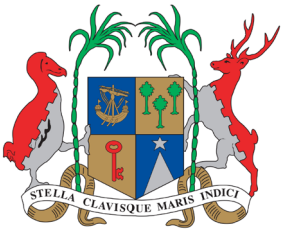


REPUBLIC OF MAURITIUS

# NATIONAL AUDIT OFFICE

## PERFORMANCE AUDIT REPORT

## SUSTAINABLE WATER RESOURCES MANAGEMENT

### SDG 6: ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

### MINISTRY OF ENERGY AND PUBLIC UTILITIES

**DECEMBER 2025**

# FOREWORD

Section 16 (1A) of the Finance and Audit Act makes provision for the Director of Audit to carry out performance audit and report on the extent to which a Ministry, Department or Division is applying its resources and carrying out its operations economically, efficiently and effectively.

I am pleased to send to the Honourable Prime Minister, Minister of Defence, Home Affairs and External Communications, Minister of Finance, Minister for Rodrigues and Outer Islands, this Performance Audit Report entitled "Sustainable Water Resources Management" to be laid before the National Assembly.

Mauritius has been affected by periods of drought of varying intensity that led to shortages in water supply. Water demand for domestic use, irrigation requirements, and industrial activities contribute to put a stress on the water resources of the island. Moreover, global warming and climate change continue to impact on the availability of water resources.

Irregular supply of water resulting in public outcry, leakages due to ageing pipe network contributing to a high level of non-revenue water and delays in the implementation of infrastructural water projects motivated the selection of this audit.

This performance audit assessed whether the Ministry of Energy and Public Utilities and its agencies were effective and efficient in sustainably managing water resources to ensure an adequate supply to the population. The Report contains audit findings, root causes, conclusions and recommendations for improvement. The Ministry was given the opportunity to comment on the contents of the Report and, where relevant, the responses have been included therein.

The Ministry took laudable initiatives to commission a series of reports on the water sector. However, the implementation of the recommendations contained in the reports that would have improved the water sector have been very minimal or insignificant. The Ministry has been subject to a "*report-on-report syndrome*", that is commissioning of another report following submission of a report.

A follow-up audit will be carried out to evaluate the effectiveness and timeliness of actions taken in relation to the reported findings and recommendations.

I take this opportunity to thank the Senior Chief Executive of the Ministry of Energy and Public Utilities and the General Manager of the Central Water Authority, the Director of the Water Resources Commission, formerly Water Resources Unit and their staff for their cooperation.

**DR. D. PALIGADU**
Director of Audit
National Audit Office
Port Louis

01 December 2025

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# ABBREVIATIONS AND ACRONYMYS

| | |
|---|---|
| CWA | Central Water Authority |
| IWA | International Water Association |
| IWRM | Integrated Water Resources Management |
| MEPU | Ministry of Energy and Public Utilities |
| $Mm^3$ | Million Cubic Metres |
| MP | Master Plan 2012 |
| NRW | Non-Revenue Water |
| NWP | National Water Policy 2014 |
| OECD | Organisation for Economic Co-operation and Development |
| UNEP | United Nations Environment Programme |
| WMA | Wastewater Management Authority |
| WRC | Water Resources Commission |
| WRMC | Water Resources Monitoring Committee |
| WRA | Water Resources Act |
| WRU | Water Resources Unit |
| WSZs | Water Supply Zones |

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# Executive Summary

The Ministry of Energy and Public Utilities (MEPU) is responsible for the formulation of policies and strategies for the water sector and together with its agencies, the Central Water Authority (CWA) and the Wastewater Management Authority (WMA) manage the potable and waste water resources of the island.[1]

Intermittent supply of water with public outcries, leakages in the pipe network, inordinate surface run-off of rainwater to the sea and delays in the implementation of infrastructural water projects have been the subject of debates quite regularly in the media and the National Assembly.

Non-Revenue Water (NRW) is a major issue for the CWA and MEPU to address. In a research study published in July 2018 by the International Water Association (IWA), NRW levels at the international level ranged from 4 to 50 percent. NRW level in Singapore was a low 4 percent and, in the Netherlands, 5 percent. In other developed countries it ranged from 15 to 30 percent and in developing countries, it varied between 40 and 50 per cent. In 2018, NRW level in Mauritius was around 57 per cent, and since then has been increasing to reach an average of 60 per cent during the past five years.

It is against this background that the National Audit Office (NAO) carried out this performance audit on sustainable water resources management in Mauritius. The objective of the performance audit was to assess whether MEPU and its agencies were effective and efficient in sustainably managing water resources to ensure an adequate supply to the population.

This report focusses on the water system[2] in Mauritius only and its management by MEPU along with CWA and WMA. Managing water losses, provision of water infrastructures, governance arrangements, water legislation and institutional setup for managing water resources were examined.

## Key Findings

A **Persistent high Non-Revenue Water (NRW) level**. NRW management in a water distribution system is of the utmost importance. It is used as a proxy indicator for efficient network operation. According to the CWA, NRW in Mauritius varied from 53 to 71 per cent in the different water supply zones and was at an average of 60 per cent for the whole island in 2024. Every year, the NRW problem accounts for up to 200 million metre cubes ($Mm^3$) of treated water lost and/or not billed by the CWA. In the financial year 2024-25, the 'loss' of around 195 $Mm^3$ represented some 1.5 years of the annual consumption.

Old and ageing pipelines are the main causes for the high level of NRW. During financial year 2024-25, CWA incurred some Rs 1.6 billion in the provision of its water supply service, that is, production and distribution costs that could not be recouped due to NRW caused by defective pipelines. At the same time, NRW represented some Rs 2 billion of notional revenue forgone. As such, defective pipelines created total estimated notional losses reaching some Rs 3.6 billion in the past financial year 2024-25. During the last six financial years, the total

[1] The Irrigation Authority has not been considered in this assignment.
[2] A water system refers to the infrastructure and processes involved in the collection, treatment, distribution, and management of water resources.

estimated notional water losses due to NRW caused by defective pipelines totalled some Rs 19 billion.

Managing water losses at the CWA was not undertaken with a proper NRW management strategy. The NRW Management Cell at the CWA had, also, not been sufficiently equipped to carry out NRW reduction and monitoring activities. Around 25 kilometres of pipes were replaced annually during the period 2015 to 2024, through major contractors. At this rate, it will take several decades to renew some 1,500 kilometres of old defective pipes. On average, 39 per cent of capital grants made available in annual budgets during the past 15 years, under the Pipe Replacement Programme were utilised.

As from the year 2023, an improvement in the kilometres of pipes replaced was noted. The CWA embarked on pipe replacements with in-house resources and through Small and Medium Enterprises contractors. The renewal of some 385 kilometres of pipes was noted over a period of two years, that is 192.5 kilometres per year which is 7.7 times higher than the average of 25 kilometres of pipes laid every year during period 2015 to 2024 through major contractors.

B **Major water mobilisation projects delayed**. Water infrastructures are essential for the capture and storage of water resources. The Masterplan for Development of Water Resources for the time horizons 2025-2050, released in 2012, MP 2012, recommended several water mobilisation structures to be established by 2050, with the majority needed by 2025. Implementation of major water projects were well behind schedule by the masterplan timelines. Only two dams, Arnaud and Bagatelle, were completed during the last 12 years. The Bagatelle dam, completed in 2017, was two years behind the masterplan's schedule.

With projects initiated, a few major water infrastructures will become operational as from the year 2028 only. Overall, implementation of projects will very likely be 10 to 22 years behind their scheduled dates set in Master Plan 2012.

The Rivière des Anguilles Dam project spent some 15 years in the waiting, from 2009 to 2024. The project which was estimated at Rs 2.6 billion in 2009 has more than trebled to reach some Rs 9.4 billion in 2024. The construction of the dam is expected to start in mid-2026 and scheduled to be completed by end of 2029, that is, more than a dozen years lateness when compared to the scheduled operational year 2016 as stated in the Master Plan 2012.

C **Ineffective Water Governance**. Water governance relates to laws, regulations, institutions, policies, plans and actions. Water governance was not that effective at the level of MEPU and its agencies to facilitate adequate supply of water to users.

*C.1* **Lapses in the implementation of policies, strategies and plans**. Over the years, MEPU formulated and/or commissioned several strategic documents such as the National Water Policy 2014 (NWP 2014), a Masterplan for Development of Water Resources (for the time horizons 2025-2050, MP 2012), an Integrated Water Resources Management Plan 2015 (IWRM 2015)[3] and, more recently, a Roadmap 2021-2024 for improving water supply service – Contingency measures for the dry season (RM 2021-24).

[3] The plan aimed at mainstreaming IWRM principles into water resources management.

These documents covered different aspects of the water sector, set the directions and contained useful recommendations to be implemented by MEPU and its stakeholders, to improve water supply to users.

The Master Plan 2012 had measures when implemented would allow meeting future water requirements on an uninterrupted 24 hours/365 days of potable water supply. However, putting into effect same was in many respects either too slow or not executed at all.

This was mainly due to the absence of an appropriate legal framework, the non-development of several sub-policies covering specific aspects of water management and the absence of an appropriate mechanism to spearhead the implementation of recommendations in the Master Plan of 2012 and in the Road Map 2021-2024.

The Ministry was not effective in implementing the measures and/or recommendations due to the absence of a suitable accountability mechanism. Consequently, many ideas presented and proposals made could not be put into action; they remained on paper only.

C.2 **Inordinate Delay in Formulating a New Water Legislation**. It took some 30 years, to come up with the Water Resources Act 2024 (WRA 2024) which became effective on 1st November 2024.

Good water legislation comprehensively addresses the management, sustainable use and protection of water resources. The legislative framework that was in place until October 2024 for the water sector was fragmented with different institutions operating within their own pieces of legislation. The framework had not been reviewed since long and did not take on board IWRM principles. Experts had highlighted these shortcomings decades earlier and recommended a consolidated single legal framework.

The absence of a consolidated legislation implied that for years water resources management and operations were based on the old legal texts. This affected the development of the water sector as the NWP 2014 and IWRM 2015 could not be implemented, and institutional arrangements could, also, not be properly set to ensure good water governance.

*C.3* **Inadequate Institutional Setup**. Institutional arrangement is a key aspect in water governance. Effective institutional mechanisms foster coordination and collaboration at various governance levels.

Experts in the water sector advocated the establishment of an apex body for the coordination and regulation of all water related activities. With the enactment of the new WRA 2024, the Water Resources Unit (WRU) was renamed Water Resources Commission (WRC), but as of October 2025, it did not fulfil the intended role as coordinator cum regulator recommended by the experts.

*C.4* **Water Balance, Environment Flow and SDG.** The evapotranspiration proportion of 30 percent of annual mean rainfall that the WRC has applied for years may have been altered with climate change leaving less water resources feeding the surface and groundwater sources.

Environmental flow (EF)[4] forms the basis for good water resources management. All water in excess of the EF is the utilisable or "allocable" water that resource managers can allocate and deliver to users. MEPU, however, does not measure the Environment Flow.

According to UNEP's 2021 report, IWRM level has been set as medium for Mauritius. However, no statistics were available for this indicator. The Ministry was not adequately measuring, monitoring and reporting on the attainment of SDG 6 targets

***Conclusion***

The water sector in Mauritius has not evolved significantly over the years. Not renewing defective pipelines as early as possible, not mobilising needed water infrastructures in a timely manner and an inadequate water governance are the main causes for this situation.

NRW level stagnates at a high level. A proper NRW management strategy is not available to deal with the problem. Funds made available for pipe replacements have not been fully utilised.

There have been a series of reports commissioned, but the implementation of the recommendations therein that would have helped the sector to improve have been very minimal or insignificant. MEPU has been subject to the "*report-on-report syndrome",* that is commissioning of another report following submission of a report.

The measures taken by the Ministry and its agencies were not that effective and efficient enough to sustainably manage water resources to ensure an adequate uninterrupted supply to the population.

While the Ministry, CWA and WRC ~~A~~ claim that efforts have been put in to address the problem in the water sector it is noted, however, that such efforts have not been sufficient enough to effectively, efficiently and sustainably manage water resources.

**Recommendations**

1) A High-Level Steering Committee should be set up to provide management oversight for projects, ensuring strategic alignment, making key decisions, mitigate risks and offering the right support. This will increase the likelihood of success and meet the intended objectives.

2) MEPU should ensure that CWA formulates a proper NRW management strategy for managing water losses. The Water System Improvement Matrix developed based on IWA best practices may be considered in this endeavour. It helps to manage the water loss problem and move up the water system improvement step ladder leading to higher operational levels.

3) Clear KPI should be set for NRW. Consideration should be given to reduce the NRW, from an average 60 to 50 per cent in the first 5 years starting as from 2026; from 50 to 40 per cent during the next 3 years in the first instance.

4) Given the water problem faced by the country in periods of drought, time is a key factor for water infrastructure projects. There is a need to expedite implementation of water mobilisation structures. Necessary actions should be taken to have them ready for

[4] EF are defined as the quantity and timing of freshwater flows and levels necessary to sustain aquatic ecosystems which, in turn, support human cultures, economies, sustainable livelihoods, and wellbeing.

operation at the earliest. Project and contract management for pipelaying and other works need to be improved.

5) The Ministry should improve its water governance framework by creating a supportive ecosystem that enhances the likelihood of successful policy implementation and which can focus, amongst others, on the following key components:

    - Developing strong governance structures that provide ongoing support and oversight.
    - Establishing a Monitoring and Evaluation system for tracking progress and evaluating the impact of the measures implemented.

    The above can be facilitated by adopting the Organisation for Economic Co-operation and Development (OECD) Water Governance Principles and Governance Indicator Framework tool.

6) The CWA should consider integrating state-of-the-art technologies and AI-powered solutions in new networks that it is creating as well as those that it is upgrading or renewing. These will pave the way to more efficient and effective water loss management, and sustainable water distribution.

7) With a new legislation now in place, the Ministry should ensure that its provisions are effectively enforced as soon as possible for the benefit of the water sector. This includes the transformation of the WRC into a suitable body for the coordination and regulation of all water related activities.

8) The MEPU/WRC should put in place a proper mechanism to assess Environment Flow Requirements to manage water resources sustainably.

9) As Mauritius is a signatory to the UN 2030 Agenda it is committed to achieve the SDGs. MEPU as responsible organisation should put in place a mechanism to collect and validate the relevant data, and compile statistics to enable it to monitor and report on the attainment of SDG 6.5.1- *Degree of integrated water resources management.*

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# Chapter One

## The Audit Area

*This chapter describes the audit area, the roles and responsibilities of key players and other stakeholders involved in water resources management. It also provides details on key aspects of the water sector.*

### 1.1 The Water System in Mauritius

A water system refers to the infrastructures and processes involved in the collection, treatment, distribution and management of water resources for various purposes, such as drinking, sanitation, irrigation and industrial use. It typically consists of the following components:

(a) *Source*: This can be a natural source like rivers, lakes, or groundwater wells, or man-made sources such as reservoirs and dams or desalination plants.

Water resources in Mauritius have their origin from, and are maintained by, rain. Rainfall over the island has resulted in the formation of a drainage network, the river system, leading the rain water from the surface of the island to the final recipient, the sea (surface runoff). Hydrologically, this system comprises 25 major catchment areas and 24 minor river basins.

Rainwater, also, flows or seeps into the ground principally on the Central Plateau and feeds the island's aquifer system. According to the UN, groundwater accounts for 99 per cent of all liquid freshwater on Earth.[5] Rivers have their sources from groundwater stored in the aquifers.

(b) *Collection*: Water is collected from the source using various methods, such as dams, intakes, or wells. Presently, the island has a dozen reservoirs with a total capacity of 105.5 million cubic metres ($Mm^3$). Of these, seven are major ones created by impounding rivers by dams. The major impounding reservoirs enable the holding of 92.2 million cubic metres with an annual yield of 164.4 $Mm^3$.

There also exists three major river abstractions and 350 river-run off takes. The river network and the man-made structures constitute the surface source. It provides some 47 per cent of our raw water resources. Around 53 per cent of our water come from the aquifers, the underground source. The two sources are naturally interconnected.

Boreholes (wells) are dug to pump out underground water. Groundwater cannot be impounded and flows continuously to the sea. Aquifers close to the coastline that are not sufficiently recharged are subject to sea water intrusion.

Surface and groundwater sources in Mauritius are considered public property. Users have the right to use water from the sources, but have no right to own them. The management of these sources rests with the Water Resources Commission, operating under the aegis of the Ministry of Energy and Public Utilities.

(c) *Treatment and distribution*: Raw water collected undergoes treatment processes to remove impurities and ensure it meets quality standards for safe consumption. Common

[5] The United Nations World Water Development Report 2022: *GROUNDWATER Making the invisible visible*.

treatment methods include filtration through conventional slow sand filters, rapid gravity sand filters and disinfection using chemicals. Treated water is channelled and distributed through a network of pipes and infrastructures to reach consumers. These two functions are undertaken by the CWA, a statutory body.

CWA operates seven major treatment plants and 52 Containerised Pressure Filters (CPF)[6]. These facilities are capable to produce some 509,000 $m^3$ of water every day from surface sources. Water abstracted through 226 boreholes from groundwater sources are chlorinated and injected directly into the distribution network or service reservoirs. The current network comprises some 5,570 kilometres of distribution pipelines drawing from 98 service reservoirs. Potable water is supplied across the island through six distribution systems – the Water Supply Zones (WSZs).

(d) *Consumption*: Water is used by some 382,693 domestic consumers for various purposes like drinking, cooking, bathing and sanitation. The water system has to ensure a reliable supply of clean water to meet these needs. Water is also used for commercial, business, irrigation, industrial, including electricity generation purposes. In 2024, different categories of subscribers totalling some 412,262 consumed 131.6 $Mm^3$ of water.

(e) *Wastewater management*: After water is used, it becomes wastewater, which goes through a separate system for collection, treatment, and disposal. Wastewater treatment plants remove pollutants and harmful substances from the water before it is discharged back into the environment. Wastewater is handled by the Wastewater Management Authority (WMA).

(f) *Water conservation and management*: A water system needs, also, to focus on managing water resources efficiently, promoting conservation practices, and implementing measures to prevent water pollution. This includes monitoring water usage, implementing water-saving technologies, and raising awareness about the importance of responsible water management.

In Mauritius, water resources are managed by MEPU and several other stakeholders responsible for one or more of the components or functions mentioned above.

## 1.2 Water Resources Management – Key Players, Roles and Responsibilities

1.2.1 *Ministry of Energy and Public Utilities (MEPU)*. MEPU is the main body responsible for the management of water resources. Its vision and mission for the water and wastewater sectors are to ensure water security by making available reliable water supply and safe disposal of wastewater. To these ends, it formulates policies and strategies. To give effect to these, it assesses water needs and determines allocation of water to different sectors, implements projects for the mobilisation of water resources such as construction of dams and safe disposal of wastewater, and monitors the quality of water.

The Ministry is headed by a Senior Chief Executive and is assisted by a Deputy and Assistant Permanent Secretary and supporting staff for managing the water sector, amongst others. MEPU has also a technical wing. A Director General (DG) Public Utilities used to manage all aspects of public utilities and monitoring of projects.[7] Another Director is responsible for

[6] The CPF is a smaller modular and movable treatment plant that is housed in a container.

[7] The post has been vacant, since 2021, after the retirement of the DG. Until 30 June 2025, it was funded and on MEPU establishment. As from 1st July 2025, it is no longer funded and does form part of the Ministry's establishment (Budget Estimates 2025/26).

managing technical services (DTS). He is supported by a deputy, different grades of engineers, a quantity surveyor, a statistician and an analyst.

