

FRESHWATER COUNTRY PROFILE MAURITIUS

Decision-Making

Programmes and Projects

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Status

Capacity-Building, Education, Training and Awareness-Raising

Information

Research and Technologies

Financing

Decision-Making: The Ministry of Public Utilities is the parent body for the management of water resources. This power has been delegated to the Water Resources Unit, which is responsible for the assessment, management, development and conservation of water resources. There are three subsidiary bodies for managing the available water: the Central Water Authority, responsible for potable water distribution, the Irrigation Authority, responsible for irrigation purposes and the Waste Water Management Authority (WMA), responsible for managing wastewater.

The following legislations regulate the water sector:

- Rivers and Canal Act (1863) provides for management of rivers and canal as well as for protection of river water against pollution.
- CWA Act (1971) provides for the creation of the authority and its duties and powers regarding supply of potable water for different purposes and water resources development, management and conservation.
- Groundwater Act (1970) provides for management of the aquifers.
- Environment Protection Act (2002) provides for protection of water resources (standards for water).

The Forestry Service is responsible for the management of all state-owned land, within the framework of the National Forest Policy. One of the objectives of forest management is water conservation. The private sector, NGOs and youth movements are also involved in water conservation activities

Drought conditions are monitored by the Ministry of Agriculture, Food Technology and Natural Resources, the Ministry of Public Utilities (Central Water Authority) and the Ministry of Environment and National Development Unit. Guidance is provided by the Meteorological Services.

Programs and projects:

A. Integrated Water Resources Development and Management: A number of projects have been implemented by the Water Resources Unit since 1993 to assess the fresh water resources more accurately and to harness optimum amount of water resources. The Water Resources Unit has 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. These comprise development of ground water, construction of run-of-river diversion schemes and a number of storage dams. As a first step, the construction of Midlands dam had started in January 2000 with a capacity of 25.5 mm³ and has been completed in December 2002.

On the other hand, the Central Water Authority has since 1994 been replacing old and obsolete potable water infrastructure, mobilising additional resources, increasing treatment capacity, upgrading and extending the potable water distribution network and enhancing the potable water distribution network and enhancing drinkable water quality.

Concerning the development of surface water for potable and irrigation use up to the year 2040, the following storage dams have been identified. MAV stands for Mare aux Vacoas.

Storage Dams	Proposed Implementation Date	Regions to be served
Bagatelle Dam	2010	Lower MAV & Port Louis
Chamarel Dam	2015	South District Water Supply System
Calebasses Dam	2020	North District Water Supply System
Mon Vallon Dam	2020	Lower MAV & Port Louis

With a view to increasing development of groundwater potentials, extensive hydrological studies have been conducted over the island, and each year about five new boreholes are drilled and commissioned to mitigate problems in water stressed areas. At the same time, it is ensured that the guidelines set for the development within the vicinity of boerholes are strictly adhered to so as to harness groundwater in a sustainable manner.

B. Water Resources Assessment: Constant monitoring of levels of all water resource systems. Regular testing and sampling of both surface and groundwater are undertaken to safeguard against pollution of these resources. Measures to enhance water quality have been implemented. Two fully equipped and sophisticated laboratories have been set up. One deals with the monitoring of the quality of treated water supplied to ensure compliance with the guidelines set by the WHO for potable water. As there are no major outbreaks of water-borne diseases, nor any increase in reported cases of such diseases, it can be inferred that potable water supplied is safe. The second laboratory monitors the quality of raw water resources and also the quality of trade effluents discharged into aquifers and watercourses. A map of the zones of the country has been established and polluting industries identified.

C. Protection of Water Resources, Water Quality and Aquatic Ecosystems: The Rivulet Terre Rouge Estuary Bird Sanctuary (RTREBS) was declared as a Nature Reserve on 27 August 1999 by the Government of Mauritius and was designated as a Ramsar Site in 2001. Around 1000-1200 migratory birds representing 11 regular species and 4-5 vagrant species visit RTREBS each year.

D. Drinking-Water Supply and Sanitation: The Central Water Authority (CWA) a parastatal body operating under the aegis of the Ministry of Public Utilities, is responsible for the mobilization, treatment and distribution of potable water for mainland Mauritius.

The main source of water supply comes from ground water (54%) – abstracted through 112 boreholes. The balance (46%) is derived from surface sources – impounding reservoirs and river intakes.

Because of its excellent quality, ground water is only 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 m³/day.

Service delivery is effected through 3,500 km of distribution network. 105 service reservoirs with storage capacity of 238,000 m³ sustain supply.

