REGULATED INDUSTRIES COMMISSION

Strategies and Policy Guidelines for the Efficient Use of Water in Trinidad and Tobago

August 2023

Consultative Document

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SECTION 1.0 INTRODUCTION

1.1 Background

Water is essential for life. It is critical for the survival of ecosystems, integral to human health and well-being and necessary for economic prosperity. Although water may appear to be in abundant supply, it is a limited resource.[1] Demand for potable water is projected to increase by 20 to 30% by 2050[2]; therefore, it must be used efficiently to ensure sustainabiliy. Efficient water use is at the core of the United Nation's 2030 Agenda for Sustainable Development. Specifically, Sustainable Development Goal 6 (SDG 6) - Target 6.4 requires countries to "substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity, by 2030".

Although Trinidad and Tobago is not classified as water scarce, the country's sole water utility, the Water and Sewerage Authority of Trinidad and Tobago (WASA), struggles to meet the country's daily water demand adequately because of (i) inefficiencies in water use and in the supply system and (ii) inadequate capacity of the water supply network to satisfy demand. Trinidad and Tobago is characterised by a relatively high water consumption per capita[3] compared to other countries in the region such as Barbados and Grenada.[4] Additionally, water tariffs[5] are relatively low, and there is limited metering[6].

Trinidad and Tobago faces recurrent water supply deficits because of the aforementioned issues. Consequently, many consumers receive an intermittent supply (sometimes less than two days per week). This situation is further exacerbated during the Dry Season when reduced rainfall adversely affects the amount of water available from surface water resources.

[1] 70% of the earth's surface is covered by water, but only 2.5% of that water is freshwater.
[2] UN World Water Development Report 2019. UN World Water Development Report 2019 | UN-Water (unwater.org)
[3] Source: Water and Sewerage Authority, 2021.
[4] Source: The World Bank, 2018. Annual freshwater withdrawals, total (billion cubic meters).
[5] Ekwue, Edwin. (2010). Management of water demand in the Caribbean region: current practices and future needs. The West Indian Journal of Engineering. 32. 28-35.
[6] Source: Water and Sewerage Authority, 2017.

As the economic regulator of the water sector, the Regulated Industries Commission (RIC) recognises the need for policy intervention to appropriately address the problems relating to the water sector in Trinidad and Tobago. If the problems identified above are left unaddressed, the situation will likely worsen with population growth and increasing demand for potable water. Thus, WASA should take steps to manage available water resources in a sustainable manner. To achieve this, a series of suitable water-efficient strategies and policies must be developed and implemented to increase water efficiency and minimise the need for new water supply resources in Trinidad and Tobago. The utility must embark on a public education programme to educate consumers about using water efficiently. Consumers must also acquaint themselves with information pertaining to water use efficiency.

1.2 Purpose of Document/Consultation

This document provides the RIC's initial perspective on the strategies and policy guidelines for the efficient use of water in Trinidad and Tobago and identifies the role key stakeholders can play in this endeavour.

This document is expected to stimulate discussion with all stakeholders during the consultation period, and will ultimately provide a foundation for establishing effective water efficiency practices within the population. The RIC will continue to engage with all stakeholders to promote water use efficiency in Trinidad and Tobago.

1.3 Structure of Document

The remainder of this document is organised as follows:

Section 2: The State of Public Water Supplies in Trinidad and Tobago.

Section 3: The State of Water Efficiency Efforts in Trinidad and Tobago.

Section 4: The Case for More Efficient Water Use in Trinidad and Tobago

Section 5: Key Lessons from Water Efficiency Policy Implementation in Other Jurisdictions

Section 6: Proposed Strategies and Policy Guidelines for the Efficient Use of Water in Trinidad and Tobago.

1.4 Responding to this Document

All persons wishing to comment on this document are invited to submit their written responses by **October 21, 2023**. Responses should be sent by post, fax or email to:

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Regulated Industries Commission
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Port-of-Spain,
Trinidad and Tobago
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Tel.: 1(868) 625-5384; 627-7820; 627-0821; 627-0503
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Email: ricconsultation@ric.org.tt
Website: www.ric.org.tt

All responses will normally be published on the RIC's website unless there are good reasons why they must remain confidential. Any requests for confidentiality must be indicated.