1.2.2 *Water Resources Commission (WRC)*. With the proclamation of the Water Resources Act 2024 (WRA 2024), the Water Resources Unit (WRU) changed into the WRC as from 1st November 2024. WRC[8] is the executive agency of MEPU and is responsible for the assessment, management, development and conservation of water resources. The main functions of the WRC under the new legislation are listed in **Appendix II.**

1.2.3 *Central Water Authority (CWA)*. The CWA established as a parastatal body operates under the aegis of MEPU. The CWA is the sole undertaker responsible for the treatment and distribution for potable water for domestic, commercial and industrial usage. It also manages water supply infrastructures. Its vision and mission are to secure and provide a sustainable water supply service of an appropriate quality at an affordable price which meets the growing needs of the people and to support the economic development of the country. The two main sections of the CWA responsible for water related projects are as follows:

(i) *Planning and Design (P&D) section.* The P&D section in collaboration with the CWA's Drawing and Survey Office, is responsible for the management of projects. It sets and maintains standards for project management. The P&D section, through planning, survey, design, implementation, and supervision of works, strives to ensure that a wide range of water projects such as laying of new or renewal of old and defective pipelines, construction of service reservoirs and water treatment plants are completed within the required timeframe and budgeted cost. Execution of these projects are occasionally outsourced through consultancy services.

(ii) *Water Treatment Plant (WTP) section.* The WTP is responsible for the treatment of raw water abstracted so that water supplied by the authority meets the norms recommended by the World Health Organisation (WHO) for drinkable water.

1.2.4 *Wastewater Management Authority (WMA)*. The WMA operates as an autonomous organisation under the aegis of MEPU and is responsible for the collection and treatment of domestic, commercial and industrial wastewaters for disposal to an environmentally acceptable quality.

It plays a vital role in the protection of the environment and in ensuring the country's sustainable development through the provision of appropriate water pollution standards, wastewater control systems and management services to the entire population of Mauritius.

Water reuse, also, commonly known as water recycling or water reclamation recovers wastewater from a variety of sources then treats and reuses it for beneficial purposes such as agriculture and irrigation, potable water supplies, groundwater replenishment, industrial processes and environmental restoration.

The WMA manages the public wastewater system, which consists of some 755 kilometres of sewer network connecting 96,365 customers as of January 2025, 70 pumping stations and nine

[8] For clarity, we refer to the commission as WRU for periods prior to1st November 2024 and as WRC for periods after 31st October 2024 in this report. For roles, responsibilities and activities whose nature did not change with appellation we use WRU/C.

treatment plants. Every year, some 48 $Mm^3$ of wastewater is treated and some 920,000 $m^3$ are used for irrigation purposes.

1.2.5 *Ministry of Environment, Solid Waste Management and Climate Change.* The National Climate Change Adaptation Policy Framework (NCCAPF) of the Republic of Mauritius, was elaborated based on the analysis of the current and projected climate change impacts.

It recommends adaptation policy options and measures around the water demand and supply, agriculture and terrestrial ecosystems, fisheries and marine ecosystems, tourism and coastal areas, human health, and infrastructure sectors.

The main strategies include:

- *Water Resources Management.* Improved forecasting, management protection and quality of water resources, including upgrading and building of new treatment plants and reservoirs and reducing water losses in the distribution system.
- *Rainwater Harvesting*. Procurement and installation of rainwater harvesting systems and improvement in policy, legal and regulatory water framework in mainland Mauritius, Rodrigues and other outer islands.

1.2.6 *Land Drainage Authority (LDA)*. The LDA was established following the Land Drainage Act and one of its functions is to conduct and coordinate research and development on land drainage and watershed management and share all available information with all relevant stakeholders. The Water Resources Unit is a member of the Land Drainage Board.

## 1.3 Legal Framework

Until 31st October 2024, several pieces of legislation governed how water resources were protected, used, developed, managed and controlled. The water sector was regulated under, but not limited to, the legal texts stated in Table 1.

**Table 1** – *Water related legal texts*

| | **Legislations** |
|---|---|
| 1 | River and Canal Act 1963 |
| 2 | Ground Water Act 1969 |
| 3 | Central Water Authority Act 1971 |
| 4 | Central Water Authority (Dry Season) Regulations |
| 5 | Environment Protection Act (2002) |
| 6 | Irrigation Authority Act (1978) |
| 7 | Planning and Development Act (2004) |
| 8 | Public Health Act (1925) |
| 9 | Waste Water Management Authority Act 2000 (revised 2023) |
| 10 | The Local Government Act (2011) |
| 11 | Forest and Reserves Act (1983) |
| 12 | Fisheries and Marine Resources Act (2007) |
| 13 | National Disaster Risk Reduction and Management Act (2016) |
| 14 | Utility Regularity Authority Act 2004 (revised 2016) |
| 15 | Agriculture and Natural Resources Act (1977) |
| 16 | Planning and Development Act (2004) |
| 17 | State Lands Act (1874) |
| 18 | Town and Country Planning Act (1954) |
| 19 | Valuation of Property (sewerage) Act (1954) |

*Source*: MEPU

Some of the legislations listed have been consolidated into the Water Resources Act 2024 which was proclaimed in October 2024 and became effective as from 1st November 2024.

According to MEPU, the new Act takes into account the water requirements of the country and the development of the water sector.

## 1.4 Policies and Strategies

Policies and strategies have been formulated and developed for the water sector over the years. The most important ones are described below:

1.4.1 *National Water Policy (NWP) 2014.* The NWP 2014[9] stresses the value of a holistic approach which recognises extensive and inter-sectoral decision-making process for water. The NWP embraces the principles of Integrated Water Resources Management (IWRM).

The United Nations Environment Programme (UNEP) defines IWRM as a process that promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

IWRM is a cross-sectoral policy approach designed to replace the traditional, fragmented sectoral approach to water resources and management that usually leads to poor services and an unsustainable resource use. The IWRM principles are described in **Appendix III**. An IWRM plan was, also, prepared in 2015 guided by the NWP 2014.

1.4.2 *Master Plan for Development of Water Resources in Mauritius 2012 (MP 2012).* The NWP brought forward a vision that water resource planning and allocations are to be managed on both the supply and demand sides guided by the IWRM.[10]

Against this background, government commissioned consultancy services towards preparation of a *Master Plan for Development of the Water Resources in Mauritius* under the aegis of the then WRU. The study was carried out during the period 2010-2012 with the financial support of World Bank at a cost of some Rs 44.7 million. It was published in October 2012.[11] It provided a roadmap for integrated management of water resources up to the time horizons 2025 and 2050. MP 2012 covered 4 key thematic areas:

- Analysis of water demand and water availability.
- Water mobilisation options to meet future water requirements and investment plan.
- Legal analysis and water rights reform programme.
- Institutional set-up and capacity building.

[9] The policy paper was drafted in 2010 and, finalised and published in July 2014.

[10] For years, the common approach to water resources development in Mauritius has been to focus on developing new supplies and infrastructure to meet perceived water needs. This water supply management approach considers water needs as requirements that must be met, and not as demands that may be variable and controllable.

[11] The masterplan report provided a roadmap to realise the integration and management of Mauritius' water resources for the time horizons of 2025 and 2050, and an investment plan for implementation of the associated water mobilisation infrastructure components. This integration was necessary to avoid fragmented decision-making and to allow a comprehensive view to be adopted for the further development of Mauritius' water resources with due consideration given to the National Development Strategy (Green Paper NDS, 2005) and the National Water Policy (then, 2010 draft).

Future requirements mean **an uninterrupted (24 hours/365 days) supply of potable water** that can be sustained throughout a planning horizon up to year 2050, and, also, that the needs of raw water for irrigation purposes are met.

Additionally, as part of the available water resources, provisions were also made for the requirements related to an environmental flow reserve to be maintained in the surface water systems as well as the impact of climate change, with possible decline and altered variability in annual rainfall as a result.

An overview of the master plan is presented in **Appendix IV**.

1.4.3 *National Integrated Water Resource Management Plan 2015 (IWRM 2015).* Following the NWP 2014, the above plan was prepared in 2015 with the financial support of Global Environment Facility (GEF). It identified a range of priority interventions that are required to implement IWRM and address challenges facing water management.

The plan proposed a holistic approach to water resources management and concerted actions among the key institutions and stakeholders.

In recognising the linkages between freshwater and the oceans and coastal zones, land, biodiversity and other resources, and integrating their management, the IWRM plan aims to contribute to achieving the social, economic and environmental development objectives of the country and to contribute to meeting the country's water management challenges of the future.

Since 2015, the plan is being implemented through a regional IWRM project in collaboration with the United Nations Office for Project Services (UNOPS) and UNEP.

A Water Resources Monitoring Committee (WRMC) is in place with members from relevant sectors and meets to discuss relevant strategies with regards to drought management, water conservation and other associated issues. This inter-agency mechanism is primarily concerned with sustainable resource allocation and meet on an ad hoc basis, primarily during the dry season. In addition, a national IWRM Steering Committee has been set up as part of the oversight arrangements required to advise on the UNDP/UNEP IWRM programme.

1.4.4 *Road Map 2021-2024 for improving water supply service – Contingency measures for the dry season (RM 2021-24)*

The roadmap was developed in 2021 with a view to improving the provision of water for domestic purposes during the dry months of October to December for the period 2021 to 2024. The roadmap was prepared in consultation with relevant stakeholders and its strategies were geared towards sustainably addressing the service deficiency by focusing on:

- The development of new supply sources.
- Improvement of existing water treatment facilities and development of new ones.
- Wider use of water treatment technologies such as containerised pressure filters.
- Upgrading of the relevant supply network infrastructure to reduce non-revenue water.
- Improvement of water pressure in the network where inadequate through the construction of service reservoirs and the use of new technologies such as inflatable reservoirs.

RM 2021-24 contained recommendations for the implementation of projects for optimal water mobilisation, treatment, and new distribution network, in each of the six CWA's district water supply systems, while considering water supply shortages in the dry periods, the demand of water over period 2020-2024 and the supply gaps, including losses in the network. A number of projects were identified for implementation in the short to long term from January 2021 to June 2024. Projects already implemented since the setting of the Contingency Plan Committee in 2020 were also included.

## 1.5 Principles on Water Governance

Water governance is the set of rules, practices, and processes through which decisions for the management of water resources and services are taken and implemented, and decision-makers are held accountable. Beyond defining what should be done, water governance is about who does what, at which level of government, and how.

In 2015, the OECD[12] introduced the Water Governance Principles which apply to the overarching water policy cycle. The principles help frame the key conditions for effective, efficient and inclusive water policies and provide a tool for countries to understand whether their water governance systems are working or where change, reform or action is needed. They cut across water management functions e.g. drinking water supply, sanitation, flood protection, water quality, water quantity, rainwater and stormwater, water uses e.g. domestic, industry, agriculture, energy and environment, resources and assets e.g. public, private, mixed and ownership of water management. See Figure 1.

**Figure 1 –** *OECD Principles on Water Governance*


*Source/image credit*: OECD

[12] The Organisation for Economic Co-operation and Development (OECD) is an international organisation that works to establish evidence-based international standards and build better policies for better lives.

## 1.6 Water and the United Nation's Sustainable Development Goals

Mauritius is committed to implementing the UN Sustainable Development Goals (SDGs). SDG 6 is to "ensure availability and sustainable management of water and sanitation for all". The related targets 6.4 and 6.5 measure the change in water-use efficiency over time, level of water stress and the degree of integrated water resources management implementation.

Mauritius has achieved the Millennium Development Goal regarding access to safe drinking water and the next step is to work towards attaining the targets set under SDG 6.

## 1.7 Climate Change and Water for Mauritius

Climate change knows no borders. It affects all countries, but it is known that Small Island Developing States (SIDS) are among the most vulnerable nations. For more than a decade now, SIDS have been advocating to limit the increase in global average temperature to no more than 1.5 °C. Already, 1.45 °C of global warming[13] have caused oceans to become warmer and more acidic, leading to more intense marine heatwaves, faster sea level rise, more intense cyclones and increased coastal erosion.

According to the Mauritius Meteorological Services (MMS)[14], warming of the atmosphere has impacted the hydrologic cycle over the southwest Indian Ocean. Long-term time series of rainfall amount show a decreasing trend in annual rainfall over the island. In fact, the average rate of decrease per decade is around 57 mm. Other observed impacts by MMS are:

- A lengthening of the intermediate dry season, the transition period between winter and summer.
- A shift in the start of the summer rains. This shift translates into much pressure on the water sector to meet increasing demands.
- The number of consecutive dry days is increasing while the number of rainy days is decreasing.
- Even though the number of rainy days is decreasing, heavy rainfall events lead to flash floods.
- The frequency of extreme weather events, heavy rains and storms of tropical cyclone strength or higher, has increased significantly over the last two decades.

With global warming, climate change has and will continue to impact our water resources. Alteration in precipitation patterns will likely lead to droughts in some regions and floods in others. Rising temperatures will also increase water evaporation rates, thus straining water resources. Additionally, melting glaciers and ice caps will contribute to sea level rise, leading to saltwater intrusion into freshwater sources. Overall, climate change will intensify water

[13] The latest *State of the Global Climate* report by World Meteorological Organisation (released 23 March 2024) WMO stated therein that the decade ending 2023 was the warmest ten-year period on record. In March 2025, WMO further stated that 2024 "was the warmest year in the 175-year observational record". The publication showed that records were broken, and in some cases smashed, for greenhouse gas levels, surface temperatures, ocean heat and acidification, sea level rise, Antarctic Sea ice cover and glacier retreat.

[14] Mauritius Meteorological Services (MMS) - Climate Change Webpage - http://metservice.intnet.mu/climate-services/climate-change.php

scarcity, quality issues, and distribution challenges. While efforts are made to manage and mitigate these challenges, continued monitoring and sustainable water management practices are essential to address Mauritius's water situation effectively.

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# Chapter Two

## Managing Water Losses

*This chapter presents findings on how MEPU and the CWA are addressing non-revenue water. It includes a section on integrating information technology in water supply system.*

### 2.1 Introduction

Public utilities around the world face water losses. Low level of water losses cannot be technically and economically avoided even in the best operated and maintained systems where utilities invest heavily in water loss control. As per a research study published by the International Water Association (IWA)[15] in July 2018, Non-Revenue Water (NRW) levels in developed countries ranged from 15 to 30 per cent; in Singapore it was a low four per cent and, in the Netherlands, five per cent. In developing countries, it varied between 40 and 50 per cent.[16]

### 2.2 NRW in CWA Network

Over the years, water losses in the CWA distribution network have increased from some 52 per cent in the year 2000 to 60 per cent in 2024. On average, NRW fluctuated from a low 53 per cent in the south and the north to a high 71 per cent in the east and stood at some 60 per cent for the whole island in 2024. During the last five years, islandwide NRW was on an average 60 per cent mark but differed in various water supply zones, with the lowest at 46 per cent in the year 2022 in the south and highest of 72 per cent in the east in year 2021 as shown in Table 2.

**Table 2** – *Average NRW (% by volume) by WSZ and islandwide 2020 – 2024*

| Water Supply Zone | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|
| East | 69 | 72 | 70 | 71 | 71 |
| South | 53 | 52 | 46 | 52 | 53 |
| North | 53 | 58 | 58 | 55 | 53 |
| Lower Mare Aux Vacoas (MAV) | 62 | 66 | 65 | 63 | 65 |
| Upper MAV | 62 | 62 | 61 | 61 | 59 |
| Port Louis | 59 | 58 | 56 | 60 | 60 |
| **Islandwide** | **60** | **61** | **60** | **60** | **60** |

*Source*: NAO Analysis of figures from Statistics Section of CWA

### 2.3 Non-Revenue Water

NRW is water flowing in the distribution network that is not invoiced, and so does not generate revenue for the utility. It is the difference between the volume of treated water produced and injected into the distribution system and the volume of water billed to consumers.

[15] IWA is the leading network and global knowledge hub for water professionals, and anyone committed to the future of water. It promotes and supports technological innovation and best practices through international frameworks and standards.

According to the IWA, water losses that contribute to NRW have three components: unbilled authorised consumption, apparent and real losses Figure 2 refers. Unbilled authorised consumption is water distributed for example for firefighting or provided to consumers for free[16]. Apparent losses include all types of inaccuracies associated with customer metering as well as data handling errors, such as meter reading and billing, plus unauthorised consumption from theft or illegal use. They are commonly referred to as commercial losses. Real losses arise from leakages from the pressurised system through transmission mains, mains and service pipes and the utility's service reservoirs, from the distribution input meters up to the point of supply. They are often referred to as physical losses.

**Figure 2 –** *IWA Water Balance*

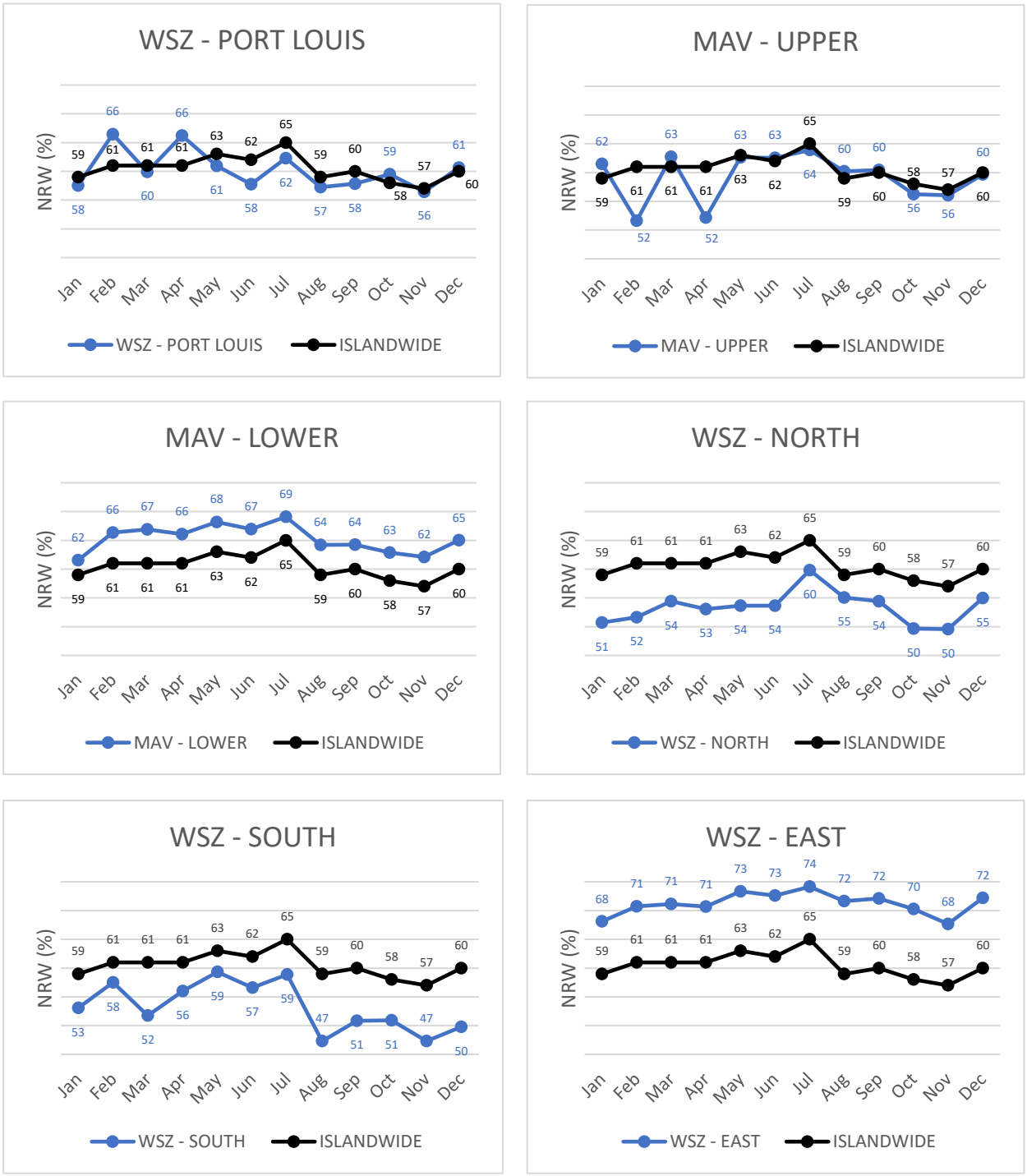
<table>
<tr><td rowspan="12">System Input Volume</td><td rowspan="3">Authorised consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed metered consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed unmetered consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled metered consumption</td><td rowspan="10">Non-Revenue Water</td></tr>
<tr><td>Unbilled unmetered consumption</td></tr>
<tr><td rowspan="7">Water Loss</td><td rowspan="4">Apparent (commercial) Losses</td><td>Unauthorised consumption</td></tr>
<tr><td>Data handling and billing errors</td></tr>
<tr><td>Underestimation of unmeasured consumption</td></tr>
<tr><td>Customer metering inaccuracies</td></tr>
<tr><td rowspan="3">Real (physical) Losses</td><td>Leakage on transmission and distribution mains</td></tr>
<tr><td>Leakage and overflows at utility's storage tanks</td></tr>
<tr><td>Leakage on service connections up to the point of customer metering</td></tr>
</table>

*Source*: IWA

As the components contributing to NRW are many and variable, NRW, also, fluctuates. Figure 3 shows the wavering of NRW levels in CWA's six Water Supply Zones and for the whole island during 2024.