CWA, through its Scientific Services Department ensures that the quality of drinkable water supplied conforms to the World Health Organization (WHO) standard specifications for drinking water. An average of 1,500 samples of raw and treated water are collected monthly for analysis.

Service Levels: The piped potable water distribution network has over the years, been extended to cover the whole island. All the population of Mauritius now have access to piped potable water. According to the 2000 Housing and Population Census survey (CSO), 99.6 % of the population have access to piped potable water within their premises, with 85 % having piped water inside their houses. The balance of the households relied either on Public Fountains or CWA water tanker service for their potable water needs. Potable water supply to these households (who cannot afford to subscribe to individual house connections) can only be found within the framework of government programme of support for vulnerable groups, as most of them are squatters on statelands.

Treated water supplied by CWA averaged 185,000 m³/day by 1991. It rose to 222,263 m³ /day by 1995 and is presently of the order of 500,000 m³ /day.

Abundant and low priced potable water between 1993 – 2000 (at 0.4 cts/litre), presently 0.9 cts ,helped in sustaining economic development of the country, rapid urbanization and maintain health, growth and productivity.

Per capita consumption for domestic usage, which averaged 130 lhd in 1991 now stands at 170 lhd, with an equivalent non domestic consumption increasing from an average of 2 lhd in 1991 to 44 lhd presently.

Sales to domestic subscribers which accounted for 81 % of total sales in 1991 has increased to 83 % by end of 2003.

Unaccounted for water averages 50% of throughput. Of this percentage, the physical loss rate is 65 % and the commercial loss rate 35 %.

CWA has embarked on an ambitious project for the reduction of non-revenue water to 25 % by end of 2008. Projects have been identified and an implementation programme established. This frontal attack on non-revenue water is estimated to cost Rs1.04 billion. The European Investment Bank has made available a loan equivalent to 50% of the project value, the balance being met by CWA.

The number of subscribers which was of the order of 163,685 at end June 1991 has increased to 266,458 by end December 2003, i.e. an increase of 62.8 % over a twelve year period. Domestic accounts rose from 158,174 in 1991 to 250,295, i.e. an increase of 58.3 % over the 12-year period. Non domestic accounts increased from 11,852 in 1991 to 16,163 in 2003, i.e. an increase of 36.4 %.

During normal season 90.7% of the population benefit from 18 – 24 hours supply service. 9.1% have supply between 9 to 17 hours per day and 0.2 % less than 9 hours per day. Areas suffering from poor supply and the causes have been identified. Most of the localities are situated on unfavourable topography.

During the ten past years tariffs has been revised three times. Tariff increases were made in August 1992, February 2000 and August 2002. An average increase ranging from 12.5 to 25 % was allowed. Water tariff is currently structured into 18 categories. Each subscriber is provided with a meter. Meters are read monthly and consumption charged accordingly.

E. Water and Sustainable Urban Development: To promote sustainable use of water, existing water resources infrastructure such as dams, dykes and canals have been rehabilitated. In this context, a safety analysis of seven storage dams was carried out in 1997. Based on the results of these studies, these dams are being rehabilitated to enhance their safety and life and minimise seepage losses. Mare aux Vacoas, the largest existing storage dam, has been fully rehabilitated in the year 2000, and the rehabilitation of Municipal Dyke which supplies water to the capital was completed in April 2002. The rehabilitation of other storage dams is being done in phases starting in 1999 and expected to be completed in 2007/2008. One main feeder canal has been rehabilitated in November 2002, and four other canals will be rehabilitated over the next four to five years.

The planned investments of CWA, as stipulated in its 2004 –2008 Corporate Plan aims at sustaining improvements in the level of service and reduction of non revenue water to 25 %. These will be done through renewal of distribution network, renewal of non working domestic meters, implementing actions for leakage reduction.

The total Capital Investment for the period 2004 – 2008 is of the order of Rs. 2.032 billion.

Major projects for implementation are:

1. Master Plan Study 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.
2. Telemetry and Tele-control Project: 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.
3. Reduction of Non Revenue Water Project: All the factors contributing to non revenue water have been identified. Thus specific micro projects have been formulated and will be

implemented during the Corporate Plan period. The project is estimated at Rs. 1.04 billion. Some of the micro projects, proposed for implementation are briefly described herewith :-

- (a) Renewal of 160,000 cold water meters: The objective is to renew all meters that have been in continuous service for more than ten years. It is the accepted norm that after a certain period, the meters start under recording. This has a negative impact on revenues and network efficiency.
- (b) Rerouting of pipelines prone to pilferage and elimination of clandestine tapings: 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:

- Re-route 15 km of pipelines prone to pilferage
- Setting up of a Policing Unit to track down all illegal water users
- Equip big consumers with heavy duty meter chambers embedded in concrete