SECTION 2.0 STATE OF PUBLIC WATER SUPPLIES IN TRINIDAD AND TOBAGO

2.1 Water Availability

The Water Resources Agency (WRA) estimates that 844,800 million imperial gallons of fresh water are available annually in Trinidad and Tobago (T&T) of which 79% can be found in rivers and 21% collected in aquifers.[7] This is equivalent to 0.6 million gallons (2,727 m^3) of water per person annually. On the basis of the international criterion for water scarcity (less than 1,000 m^3/year per person)[8], Trinidad & Tobago is not considered a water-scarce country.

2.2 Water Quality

The quality of raw water available to WASA at various sources has shown consistent signs of deterioration over the years. The degradation has been caused primarily by unregulated and poor land-use practices, which affect watershed areas and pollute rivers with chemical contaminants and heavy sedimentation. The degradation negatively impacts the availability of raw water and increases the cost to produce potable water. In addition, high turbidity after heavy rainfall events at times results in plant shutdown in excess of 24 hours.[9] Although fresh water sources have degraded, WASA's treatment processes is adequate to produce water that meets WHO guidelines for drinking-water quality.[10] However, continued deterioration of the raw water quality will require the utility to invest in more advanced filtration and chemical treatment processes to maintain acceptable potable water standards

[7] Report of the Cabinet Sub-Committee Appointed to Review the Operations of the Water and Sewerage Authority and to Determine a Strategy for Enabling the Authority to Achieve its Mandate, Trinidad and Tobago Parliament (2020).
[8]United Nations World Water Development Report 4 (2012)
[9] WASA. WASA Trinidad & Tobago. Facebook. March 2, 2021. https://www.facebook.com/WASATrinidadTobago/photos/pb.100064440051769.-2207520000./2784669458324694/?type=3
[10] WASA samples and tests water using internal laboratories to check water quality using WHO guidelines.

2.3 Water Production

In 2019, WASA's total water production[11] was 81,608 million imperial gallons, which was consistent with the average annual production over the 2016-2019 period of 82,268 million imperial gallons equivalent to 225 millon gallons per day(mgd)[12]. In 2019 and 2020, WASA stated that its water production averaged 218 mgd, which was 9.7% lower than the average for 2016-2019 and 10% lower than its production capacity of 243 mgd. The utility reported that this was due to a series of harsh dry seasons and drier than normal rainy seasons, which reduced inflows to the major impounding reservoirs and surface water intakes.[13] While surface water accounts for the highest source of supply (54%), WASA purchases desalinated water from the two (2) independent operators[14] which accounts for 19% of the country's potable water supply. Although WASA's water production decreased in 2019 and 2020, the average water produced over the period equated to 156 gallons/person/day. This figure is still significantly higher than that of other countries within the region, including Jamaica (65 gallons/person/day) and Barbados (66 gallons/person/day).[15] [16]

2.4 Water Supply - Challenges Meeting Demand

A significant deficit exists between water supply and demand on both a regional (North, South, Central and Tobago) and temporal (dry and wet season) basis. Over the period 2016-2019, WASA's production averaged 225 mgd of water, while demand was estimated at 248 mgd. Non-Revenue Water (NRW), consisting of water lost through leaks and illegal connections, was estimated to be 53% (119.25 mgd). The supply deficit in the dry season, on average, was 79 mgd and the annual average deficit was 24 mgd.[17]

[11] Total water production includes the volume of WASA's total water production from various sources in addition to the volume of water produced by desalination companies.
[12] mgd in this document represents million imperial gallons per day
[13] WASA. WASA Trinidad & Tobago. Facebook. July 21, 2020. https://www.facebook.com/WASATrinidadTobago/photos/a.424720110986319/2211155932342719/?type=3
[14] The Desalination Company of Trinidad and Tobago (Desalcott Ltd.) and Seven Seas Water Group.
[15] Development of an Appropriate Rate Structure: Benchmarking Report, Castalia Limited (2018).
[16] Figures did not account for the difference in size of industrial sectors among each country.
[17] Report of the Cabinet Sub-Committee Appointed to Review the Operations of the Water and Sewerage Authority and to Determine a Strategy for Enabling the Authority to Achieve its Mandate, Trinidad and Tobago Parliament (2020)