[16] In Mauritius, CWA subscribers consuming up to six $m^3$ of water per month need not pay their bills. During periods of acute shortages, water from tanker services is also provided freely to consumers.

**Figure 3** – *NRW by WSZ and islandwide during 2024*




*Source*: NAO analysis of CWA statistics

Real physical losses or leakages, divert water from reaching customers and increase operating costs. More water needs to be treated and injected into the distribution system for consumers to have a supply. They, also, result in larger investments to increase network capacity.

Losses reduce income and, thereby, financial resource generation. Reducing real losses results in a greater amount of water available for consumption and postpones the need for investing in the replacement or upgrade of distribution pipelines and/or new sources. It, also, lowers

operating costs. Similarly, reducing commercial losses generate more revenues. Thus, reducing NRW releases new sources of both water and finance.

The main cause for NRW in Mauritius is old and ageing pipelines. According to CWA, there are about 1,500 kilometres of pipes which are very old, aged between 50 and 80 years. These pipes present high deficiencies in terms of huge losses, frequent bursts and inadequate carrying capacity.

They are made of asbestos cement, cast iron, galvanised iron, steel and polyvinyl chloride (PVC), that cannot be easily repaired and need to be replaced. Physical losses are a significant component of NRW, often accounting for the largest portion for many utilities. CWA estimates that physical losses account for some 50 to 60 per cent of the NRW it experiences in its distribution network.

Of the 1,500 kilometres, CWA identified about 500 kilometres of pipes in all the six WSZs through a GIS mapping exercise that are considered critical and need to be replaced urgently.

### 2.4 **Addressing the NRW problem**

To fix the NRW problem, CWA has been replacing and upgrading its distribution network. This activity has been carried out over many years and is still ongoing.

In 2023 and 2024, CWA embarked on replacing 350 kilometres [17] out of the 500 kilometres critical pipes in three different ways: through major contractors[18]; small and medium enterprise (SME) contractors[19]; and with in-house resources (for pipes of length up to 1 kilometre). New pipes of a combination of polyethylene and ductile iron are being laid as replacement.

A NRW management cell was set up at CWA in September 2020 with the objectives to:

- reduce the NRW level to an economically accepted level conforming to the best international practices;
- improve the water network efficiency through active leakage management;
- improve the management and monitoring of the water network; and
- ensure a sustainable NRW capacity building and institutional strengthening.

With the creation of this cell, the Anti-Fraud Unit (AFU) was attached to it. The core duties of the AFU are:

- to act as a deterrent against illegal use, pilferage and fraudulent use of water;
- to track down illegal connection/abstraction of water from the distribution network and boreholes; and
- to take appropriate action against illegal or suspected illegal cases detected.

[17] For 2023, 200 kilometres; in 2024, 150 kms and for 2025, another 150 kms of pipes are planned to be replaced.
[18] For medium and major pipe replacement projects where pipelines of length above 3 kms are concerned, mostly along classified roads.
[19] For pipelines of length between 1 km and around 3 kms along the medium lateral roads (excluding classified roads).

*Criteria*

As per CWA's Performance Based Budgets[20], dated February 2023, with the replacement of the aforementioned critical pipelines, NRW is expected to be reduced by some 20 per cent, that is, down to 40 per cent. Recommendations made in the masterplan 2012 were based on the assumption that NRW would be reduced to 40 per cent by 2025 and 25 per cent by 2050.

*Conditions*

(a) *Adverse financial implication.* Results of an analysis of figures for the past six financial years from 2019-20 to 2024-25 showed that NRW has had adverse financial impact. Costs incurred for the treatment and distribution of water that is lost due to NRW and more specifically *resulting from old and defective pipelines* was on average Rs 1.24 billion per year.

Revenue foregone due to leakages from defective pipes revolved around Rs 1.9 billion every year. As such, estimated notional water losses due to NRW caused by defective pipelines totalled some Rs 19 billion during the last six financial years, an average of Rs 3.2 billion per year. Details are shown in Table 3.

[20] Recurrent and capital estimates: revised financial year (FY) 2022/23; proposed FY 2023/24; and planned FYs 2024/25 & 2025/26.

**Table 3** – *Financial impact of NRW at CWA*

| | | FY 2024/25 | FY 2023/24 | FY 2022/23 | FY 2021/22 | FY 2020/21 | FY 2019/20 |
|---|---|---|---|---|---|---|---|
| **Volume of water produced ($Mm^3$)** | **A** | 327 | 329 | 313 | 323 | 302 | 305 |
| **Consumption (sales) volume ($Mm^3$)** | **B** | 132 | 129 | 125 | 126 | 121 | 124 |
| **Non-revenue water, NRW ($Mm^3$)** | **C** = A – B | 195 | 200 | 188 | 197 | 181 | 181 |
| **NRW (% by volume)** | **D** = C/A | 60 | 61 | 60 | 61 | 60 | 59 |
| **Total costs for water supply service (Rs million)[21]** | **E** | 3,187 | 2,888 | 2,592 | 2,234 | 2,011 | 2,062 |
| **Average cost per $m^3$ produced and distributed (Rs)** | **F** = E/A | 9.7 | 8.8 | 8.3 | 6.9 | 6.7 | 6.8 |
| **Estimated cost for NRW (Rs million)** | **G** = C*F | 1,892 | 1,760 | 1,560 | 1,359 | 1,213 | 1,231 |
| **Estimated volume of physical losses – leakages through defective pipelines[22] ($Mm^3$)** | **H** = $\frac{C*50}{D}$ | 163 | 164 | 157 | 161 | 151 | 153 |
| **Estimated cost for NRW resulting from defective pipelines (Rs million)** | **I** = H*F | 1,581 | 1,443 | 1,303 | 1,111 | 1,012 | 1,040 |
| **Revenue from water sales (Rs m)** | **J** | 1,611 | 1,574 | 1,514 | 1,544 | 1,419 | 1,488 |
| **Average selling price per $m^3$ sold (Rs)** | **K** = J/B | 12.2 | 12.2 | 12.1 | 12.3 | 11.7 | 12.0 |
| **Estimated revenue foregone from NRW (Rs million) [23]** | **L**= C*K | 2,379 | 2,440 | 2,275 | 2,423 | 2,118 | 2,172 |
| **Estimated revenue foregone from NRW due to defective pipelines (Rs million)** | **M** = H*K | 1,989 | 2,000 | 1,900 | 1,980 | 1,767 | 1,836 |
| **Estimated notional loss from NRW (Rs million)[24]** | **N** = G+L | 4,271 | 4,200 | 3,835 | 3,782 | 3,331 | 3,403 |
| **Estimated notional loss from NRW caused by defective pipelines (Rs million)** | **O** = I+M | 3,570 | 3,443 | 3,203 | 3,091 | 2,779 | 2,876 |

*Source*: NAO analysis of CWA figures (from audited financial statements, 2020/21 to 2023/24, and unaudited 2024/25) and CWA statistics section (MIS).

The minimum that a water utility to strive for is to break-even, that is, generating enough revenues to cover its costs. However, the unit selling price that has been around Rs 12 per $m^3$ during the past six financial years and the average cost incurred to produce and distribute water is around Rs 20 per $m^3$ during the same period resulted in significant losses. Over a period of six years the cost per $m^3$ increased by some 45 per cent from Rs 16.62 in 2019-20 to Rs 24.14 in the year 2024-25.

[21] CWA treats raw water in its plants and CPF's and distributes the produce through its network of reservoirs and pipelines to the taps of consumers. Significant costs are involved in the process and revenue generated from water sales. Costs comprise operating cost, depreciation and amortisation, and finance costs. The Authority does not work out the direct cost for producing water, or distributing the produce, proper. The aggregate of costs mentioned are used to derive an estimated cost per $m^3$.

[22] As mentioned at paragraph 2.3, the CWA estimates that 50 to 60 percent of wastages arise from old and defective pipelines – real (physical) losses. The remaining NRW results from unbilled authorised consumption and apparent (commercial) losses. See figure 2. In this analysis we have used the least 50 percent.

[23] This is the estimated maximum revenue foregone; it includes authorised unbilled metered/unmetered consumption.

24 The notional loss comprises production and distribution costs that cannot be recouped, and revenue forgone for not invoicing and/or not being able to invoice water used i.e., NRW.

The absence of a policy decision on water tariff revision, also, contributed to financial losses. The last tariff revision at the CWA dates back to 2012 and since then, requests for additional tariff increases have not been approved by the appropriate authorities.

Therefore, the CWA has had to work with low tariffs and, as from January 2016, has been registering substantial losses as shown in Table 4.

**Table** 4 – *CWA financial surplus/deficit 2015 – 2024*

| Period | Surplus/(Deficit) (Rs) | Cumulative Surplus/(Deficit) (Rs) |
|---|---|---|
| **2015** | 46,653,353 | 46,653,353 |
| **Jan 2016 – June 2017** | (80,728,810) | (34,075,457) |
| **2017/2018** | (458,859,683) | (492,935,140) |
| **2018/2019** | (238,363,072) | (731,298,212) |
| **2019/2020** | (350,379,854) | (1,081,678,066) |
| **2020/2021** | (874,484,930) | (1,956,162,996) |
| **2021/2022** | (474,498,620) | (2,430,661,616) |
| **2022/2023** | (580,384,303) | (3,011,045,919) |
| **2023/2024** | (300,804,948) | (3,311,850,867) |
| **2024/2025*** | (574,227,243) | (3,886,078,110) |

*Source*: CWA financial statements (audited, 2015 to 2023/2024; *unaudited, 2024/2025)

Since the year 2016, the CWA has been operating continuously with an average reported annual deficit of some Rs 414 million. The cumulative deficit reached some Rs 3.9 billion as of 30 June 2025.

As per the CWA, the estimated revenue forgone due to the free 6 $m^3$ scheme which was introduced in 2016, was some Rs 40 million annually. The CWA has to bear the full cost of this policy without any compensation.

***Ministry's Response***

*The Ministry has advanced on proposals made to policy makers on a review of the water tariffs. A paper is expected to be brought to Government shortly.*

(b) *Insufficient staffing at NRW management cell.* Staffing for the cell as approved in September 2020, when it was set up, and through to May 2025 are detailed in Table 5:

**Table 5-** *Staffing at NRW Management Cell*

| Staff | September 2020[A] | May 2024 | May 2025[B] |
|---|---|---|---|
| Chief Engineer (CE) | 1 | 1 | 1 |
| Principal Engineer | - | - | 2 |
| Executive Engineer/ Senior Executive Engineer (EE/SEE) | 3 | 1 | 1 |
| Technical Officer (TO) | 6 | - | 1 |
| Inspector | 6 | - | - |
| Operative | - | - | 1 |
| Total | 16 | 2 | 6 |

A – CWA board decision of 29 September 2020. B – Since January 2025.
*Source*: CWA

As per the original plan, each Executive Engineer/Senior Executive Engineer would manage two water supply zones and a Technical Officer and Inspector would be posted in each zone to carry out NRW reducing activities. A shortage of manpower has prevented the planned deployment. In January 2025, two Principal Engineers joined the cell.

Several requests of NAO to the NRW cell and management at CWA, made in 2024 and until April 2025, for any NRW management strategy, and details on NRW reduction activities describing techniques used and resources employed or required for the cell to function properly have remained unanswered.

***Ministry's Response***

There is a prominent emphasis on addressing NRW in the AFD Euros 200 million Loan for the Water Sector, so as to embed in a sustainable way the NRW Cell at CWA. Up to 2027, the Cell has to have 30 staff members to cover the island as part of indicator for disbursement of loan.

(c) *Pipe renewal and upgrading through major contractors progressing at slow pace*.

From 2015 through 2024, some 247 kilometres of pipes have been renewed islandwide, representing an average of some 25 kilometres annually; none was replaced in 2022. Table 6 refers.

**Table 6 –** *Pipes renewed or upgraded 2015 – 2024*

| **Period** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Length (Kms)** | 20.1 | 53.9 | 38.7 | 18.7 | 59.2 | 14.8 | 13.1 | - | 5.3 | 23.3 |

*Source*: CWA

As of January 2025, several projects for the renewal of some 48 kilometres of pipes were being implemented. These are due for completion in 2025 onwards.

*Root causes.* The low rate of pipe renewal through major contractors is mainly attributed to the following factors.

a *Underspending of funds made available for pipe replacement projects*

Capital grants are provided to CWA under the budget of MEPU for projects involving pipe renewal under the Pipe Replacement Programme and Other Distribution Works. Application for disbursement of funds can be made to the Ministry when payment certificates from contractors are certified by P&D Section. During the last 14½ years (to end June 2024) a total of Rs 6,917 million were made available for this programme, but sums disbursed to CWA for pipe replacement projects amounted to only Rs 2,730 million. On average, this represented some 39 per cent only. Thus, some 60 per cent of funds made available during this period have not been utilised. Table 7 refers.

**Table 7** – *Pipe replacement programme: budgeted and disbursed amounts 2010 – 2024*

| Year | Amount budgeted (Rs million) | Amount disbursed (Rs million) | % disbursed | Amount applied (Rs million) | % applied |
|---|---|---|---|---|---|
| 2010 | 190 | 38 | 20 | N/A | N/A |
| 2011 | 198 | 138 | 70 | N/A | N/A |
| 2012 | 67 | 74 | 110 | N/A | N/A |
| 2013 | 205 | 44.5 | 22 | N/A | N/A |
| 2014 | 131 | 101 | 77 | N/A | N/A |
| 2015 (Jan - Jun) | 102 | 23 | 23 | N/A | N/A |
| 2015/16 | 316 | 254 | 80 | N/A | N/A |
| 2016/17 | 1,385 | 222 | 16 | N/A | N/A |
| 2017/18 | 993 | 339 | 34 | N/A | N/A |
| 2018/19 | 985 | 549 | 56 | N/A | N/A |
| 2019/20 | 250 | 91 | 36 | 94 | 38 |
| 2020/21 | 346 | 75 | 22 | 75 | 22 |
| 2021/22 | 390 | 71 | 18 | 71 | 18 |
| 2022/23 | 540 | 163 | 30 | 256 | 47 |
| 2023/24[A] | 819 | 546 | 67 | 575 | 70 |
| **Total 2010 to 30.06.2024** | **6,917** | **2,730** | **39** | N/A | N/A |
| 2024/25[A] | 1,216 | 251* | 21* | 420* | 35* |

N/A – Not available/applicable
A – For financial years 2023/24 and 2024/25, figures include monies for SMEs, also.
*As of 31 December 2024
*Source*: NAO analysis of CWA figures.

The reasons for underspending funds over the years have been and still are manifold:

- *Insufficient personnel to drive projects*. Pipelaying works are undertaken by the P&D section through contractors. The P&D section is staffed by different grades of engineers, technical officers and inspectors. These personnel initiate projects, define their scopes, prepare tender documents, seek clearances for required wayleaves, and manage the projects after award of contracts to selected contractors.

An analysis of data on staffing at the P&D section for the past four years showed that labour force thereat has been decreasing from 48 in the financial year 2020-21 to 33 in 2022-23. As of January 2025, it was still 33.

*Delays in executing projects.* Tender preparation and its finalisation were a time-consuming process. Securing wayleaves from certain authorities and members of the public for pipelaying, also, took much time.

- *Delays in receiving funds from Ministry for works undertaken.* From data analysed for the past five financial years, delays in receiving financing from MEPU for payments to contractors were noted. The gap between dates of receipt and application made for funds ranged from around one to some five months. **Appendix V refers**.[25]

[25] The appendix also shows delays for funds receipts for projects other than pipelaying or renewal. Due dates for payments to contractors where available are also given.

- *Project and contract management issues*. These issues have been the subject of criticisms in this Office management letters following its annual audit exercises on the financial statements of the authority over the years. Some of the issues highlighted included:

(a) Failure to correctly define scope of projects that lead to variations and/or omissions with extension of time and cost.
(b) Delay to hand over of site to contractors.
(c) Disagreement between CWA project managers and contractors on contractual obligations that at times led to arbitrations and terminations of contracts. Upon termination, new contractors had to be selected to complete outstanding works. This implied new tendering exercises adding delays to completion of works and additional costs.

## 2.5 Non-Revenue Water reduction target not met with the Pipe Replacement Programme

The pipe replacement programme (PRP) using in-house resources and executed through SMEs spanned over a period of three years. 200 kilometres of pipelines had been identified islandwide for replacement to be undertaken from April 2023 to December 2024 using in-house resources. Another 200 kilometres of identified defective pipelines in all the water supply zones had to be replaced through SMEs from July 2023 to September 2024. MEPU and the CWA signed an agreement for the PRP that contained key performance indicators (KPI). For financial year 2023-24, using in-house resources and through SMEs, 125 kilometres of pipes had to be replaced (FY 2024-25: 140 kilometres). With the pipe renewal, a five per cent reduction in NRW was targeted for FY 2023-24 and an additional six per cent for FY 2024-25.

As of December 2024, the in-house PRP allowed the renewal of some 257 kilometres of pipelines over the island and through SMEs, some 128 kilometres. Several SME projects that were still ongoing or deferred as at that date would add another 63 kilometres when completed or executed bringing the total to 191 kilometres in 2024-25. As of December 2024, the total of 385 kilometres of pipes replaced by far exceeds the 265 kilometres that were targeted by end June 2025.

However, works were not fully completed and adequately carried out in the in-house category as stretches of pipes still had to be buried underground as of December 2024. As regards NRW, the 60 per cent that was recorded in previous years still lingered as of December 2024. The new pipes laid have had no effect in reducing NRW.