- (c) Renewal of Trunk, Service and Distribution mains and phasing out of AC pipelines : out of 3,500 km of pipelines, some 13 % are above 30 years. It is proposed to assess their conditions for replacement. Most of the AC pipelines have been laid during 1983 and averages 20 years of service. The most economic life of these pipelines are set at 30 years. CWA is contemplating phasing out of this material.
- (d) Identification and repairs of invisible leaks : Identification and repairs to leaks is a continuous exercise and needs to be sustained if efficiency gains from leak detection are to be maintained. It is proposed to purchase leaks detection equipment and associated accessories to support the programme. CWA also intends to enlist the support of Specialist Project Management Team remunerated on performance basis to take over the project.

Besides the RUFW Project, CWA will implement projects for the :

- (a) Rationalization, upgrading and extension of the water distribution system in the East. The objective is to support major upcoming development projects in the housing, hotel and industrial sectors. The project estimated at Rs. 245 (M) is being implemented in two phases. The project is being partly financed by the government, CWA and the consortium of promoters.
- (b) Elimination of Blackspot Areas: Prior to 1995, the distribution of blackspot areas was those localities, which received less than four hours supply daily. Some 110 such localities, classified as blackspot areas, had their supplies improved through a Marshall Plan – within the 1990 – 1995 Corporate Plan. The definition of blackspot areas has now been widened to include poor pressure since 97 % of the population has levels of service ranging from 18 – 24 hrs daily.

With the availability of additional resources through the new La Nicoliere Treatment Plant, expansion of treatment capacity at Piton du Milieu and the construction of La Marie New Treatment Plant, CWA is now in a position to upgrade levels of service throughout the island.

Projects and programmes have been identified. Within this same project there is a component for the bulk transfer of treated water from La Nicoliere new Treatment Plant to Priest Peak reservoir in Port Louis via Calebasses reservoir to service Port Louis city during dry season.

CWA has a corporate commitment to continuously improve the performance of activities relating to drinking water quality, as it is a question of Public Health. Systematic water quality monitoring is conducted through analysis for a wide range of chemical, physical and

micro biological parameters to ensure compliance with standards set by WHO and the Ministry of Environment and National Development Unit.

F. Water for Sustainable Food Production and Rural Development: A Resource Management Division is responsible for research and development programme at Agricultural Research and Extension Unit (AREU) with the aim of developing management practices that will ensure optimal utilization of resources for agricultural production. The main objective of AREU is to serve the farming community of the non-sugar sector through excellence in cost-effective high quality research and extension. Major thrust areas include: optimal land and water use, organic waste recycling, organic agriculture, integrated pest management and integrated plant nutrient management systems. See also under Sanitation Profile.

In 2002, the area under irrigation for miller-planters (sugar cane plantation) was 14,079 ha. Land under irrigation as at December 2001 was:

Type of irrigation	Land utilized (ha)
Overhead irrigation	17,119
Surface irrigation	2,723
Drip irrigation	1,789

G. Impacts of Climate Change on Water Resources: An important irrigation project has started in the North part of the country, where drought is prevalent. This project is a part of National project to ease distribution of water in the Northern sector of Mauritius. It is called the “Midland Dam Project”. It is financed by foreign capital. Efficient irrigation methods (using less water) such as drip irrigation are being used.

Status: The fresh water supply of Mauritius consists of 92 rivers, 11 man-made lakes, 2 natural lakes, and ground water distributed into seven ground water basins. The mean annual rainfall varies from 750 millimeters on the coast to 4200 millimeters on the Central Plateau. Surface water is diverted into 25 major basins and 21 minor ones and is utilized for domestic and industrial purposes and to service the heavy irrigation needs of the sugar cane plantations. A number of wells, from 5 main aquifers, have been drilled, mostly for irrigation and domestic use. In order to increase the water availability, research has been conducted and deeper-than-usual boreholes have been drilled.

Present annual water utilisation is of the order of 1030 Mm³ equivalent to about 26% of average annual rainfall over the island. About 882 Mm³ are from surface water and the remaining 148 Mm³ from groundwater, which accounts for 57% of municipal water supply (domestic, industrial, tourism). Water is mainly used for the following purposes:

- Domestic, industrial and commercial (~ 21%)
- Industrial (private boreholes) (~1%)
- Agricultural (~48%)
- Hydropower (~30%)

About 99.4 % of the population has access to safe water. Due to an increase in water requirements by industries and tourists, an integrated draft plan has been prepared for harnessing additional water resources to meet the water requirement of different sectors of the economy up to the year 2040. The projections for potable water requirement assume a population of 1.6 million and a per capita consumption 250 litres/day in 2040. At present, the population is 1.2 million and the per capita consumption is 190 litres/day.