In its 2021 Dry Season Management Plan, WASA stated that it usually produces an overall maximum of 256 mgd of potable water under normal conditions. The difference between the average of 2016-2019 and maximum production capability could be attributed to the drier than normal rainy seasons.[18] However, for the 2021 dry season period, the utility's projected production ranged from a low of 203 mgd to a high of 240 mgd. Consequently, WASA projected a production deficit of 48 mgd (20%) on average for Trinidad and 4 mgd (29%) for Tobago.[19]

The existing deficit between water supply and demand can be largely attributed to the following:

(a) Aged and inefficient network infrastructure

WASA's transmission and distribution systems consists of over 7,000 km of pipeline of varying types and sizes, as well as three hundred (300) installations that include wells, booster stations and water & wastewater treatment plants. In 2019, WASA reported that 47% of its transmission and distribution lines were in need of upgrading or replacement. The upgrades and replacements were required because of corrosion that resulted in leaks, and encrustation found in older pipes which limited available flow to customers. Consequently, as a result of the aged infrastructure, WASA experienced approximately 4.3 breaks per km of water distribution network per year whereas a well-maintained utility, irrespective of jurisdiction or location, has approximately one (1) break per km of distribution network per year.[20] The situation is further exacerbated by the delivery of an intermittent water supply to many customers. The shortcomings of an intermittent supply and its impact on water supply networks have been extensively documented and include underutilised and overexploited equipment, vacuum conditions leading to water contamination and higher maintenance costs.[21] The constant cycling on and off of water flowing in the pipelines creates shocks and excessive stress on pipelines, joints and pumps in the system. This increases the rate of pipe breaks, accelerates joint failures, and shortens the life of pumps in the system. This in turn contributes to the high level of leakage.

[18] WASA. WASA Trinidad & Tobago. Facebook. July 21, 2020. https://www.facebook.com/WASATrinidadTobago/photos/a.424720110986319/2211155932342719/?type=3
[19] WASA Dry Season Management Plan (2021)
[20] *2016 Performance Measurement & Benchmarking Report*. Toronto, Canada: Toronto Water Services. 2018.
[21] Pandit M. & Faure F. Intermittent Water Distribution. Sustainable Sanitation and Water Management (2019)

(b) Inadequate network capacity

Although major developments have been undertaken with respect to the water supply infrastructure, the system has never fully satisfied the growing water needs of the population in Trinidad and Tobago. Thus, the existing water supply infrastructure does not have the network capacity to adequately supply all customers on a 24/7 basis. Low tarrifs limit the ability of the utility to invest in the development of the infrastructure. In this regard, water supply is distributed on an intermittent (scheduled) basis to approximately 59% of consumers annually.[22]

(c) Non-Revenue Water (NRW)

When WASA's water production is compared to demand, it is observed that there is an imbalance between the water produced, water supplied and water billed. Water losses on the network are attributed to leakage in the transmission and distribution network and on customers' premises, and theft. These losses are excessive and estimated to be 53% of the total water produced[23]. In addition to this, a significant amount of water loss occurs outside the direct control of the utility through leaks and wastage on customer's premises because of defective devices and inefficient water use. WASA estimates that half of the 53% of the losses are on customers' premises. Although the cost of this loss is borne by the utility in the cases where the customers are not metered, it is not regarded as NRW in the watetr industry's definition of the term. This problem stems from the fact that residential customers generally are not metered and pay a flat fee to the utility.

(d) High per capita consumption of water

In Trinidad and Tobago, the average daily water consumption per capita is estimated at 82 gallons per day, as compared to an average of 46 gallons per day regionally.[24],[25] Trinidad and Tobago's water consumption rate is double that of the World Health Organisation's (WHO) standard for reasonable consumption.[26] Trinidad and Tobago's water consumption

[22] Water and Sewerage Authority (2019)
[23] WASA (2021)
[24] WASA media briefing (May 2020).
[25] Figures include industrial customers which will distort water consumption per capita for Trinidad and Tobago as the country is heavily industrialised.
[26] Does not account for difference in size of industrial sector by country.

continues to be relatively high because there is very little economic incentive for consumers to reduce water consumption as tariffs are low and metering is limited.