## 2.6 Water System Improvement Matrix

The International Water Association has established several guidelines for reducing and controlling water losses. A Water System Improvement Matrix has been developed based on IWA best practices and methodologies to help a water utility to assess at what operational level it currently is and what are required to transition to higher levels. It helps identify current performance and necessary improvements.[26]

[26] Materials on the Water System Improvement Matrix have been drawn and adapted from Improving Water Supply Networks – Fit for Purpose Strategies and Technologies by Stuart Hamilton, Bambos Charalambous, Gary Wyeth. An IWA 2021 publication. (https://doi.org/10.2166/9781780409207; ISBN (electronic): 9781780409207)

*Criteria:* Characteristics of the matrix are summarised as follows:

- Four categories of water distribution system are considered: basic, ordinary, smart, and intelligent network system.

- The matrix evaluates each system based on seven basic elements:

  (1) *Bulk flow measurement*. Bulk flow management involves measuring water flow through strategically placed meters to monitor volumes from sources to treatment plants and distribution networks. Accurate measurement is necessary for calculating NRW and ensuring efficient water management.
  (2) *Customer metering*. Customer metering tracks water consumption and revenue generation. Addressing apparent losses from metering errors improves revenue.
  (3) *Pressure management*. Pressure management ensures adequate water flow while preventing damage to infrastructure. Balancing pressure levels is crucial to minimise leakage and maintain service quality.
  (4) *Leakage management*. Effective leakage management requires proactive measures to detect and repair leaks, especially in systems with intermittent supply.
  (5) *Asset management*. Asset management focuses on maintaining and replacing infrastructure to ensure efficient water distribution. A comprehensive maintenance plan is essential to extend asset lifespan and minimise water losses.
  (6) *Water balance and KPI's*. The IWA water balance helps to understand NRW elements and identify areas for improvement. Establishing performance indicators is essential for monitoring efficiency and service quality.
  (7) *Human resources*. Human resources are vital for effective management and operation of a utility. Ongoing training and capacity building are necessary for staff to meet the challenges of water distribution systems.

- The matrix outlines improvement steps for each key area, providing a structured approach to enhance operational efficiency. Each area has three improvement levels.

- A scoring system is established to evaluate overall system performance based on the seven key areas.

*Conditions*: Several elements mentioned above are already being covered by CWA as described below:

(a) *Metering*. Measures have been and are being taken to address bulk flow measurement and customer metering. Following a survey conducted in 2021, CWA identified a total of 666 bulk production water meters, of which 50 per cent were defective, while the remaining meters, though operational, raised concerns regarding accuracy and reliability. Procurement exercises were undertaken in past years to replace 230 water meters and 85 water mechanisms. As part of its ongoing efforts to enhance bulk flow water metering accuracy and improve NRW management, the CWA is in the process of replacing 300 bulk meters with financing from AFD.

As regards customer metering, a meter replacement exercise is ongoing, but not progressing rapidly enough as the number of defective meters kept increasing over the years. An improvement was noted in 2024, but having a number of 50,959 defective meters by the year end is considered to be on the high side. Table 8 refers.

**Table 8** – *Defective customer meters*

| Date | April 2022 | September 2022 | March 2023 | March 2024 | December 2024 |
|---|---|---|---|---|---|
| ***No. of defective meters*** | 31,090 | 34,187 | 40,644 | 68,699 | 50,959 |

*Source*: CWA

Ascertaining each component in the IWA water balance is essential for proper NRW management. This requires correct metering. However, defective, inaccurate or unreliable bulk flow and customer meters hindered the ability to obtain accurate data. As such, the CWA has not been in a position to gauge the magnitude of the water balance components.

(b) *Pressure and leakage management*. A balancing act is carried out by CWA to manage system pressure with the objective to reduce high pressures in order to control leakage volumes and reduce burst frequency while at the same time trying to ensure pressure and flow to customers. The amount of pressure at a household tap depends on where the property is located compared to the source of supply. When the service reservoir is at an elevated point, households get a good pressure. Conversely, when the property is at a higher elevation a reduced pressure or no flow may result.

Leakage management by technical teams are undertaken in various ways from visual leakage repair, use of leak detection equipment and step testing[27].

(c) *Asset management and human resources*

The above activities are undertaken at CWA without a proper NRW management strategy that takes into account the seven elements outlined above. It is to be highlighted that in the matrix the water balance and KPIs components were missing.

The IWA Water Balance is a useful tool in analysing the various components of water production, storage and distribution. It allows a utility gauge the magnitude of its water loss problem and set priorities for correcting the situation based on analysis of the identified revenue and non-revenue water elements.

Water balance audits are carried out through different approaches to refine quantities that may have been initially estimated. The auditing process provides insight into the nature and magnitude of water losses occurring and helps the utility to focus on the practices needed to control the losses.

A system performance assessment using appropriate internationally accepted key performance indicators (KPIs) is a useful tool in establishing and monitoring progress and benchmarking. Benchmarking helps to search for and identify best practices to implement and improving performance. Data collection is an integral step in the benchmarking path to improved performance.

[27] Step testing is a method where valves are controlled to cut water supply to selected parts of the network, then water flow data is monitored to spot changes in water supply patterns. When the supply flow drops after closing a valve, then this would indicate the existence of water losses through pipelines downstream of the valve. Repeating this process helps CWA in spotting potential sources of water leaks. Step tests are usually carried out at night when there is minimal consumption i.e., minimum flow.

According to IWA, NRW by volume (%) is widely used, but is not necessarily meaningful as it is influenced by consumption. Due to this limitation, NRW should, also, be expressed as a percentage by value of the cost of running the system. The different components of NRW, apparent losses, real losses and unbilled authorised consumption, will produce different values per unit volume.[28] As such, NRW percentage by value may differ significantly from NRW percentage by volume. Other KPIs recommended by IWA are: percentage of authorised consumption (for apparent losses); Infrastructure Leakage Index (ILI, for real losses); and litres per service connection per day when the system is pressurised (for NRW).

NRW management of a distribution system is of the utmost importance. The CWA did not consider all elements like those outlined in the water system improvement matrix and develop a proper NRW management strategy. A proper strategy needs to be crafted that reviews and addresses the elements described above to manage the water loss problem and move up the water system improvement step ladder. The CWA has been using NRW by volume (%) and did not consider using other NRW performance indicators.

## 2.7 Information Technology and Water Systems

At the upper end of the matrix lies smart and intelligent network systems. Smart systems enhance their supply systems with the implementation of information technology solutions. They have data-gathering sensors (smart devices) installed across the network to monitor, record and communicate the data to a series of software solutions for further analysis. Results of the analysis are communicated to relevant departments, assisting in improving their operational efficiency.

At the high-end of the smart system functionality, the output of the data analysis can be used to automatically control the supply system's operations. These automated controls still need human oversight, but are the start of an intelligent control system.

Generative AI is revolutionising the way water utilities manage NRW. It can create synthetic datasets, simulate scenarios, and predict future outcomes. These capabilities are valuable for NRW management where time-series data like water flow rates, pressure levels, and consumption patterns play a crucial role. With time-series modelling, utilities can:

- ✓ Detect leaks. Asset managers need not send personnel for this activity. Instead, the resources can focus on repairing the identified leaks quickly, thus, stopping water from being further wasted.
- ✓ Predict water demand, detect anomalies, theft and fraud. In this way, the utility can anticipate and address water losses.
- ✓ Adjust pressure and flow rates to minimise losses while maintaining service quality.
- ✓ Optimise infrastructure and evaluate impact of infrastructure upgrades.

[28] It is common practice to value apparent losses based on the sale price of water to customers. The lowest valuation for real losses can be based on the variable production and distribution cost. Unbilled authorised consumption can be valued somewhere between the valuations for apparent and real losses.

An intelligent system is self-monitoring, self-analysing and self-adjusting the supply system to optimise performance. These systems are already being operated in some countries.[29] As AI continues to evolve, its applications in NRW management will expand, enabling more efficient and sustainable water distribution systems. Utilities adopting this technology are better equipped to address the growing challenges of water scarcity and climate change, ensuring water supply for future generations.

There was no evidence that the CWA is integrating IT in its network system.

*Root Cause*: CWA did not plan to leverage the power of IT and AI-powered solutions in managing NRW.

[29] The Singapore's Public Utilities Board has implemented AI-driven systems to monitor its water distribution network and detect leaks in real time. Generative AI models are used to simulate network behaviour and optimise maintenance schedules. Utilities in Europe are using generative AI to predict water demand and identify anomalies in consumption patterns, reducing NRW by up to 20 percent in some cases.

# Chapter Three

## Water Mobilisation Infrastructures

*This chapter presents findings on whether the Ministry and its agencies were efficient and effective enough in their efforts to develop and maintain the necessary water infrastructures to ensure sustainable water resources management and to provide adequate water supply to the population.*

### 3.1 Delays in the construction of water mobilisation infrastructures

The construction of new and the enlargement of existing dams and the drilling of new boreholes are the responsibilities of the Water Resources Commission (WRC), formerly Water Resources Unit (WRU).

*Criteria.* To meet future water requirements – an uninterrupted 24 hours/365 days supply of potable water – for the whole country, Master Plan 2012 contained recommendations on a number of water mobilisation structures to be established by 2050.[30]

The Master Plan pointed out that the bulk part of these measures would be required during the first half of the planning horizon, that is, by 2025. The structures included, among others:

- Completion of Bagatelle Dam for 20 $Mm^3$/year.
- Construction of Rivière des Anguilles Dam for 30 $Mm^3$/year.
- Construction of new dams: three to mobilise 50 $Mm^3$/year
- Enlargement of existing dams: three to mobilise 13 $Mm^3$/year
- New boreholes: 52 to mobilise 45 $Mm^3$/year

The then WRU identified several infrastructures to work on until the horizon 2050. Details are shown in Table 9. Tentative dates for operation of the infrastructures as per Masterplan, actual and planned dates as per WRU, potential yields and geographic coverage are, also, stated.

*Condition.* Only construction of two dams was completed during the last 12 years, Arnaud in 2014 and Bagatelle in 2017. Other projects listed will be implemented and available for operation as from 2027. The construction of the Bagatelle Dam was two years behind the masterplan's schedule and implementation of other projects will very likely pass ten to 22 years their tentative dates set in the Master Plan.

Inordinate delays were noted in the execution of projects. WRU explained that water mobilisation projects, in particular construction of new dams, enlargement and rehabilitation of existing dam structures are complex, capital intensive and time consuming. Also, major and complex financing mechanisms are involved.

Their implementation greatly depends on availability of funds and on the priority of use of funds. Consideration needs, also, to be given to land issues, resettlement of inhabitants in the area involved, environmental and social impacts.

[30] The masterplan recommended through implementation of the proposed water mobilisation configurations that an additional 224 $Mm^3$ of water be mobilised during the plan period. Refer to Appendix IV, Highlights of the Masterplan 2012.

**Table 9** – *Water mobilisation infrastructures as per Master Plan and WRC*

| Water infrastructure | Location | Yield ($Mm^3$/Year) | Geographic Coverage | Year in service according to | |
|---|---|---|---|---|---|
| | | | | MP 2012 | WRC |
| Arnaud Dam | Arnaud | 10 | MAV System | | 2014 |
| Bagatelle Dam | Bagatelle | 25 | Plaine Wilhems/Port Louis | 2015 | 2017 |
| Rivière des Anguilles Dam | Rivière des Anguilles | 48 | South | 2016 | 2029 |
| Enlargement of La Ferme Dam | La Ferme | Increase of safe yield of 2 $Mm^3$/year | West | 2015 | 2028 |
| Enlargement of Piton du Milieu reservoir | Piton du Milieu | Increase of safe yield of 2.9 $Mm^3$/year | East | 2020 | 2030 |
| Enlargement of La Nicolière reservoir including upgrading of its feeder canal (LNFC) | La Nicolière and LNFC | 72 | North | 2018 | 2032 |
| Rehabilitation of Mare Longue Dam | Mare Longue | - | MAV System | - | 2032 |
| Mon Vallon Dam | Mon Vallon | 9.6 | West | 2025 | 2035 |
| Constance Dam | Constance | 19 | North/East | 2018 | 2040 |
| Calebasses Dam | Calebasses | 13 | North | 2025 | 2045 |
| 40 Boreholes | Island-wide | Determined on site | Islandwide | 40 by 2025 +12 by 2035 | 2013–2050 |

*Source:* WRC/MP 2012

3.1.1 *Rivière des Anguilles Dam (RAD) project.* This project has been delayed by some 15 years, from the recommendation made to implement it in 2009, to the launch of a pre-qualification of contractors' exercise in early 2024. It was kept in abeyance for some eight years, from 2009 to early 2018. As of May 2025, a prequalification exercise was completed. WRC expects the dam to be operational by end 2029.

The project value more than trebled from Rs 2.56 billion[31] in 2009 to some Rs 9.4 billion in 2024. Except for the years when the first pre-qualification of contractors' exercise and the ensuing tender exercise were launched[32], substantial funds have never been provided to execute it.

During 2024, necessary funds have been secured through loans from funding agencies for the financing of the dam and other components in the larger integrated project. As of 30 June 2024, some Rs 290 million had been spent on the RAD project towards principally consultancy services and land acquisition.

3.1.2 *Enlargement and upgrading of La Ferme Dam*. This project has, also, been delayed by more than 12 years. The main obstacle to its execution has been the presence of human habitations, especially squatters, within the boundaries of the reservoir. The squatting issue has been ongoing for more than 25 years. With the construction of a housing facility which started in 2022 and was completed in 2024 most of the squatters were relocated in 2024.

[31] PSIP figure.
[32] Rs 500 million in 2020/21 and Rs 900 million in 2021/22.

As of May 2025, the appointed consultant has completed a number of works, like the preparation of prequalification bid and bidding documents. However, the site was not secure enough to prevent new squatters from entering there and illegal constructions not cleared, among others, before the dam and rehabilitation works can commence. The squatting issue resulted in the postponement of the execution of the project several times and the latest to August 2026.

3.1.3 *Enlargement of La Nicolière reservoir and rehabilitation of La Nicolière Feeder Canal (LNFC)*. So far, only a feasibility study has been undertaken for the enlargement of La Nicolière reservoir project. It took some six years for both foreign and local consultants to carry out same and the outbreak of Covid-19 delayed the activity.

A draft feasibility report was submitted in May 2023. The document has been revised a few times to reflect the views and comments received from major stakeholders and changes requested by WRU. The feasibility report has yet to be finalised as the WRU has requested additional minor amendments.

As regards the LNFC, it requires rehabilitation/upgrading works to enhance its structural stability. After extensive refurbishment works carried out in 2003, there are still significant stretches, where either the lining has collapsed with age or there is no lining at all.

The carrying capacity of LNFC is, also, impaired by sedimentation and debris accumulation at times of heavy rainfall. Consultancy works for the rehabilitation of the canal are ongoing since August 2022.

***Ministry's Response***

The feasibility report has been finalised. It would be humanly not feasible for the human resources available at WRC to work on three dam projects concurrently, hence need to prioritise.

3.1.4 *Construction of Constance Dam.* The Constance dam is a recommendation of Master Plan 2012. It aims at optimising the use of available water resources and harnessing additional water resources from Rivière Françoise and rivulets to meet present and future water demand in the north-eastern part of the island.

The terms of reference for consultancy services for a feasibility study for the proposed construction of the dam is under preparation and recruitment of the consultant will be initiated upon availability of budgetary provisions. Initially planned for operation in 2018, as per Master Plan 2012 tentative year of service, it is scheduled to come into service in 2040.

***Ministry's Response***

The project will be undertaken at a later stage.

3.1.5 *Drilling of boreholes*. From 2013 to May 2025, WRU drilled 32 boreholes islandwide. Of these, only 20 have been handed over to the CWA for operation. These have the potential to deliver some 24.7 $Mm^3$ per year. Four wells were found to be dry or of low yield[33]and six are used as monitoring wells.[34]

In response to the dry season 2022, the CWA exploited some 10 boreholes of the private sector. For the dry season 2023, the CWA intended to exploit new boreholes. Normally, the CWA requests the WRC to drill boreholes in regions of black spots and the latter conducts a procurement exercise to dig the wells in line with available hydro-geological information at its end. However, a few requests during recent times from the CWA could not be met satisfactorily.

As such, several black spots regions continued to suffer a lack of water supply. To improve this state of affairs, the CWA appointed a consultant on a freelance basis to carry out a hydro-geological investigations so as to identify and locate additional surface and/or sub-surface water sources around Mauritius for exploitation.

Based on the investigations carried out, boreholes have been drilled by the CWA. So far, out of 27 boreholes to be drilled by the CWA contractors, 18 were completed. Of these, 11 are already operational with a safe yield of 16.7 $Mm^3$ per year; construction of pumping stations is pending at two boreholes where the tested yields sum to some 4,800 $m^3$ per day; one was abandoned owing to low yield; and four were not found conclusive, that is, not fit for operation.

The remaining nine borehole sites that could not be drilled and three new ones were earmarked for drilling under a new framework agreement, but for lack of funding from the MEPU the procurement exercise could not be initiated. It was explained that they will be taken over by the WRC.

*Root Cause*. The MEPU did not adequately plan to materialise the projects. Necessary steps were not taken to address the constraints affecting the projects.

*Consequence*. There were inordinate delays on these major water mobilisation projects that caused their costs to inflate several folds, especially for the RAD. Water users to be serviced by these infrastructures continue to face water shortages. Insufficient water supply due to delays, also, affected the socio-economic development of the regions.

As regards boreholes, about 60 per cent of the number for operational wells recommended in the masterplan have been drilled over the last 12 years. Some 92 per cent of the 45 $Mm^3$ of water proposed in the plan is achieved through 31 boreholes.

***Ministry's Response***

Request for funding has always been made but depending on the allocation of funds, drilling programmes have been planned.

[33] Dry boreholes (e.g., BH 1235 at Bel Etang) and low yield ones: BH 1290 at Beemanique and 1329 at Nouvelle France.
[34] BH 1254 at Roche Bois, 1256 at Ile D'Ambre, 158 and 1260 at Ville Valio, 1261 at St Antoine and 1378 at La Barraque.

Most of the time water is being supplied from both surface and groundwater sources though during some periods water shortages are experienced from Mont Blanc, La Flora, and Riviere du Poste.

Occasional deficits are also supplemented by the Mare-aux-Vacoas reservoir. Necessary actions have been taken for connection between the major water bodies e.g., Midlands – Piton du Milieu – La Nicoliere, Mare-aux-Vacoas – Arnaud – Mare Longue – Riviere du Poste etc.

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# Chapter Four

## Water Governance

*This chapter presents the findings on whether the Ministry and its agencies were efficient and effective in sustainably managing water resources.*

### 4.1 Introduction

Water governance relates to policies, laws and regulations, institutions and prompt actions. An effective water governance helps to ensure that water resources are managed in a transparent, accountable and equitable manner and that water services are delivered in a way that meets the needs of citizens while, also, being financially sustainable.

Water governance has not been that effective at the level of both the Ministry and its agencies.

### 4.2 Proper mechanisms not established for implementation of Policies and Strategies

Over the years, the MEPU took several initiatives such as formulating the National Water Policy (NWP) 2014 and developing strategies and plans to address the challenges faced in the water sector. To give effect to these initiatives, it is essential to have them properly implemented. However, it was noted that there was no mechanism set to this end.

