801 hectares in 2006 (-3.2%). During the same period area under tea

plantation increased from 688 hectares to 709 hectares (3.0%) and area under tobacco rose to 258 hectares from 252 hectares (2.4%) (Table 5.2).

## **5.2 Fertiliser and other inputs**

Intensive use of chemical based fertilisers and other agro-chemicals may contribute to the pollution of the environment through the leaching of nitrate to ground water.

The total quantity of fertilisers imported is shown in Table 5.6. The imports of fertilisers for the year 2007 were 45,336 tonnes, a decrease of around 18% over the 2006 figure of 55,313 tonnes.

## **5.3 Waste disposal**

Increasing waste generation and consequently its disposal pose a major environmental problem. Waste collected are either sent directly to the Mare Chicose Sanitary Landfill, which started operating by the end of 1997, or go through the process of compaction at the four transfer stations (St Martin, Roche Bois, Poudre D'Or and La Brasserie) before their transportation to the landfill site.

Solid waste has been tracked mainly as domestic, construction and others. In 2006, with the outbreak of the *Chikungunia* disease, some 110 clean-up campaigns were carried out throughout the country which caused the amount of wastes to rise up.

In 2007, the total amount of solid waste landfilled at Mare Chicose stabilised to 388,367 tonnes from 407,040 tonnes in 2006 (Table 5.10).

## **5.4 Environmental Impacts Assessment (EIA) and Preliminary Environmental Report (PER) Licences**

The Ministry of Environment and National Development Unit grants EIA licences to meet environmental requirements. Those undertakings that require such a licence are listed in the First Schedule of the new Environment Protection Act, 2002.

In 2007, 56 EIA licences were granted of which 33% each were issued to industrial development and poultry rearing and related works and 23% were provided to housing (Housing projects like bungalows, flats etc), (Tab 5.12) .

During the same period, 96 PER licences were granted, out of which 29% were for industrial development projects.

## **6. Human settlement**

### **6.1 *The economy***

Table 6.1 shows some main environment indicators over the ten year period, 1998 - 2007. Table 6.2 provides some key socio-economic indicators showing the structural changes that have occurred during the same period.

Gross Domestic Product (GDP), which measures the total value of production, increased in nominal terms by about 107%, from Rs 100,042 million in 1998 to Rs 206,981 million in 2007. The share of agriculture in GDP fell from 9.3% in 1998 to 4.7% in 2007; that of manufacturing decreased from 24.0% to 19.8%, while that of financial and business services increased from 16.1% to 21.4%.

During the same period, population of the Republic of Mauritius increased by 8.6% from 1,160,421 to 1,260,403 and population density from 572 to 620 per km<sup>2</sup>.

### **6.2 *Energy***

While being an essential ingredient for the economic development and for the well being of the population, energy-related activities are also a source of major concern for the environment. They are by far the most important contributors of air pollutants, through the emission of carbon dioxide and other greenhouse gases.

#### **6.2.1 *Primary energy requirement***

The total primary energy requirement of the country increased by 0.4%, from 1,374 ktoe in 2006, to 1,379 ktoe in 2007. Around 82% of the total primary energy requirement was met by imported fuels (oil, LPG and coal) and the remaining 18%, obtained from local sources (bagasse and hydro). Details on the primary energy requirement by energy source are shown in Table 6.14.

#### **6.2.2 *Inputs for electricity production***

Different types of fuel are used for electricity production. Coal remained the most important input and its share rose from 42% in 2006 to 48% in 2007. On the other hand, the contribution of fuel oil fell from 31% to 26% and that of kerosene from 0.3% to 0.2% (Table 6.16).

#### **6.2.3 *Final energy consumption***

In 2007, final energy consumption reached around 853 ktoe, a decrease of 2.4% over the figure of 874 ktoe in 2006. Changes in the different sectors were as follows: “Commercial and Distributive Trade” (+6.0%), “Transport” (-3.8%),

“Household” (+0.2%), “Manufacturing” (-3.3%) and the agricultural sector (+2.1%) (Table 6.18).

The largest consumers were the transport and manufacturing sectors, which accounted for 48% and 31% of the total energy consumption respectively (Table 6.19).

#### **6.2.4 Transport**

Industrialisation, continuous economic growth and higher standard of living have led to a rapid increase in transport services over the recent years. A number of environmental problems are associated with transport, especially emission of carbon dioxide and other pollutants such as nitrogen oxide, volatile organic compounds, sulphur dioxide and particulate.

In 2007, petroleum products used for transportation were as follows; 151,780 tonnes of diesel oil, 98,940 tonnes of gasoline, 6,633 tonnes of liquefied petroleum gas (LPG) and 138,104 tonnes of aviation fuel (Table 6.17).

#### **6.3 Stock of registered motor vehicles**

In 2007, the fleet of motor vehicles reached 334,145, up by 4.6% over the year 2006 (Table 6.20).

#### **6.4 Complaints**

The number of complaints by category received by the Pollution Prevention and Control Division at the Ministry of Environment and National Development Unit for the years 1998 to 2007 is shown in Table 6.33. The number of complaints decrease from 813 in 2006 to 568 in 2007. The major causes for complaints were noise (24%) and solid waste and odour (15% each).

#### **6.5 Contraventions**

In 2007, the Police de L'Environnement issued 8,432 contraventions of which illegal littering accounted for 96% (8,119).

During the same period, 3,796 notices were issued to drivers of vehicles emitting black smoke (Table 6.34).