(e) Inadequate water storage capacity

WASA typically stores raw water in nine (9) impounding reservoirs and treated water in 57 service reservoirs (tanks) . Total water storage (raw and treated) across both islands is 14,729 MIG. Under circumstances where there are no inflows to any of these reservoirs, typically during harsh dry seasons, the country will have less than 70 days (approximately 2 months) of water at an average production of 218 mgd.[27] Reduced production would result in insufficient supply to customers unless water usage patterns change to become more in line with WHO guidelines.[28]

Apart from the issues outlined above, other factors that affect WASA's ability to meet the country's demand for potable water include:[29]

- The limited implementation of a holistic integrated water resources management strategy;
- Impacts of climate change and climate variability; and
- Pollution.

[27] Does not consider the effect of siltation on reservoir capacity
[28] Report of the Cabinet Sub-Committee Appointed to Review the Operations of the Water and Sewerage Authority and to Determine a Strategy for Enabling the Authority to Achieve its Mandate. Trinidad and Tobago Parliament (2020).
[29] Draft Revised National IWRM Policy (2017)

SECTION 3.0 The State of Water Efficiency Efforts in Trinidad and Tobago

According to a recent UN report on water-use efficiency, Trinidad and Tobago is estimated to have a water-use efficiency of 58.1 USD/m^3 , which is significantly higher than the global water-use efficiency average of 18.9 USD/m^3.[30] While this is better than the global average, there is significant opportunity to bring it in line with that of more water efficient countries such as France (85 USD/m^3), Belgium (102 USD/m^3) and Germany (113 USD/m^3).[31, 32] Some notable efforts that support water efficiency in Trinidad and Tobago:

- *The Development of Integrated Water Resources Management Policy – GoRTT*

  As part of its overarching policy for improving the water sector, the Government of the Republic of Trinidad and Tobago (GoRTT) is committed to "the management of the water resources of the country, to provide not only a reliable water supply to meet present demands but also to ensure the sustainability of supply and the available water resources of the country to meet the needs of future generations."[33] To attain this goal, GoRTT intends to adopt and implement an Integrated Water Resources Management (IWRM) approach, which is accepted internationally as the way forward for efficient, equitable and sustainable development and management of the world's limited water resources and for coping with conflicting demands. In initiating this process, GoRTT finalised a National IWRM policy in 2005. The Policy sought to unify all of the initiatives for improving the water sector and provide a strong direction and vision for the effective management of the nation's water resources in an integrated and sustainable manner.

  In addition, GoRTT proposes to implement a new legislative framework for integrated resources management to regulate the water and wastewater sector effectively. The development of this framework is based on the formulation of a revised National IWRM Policy linked to other national policies and international conventions. Although this Policy was

[30] Progress on Water-Use Efficiency (SDG target 6.4). UN-Water. United Nations.
[31] Ibid
[32] Average of Organization for Economic Cooperation and Development (OECD) member States equates to 181.05 USD/m^3
[33] Draft National Integrated Water Resource Management Policy. GoRTT (October 2016).

revised in 2017 in line with GoRTT's 2030 Vision, it is yet to be formalised via institutional frameworks and management strategies,

- *Holistic Multi-Pronged Approach – GoRTT and WASA*

The GoRTT, in consultation with WASA, has acknowledged that a holistic multi-pronged approach is required to successfully treat with the problems affecting the efficient and reliable provision of water services.[34] As part of this approach, there are at least three initiatives that impact directly on the issue of water efficiency. These include:

- rectifying the transmission issues by repairing ageing infrastructure to reduce the levels of non-revenue water
- metering and
- enhancing water conservation awareness.