#### 4.2.1 *No implementation strategy for NWP 2014*

*Criteria*. A water policy provides measures to manage resources in accordance with adopted goals and policies[35]. It addresses the medium to long-term actions that will pave the way for the implementation of water-related policies and achieve the developmental goals for the water sector.

The water policy is to be followed by an implementation strategy which is a means of translating its goals and objectives into action.

One key recommendation to drive the NWP 2014 was that it shall be captured under a Water Act encoding specific provisions of the water policy with a view to facilitating implementation.

*Condition*

- *Inordinate delays in the development of the NWP*. The process for the formulation of the NWP was initiated prior to 2005. The policy was approved by Government in August 2014. It took at least nine years to have the NWP 2014 finalised and approved.

It was reviewed and updated in June 2020 and a new version NWP 2020-2030 has been formulated. However, as of May 2025, the latter had not yet been finalised and approved. Both versions provide a framework for having a system of laws and institutions and for a plan of action with a national perspective.

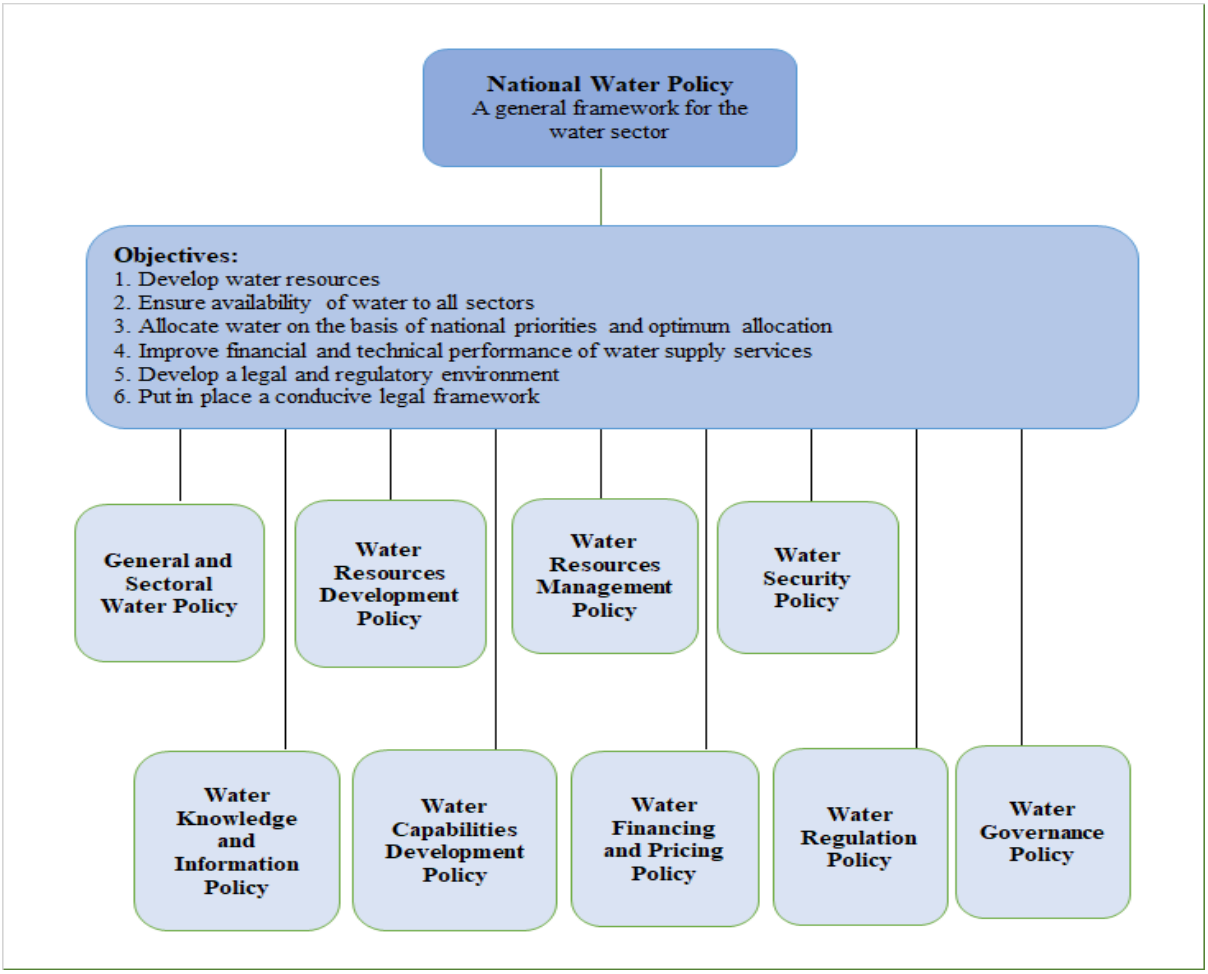
- *Difficulties to put into effect NWP 2014*. Implementing the NWP proved difficult as it was not supported by an appropriate legal framework. The much needed and awaited

[35] Food and Agricultural Organisation – Policy Review and Strategy formulation.

legislation, WRA 2024, became effective as from 1st November 2024, that is, some ten years after the NWP 2014 was formulated.

➢ *Other policies under NWP 2014 not developed*. The development of several sub-policies dealing with specific aspects of water management were explicitly recommended in the NWP. Figure 4 refers. More than ten years after the NWP was approved, these sub-policies have not yet been formulated. As a result, implementation strategies and annual action plans could not be developed.

**Figure 4 –** *National Water Policy and Sub-Policies*




*Source:* MEPU

*Consequence*. More than ten years after the formulation of NWP 2014 its objectives were not achieved.

*Root cause*. The Ministry did not take the appropriate measures to establish an enabling environment to facilitate the implementation of the NWP.

***Ministry's Response***

Several projects have been implemented though not specifically adopting the NWP 2014 as provided for. But projects implemented implicitly used the NWP provisions.

### 4.2.2 *Partial Implementation of the recommendations of the Master Plan (MP 2012)*

*Criteria*. Master Plan 2012 provided a roadmap for integrated management of water resources up to the time horizons 2025 and 2050. A number of recommendations were made under its four components. To meet future water demands, the consultant mentioned a number of mobilisation options that would be required during the first half of the planning horizon, that is, by 2025.

*Condition.* As of May 2025, two components were partially completed and the two others were not achieved. Table 10 refers.

**Table 10** – *Status of implementation of Master Plan 2012*

| Components | Achieved/Not Achieved | Remarks |
|---|---|---|
| **1.** Water demand analysis and Water availability | Not achieved | Non-revenue water target set at 40 per cent for 2025; presently at 60 per cent |
| **2.** Mobilisation options and water resources investment plan | Partially achieved | Only 2 projects completed. Four in progress and 16 not yet started. |
| **3.** Legal analysis and Water Rights Reform Programme | Partly achieved | New Water Resources Act 2024 proclaimed in October 2024 and effective as from 1st November 2024. |
| **4.** Institutional structure and capacity enhancement | Not achieved | WRU renamed as WRC. New roles, responsibilities and functions assigned to WRC, but, so far, it operates exactly as the WRU. WRC is not the same as the Water Resource Monitoring or Regulatory 'Agency' proposed in the plan. |

*Source*: NAO analysis

*Root cause*. The Ministry did not set up an appropriate mechanism including action plan followed by active execution, requiring coordinated efforts to spearhead the implementation of the Master Plan 2012 recommendations. There was no project steering committee in place to ensure smooth implementation

*Consequence*. The objectives of Master Plan 2012 were not met. Several projects which could have provided sustainable solutions to water shortages, were either not executed or delayed.

***Ministry's Response***

Implementation of projects depends on: funding; technical design; priority and service areas. Request for additional funding and recruitment of staff (for the WRC) was made in the context of the budget 2025-26, but was not entertained. Proposal is being made in the context of the next PRB Report for a revised structure of WRC. In the meantime, progressive implementation of the WRA with key provisions is being done.

### 4.2.3 *Non-implementation of National Integrated Water Resources Management Plan (IWRM 2015)*

*Criteria*. The overall purpose of IWRM 2015 was to mainstream IWRM principles into water resources management in Mauritius. MEPU as the lead agency had the responsibility to oversee, coordinate, implement and monitor the implementation of the plan.

The IWRM principles needed to be integrated in the Water Resources Act so as to provide the legal framework for water management, to enable implementation of the plan.[36] Another

[36] The plan had stated that the, then, legal/regulatory framework was fragmented and partially outdated. It was not well suited to IWRM.

important requirement was the setting up of a National IWRM coordination mechanism to put into action the plan.

*Condition*. The plan contained 26 targets under eight priority areas; seven targets were identified as of highest priority, shown in bold in Table 11. As of May 2025, some ten years after the targets were set, none was implemented.

The required legal framework became available in November 2024 only with the proclamation of the WRA, that is, some nine years after drawing the plan. The proposed IWRM coordination mechanism was, also, not setup to ensure long-term sustainability and organised implementation of the plan.

**Table 11** – *Integrated Water Resource Management Plan/Action Programme*

| **Priority Area** | | **Target** | |
|---|---|---|---|
| **1** | Integrated catchment management | 1.1 | Feasibility of establishment of Water Management Areas based on hydrologic zones determined |
| | | 1.2 | Groundwater effectively protected and sustainably utilised in all aquifers |
| **2** | Water resources management/ development, water use efficiency and water demand management | 2.1 | Water use authorization system and water allocation guidelines implemented |
| | | 2.2 | Raw water pricing framework adopted and implemented |
| | | 2.3 | Businesses and households are water efficient |
| | | **2.4** | **Water use efficiency in irrigated agriculture improved** |
| | | 2.5 | Water demand management strategy implemented |
| | | 2.6 | Water sector investment plan adopted |
| **3** | Surface, Ground and Wastewater quality and environmental sustainability | **3.1** | **Catchments effectively protected** |
| | | 3.2 | Effective water quality monitoring system operational |
| | | 3.3 | Effective environmental enforcement mechanisms in place |
| | | **3.4** | **Pollution prevention and reduction measures implemented** |
| | | 3.5 | Freshwater/ ocean interactions understood and protection measures implemented |
| **4** | Security from water related disasters | 4.1 | Climate change adaptation strategy for the water sector adopted and implemented |
| | | 4.2 | Effective disaster mitigation systems established and disaster mitigation capacity enhanced |
| **5** | Water resources information management | 5.1 | Central national water resources database and Decision Support System (DSS) established |
| | | 5.2 | Information sharing platform operational |
| **6** | Stakeholder participation and capacity building | **6.1** | **Stakeholder involvement mechanisms designed and implementation initiated** |
| | | **6.2** | **Human resources development plan implemented** |
| **7** | Water and sanitation services provision | 7.1 | Sewerage network expanded (in accordance with Sewerage Master Plan) |
| | | 7.2 | Amount of non-revenue water reduced |
| | | 7.3 | Water and sanitation tariff structure revised in accordance with principles of cost recovery and social equity |
| | | **7.4** | **Public awareness on cost of potable water production, importance of water saving and impact of pollution on water resources raised** |
| **8** | National water resources governance | **8.1** | **Comprehensive National Water Act enacted** |
| | | 8.2 | Institutional framework for water management streamlined in accordance with IWRM principles |
| | | 8.3 | National IWRM coordination mechanism established |

*Source*: MEPU-IWRM Plan 2015

*Root cause*. The Ministry did not formulate an appropriate legal framework conducive for the implementation of the plan in a timely manner.

*Consequence*. The overall purpose of the IWRM plan was not achieved.

***Ministry's Response***

Mauritius has not achieved all of the IWRM plan's ambitions, it is inaccurate to claim that its purpose was not achieved. The principles of IWRM are already guiding project design and sector planning, and progress has been incremental rather than absent. The 2024 Water Resources Act provides an even stronger legal foundation to continue embedding IWRM in practice.

4.2.4 *Road Map for improving water supply service (RM 2021-2024) partially implemented and not well monitored.*

*Criteria.* RM 2021-24 provided for the redesign of the whole water supply chain to meet demand during the dry seasons in the years 2021 to 2024 through the development of cost-effective water-harnessing projects from rivers. Projects were classified as:

- Short-term – to be implemented between January 2021 to October 2021;
- Medium-term – to be implemented from July 2021 to June 2022; and
- Long-term – to be implemented over the period July 2021 to June 2024.

*Condition*. A work plan was prepared for the implementation of projects within a given time frame. However, several projects had not been implemented as per the work plan. The Ministry did not keep track of implementation of projects. Information on the number of projects completed or in progress were not communicated by CWA for monitoring purposes, even upon request.

*Root cause.* The Ministry did not set up a proper mechanism to monitor and ensure the implementation of projects.

*Consequence*. The objectives set in the roadmap for the dry seasons were not fully met.

4.2.5 *Long overdue policies and projects*: *National Water Usage Policy – Reuse of treated effluent for irrigation purposes*

*Criteria*. Presently, water abstraction for agricultural purposes takes some 48 per cent share of water resources. Judicious use of treated effluent can reduce the pressure on the demand for raw water for irrigation. Master Plan 2012 recommended that a policy, which actively encourages the use of recycled water, is necessary.

*Condition*. In December 2020, MEPU decided to set up a Technical Committee to examine the possibility of using treated effluent for irrigation and for the sustainable use of potable water, and to submit a complete report within one year.

The Committee was never set up. The matter was taken up again as a budget measure in FY 2023-2024. The introduction of a National Water Usage Policy was announced to, amongst others, encourage the use of tertiary treated effluents for irrigation of lawns, golf courses, green spaces at hotels, and integrated resort schemes.

As of September 2025, the policy had not yet been prepared and, consequently, no mechanism had been set up to implement the measure.

Every year, WMA treats some 48 $Mm^3$ of wastewater at different levels. Effluents treated up to the tertiary level can be used for the irrigation of sugarcane fields. However, only 920,000 $m^3$ of the resource are being used presently.

The long distance between treatment plants and plantations is the main hurdle in using the resource for irrigation purposes according to operators in the agricultural field.

*Root cause*. Following the coming into force of the WRA 2024 in November 2024 MEPU did not initiate appropriate actions to formulate the National Water Usage Policy.

*Consequence*. Not exploring the possibility to use treated water for irrigation or other purposes inevitably puts stress on the supply of freshwater resources.

***Ministry's Response***

Only the Grand Baie and St Martin waste water treatment plants produce treated waste water. The treated waste water at Grand Baie is already being sold to Mont Choisy Ltd for irrigation of Golf Course, the 920,000 $m^3$ mentioned above. As for the treated waste water at St Martin, discussions are ongoing between the WMA and private stakeholders for its use.

4.2.6 *Water sector reforms proposals have not led to comprehensive reforms*

Over the years, MEPU commissioned studies or received support from international organisations like the World Bank (WB), African Development Bank (ADB), Agence Française de Développement (AFD) and others on bringing reforms to the water sector with a view to preparing policies and strategies to ensure sustainable water supply and water security, and improve water governance.

**Appendix VI** lists some of the collaborations and consultancy services received during the last 15 years. Set out below are details of the latest study conducted and other reform initiatives in the pipeline.

A. *Reforms in water sector under CRIDF*. Experts from Climate Resilient Infrastructure Development Facility (CRIDF)[37] have assessed the water resources of the island as well as the distribution network with a view to:

- Restoring a 24/7 water supply service to the population including improved real-time management of critical water infrastructure, reduction in physical and commercial water losses (Non-Revenue Water);
- Increasing capacity of Mauritian Authorities to plan, procure, implement, and monitor projects;
- Strengthening and improving coordination of reformed key institutions of the water sector; and
- Enabling continued investment in the tourism sector, which is critical for the economy of Mauritius.

[37] CRIDF is a UK supported regional programme under which long-term solutions to water issues in the Southern African region are provided. Experts from South Africa are working on the water sector reform study since November 2021.

The consultancy involves similar tasks undertaken by other experts in the past such as water resources assessments, trunk network optimisation analysis, NRW assessment, water quality, public engagement, institutional reforms and capacity development. Table 12 refers.

**Table 12**: *Similar tasks under Water Sector reforms studies by different consultants*

| | CRIDF (Nov 2021 – Mar 2024) | Masterplan 2012 | Singapore Cooperation Enterprise 2012 |
|---|---|---|---|
| **Tasks** | Water resource assessments; water balance analysis and high-level water masterplan to compute total water demand. | Water demand analysis and water availability | - |
| | NRW assessment | NRW | - |
| | Water supply and distribution improvement programme in two of CWA's Water Supply Zones<br>Project implementation and management plan | Water mobilisation options<br>Zone-based mobilisation options<br>Investment plan and implementation schedule | - |
| | - | Legal analysis and water rights reform programme | Review of Legal and regulatory framework |
| | Support to institutional reforms/capacity development | Institutional set-up and capacity building | Review of institutional structure |

*Source*: NAO analysis of CRIDF's terms of reference and available reports

B. *Preparation of Master Plan for Sustainable Integrated Water Management*. In 2024, the Ministry embarked on the preparation of the abovenamed masterplan to meet the requirements of a sustainable and resilient water sector and ensuring water security taking into account climate change, preservation of biodiversity and social inclusion in line with SDG's and the Paris Agreement on Climate Change.

To this end a contract for consultancy works was awarded to the selected joint venture of European and Mauritian firms in August 2025. Its main services consist of:

- Preparation of Master Plan for Sustainable Integrated Water Management;
- Strategic review of the NWP 2014 and IWRM plan 2015; and
- Strategic Environmental and Social Impact Assessment (ESIA) of the reviewed NWP and IWRM plan.

The above forms part of a larger reform initiative that encompass feasibility study for Build Operate Transfer (BOT) projects for wastewater treatment plants of WMA; pipe replacement projects, telemetry and new bulk production meters for the CWA; technical assistance through the recruitment of a Dam Expert and a Construction and Contract Manager for the WRC; Gender and Social inclusion in the water sector reform; and water and sanitation tariffs review.

These are classified under five pillars and are being financed by the AFD.[38] AFD has, also, extended its support for a feasibility study on the water sector having as objective strengthening climate change adaptation and preservation of biodiversity among others.

[38] In December 2023, government and the AFD signed a Budget Support Loan Agreement for the water sector in Mauritius and Rodrigues to the tune of € 200 million. A first tranche of € 60 million has been received on signature of the agreement. Of note, is that the remaining € 140 million will be disbursed over four financial years ending

*Criteria.* The process of effective policy implementation involves the preparation of an implementation strategy followed by action plans. Strategies and plans drawn need to be acted upon to meet objectives set. Follow-up actions, also, need to be taken and results monitored against plans drawn.

*Condition.* Local and external consultants who worked on water sector reforms or related initiatives over the years, came up with findings and recommendations that were more or less comparable or similar.

Succeeding studies showed almost similar issues that had already been identified, and like proposals that had already been communicated to MEPU in earlier reports. The recommendations were not implemented; they were not translated into actions for the betterment of the water sector. The Ministry did not optimise and/or make effective use of the support received. **Appendix VII** summarises the key policies and strategies formulated since 1997 to date. Little has been done to put them into effect.

Given that the AFD funded consultancy work to carry a strategic review of the NWP 2014 and IWRM plan 2015 in 2025, there is the risk that MEPU will wait for the new documents to be readied sometimes in 2027 before taking action. This will cause further delay and should be avoided.

*Root cause*. Proper policy implementation through strategies and action plans was not adopted. The Ministry has been ineffective in delivering and achieving its measures/actions due to its lack of focus resulting from too many reports from different experts on same topic, lack of commitment in putting into practice measures recommended and absence of accountability through Steering Committees.

*Consequence*. Concrete results were not achieved to ensure water security and the country still faces water shortages especially during dry spells.