The issues of water quality are closely tied up with the management of the coastal zone and fisheries since they are all part of a symbiotic system. There is awareness of potential water contaminants and an aggressive programme to stop pollution at its source, caused by both industrial and non-point source pollution, has been set up. The Ministry of Environment has promulgated various standards for

the control of waste water disposal. Monitoring is conducted on surface, ground and lagoon water, and special attention is paid to effluents from industrial dyeing and washing activities. Pesticide use, agricultural chemicals and haphazard disposal of waste may have caused water contamination. The sugar mills have pre-treatment facilities for waste water, with some of the treated effluent being used for irrigation purposes; nevertheless any wastewater discharged into the rivers inevitably ends up in the lagoon (rewritten text). Deforestation on the steep slopes in the central region erodes topsoil and causes siltation of the river basins, ultimately ending up in the coastal zone.

Constraints

- Lack of expertise in defining the maximum permissible limits for pollutants
- The high cost for treatment of effluent
- Optimum permissible limits for pollutants have to be worked out to ensure that Mauritius can afford to preserve its environment whilst ensuring that the various manufacturing sectors remain competitive.

Challenges

- To increase awareness for the general public on the necessity to conserve water and to preserve its quality
- The creation of adequate carry-over water storage to cope with unusually longer dry spells
- An ambitious programme for the reduction of non revenue water is under implementation. 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 %.

A thorough, in-depth hydro-geological study island wide was carried out from 1995 to 1999. This study has permitted a better definition and understanding of (a) the overall geology of the island, (b) the aquifer boundaries and potential, (c) direction of groundwater flow, and (d) risks to the groundwater resources of the Island.

Capacity-building, education, training and awareness-raising: The CWA is investigating possibilities of entering into a twinning agreement with a highly developed organization in the field. Request has been formulated for consideration by the Government of Australia under the Australia-Mauritius Joint Commission.

Information: Data on water quality monitoring are available from the Central Water Authority, the National Environmental Laboratory and the Ministry of Fisheries. These data need to be processed and analyses need to be carried out within a time scale. A Statistical Unit attached to the Ministry of Environment is presently compiling all the information for analyses and publication.

Research and Technologies: With the collaboration of the International Atomic Energy Agency (IAEA), AREU is developing integrated plant nutrient system for major cropping system in order to limit leaching of agro chemicals, while at the same time to study the fate of nitrate in the soil/ plant/ water system under intensive vegetable production. Improvement in the vegetable legumes/ Rhizobium symbiosis is also being studied with a view to diminish fertilizer N input in crop production. Emphasis is being laid on organic farming. To this end, crops that could be produced organically are being tested and the techniques of organic production system are being evaluated. Another project undertaken in line with sustainable agriculture is the use of leguminous cover crops for soil, water and fertility conservation. Waste recycling is also being given much attention as organic waste can help cut down on inorganic fertilizer input.

The University of Mauritius has been engaged on major projects related to the environment. Thus, the management of industrial wastewater, solid waste and ground water has been studied fairly extensively at the Faculty of Engineering of the University of Mauritius.

Two newly built flow measuring stations have been equipped with data loggers and remote data transmission systems, which enable real time monitoring of flow in some rivers.

Financing: Funding of most projects will be made by Government and external sources, which are as follows: World Bank, African Development Bank, Kuwait Fund and the European Investment Bank which is financing major projects in the potable water sector.

Cooperation: Mauritius has ratified the United Nations Convention to Combat Desertification on 11 January 1996 and is working very closely with SADC countries. The IAEA co-operates in funding and providing technical assistance and training in a project that require nuclear techniques to study the soil - plant relationship and the fate of nitrate in soil, water and plant.

The Government of Mauritius is also signatory to a number of international conventions relating to conservation and sustainable utilization of genetic resources. These include the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR), 1971.

Close cooperation exists between the managers of the water uses and the end users who receive water, other than for potable use, on a quota basis. This is regulated either through water rights or by mutual agreement. Mauritius is fully active in the UNESCO International Hydrological Programme (IHP). The IHP National Committee operates under the chairmanship of the Ministry of Public Utilities.

The general coordination for the Humid Tropics Programme for the East Africa Region (Theme 6 of the IHP) was offered to Mauritius in November 1997, on the occasion of the Launching Meeting of the Humid Tropics Programme held at the University of Mauritius.

The Water Resources Unit of the Ministry of Public Utilities provides facilities, since 1995, to foreign students wishing to carry out their university projects in Mauritius.

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