- *Establishment of Baseline Water Efficiency Performance of Fixtures – Private Sector*

The Trinidad and Tobago Green Building Council (TTGBC), a member-driven organisation, has advocated for water efficiency as part of its efforts to promote the sustainable design of buildings throughout Trinidad and Tobago. The TTGBC aims to promote water efficiency through simple, low or no-cost strategies that can significantly reduce potable water consumption. The TTGBC evaluated the performance of plumbing fixtures and activities which consume potable water to establish a baseline of water efficiency performance of fixtures that would reduce environmental and economic impacts associated with excessive water use. This resulted in performance calculations on water fixtures and the establishment of a recognition award criterion in which water performance must be 10% more efficient than baseline performance. Baseline performance values for specific water fixtures include: Water closet/Toilet (1.6gpf), Urinals 1 (gpf), Lavatory Faucet (0.5 gpm), Kitchen faucet (2.2 gpm) and Showers (2.5 gpm).[35]

[34] Holistic approach required to tackle WASA issues. Trinidad and Tobago Government News. GoRTT (2019).
[35] Water Efficiency – TTGBC | The Trinidad & Tobago Green Building Council

- *Review of Water Tariffs – RIC*

WASA's current water tariffs were last adjusted in 1993, 30 years ago. In the ensuing years, the utility continued to carry out capital works and incurred increasing operational expenses to meet demands at tariff levels that have remained stagnant since 1993. WASA's current revenues from rates cover approximately one-third of its operational expenses. The RIC is aware of the importance of cost reflective rates to ensure sustainability of the utility and to send appropriate price signals to consumers to incentivize efficient consumption.

- *Other notable efforts that support water efficiency in Trinidad and Tobago:*

Notwithstanding the initiatives mentioned above, the advancement of water efficiency measures in Trinidad and Tobago has been hampered due to fundamental issues, including:

- The non-approval of the National IWRM policy;
- The absence of an appropriate institutional framework and organisational structures for effective water management;
- The absence of an effective national water efficiency plan that works in tandem with the National IWRM;
- The absence of national targets and standards for efficient water usage;
- The absence of a water loss reduction programme;
- Lack of upgrades in the water infrastructure;
- Lack of dedicated financing mechanisms to support water efficiency;
- Water rates that are not cost reflective;
- The high water consumption relative to other jurisdictions;
- Limited metering; and
- Lack of public awareness about the benefits of water conservation and water use efficiency.

SECTION 4.0 THE CASE FOR MORE EFFICIENT WATER USE IN TRINIDAD AND TOBAGO

4.1 The Importance of Water Efficiency

It is projected that two-thirds of the global population will be living in areas of water stress[36] by 2025, if the current levels of water consumption continue.[37] Accordingly, the UN Sustainable Development Goal (SDG) Target 6.4, addresses water scarcity, aiming to ensure that there is sufficient water for the population, the economy and the environment by increasing water-use efficiency across all sectors of society.

Water use efficiency is key to fostering sustainable water consumption. It differs from water conservation because it focuses on reducing waste, not restricting use. Water efficiency generally means "doing more and better with less water".[38] From an economic perspective, water use efficiency implies obtaining more value with available water resources. This means reducing resource consumption, pollution and the environmental impact of water used to produce goods and services at every stage of the value chain. Essentially, improving water use efficiency means increasing water productivity, that is:

- reducing the intensity of water use for, and pollution from, socio-economic activities through maximising the value of the uses of water;
- improving the allocation of water among competing water uses such as agriculture, domestic, manufacturing, etc. to obtain greater socio-economic value per drop of water;
- ensuring environmental flows[39]; and
- improving the technical efficiency of water services and the management efficiency of their provision over the complete life cycle.[40]

Some key benefits of improving water efficiency are as follows:

[36] Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use.
[37] The UN World Water Development Report, United Nations UN-Water (2014)
[38] *Water Efficiency and Conservation.* American Rivers, 2016.
[39] Water bodies that provide a wide range of services for ecosystems and human society to thrive on.
[40] The UN World Water Development Report, United Nations UN-Water (2014)

I. S*aves money* - Reducing water use automatically reduces water charges for metered customers and overall operational costs for utilities by reducing the amount of water produced.