***Ministry's Response***

There has not been sector-wide reform for several reasons including political, social, technical and economic. Instead, there have been incremental reform initiatives. Though each of these strategies have not been undertaken in a structured manner in line with the recommendations, several initiatives, studies and projects have been implemented to keep pace with meeting the demands which, implicitly, are in line with the strategies formulated.

Once the legal framework has been established, the governance aspects can be addressed effectively.

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30 June 2027, *subject to the achievement of KPI's addressing critical issues in the water sector*. The KPIs are set out in a policy matrix under five pillars as follows:

- Pillar 1 – Water policy is updated and anchored in the SDG's and Paris Agreement;
- Pillar 2 – Water sector is appropriately funded for implementation of reforms;
- Pillar 3 – Distribution of potable water is improved in Mauritius and Rodrigues;
- Pillar 4 – Gender and social inclusion are integrated in the water policy; and
- Pillar 5 – Public policy dialogue involving all stakeholders is established in Mauritius and Rodrigues.

The loan is, also, accompanied by a grant of € 2 million to MEPU to cover technical assistance for implementation of the loan (€ 1.52 million) and consultancy services (€ 480k) managed by AFD.

Based on the resources available, technical or financial, the Ministry through its agencies is working on the different aspects of the water supply chain to improve the security of supply and quality of service. An assessment of the request made by the Ministry over the past years for budget support as well as technical assistance (AFD, WB, AfDB, EU, GCF etc) would reveal that the problems had been identified, and efforts made to seek support to address them as they entail financial and human resources.

MEPU/WRC is not and will not be waiting for formulation of new policies. The existing ones are already being implemented through different initiatives/projects.

Based on conditions prevailing and policy decisions at the different moments, the Ministry has adapted its strategies and actions. The main challenge has always been the mobilisation of Financial and Human Resources. The limited resources have compelled the Ministry to implement recommendations and measures on a priority basis delaying the implementation of the measures highlighted in the Master Plan of 2012.

An assignment is ongoing following the WRC Act 2024 and revised policies will be addressing climate change and SDG challenges over the longer term under AFD technical assistance.

### 4.3 **Inordinate delay in coming up with the Water Resources Act**

*Criteria*. Good water legislation comprehensively addresses the management, sustainable use and protection of water resources. Key elements include:

- *Integrated water resource management*. Fostering a coordinated approach to managing water resources across different sectors and regions to balance social, economic, and environmental needs.
- *Governance and enforcement*. Creating robust governance structures to implement and enforce water laws effectively, ensuring that there are adequate resources and authority to enforce compliance and penalise violations.
- *Infrastructure development and maintenance*. Supporting the development and maintenance of water infrastructure for storage, treatment and delivery. This also includes upgrading old or inefficient infrastructures.
- *Water rights and allocation*. Clearly defining how water rights are granted and transferred, including criteria for allocation among agricultural, industrial, residential, and ecological needs.
- *Water quality standards*. Establishing standards to ensure water quality for various uses, such as drinking, recreation, and ecological health. This includes setting limits on pollutants and regular monitoring of water quality.
- *Conservation and efficiency.* Promoting water conservation and efficient use through technologies and practices that reduce water waste. This can include incentives for water saving technologies.
- *Emergency response and flood management*. Establishing protocols for managing water related emergencies, such as floods and droughts, including early warning systems and disaster readiness plans.
- *Climate change adaptation*. Addressing the impacts of climate change on water resources by incorporating climate resilience into planning and operations, such as adapting to altered water availability and extreme weather events.

Effective water legislation needs to be adaptive to address new challenges and information over time, ensuring sustainability and equitable access to water resources for all users. Consultants and experts in the water sector for Mauritius have recommended the review and update of the existing legislation, since long, in line with good practices. Examples are:

- ***Master Plan 2012*** recommended development of a single framework act for the water sector and provided a suggested structure for a National Water Act.

- ***National Water Policy 2014*** required a reform of the legal framework through a new water legislation that shall consolidate all legislations governing ownership, development, appropriation, utilisation, conservation, and protection of water resources. The legal provisions that have an impact on water resource management shall be reviewed as and when required so that changes and amendments can be brought for efficient water and wastewater services.

- ***National Integrated Water Resources Management Plan 2015***. Target 8.1 under priority area 8 – National Water Resources Governance, recommended the enactment of a comprehensive National Water Act with a detailed review and gap analysis of existing legislations relevant to water management with detailed recommendations for a National Water Bill.

*Condition.* The water sector in Mauritius was until 31st October 2024 governed by several legislations. The legal framework was fragmented. Different pieces of legislation in respect of different institutions were involved. The framework had not been reviewed since long despite recommendations from experts and the inclusion of IWRM principles in the NWP and plans drawn for water governance.

The initiative to revise and consolidate the different water legislations into a Water Resources Act dates back to 1996. Different institutions were involved and legal experts were recruited at different points in time for the job. Steps taken by the MEPU to come up with the new legislation are shown in Table 13. Drafts of the Water Resources Bill and other pieces of water related legislation produced are shown in bold.

**Table 13**: *Steps taken by Ministry to produce new Water Resources Act (1996 – 2024)*

| Date | Details |
|---|---|
| 1996 | Initiative taken to revise and consolidate existing water legislations into a Water Resources Bill and set up a Water Resources Authority under a Water Resources Authority Bill. |
| May 1996 | *Office International de l'Eau* of France commissioned to prepare a Water Act for Mauritius. |
| 1998 | **Draft Water Act** for Mauritius (in French) received from *Office International de l'Eau*. No information obtained at MEPU on follow-up on this draft legislation. |
| Nov 2000 | **Rivers and Canals Bill** prepared by the WRU. |
| Jun 2001 | The services of a legal expert from the *Commonwealth Fund for Technical Cooperation* were envisaged. |
| May 2006 | CWA informed WRU that it is in the process of reviewing the Ground Water Act in consultation with stakeholders. |
| Jun 2008 | MEPU restarted the process of redrafting of a Water Resources Authority Bill. |
| Mar 2010 | Government approved that a Water Resources Authority Bill be finalised for introduction into the National Assembly to provide for the creation of the Water Resources Authority. |
| Nov 2010 | Discussion on issues on prohibition of discharge of effluents i.c.w. the Water Resources Authority Bill. |
| Feb 2014 | The Ministry relaunched the exercise for the revision of the Water Resources Authority Bill and setting up of the Water Resources Authority. |
| Sep 2015 | MEPU decided that the water bill will cover only the operational aspect of the water sector. The regulatory functions will remain with the Ministry until the coming into operation of the Utilities Regulatory Authority. The WRU will continue to function as a department of the Ministry and be renamed Office of Water Resources. |
| Jun 2016 | Terms of reference (ToR) for a consultant to be hired for the preparation of the Water Bill submitted to UNOPS. |
| Dec 2016 | A UK legal water expert, submitted five key questions for discussion before his visit in January 2017. |
| Jan 2017 | A working group set up to discuss issues with the legal expert. |
| Feb 2017 | The legal expert submitted a concept note for drafting a first draft a Water Bill for Mauritius |
| May 2017 | First draft of Water Bill submitted by the legal expert. |
| Jun 2017 | Final draft of Water Bill submitted by the legal expert. |
| Jan 2022 | MEPU decided to relaunch consultancy services for the review of legislation for water sector and drafting of a new water bill for Mauritius. |
| Mar 2022 | Correspondence sent to UNDP requesting assistance for the appointment of a consultant. |
| Apr 2022 | WRU submitted draft ToR for legal expert to MEPU. |
| Jun 2022 | Final ToR submitted to UNDP. |
| Sep 2022 | The legal expert selected again. Letter of acceptance to the legal expert issued. Cost implication: Rs 2.55 m inclusive of local taxes except VAT |
| Oct 2022 | Contract signed between MEPU and the legal expert. |
| Apr 2023 | Final draft Water Resources Bill submitted by the legal expert. |
| Nov 2023 | Government approved enlistment of services of a local legal consultant to assist in the finalisation of the draft Water Resources Bill.[39] |
| Jun 2024 | Revised final draft Water Resources Bill submitted by local legal consultant |

*Source:* NAO analysis of MEPU documents

The Water Resources Bill was presented and passed in the National Assembly in July 2024. It was proclaimed on 26 October 2024 and became effective as from 1st November 2024. It took almost three decades to have the Water Resources Act. According to the MEPU, the new Act addresses gaps and fragmentation of the old water related legal texts, and provides for, among others:

[39] Given the constitutional implications and the fact that legislation pertaining to the subject matters set out in the bill have been pending for decades, the Attorney General's Office advised MEPU to retain the services of a local legal consultant. The services, costing some Rs 1.6 million, exclusive of VAT were hired for: (a) review and finalise the Water Resources Bill and assist in reviewing and finalising regulations made; (b) study inputs from stakeholders and advise MEPU on the legal implications of these inputs; and (c) provide assistance in relation to any issues arising during the second reading stage of the Water Resources Bill in the National Assembly.

- ✓ the mobilisation and development of water resources;
- ✓ the management and administration of the resources including buffer zones and works related to watercourses/canals;
- ✓ the management and regulation of underground water;
- ✓ dam safety and protection;
- ✓ the regulation and licensing of water services by considering existing water rights and water use permits;
- ✓ enforcement including preservation and conservation of water resources;
- ✓ water quality monitoring;
- ✓ clear roles, responsibilities and functions of the Water Resources Commission; and
- ✓ the required institutional setup in the water sector for the implementation of the above.

*Root cause.* The Ministry did not have the required expertise to come up with the needed Act; experts had to be hired for the task.

In recent years, two drafts were produced, but not enough was done to build upon the first delivered by legal expert in June 2017 to improve and finalise it in a timely manner. A new draft was requested from the same consultant which was delivered in April 2023 at a cost of some US$ 113,000. It is to be noted that it is the same legal expert who formed part of the team that produced the Master Plan 2012 some twelve years earlier.

*Consequence.* The absence of a new revised legislation implied that for decades water resources management and operations have been based on the old and fragmented legal texts. This has affected the water sector in the following ways:

(i) *Inability and delay to implement the NWP 2014*.

(ii) *Inability to execute the IWRM 2015*.

(iii) *Inappropriate institutional structure.* The water resources sector comprises different relationships between organisations whose responsibilities cover water and sanitation, surface and groundwater resources, drainage and flood control, irrigation, hydro-power generation etc. It is one of the most inter-disciplinary of sectors. Its planning, management and regulation is, therefore, the concern and responsibility of a range of Ministries or authorities.

For lack of an appropriate legislation in the past, different agencies have been operating in the water sector, under their own legislations and regulations. Their roles and responsibilities under the latter were not well defined and conflicting powers were conferred too. This resulted in duplication of functions for some agencies and inability to carry their mandated roles for others. This situation affected the management of the sector.

## 4.4 **Weaknesses in Institutional Arrangements**

Institutional arrangement is a key aspect in water governance. Effective institutional mechanisms foster coordination and collaboration at various governance levels. A proper institutional arrangement is dynamic and capable of evolving with changing circumstances. It requires a balance between strong regulatory frameworks, effective service delivery, stakeholder engagement, and sustainable resource management.

Weaknesses in institutional arrangements can undermine the effectiveness, transparency and legitimacy of decision-making processes, ultimately impacting on the ability of institutions to address complex challenges such as water security, drought management and climate change.

*Criteria.* Several studies and reports mentioned earlier in this report pointed to the establishment of proper institutional arrangements. Examples are:

a) ***Master Plan 2012*** recommended:

- setting up of a central nodal organisation for the coordination of all activities including domestic, agricultural, industrial, commercial and hydroelectrical power generation related to water resources management.[40]
- a separation between the WRU and the three water related authorities i.e CWA, Irrigation Authority and Wastewater Management Authority.
- setting up a Water Resources Commission, comprising all Ministries and other entities representing interests in the water sector.

b) ***Singapore Cooperation Enterprise (SCE, 2011)*** recommended realignment of sector agencies into three institutions as follows:

- The Ministry for overall planning and oversight;
- A regulator to balance the needs of customers with the needs of water utilities; and
- A water sector utility/organisation to provide water and wastewater services to the public.

The above would require:

- Clarification of the roles and responsibilities of MEPU and the ways in which it will exert control while still giving the regulator and the utility the flexibility and independence they will need to perform well.
- Merging the CWA, WMA, and the Irrigation Authority into a new Water Authority whose main mission would be service delivery.
- Setting up a Regularity Authority with the capacity to enforce standards for service levels and water quality as well as balancing the needs of customers and the needs of the utility in tariff setting.

Experts, thus, advocated the establishment of an apex body for the coordination of all water related activities, a regulator and the merger of existing service providers into one organisation for service delivery; all with clear mandates, roles and responsibilities for the water sector.

*Condition.* None of the above arrangements has, so far, been put into place.

The objective of coming up with a new consolidated legislation, since 1996, for the water sector was to provide the legal framework to establish a Water Resources Authority/Agency for the management, regulation, development, conservation, sustainability and shared use of water resources in Mauritius, and to make provision for the licensing and regulation of water supply providers utilising alternative sources of water.

[40] The consultant further recommended that the WRU should in future develop into a fully independent Water Resource Monitoring or Regulatory 'Agency' which can objectively address the allocation of water and negotiate with all main water user categories.

The Authority or agency would be somewhat the equivalent of the central nodal coordinating organisation and Water Resources Commission mentioned by Master Plan 2012, and Regularity Authority advocated by SCE 2011. Such an authority/agency has not yet been setup.

The WRU was renamed WRC as from 1st November 2024. The new WRA 2024 has clearly defined its roles, responsibilities and functions. New activities have been added. The WRC has retained the same management, structure and functions as the former WRU. Therefore, the Commission is far from the organisation, referred to by Master Plan 2012 and SCE 2011.

***Ministry's Response***

The WRC will be the nodal organisation for water resources management in a sustainable manner and the relevant structure is expected to be prescribed by PRB.

4.4.1 *Absence of proper oversight mechanism on the sustainability of water resources*

*Criteria.* Oversight is an essential component of good governance. In the public sector, it refers to the actions taken to review and monitor public bodies and their policies, plans, programmes and projects to ensure that they are achieving expected results; represent good value for money; and are in compliance with applicable laws, regulations, policies and standards. Oversight responsibilities are distributed at different levels.

*Conditions.* The following were noted:

(i) *Non-establishment of Inter-Ministerial High-level Committee.* To implement NWP 2014 the committee was required to meet regularly to review and take appropriate measures under different water situation scenarios. The committee has never been set up.

(ii) *Non-Functional High-Level Committees*. High-level committees to manage water resources were set up at different points in time. Many subsequently ceased to operate. For example, a High-Level Committee (HLC) to monitor the implementation of the water sector reform was set up in 2013, chaired by the Accounting Officer of the Ministry and comprising representatives from its agencies and other Ministries. After a brief period, meetings were discontinued.

(iii) *High-level Committee on water with limited focus.* In September 2021, Government decided to set up a HLC on water comprising policy makers. The first meeting was held in January 2022 in connection with the dry season 2022 followed by two meetings with regard to dry season 2023. The committee focussed on water issues during the dry seasons only. As it was an ad-hoc committee, it did not provide oversight on sustainable water resources management in the water sector at large and all year round.

(iv) *Lack of structured decision-making process.* For committees that were functional, they were not well structured to ensure that decisions taken were implemented and followed-up to ensure that goals set were attained. On scrutiny of notes of meetings held in 2022 and 2023 of the Water Resources Monitoring Committee, it could not be ascertained that its decisions were acted upon and outcomes achieved. The decisions were not followed by the actions taken by the relevant stakeholders. The committee did not have implementation and monitoring plans to achieve the intended results.

4.4.2 *Unclear roles, responsibilities and accountability*

*Criteria.* Effective oversight is based on clear definition of roles, responsibilities and accountability.

*Conditions*

- *Overlapping roles of different institutions*

  - Until 31st October 2024, the WRU did not have any specific legal framework. Its roles and responsibilities were embedded in the CWA Act. There resulted an overlap and duplication of roles, responsibilities and functions between the authority and the unit. Table 14 refers.

    The WRA 2024 has now provided the legal framework for the WRC. Its responsibilities and functions are now distinct from those of the CWA.

  - Reporting and accountability at the level of the WRU and towards the MEPU were not formally defined. This affected performance measurement and achievement of outputs. The WRA 2024 requires the Director, the WRC, to be responsible to the supervising officer of the Ministry.

**Table 14** – *Functions of CWA vs WRU, before 1st November 2024*

| | CWA (as per CWA Act) | WRU |
|---|---|---|
| **Object** | Responsible for the control, development and conservation of water resources | Responsible for the implementation of water mobilisation projects. |
| **Functions** | To investigate water resources and to collect, correlate, interpret any data with regard to those resources.<br>To prepare an inventory of water resources and to keep the inventory continuously up to date. | Keep a database of water resources. |
| | To study and formulate policy in relation to the control and use of water resources for different purposes. | Study and formulate policies in relation to the control and use of water resources. |
| | To prepare plans for the conservation, utilisation, control and development of water resources. | Prepare and follow-up plans for the conservation, utilisation, control and development of water resources. |
| | To coordinate and scrutinise the projects undertaken by any person relating to the conservation, utilisation and development of water resources and to assess the technical possibilities, benefits and economic feasibility of the projects. | Coordinate and scrutinise the projects undertaken by any person relating to the conservation, utilisation and development of water resources and assess the technical possibilities, benefits and socio-economic feasibility of the project. |
| | To conduct and coordinate research and investigation on the economic use of water. | Conduct and co-ordinate research and investigation on the economic use of water. |
| | To promote, design, construct, operate and maintain schemes and works for the purpose of conservation and development of water resources. | Promote, design and construct, in consultation with appropriate authorities, schemes and works for the purpose of conservation and development of water resources. |
| | To ensure that water supply conforms with such standards as are laid down by law. | Ensure that water supply conforms with such standards as are laid by law. |

*Source*: NAO analysis

- *Reliable reporting mechanisms to effectively guide decision making missing.*

Decision mechanism begins when information from either the internal or external environment feeds into the decision process. A decision is then generated that can lead to an action.

In the absence of a formal forum engaging all stakeholders, MEPU participated in meetings where water-related matters were discussed. However, in many instances there was no formal reporting mechanism that could escalate matters discussed to the top management of the Ministry. For example, MEPU, through the WRU and CWA, was a member and participated in board meetings held at the Irrigation Authority (IA), Wastewater Management Authority and Land Drainage Authority.

Lapses in reporting to MEPU's management on the part of the officers attending the board committees were noted. The latest notes of meeting available at the Ministry for the IA board were for October 2021.

According to the WRU, board meetings at IA have been held continually since then. This led to ineffective accountability processes and became an obstacle to decision making at MEPU level.

### 4.5 **Inefficient use of funds in the Water Sector**

*Criteria*. Effective governance for water resources management entails the effective management of public expenditures. The Ministry of Finance has set out guidelines for the preparation and submission of budget proposals. With regards to capital expenditure, it provides that for new projects, Ministries and departments should:

- prioritise their requests taking into account the state of preparedness of projects; and
- submit their requests for funding based on a realistic implementation plan and disbursement schedule.

*Condition*

(i) *Substantial funding for water sector in recent periods only.* Funds provided and planned under successive Public Sector Investment Programmes (PSIP)[41] for the water sector showed increasing proportion of the total PSIP amounts as from 2020 onwards. Table 15 refers.