II. *Saves energy* - Water and wastewater utilities are typically energy-intensive operations as a considerable amount of energy is needed to treat and pump water and effluent daily. The quantum of energy used can be reduced if consumers utilise water supplies efficiently.

III. *Protects the environment and reduces carbon footprint* – More efficient water use benefits the environment as it reduces the amount of resources needed to produce the required water output and hence the amount of green-house gases that is produced in the treatment process. The UN notes that using water more efficiently would help reduce planet warming emissions and curb climate change, a potential benefit that is yet to be widely recognised.

IV. *Fosters sustainable water use* - Effective supply and demand management policies aimed at improving water-use efficiency are expected to contribute to sustainable water use.

4.2 Why Trinidad and Tobago Need to Become More Water-Efficient

The nation's effort to become more water-efficient does not only stem for our commitment to meeting the requirements of SGC 6.4, but more importantly to address demand and supply imbalance, given the relatively high levels of NRW (53%). The negative impacts of climate change and climate variability on rainfall, river flows and aquifers have also placed this issue at the forefront because surface water and groundwater abstraction can be significantly compromised. Water efficiency can also help reduce water and energy bills over time for households and businesses, which would improve the country's overall water productivity[41].

[41] The measure of output (biomass, crop yield or revenue) divided by some measure of water applied or consumed in production

In light of the issues highlighted above, it is evident that Trinidad and Tobago needs to improve efforts to become more water efficient. Water use efficiency is perhaps one of the few measures that can positively impact both climate change mitigation[42] and adaptation[43].

[42] Making the impacts of climate change less severe by preventing or reducing the emission of greenhouse gases (GHG) into the atmosphere.
[43] The process of adjusting to the current and future effects of climate change.

SECTION 5.0 KEY LESSONS FROM WATER EFFICIENCY POLICY IMPLEMENTATION IN OTHER JURISDICTIONS

In recent times, increasing global water supply challenges have given rise to greater focus on water use efficiency.[44] Many governmental organisations have created policies and strategies to incentivise water use efficiency. Also, several non-governmental organisations (NGOs) have been raising awareness and contributing to water use efficiency efforts at national and regional levels. Various water-efficient solutions and practices focus on reducing potable water use, and substitution with non-potable water resources such as greywater and stormwater for irrigation.. Some of the more prominent water-efficiency undertakings are discussed in the following sections.

Integrated Water Resource Management and Water Efficiency Planning

Several jurisdictions, including the UK[45], United States[46] and Australia,[47] have developed policies for integrated water resource and efficiency planning. Comprehensive integrated resource planning makes full use of available water in water supply planning and encourages participation in regional coordination and integration efforts. Integrated planning takes a holisitic approach to focusing efforts and resources of a diverse range of bodies and communities to resolve commonly identified problems. An integrated approach to water management is expected to contribute to improved water use efficiency.

There is also increased awareness that the three parts of the urban water cycle (water supply, sewage and stormwater) need to be considered in an integrated way to improve cost effectiveness and increase sustainability. New greenfield developments and urban renewal projects provide many opportunities to implement new systems at lower marginal costs than retrofitting or maintaining older, less efficient reticulation systems with more innovative treatment systems which can provide more locally appropriate scales and types of treatment and reuse.

[44] Water, Growth and Finance – Policy Perspectives. Organisation for Economic Co-operation and Development (OECD), August 2016.
[45] Waterwise Water Efficiency Strategy for the UK
[46] United States of America Environmental Protection Agency and American Water Works Association
[47] Principles for Greater Water Efficiency. Planning Institute of Australia (PIA).

Improving Regulations

The Planning Institute of Australia (PIA) has outlined water efficiency best practices by using and refining statutory mechanisms. These mechanisms included the management, protection and enhancement of waterways through legislation, environmental protection policies, codes/guidelines for appropriate practice, and the identification of water protection areas. The UK, through its Waterwise Water Efficiency Strategy, indicate that utility regulation should focus on establishing metering, water neutrality[48], tariffs, and improving delivery of large-scale domestic retrofit programmes.

Improving Education and Awareness

In the United States, the American Water Works Assiciation (AWWA) in its Policy Statement on Water Efficiency, encourages utilities to support education and public information on local water resource issues, water efficiency, and conservation to increase awareness of customer water use. In Waterloo, Canada[49] extensive communication and outreach activities associated with a Water Efficiency Master Plan since 1974 have been implemented – including the use of print material, mass media to raise public awareness around specific program elements, talks and workshops, and promotional giveaway items (such as water fixtures, shower timers, etc.). Waterloo has also taken measures to foster behaviour change to reduce water use through public presentations and seminars, and other activities. In addition, there are opportunities for developing and implementing appropriate water efficiency mechanisms.[50] Utilities should encourage appropriate onsite water catchment and reuse such as rainwater and stormwater harvesting and the use of air conditioner condensate and greywater, consistent with the protection of public health. Utilities should also support continued research into efficient water use practices.

[48] Conservation of water through the minimization and offsetting of demand so that the total demand on the public water supply in a defined region is the same after development as it was before.
[49] Waterloo Water Efficiency Master Plan (2015 – 2025)
[50] Certification programmes, standards and codes for plumbing fixtures and appliances, as well as outdoor uses of water.

Universal Metering

Monitoring water use efficiency requires some form of measurement. The volume of water used measured against the water required is critical to understanding supply system efficiency to determine and inform planning for necessary maintenance and refurbishment. Generally, meters measure the volume of water passing through pipes along the way from withdrawal to distribution and delivery. Some meters can also provide real-time data of the timing and patterns of use. Such detailed information can help identify sources of leakage and prioritise abatement measures. When metered usage is communicated to customers, it also helps to incentivise them to manage their water use more efficiently.

The UK and the United States[51] identify the establishment of metering as one of the key components to utility delivery[52] and regulation. Furthermore, The United Nations (UN) Roadmap has identified low-cost metering as a means of systematic water management improvement. Conventional water meters can be too costly for low-income customers to acquire, install and maintain. Therefore, special programmes are needed for these customers in which the utility supplies and installs meters and recovers the cost over time through customers' bills.

Incentives for Efficient Water Use

Ideally, water charges should reflect the full long-range costs (i.e., forward-looking, not historical cost) of operating and maintaining a water utility, as well as the scarcity and value of the resource. The rate structure should also encourage and reward conservation and efficient use. Water efficiency policies from the Environmental Protection Agency (EPA) and PIA suggests that rewards be provided to those that exceed the current standards for efficient water use. These policies advocate incentive programmes such as rebates and tax credits to homeowners and businesses to encourage replacement of plumbing fixtures and appliances with water-efficient models. The EPA also recommends a conservative water rate structure, such as an inclining block

[51] Ibid.
[52] The utility service, such as water, gas or electricity, that involves the local utility only delivering that to a customer.

tariff, as a best practice towards water use efficiency. In addition, the AWWA suggests that utilities should use full-cost pricing and rate structures to incentivise the conservation of potable and non-potable water that include clear rate increases between tiers.

Water Efficiency Labelling

The use of more efficient fixtures and fittings in households can improve water use efficiency. such as the replacement of inefficient taps, toilets, showerheads, washing machines, and dishwashers with more efficient devices. In turn, this can reduce per capita consumption significantly.

Australia, China, Ireland, Israel, New Zealand, Singapore and the USA now have water efficiency labelling requirements that provide consumers with information that empowers them to choose more water-efficient appliances. In addition, the UK encourages suppliers to adopt best practices in water use efficiency such as; educating customers about water used efficiency, empowering them in selecting water efficient appliances, providing resources for water calculators, and encouraging the use of water efficiency devices in new developments as well as retrofits.

Water efficiency benchmarking and labelling leads to market transformation, as the industry understands the costs and benefits associated with efficiency savings. This understanding drives innovation and results in a steady development of efficiency technologies across a range of industry sectors. Labelling also offers businesses a platform to communicate their commitment to corporate social responsibility, especially in industries that traditionally have high water use.