**Table 15** – *Water Sector funding under PSIP's 2019/20 – 2024/25*

| ***PSIP*** | **2019-20 to 2023-24** | **2020-21 to 2024-25** | **2023-24 to 2025-26** | **2024-25 to 2026-27** |
|---|---|---|---|---|
| *Amount provided (*Rs billion) | 7.1 | 12.9 | 12 | 13 |
| *PSIP total amount (*Rs billion) | 207.2 | 158.1 | 137 | 143.1 |
| *Proportion of total amount (%)* | 3.4 | 8.2 | 8.8 | 9.1 |

*Source*: NAO analysis of PSIP's sector wise analyses (all amounts stated in Rs billion).

[41] The PSIP sets out a three-year rolling strategic investment plan for public sector projects, programmes and schemes that reflect national priority areas for development and identifies the potential financing sources. Earlier PSIP's were prepared for five years.

(ii) *Significant unspent funds for water sector*. An analysis carried out over the last eight years showed that funds appropriated for water projects were not fully utilised. Substantial unspent balances ranging from Rs 200 million to some Rs 1.5 billion were noted. Table 16 refers. This reflected poor state of preparedness, unrealistic budget estimates and limited implementation capacity.

**Table 16 -** *Unspent Balances under water services 2016/17 – 2023/24*

| FY | Appropriation | Total provision* | Difference | Supplementary appropriation | Actual expenditure | Unspent balance | |
|---|---|---|---|---|---|---|---|
| | (Rs m) | (Rs m) | (Rs m) | (Rs m) | (Rs m) | (Rs m) | % |
| 2016/17 | 1,690 | 1,690 | - | - | 814 | 876 | 52 |
| 2017/18 | 3,034 | 3,534 | (500) | 913.1[A] | 2,063 | 1,471 | 42 |
| 2018/19 | 2,209 | 2,183 | 26 | - | 1,507 | 676 | 31 |
| 2019/20 | 1,059 | 1,037 | 22 | - | 551 | 486 | 47 |
| 2020/21 | 1,106 | 623 | 483 | - | 379 | 244 | 39 |
| 2021/22 | 1,982 | 1,456 | 526 | 10[B] | 400 | 1,056 | 72 |
| 2022/23 | 1,256 | 838 | 418 | - | 636 | 202 | 24 |
| 2023/24 | 2,276 | 2,323 | (47) | - | 1,605 | 718 | 31 |

*After supplementary appropriation and virement. [A] – Water tank scheme, Rs 12 million; shares and equity participation, Rs 900 million; and new pumping station at Plaine Lauzun, Rs 2.1 million. [B] – Water tank scheme.

*Source*: NAO analysis of figures from Annual Reports of Accountant General, The Treasury

According to Public Expenditure and Financial Accountability, a methodology for assessing public financial management performance, actual aggregate expenditure that deviates significantly from the original approved budget undermines fiscal discipline and the ability to control the total budget, and subsequently to manage risk. This affects one's ability to effectively and predictably allocate resources to strategic policy priorities. Service delivery is inevitably affected by large deviations from planned expenditure.

(iii) *Funds earmarked, but projects not realised.* Table 17 provides details on a few projects where funds provided were not optimally used. Excessive request for funds was made over the years.

**Table 17** – *Excessive and Inefficient use of funds 2015-2024 (Rs million)*

| FY | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 | 2020/ 2021 | 2021/ 2022 | 2022/ 2023 | 2023/ 2024 |
|---|---|---|---|---|---|---|---|---|---|
| ***Studies and Surveys – Upgrading of La Nicolière Reservoir*** | | | | | | | | | |
| Appropriation | 15 | 5 | 20 | 10 | 3.5 | 4 | 6 | 6 | 3 |
| Provisions | 14.12 | | - | - | - | 3 | 1.1 | 5.2 | 6.6 |
| Expenditure | - | - | 9.6 | 2 | 2.2 | - | - | - | 6.5 |
| ***Pont Lardier Water Treatment Plant (project value-Rs 425 m)*** | | | | | | | | | |
| Appropriation | - | 50 | 54 | 12.1 | 10.8 | 55 | 60 | 150 | 70 |
| Provisions | - | | 51.9 | 2.1 | | 5 | - | 2.3 | 70 |
| Expenditure | - | - | - | 1.9 | 3.6 | 2.4 | 1.2 | 1.5 | - |
| ***Pipe Replacement Programme – Beau Bassin/ Rose Hill (project value Rs 491.62 m)*** | | | | | | | | | |
| Appropriation | -- | - | 175 | 185 | 57.75 | 107 | 69 | 182.3 | 2.8 |
| Provisions | - | - | 75 | - | 53.3 | 14 | 69 | 130.3 | 7.2 |
| Expenditure | - | - | 51.7 | 50.2 | 13.1 | 9.1 | - | 96.7 | 7.2 |
| Launching of bids Sept 2021; poor performance contractor, COVID -19 lockdowns and labour issues | | | | | | | | | |

*Source*: NAO analysis of figures from Annual Reports of Accountant General, The Treasury

*Root causes.* The above can be attributed to:

- lack of preparedness for the implementation of the projects.
- unrealistic budget estimates leading to re-allocation of funds and unspent balances.
- sub-optimal use of funds allocated.
- delays in the planning and project implementation processes that led to delays in the release of funds. These included delay in project studies and hiring of consultants; land acquisition issues; delay in securing clearances, permits and wayleaves; delay in project design, planning and finalising bidding documents; unsuccessful bidding exercise leading to retendering; and delay in construction and implementation works. Measures to address these issues were not worked out by the Ministry.
- incorrect timing for requests for funds.

*Consequence*. Underspending led to considerable delays in the implementation of water infrastructure projects that negatively impacted on meeting targets set and achieving the desired outcomes.

### 4.6 **Sustainable Development Goals targets not up to date**

*Criteria.* The UN 2030 Agenda, under SDG 6, recognises the centrality of water resources to sustainable development and the vital role that improved drinking water, sanitation and hygiene play in other areas, including health, education and poverty reduction. Meeting SDG 6 targets enable a government to:

- reduce water stress level, freshwater withdrawal as a proportion of available freshwater resources;[42]
- increase water-use efficiency; and
- promote the coordinated development and management of water, land and related resources to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

*Conditions*

1. SDG targets were relevant as from 2015. The approved NWP 2014 was, thus, not aligned with the SDG targets of integrated water resources management; hence, towards the achievement of the targets.

[42] Water-stress level is defined as the ratio between total freshwater withdrawn (TFWW) by all major sectors and total renewable freshwater resources available (TRWR), after considering the environmental flow requirements (EFR). Therefore,

$$\text{Water Stress (\%)} = \frac{TFWW}{TRWR - EFR} * 100$$

TFWW is the volume of freshwater extracted from its source (rivers, lakes, aquifers). It is estimated at the country level for the three main sectors: agriculture, domestic and industries. It does not include direct use of non-conventional water, such as treated wastewater, agricultural drainage water and desalinated water.
TRWR is the long-term average annual flow of rivers and recharge of groundwater taking into consideration any overlap between them. The overlap between river flow and groundwater recharge is largest where groundwater contributes significantly to river flow (i.e., a significant fraction of groundwater recharge is converted into river flow), which happens in humid areas. The other extreme is in arid areas, where river flow may contribute to groundwater recharge. Not accounting for this overlap, may overestimate TRWR.
EFR is synonymous with Environmental Flows (EF). EF are defined as "*the quantity and timing of freshwater flows and levels necessary to sustain aquatic ecosystems which, in turn, support human cultures, economies, sustainable livelihoods, and wellbeing*" (adapted from Arthington, A.H., *et al.* 2018).
As per UN Water, when a territory withdraws 25 per cent or more of its renewable freshwater resources it is said to be water-stressed.

2. SDG 6 indicators were not up to date. MEPU is responsible for most of the data for the water sector. However, a number of the indicators were not available. Table 18 refers.

3. Water stress level SDG 6.4.2 was incorrectly computed. MEPU assumes that 70 per cent of annual rainfall received by the country is utilisable. This was not supported with statistical evidence.

**Table 18** – *SDG 6 Indicators*

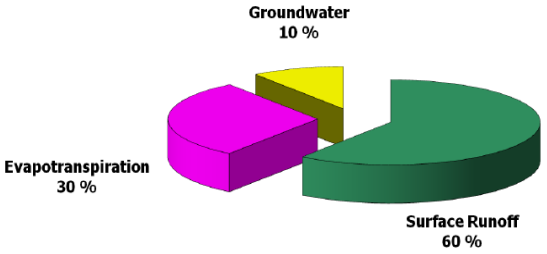
| Indicator | Responsible organisation | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|
| 6.3.2 Proportion of bodies of water with good ambient water quality (%) | MEPU | N/A | 93.10 | >95 | >95 | N/A | N/A | N/A |
| 6.4.1 Change in water use efficiency over time* (Rs/$m^3$) | Statistics Mauritius | 432.3 | 429.5 | 470.2 | 386.1 | 426.2 | 458.4 | N/A |
| 6.4.2 Level of water stress (%) | MEPU | 21.8 | 16.1 | 21.4 | 23.3 | 23µ | 22 µ | 19µ |
| 6.5.1 Degree of IWRM | MEPU | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation | MEPU | Not Relevant | | | | | | |
| 6.6.1 Change in the extent of water-related ecosystems over time | MAIFS | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

*Water use efficiency is computed as the sum of the three major sectors (namely, Agriculture, Services and Manufacturing and others) weighted according to the proportion of water used by each sector over the total use.
µ - Figures from WRC (June 2025)
**N/A** – Not available.

*Source*: Statistics Mauritius (data updated as of September 2024)/WRC

The water balance for Mauritius as set by WRU is shown in figure 5. Evapotranspiration is the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces, and by transpiration from plants. Master Plan 2012 gave a rough water balance where evaporation was stated as 43 per cent. Adding transpiration from plants, evapotranspiration would, thus, have been well above the 43 per cent mark in 2012.

**Figure 5** – *Water Balance*




*Source*: WRU

With global warming, world temperature has risen by some 1.45 °C over the last decade, as mentioned earlier in the report. The impact of this rise must have pushed the evapotranspiration level further up. Therefore, the 30 per cent evapotranspiration given above must be on a very low side.

According to UN Water[43], Environmental Flow Requirements (EFR) or Environment Flow (EF) form the foundation for water resource management and can and should be set for any river. This implies establishing scientifically determined and socially acceptable limits of water resources development for that river prior to developments taking place. All water in excess of the EF is the utilisable or "allocable" water that resource managers can allocate and deliver to agriculture, industry and domestic water users.

[43] Food and Agriculture Organization of the United Nations (FAO) 2019, Incorporating environmental flows into "water stress" indicator 6.4.2: Guidelines for a minimum standard method for global reporting.

MEPU/WRC informed NAO that it does not measure EFR or EF. Absence of EF or at least a reliable estimate is not in line with best practice for managing water resources in an optimal way.

As the MEPU has no estimate for EFR or EF, the utilisable or "allocable" water resources for the country was assumed to be the 70 per cent of rainwater out of which 60 per cent was surface runoff and 10 per cent groundwater sources. Figure 5 refers. However, a large volume of surface runoff flows to the sea, especially during heavy rainfall or cyclonic periods and a fraction of groundwater recharge is, also, lost to the sea. Thus, the annual volume of renewable freshwater resources available for beneficial use, that is, utilisable or allocable would be less than 70 per cent. In 2011, the WRU estimated the utilisable renewable freshwater potential for the island to be of the order of 33 per cent of precipitation.[44] Thus, the assumption of MEPU of 70 per cent is inflated.

Using 33 per cent of precipitation, the water stress level for Mauritius using SM data available since 2011 was worked out. Table 19 refers. The Ministry's SDG 6.4.2 based on an inflated 70 per cent of rainfall considered as utilisable can, also, be read. The table, also, shows the Water Stress Indicator which is based on water availability per person. According to UNDP, a volume less than 1,700 $m^3$ per person per year means water stress and less than 1,000 $m^3$, water scarce.

**Table 19** – *Water Stress Level and Indicator 2011 – 2024*

| **Year** | **Annual mean rainfall** | **Estimated water utilisable potential** | **Total water abstraction** | **Water stress level** | **Water stress level** | **Population** | **Water Stress Indicator** |
|---|---|---|---|---|---|---|---|
| | *(A)* | *(B: 33% of A)* | *(C)* | *(C/B)* | *based on 70% of A** | *(D)* | *(B/D)* |
| | $Mm^3$ | $Mm^3$ | $Mm^3$ | % | % | ´000 | $m^3$ |
| 2011 | 3,633 | 1,199 | 571 | 48 | 23 | 1,212 | 989 |
| 2012 | 3,023 | 998 | 582 | 58 | 27 | 1,215 | 821 |
| 2013 | 3,965 | 1,308 | 608 | 46 | 22 | 1,218 | 1,074 |
| 2014 | 3,905 | 1,289 | 620 | 48 | 23 | 1,200 | 1,074 |
| 2015 | 4,433 | 1,463 | 612 | 42 | 20 | 1,221 | 1,198 |
| 2016 | 3,536 | 1,167 | 620 | 53 | 25 | 1,221 | 956 |
| 2017 | 3,980 | 1,313 | 615 | 47 | 22 | 1,222 | 1,075 |
| 2018 | 5,252 | 1,733 | 591 | 34 | 16 | 1,222 | 1,418 |
| 2019 | 3,972 | 1,311 | 595 | 45 | 21 | 1,222 | 1,072 |
| 2020 | 3,717 | 1,227 | 607 | 49 | 23 | 1,222 | 1,004 |
| 2021 | 3,777 | 1,246 | 604 | 48 | 23 | 1,219 | 1,022 |
| 2022 | 4,105 | 1,355 | 632 | 47 | 22 | 1,216 | 1,114 |
| 2023 | 4,743 | 1,565 | 618 | 39 | 19 | 1,215 | 1,288 |
| 2024 | 4,077 | 1,345 | N/A | N/A | - | 1,200 | 1,121 |

N/A – Not available.

*Figures in bold correspond to SDG 6.4.2 indicator shown in Table 19 above. The SDG indicator was relevant as from 2015 only. The table shows the indicator level for all years.

[44] Water Resources and Water Accounts in Mauritius, *D. Deepchand and A. Sookun*, June 2011.

*Source*: NAO analysis of SM data from Digest of Energy and Water Statistics (A, C & D, October 2024), Energy and Water Statistics - Year 2024 (June 2025), and Population and Vital Statistics – Year 2024 (March 2025)

The results show that the country has been in a water stressed state since long and even fell into the water scarce category a few times. The World Bank in its 2016 "RAS report on *Mauritius Support to Potable Water Sector Reform and PPP for the CWA*" (pages 1 and 11), stated that the island was suffering from increasing water scarcity. The World Bank classified the island as water stressed in 2013, water stress indicator given as 1,083 $m^3$ per capita per year, and it anticipated that it would become water scarce by 2020, with a projected 974 $m^3$ per capita per year. The Water Stress indicators for those years in the table above come close to the figures worked out and projected by the World Bank.[45]

With climate change that the country experiences, the evapotranspiration level may have risen well above the 30 per cent mark shown in the water balance above. The water balance needs to be revisited. Proper assessment of Environment Flow needs also to be carried out so that the utilisable or allocable water resources for beneficial use can be estimated. This will enable better water resources management and proper computation of SDG 6.4.2 – water stress level.

4. SDG indicator 6.5.1 - *Degree of integrated water resources management (IWRM).* According to UNEP's 2021 report, IWRM level has been set as medium for Mauritius. However, no statistics were available for this indicator. The Ministry is not adequately measuring, monitoring and reporting on the attainment of SDG 6 targets.

5. *Concluding remarks on water governance.* Many issues covered in this chapter were already identified by consultants in different reports. However, most recommendations or proposals made have not been implemented. Those that have, have been put in practice with considerable delays. The Ministry has been proactive in the preparation of policies and strategies. However, it has not been consistent in their implementation. In recent years, it has adopted emergency measures to curb water shortages mostly during dry seasons. There was no prompt intervention with investment in water infrastructures along with better water governance to cope with all scenarios: from times of abundant rainfall to drought periods, all year round.

Water governance is effective when mechanisms are in place for policies and strategies to be implemented as effectively as possible. A number of tools are available to enhance the governance environment. For instance, the OECD Water Governance Principles help frame the key conditions for effective, efficient and inclusive water policies and provide a tool for countries to understand whether their water governance systems are working or where change, reform or action is needed. The OECD, also, developed the Governance Indicator Framework, which help to measure, monitor and evaluate the effectiveness of water governance systems. The Ministry did not consider using these tools to evaluate the water governance systems.

[45] SM revises its figures in later years. The small discrepancies between figures given by WB in its report and those worked out by audit may be attributed to such revisions.

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# Chapter Five

## Conclusion and Recommendations

*This Chapter concludes against the audit objective based on the analysis and findings supported by audit evidence and summarises the recommendations.*

***Conclusion***

The Mauritius water sector has not evolved over the years. Not renewing defective pipelines as early as possible, not mobilising needed water infrastructures in a timely manner and poor water governance are the main causes for this situation.

NRW level stagnates at a high level. A proper NRW management strategy is not available to deal with the problem. Funds made available for pipe replacements have not been fully utilised.

There have been a series of reports commissioned, but the implementation of the recommendations therein that would have helped the sector to improve have been very minimal or insignificant. MEPU has been subject to a "*report-on-report syndrome".*

The measures taken by the Ministry and its agencies were not effective and efficient enough to sustainably manage water resources to ensure an adequate supply to the population.

While the Ministry and its agencies claim that efforts have been put in to address the problem in the water sector it is noted, however, that such efforts have not been sufficient enough to effectively, efficiently and sustainably manage water resources.

***Recommendations***

(1) A High-Level Steering Committee should be set up to provide management oversight for projects, ensuring strategic alignment, making key decisions, mitigate risks and offering the right support. This will increase the likelihood of success and meet the intended objectives.

(2) MEPU should ensure that the Central Water Authority formulates a proper NRW management strategy for managing water losses. The water system improvement matrix may be considered in this endeavour. It helps to manage the water loss problem and move up the water system improvement step ladder leading to higher operational levels.

(3) Clear KPI should be set for NRW. Consideration should be given to reduce the NRW from an average 60 to 50 per cent in the first 5 years; from 50 to 40 per cent the next 3 years in the first instance.

(4) There is a need to expedite implementation of water mobilisation structures. Necessary actions should be taken to have them ready for operation at the earliest. Project and contract management for pipelaying and other works need to be improved

(5) The Ministry should improve its water governance framework by creating a supportive ecosystem that enhances the likelihood of successful policy implementation and which can focus, amongst others, on the following key components:

5.1 Developing strong governance structures that provide ongoing support and oversight.

5.2 Establishing a Monitoring and Evaluation system for tracking progress and evaluating the impact of the measures implemented.

The above can be facilitated by adopting the Organisation for Economic Co-operation and Development (OECD) Water Governance Principles and Governance Indicator Framework tool.

(6) The CWA should consider integrating state-of-the-art technologies and AI-powered solutions in new networks that it is creating as well as those that it is upgrading or renewing.

(7) With a new legislation now in place, the Ministry should ensure that its provisions are effectively enforced as soon as possible for the benefit of the water sector. This includes the transformation of the WRC into a suitable body for the coordination and regulation of all water related activities.

(8) The MEPU/WRC should put in place a proper mechanism to assess Environment Flow Requirements to manage water resources sustainably.

(9) As Mauritius is a signatory to the UN 2030 Agenda it is committed to achieve the SDGs. MEPU as responsible organisation should put in place a mechanism to collect and validate the relevant data, and compile statistics to enable it to monitor and report on the attainment of SDG 6.5.1- Degree of integrated water resources management.

**Appendix I**

## Audit Approach

(a) *Audit design and scope.* Our independent conclusions on whether MEPU and its agencies have efficiently and effectively managed water resources in a sustainable manner were reached by analysing evidence collected during the years 2023 and 2024. We formed our conclusions after considering the following audit questions:

1. Were steps taken to manage water losses in the best possible way?

2. Were sufficient efforts being put in by all parties to mobilise new infrastructures to meet demand (now and in the future)?

3. Were there adequate and effective governance practices to manage water?

    3.1 Were relevant policies and strategies for water in place and implemented?
    3.2 Were recommendations of the Water Sector Reform Initiatives carried out implemented?
    3.3 Was an up to date and relevant legislative framework available?
    3.4 Was there a proper institutional arrangement?
    3.5 Were invested funds used efficiently?

This report focussed on the water system in Mauritius only. The policies, strategies, plans, processes and practices related to water resources management were examined. Other areas covered included provision of infrastructures for managing water resources, water legislation and institutional setup. The period covered the calendar years 2012 to 2024 and was supplemented with information relating to the period up to June 2025. For certain matters, periods prior to 2012 were also covered.

(b) *Audit Methodology*. The audit was conducted in accordance with the International Standards of Supreme Audit Institutions (ISSAI) 3000 Performance Auditing Standard of the International Organisation of Supreme Audit Institutions (INTOSAI). A combination of two approaches was used to determine the nature of the examination to be carried out as follows:

- a result-oriented approach to assess whether the outcome or output objectives have been achieved.
- a system-oriented approach to examine the proper functioning of the water management system at MEPU and entities operating under its aegis.

The audit team collected data through document reviews, interviews and inspections. Information relating to policies and strategies on water resource management, legislation, mechanisms, processes, systems, procedures, practices and investment made on water infrastructure and services was collected through review of files and documents. The team also interviewed key personnel of the agencies responsible for water resources management. During site visits, the team was accompanied by technical staff who explained technical aspects of works executed.

(c) *Assessment Criteria*. The main criteria used as a basis for evaluating the evidence collected, developing audit findings, and reaching a conclusion on the audit objective were drawn from:

- Legislations;
- Policies and Strategies – National Water Policy 2014, Integrated Water Resource Management Plan 2015, Master Plan 2012 and Road Map 2021-2024, among others;
- Studies and surveys commissioned by MEPU;
- Government guidelines and procedures. These regulate administrative operations within MEPU and interaction with other government bodies;
- Public Sector Investment Programmes;
- Contract documents. These included the Procurement Policy Office (PPO) recommended standard documents and FIDIC General Conditions of Contract; and
- Good practices and guidelines available on the websites of OECD, UN and its agencies, and World Bank documents.

Details on other assessment criteria used are provided in the relevant sections of the report.

(d) *Data Validation Process*. MEPU was provided with the audit criteria, findings and recommendations to confirm their relevance, accuracy and suitability.

**Appendix II**

**Main Functions of Water Resources Commission**

- Be responsible for the use, management, control and development of water resources for different purposes;
- Monitor, and enforce measures for the conservation, efficient use and protection of water resources and their related environment;
- Be responsible for the management of bulk raw water;
- Implement water resources infrastructure projects to provide bulk raw water supplies and ensure their maintenance and safety;
- Elaborate and implement plans for the development, mobilisation, sustainable use and management of water resources, which incorporate IWRM; optimal utilisation of water resources; conservation of water and protection of water resources; schemes for the development of river basins and inter-basin transfers; and schemes for the desalination of water and alternative water sources;
- Investigate, quantify and monitor water resources in order to maintain a national inventory and database of water resources and hydrological data;
- Develop guidelines and procedures for the allocation and management of water resources during prolonged dry periods;
- Establish, maintain and operate accredited laboratories;
- Monitor the quality of surface and underground water and ensure its protection against any activity that may adversely impact upon the quality or safety of any water resource;
- Undertake or commission research and analysis as is required by the Act;
- Undertake the inspection, analysis, appraisal and coordination of civil works and projects relating to the conservation, protection, utilisation and development of water resources;
- Undertake necessary measurements and analyses to determine the availability of water resources with regard to water use permit applications and initiate and pursue necessary action in case of non-compliance or breach of condition attached to water use permits; and
- Maintain registers for water use permits and existing water rights.

*Source: Section 12 of The Water Resources Act 2024*

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**Appendix III**

## Brief on Integrated Water Resources Management Principles

IWRM is based on four principles:

***Principle 1:*** Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.

***Principle 2:*** Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.

***Principle 3*****:** Women play a central part in the provision, management and safeguarding of water.

***Principle 4:*** Water has an economic value in all its competing uses and should be recognized as an economic good.

IWRM is a holistic approach to water use and management. The IWRM approach provides multiple benefits, which are as follows:

- **Social equity**. Ensuring equal access for all users to an adequate quantity and quality of water necessary to sustain human well-being. The right of all users to the benefits gained from the use of water also needs to be considered when making water allocations. Benefits may include enjoyment of resources through recreational use or the financial benefits generated from the use of water for economic purposes.

- **Economic efficiency**. Bringing the greatest benefit to the greatest number of users possible with the available financial and water resources. This requires that the most economically efficient option is selected. The economic value is not only about price – it should consider current and future social and environmental costs and benefits.

- **Ecological sustainability.** Requires that aquatic ecosystems are acknowledged as users and that adequate allocation is made to sustain their natural functioning. Achieving this criterion also requires that land uses and developments that negatively impact these systems are avoided or limited.

*Source: Stockholm International Water Institute (2020), Principles and Practices of Integrated Water Resources Management: Workplace-based Professional Training*

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## Appendix IV

# Highlights of the Master Plan 2012

*1.* ***Water balance***

| | Input | Output | | | |
|---|---|---|---|---|---|
| | **Rainfall** | **Surface runoff to sea** | **Groundwater outflow to sea** | **Evaporation** | **Water in use** |
| | 3,700 | 1,300 | 300 | 1,600 | 500 |
| **Water balance (%)** | 100 | 35 | 8 | 43 | 14 |

Note: All figures represent the mean annual values in $Mm^3$ for the year 2011.

The above rough water balance estimation pointed to fact that the water in use comprising potable water (235 $Mm^3$/year) and irrigation water, including canal and other transmission losses (265 $Mm^3$/year) totalled 500 $Mm^3$/year. This was equivalent to 14 per cent of the average annual rainfall amount. In comparison with the net precipitation (that is rainfall less evaporation) the water in use was about 24 per cent. Given the topographical and other hydro-physical characteristics of the island, the consultant concluded **that it is not unrealistic to assume that a utilisation rate of up towards 50 per cent of net precipitation was achievable**.

2. ***Additional water mobilisation to meet future water requirements***.

To meet projected water demand, the masterplan concluded that there will be a need for the following water mobilisation structures to be established by 2050. The consultant mentioned that the bulk part of these measures would be required during the first half of the planning horizon:

- Direct river abstractions: 8 to mobilise 54 $Mm^3$/year
- New dams: 3 to mobilise 50 $Mm^3$/year
- Enlargement of existing dams: 3 to mobilise 13 $Mm^3$/year
- New boreholes: 52 to mobilise 45 $Mm^3$/year
- Construction of Rivière des Anguilles Dam for 30 $Mm^3$/year.
- Completion of Bagatelle Dam (under construction, then, and completed in 2017) for 20 $Mm^3$/year.
- Re-introduction of treated wastewater for irrigation to mobilise 12 $Mm^3$/year.

In summary**,** the masterplan recommended through implementation of the proposed water mobilisation configurations that an additional 224 $Mm^3$ of water be mobilised during the plan period.

3. ***Investment cost***. The investment required to realise this development was estimated at around Rs 10 billion, 2012 figures. This excluded the cost of the Bagatelle Dam, already under construction, then, but included the estimated cost of Rivière des Anguilles Dam.

4. ***Legal issues***. The Mauritian law correctly and explicitly recognises that all waters in its natural state, above or below ground is public property and cannot be privately owned, but a private right to use water can be recognised. However, the procedural provisions have resulted in the courts interpreting the law to infer that there is private ownership of water and reflected in Supreme Court Orders. These procedural elements need revision through a water rights reform programme. The latter should provide for the: separation of award of water rights from the judicial functions of the courts; the setting up of a technically competent government body, staffed by water resource professionals for the award of water rights; redefinition of the role of the Supreme Court; and the amendment, harmonisation of all water management legislation under a single legislation, say National Water Act.

5. ***Institutional set-up and capacity building***. The water resources sector is comprised of a complex natural, technical and social systems and a wide variety of different relationships between organisations whose responsibilities cover water and sanitation, surface and groundwater resources, drainage and flood control, irrigation, hydro-power generation etc. It is one of the most inter-disciplinary of sectors. Its planning, management and regulation is therefore the legitimate concern and responsibility of a range of ministries at central and local government levels.

The consultant stated that the WRC should be the central nodal organisation in Mauritius for the coordination of all activities domestic, agricultural, industrial, commercial and hydroelectrical power generation related to water resources management. A separation between the WRC and the three water related authorities, CWA, Irrigation Authority and Wastewater Management Authority was recommended. In addition, it was recommended to transfer the responsibility for quality of the nation's water resources to the Ministry of Environment and Sustainable Development.

The consultant further recommended that the WRC should in future develop into a fully independent Water Resource Monitoring or Regulatory 'Agency' which can objectively address the allocation of water and negotiate with all main water user categories. Against this background a capacity building programme was developed, primarily targeting staff of the WRC.

*Source: Master Plan for Development of Water Resources in Mauritius*

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**Appendix V**

## Examples of Delays in receiving funds from MEPU for works executed by CWA for period 2019 – 2024

| FY | Application No | Application Date | Receipt date | Days delay | Contract | Project description | Amount (Rs) |
|---|---|---|---|---|---|---|---|
| 2020/21 | 5 | 28/09/2020 | 21/01/2021 | 115 | C2014/10 | Alma Malinga pipeline | 888,250 |
| | 13 | 26/03/2021 | 04/06/2021 | 70 | | | 3,450,047 |
| | 9 | 29/01/2021 | 02/06/2021 | 124 | C2016/136, C2016/32 | Upgrading of distribution mains in the region of Lallmatie- Brisee Verdiere- Laventure pipeline | 258,434 |
| | | | | 124 | | | 381,504 |
| | 10 | 22/02/2021 | | 100 | | | 1,184,000 |
| | 11 | 18/03/2021 | 13/05/2021 | 56 | | | 7,560,000 |
| | 12 | | 02/06/2021 | 76 | | | 1,100,000 |
| | 5 | 28/09/2020 | 21/01/2021 | 115 | C2016/163 | South-West Coast - Phase II | 2,216,548 |
| | 6 | 19/10/2020 | | 94 | | | 3,017,098 |
| | 7 | 25/11/2020 | 01/04/2021 | 127 | | | 3,887,706 |
| 2021/22 | 11 | 25/05/2022 | 30/06/2022 | 36 | C2016/200 | Roche Bois - Plaine Verte | 4,293,418 |
| | 7 | 20/01/2022 | 11/03/2022 | 50 | C2019/87 | Renewal of service main and laterals from Bois Mangues Reservoir to Fond Du Sac | 6,627,141 |
| | 1 | 06/10/2021 | 09/11/2021 | 35 | C2018/76 | Construction of service reservoir at Cluny, Riche en Eau,Balisson , Rivière Dragon and Alma | 6,373,075 |
| | 4 | 30/12/2021 | 11/03/2022 | 71 | C2021/01 | Construction of service reservoir at Salazie and Eau Bouillie | 6,704,000 |
| 2022/23 | 14 | 28/02/2023 | 06/04/2023 | 37 | C2022/281 lot 2 | Procurement of milling, resurfacing of roads and related works in and around Rose Hill | 18,798,798 |
| 2023/24 | 20 | 02/10/2023 | 09/01/2024 | 99 | C2022/102 | Renewal of pipeline at St Croix | 6,722,628 |
| | 5 | 09/08/2023 | 17/10/2023 | 69 | C2023/132 | Renewal of service main in the Region of Petit Raffray | 306,450 |
| | 12 | 05/09/2023 | 17/10/2023 | 42 | | | 3,498,072 |
| | 8 | 17/08/2023 | 17/10/2023 | 61 | C2023/144 | Renewal of pipeline at Residence Trois Boutiques | 879,000 |

*Source*: NAO analysis of CWA data

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## Support and Consultancy Works for water sector reform initiatives — Appendix VI

| Period | Objects of study/mission visit | Actual/ Expected Outcomes/ Remarks |
|---|---|---|
| Funding agency: **Agence Française de Développement (AFD)** | | |
| December 2023 – ongoing. | To adopt and implement sustainable development strategies taking into account climate change and preservation of biodiversity in Mauritius and Rodrigues under five pillars. | Refer to section 2.3.6B |
| Funding agency/consultant: **World Bank (WB)** | | |
| December 2023 | WB discussed an investment project financing (IPF) for improving water security. The topics outlined as priorities for the Country Partnership Framework (CPF) for the period 2023-2029 were:<br>▪ Performance-based contracts for NRW reduction;<br>▪ Utilities performance improvement; and<br>▪ Desalination. | |
| February 2023 | Provide support:<br>▪ To ensure Mauritius water security by:<br>(i) Assessing potential for development of bankable desalination and water reuse projects that can attract private investors; and<br>(ii) Identifying opportunities for building resilient water services that can withstand more severe climate and economic shocks.<br>▪ To improve water utility performance and quality of services by:<br>(i) Building on the past support to improve CWA's operational and financial performance; and<br>(ii) Assessing opportunities for NRW reduction with potential private sector participation, change management plan and acceptable financial model to reduce intermittence in water supply and moving towards a 24/7 service.<br>▪ For digitalisation and automation of CWA operations for increased efficiency and financial sustainability. | |
| February 2020 | Cost and revenue modelling | |
| January 2020 | ▪ NRW reduction;<br>▪ Water resource allocation and projected supply and demand;<br>▪ Mode of financing of water projects;<br>▪ Social policy of Government on water supply;<br>▪ Process for tariff decisions;<br>▪ Process for setting and monitoring quality of service and water supplied;<br>▪ Ground water pricing methodology and process for setting the price; and<br>▪ Assessment of cost of supply of raw water to CWA | |
| February 2019 | Follow-up meeting – training needs and support. | |
| October 2018 | To review water bill and discuss on functions of WRU and capacity building. | |

| Period | Objects of study/mission visit | Actual/ Expected Outcomes/ Remarks |
|---|---|---|
| Funding agency/consultant: **World Bank (WB) *cont'd*** | | |
| September 2017 | Findings and recommendations and the process for the water sector reform | |
| February 2016 | Potable water sector reform and Public-Private Partnership (PPP) for the CWA<br>The main objectives of the project were to:<br>(a) improve service delivery to continuous 24/7 water supply within a proposed time frame of five years;<br>(b) update existing District Metering Areas and implement active leakage reduction programme;<br>(c) achieve NRW reduction and sustain it for a period of about 15 years; and<br>(d) sustain 24/7 supply after it has been achieved. | WB recommended a 15 years hybrid *affermage*-type contract (PPP Contract) whereby CWA would delegate to a private operator:<br>(i) its functions from 'source to tap' of operation;<br>(ii) maintenance of the bulk assets and the network;<br>(iii) capital investment execution and management; and<br>(iv) service delivery to customers.<br>A transaction advisor was appointed to advise on the process to move to a full-fledged management contract (affermage). According to MEPU, despite having reached an advanced stage of implementation, the project was dropped due to lack of adoption in around 2019. Thus, the affermage did not materialise. |
| Consultant: **Singapore Cooperation Enterprise (SCE), Singapore Public Utilities Board (PUB) and CH2M Hill** (the Singapore Consortium) | | |
| June 2011 | Develop an integrated water management framework to improving water resources management. | July 2012. Final report received. It comprised:<br>▪ Strategic plan and draft organisation roles and responsibilities report;<br>▪ Policy Framework Report; and<br>▪ Legal and Regulatory Framework report<br>SCE recommended, inter alia, the merger of the three service providers, CWA, WMA and the Irrigation Authority into a new Water Authority.<br>August 2012. Government approved recommendations of consultant as well as the setting up of a High-Level Committee (HLC) chaired by MEPU and comprising representatives of other Ministries to consider a detailed work plan.<br>August 2013. Government approved recommendations of HLC to implement an action plan in respect of the nine strategic initiatives identified by the SCE to reform the water sector including the above merger.<br>The recommendations were never put into action. The study cost government SGD $1,334,244 (equivalent to some Rs 32 million). |
| July 2013- June 2015 | NRW reduction project<br>(Rs 800 million of rehabilitation works) | Investment works could not be completed due to procurement delays at CWA. Preliminary results indicated only limited improvement on service quality in spite of significant expenditure. |
| Funding agency: **African Development Bank** | | |
| April 2023 | Mission for water sector investment programme to undertake dialogue with national authorities on desired and potential interventions in the water sector. | |
| February 2019 | Latest developments in the water sector in terms of policies, strategies, sector priorities and programmes in integrated water resource management, urban water supply and sanitation and rural water supply and sanitation | |

*Source: NAO analysis*

**Appendix VII**

## Key Policies and Strategies Formulated

| Policies and strategies | Issue date | Details | Financing |
|---|---|---|---|
| Integrated plan for harnessing additional water resources for vision 2040 | 1997 | Additional water resources meant increase in water by reducing losses; more efficient use of water; development of more groundwater resources; construction of river run-off diversion schemes; and a number of storage dams. | N/A |
| Groundwater resources in Mauritius<br>Status of aquifers – Wet Season 2011 | March 2011 | Undertaken by foreign groundwater expert (Dr Loic Giorgi) | Government funds.<br>1st mission – € 11.2k; 2nd mission – € 7.7k |
| Strategic Plan and Draft Organisation Roles and Responsibilities Report.<br>Policy Framework Report.<br>Legal and Regulatory Framework Report. | July 2012 | Water sector reform study carried out by Singapore Cooperation Enterprise (SCE).<br>The objective of the study was to achieve a 24/7 potable water system, reduce NRW, improve the framework for total water management and to have a roadmap in place to ensure that the water sector is ready to meet the increasing and changing needs of Mauritius. | MEPU.<br>SGD $ 1,334,244 (Rs 32,153,610) |
| Master Plan for Development of water resources in Mauritius | 2012 | Carried out by NIRAS A/S (of Denmark) in association with Mega Design Ltd. Refer to paragraph 1.4.2 | World Bank – Rs 44.8 m |
| National Water Policy | July 2014 | Undertaken by MEPU/WRU. Refer to paragraph 1.4.1 | |
| National Integrated Water Resources Management Plan 2015 | 2015 | Plan prepared jointly by the United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP), and executed by the United Nations Office for Project Support (UNOPS). Technical guidance was provided by the regional project management unit in Nairobi. Refer to para 1.4.3 | Global Environment Facility (GEF).[46] |
| Contingency measures for the dry season – A Road Map 2021-2024 for improving water supply service | April 2021 | Refer to para 1.4.4 | MEPU, WRC, CWA |
| Consultancy services for the preparation of a master plan for potable water supply and distribution in Mauritius | 2024 – ongoing | Refer to para 4.2.6B | AFD |

*Source*: NAO analysis of MEPU document

[46] Preparation of the plan was a GEF project through the Atlantic and Indian Ocean Integrated Water Resources Management (IWRM) in Small Island Developing States (SIDS) project.

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