Water Accounting

Effective management of a water system requires an understanding of the dynamics of water inputs, outputs, demands, and supply constraints. By limiting unnecessary or wasteful source water withdrawals, water authorities gain financial benefits through improved revenue recovery, less wear and tear on infrastructure, fewer service disruptions, and improved system integrity. The water audit provides an understanding of how much of the water distributed is authorised, metered,

and/or billed. Estimated volumes of losses due to leakage and poor metering and accounting can also be quantified in the water audit process. Although there are no requirements for routine water auditing in North America, a number of state and regional water resources agencies have proactively required water utilities to perform water audits.

There are policy, funding and technical challenges in requiring routine, utility scale water audits. A starting point for improved water use efficiency is using a systematic, reliable and transparent method for assessing water supply and demand and establishing a water balance in an area or region.

Water Use Efficiency Evaluations with Metrics

As mentioned before, water use efficiency cannot be monitored without some degree of measurement. The PIA cites monitoring and evaluation as a water efficiency best practice. This includes ensuring that regular monitoring and evaluations are done to track progress, identifying issues, encouraging improvements and reporting on the progress in water resource management and conservation. The UK recommends that the use of evaluations' metrics to determine the country's performance with respect to best practices for water use efficiency. The strategy specifies including baseline values against which water efficiency and resilience can be measured/compared - in the Water UK dashboard and future resilience indicators. Through evaluations, jurisdictions can assess their performance for water use efficiency.

The EPA also recommends metrics to guide progress evaluations such as those indicated below:

Criteria	**Metric**
Water System Management: Supply Side and Demand Side Accounting	Data Validity; and Non-Revenue Water[53]

[53] Non-revenue water is the difference between the volume of water put into a water distribution system and the volume that is billed to customers. NRW comprises three components: physical (or real) losses, commercial (or apparent) losses, and unbilled authorized consumption:

Criteria	Metric
Water Loss Minimisation: Leak Management	Infrastructure Leakage Index (ILI)[54] or Op24 (real loss per service connection per day), Economic Level of Leakage[55], and Water Loss Control Program/Plan
Metering	Universal metering, including sub-metering[56]
Conservation Rate Structure	Demand reductions from pricing water for efficiency[57]
End-Use Water Conservation and Efficiency Analysis	Residential Gallons Per Capita Per Day[58]

Planning for Upgrades to Water Infrastructure

Policymakers are responsible for developing the policy framework for the improvement of water use efficiency. For example, the *WaterGuide* produced by the Australian government provides the elements of an organising framework for decision-makers. The framework should seek to address the strengths and weaknesses in current water planning, and serve as the basis for an action plan to improve water management and support investments to deliver the desired outcomes.

- Physical losses comprise leakage from all parts of the system and overflows at the utility's storage tanks. They are caused by poor operations and maintenance, the lack of active leakage control, and poor quality of transmission and distribution assets.
- Commercial losses are caused by customer meter under registration, data-handling errors, and theft of water in various forms.
- Unbilled authorized consumption includes water used by the utility for operational purposes, water used for firefighting, and water provided for free to certain consumer groups.

[54] A measure of how well a distribution network is managed, maintained, repaired and rehabilitated as regards control of real (physical) losses, at the current operating pressure.
[55] An estimate of the optimum leakage level below which the costs of reducing leakage further exceed the benefits of saving water
[56] The installation of meters at the premises of all customers coupled with the implementation of a volumetric tariff structure for the purpose of billing customers for consumption.
[57] A means of exercising a public policy about water with the intent of reducing demand through a price regime.
[58] The average amount of water each person in a particular area uses on a daily basis

Water Loss Minimisation: Leak Management

Water loss through leaks in the supply network represents the largest real losses for most systems. Accordingly, focus should be placed on assessing and addressing water loss minimisation through leakage control. Metrics that measure leakage, such as number of pipe breaks per km, tailored to system characteristics that identify economic level of loss, and measures (in place and planned) to assess and control water loss shoud be used to manage leaks. The UK, Australia and Canada have implemented leak management programmes.

SECTION 6.0 PROPOSED STRATEGIES AND POLICY GUIDELINES FOR THE EFFICIENT USE OF WATER IN TRINIDAD AND TOBAGO

Improvement in water use efficiency requires a holistic approach that takes into account the views of all stakeholders. The Government is responsible for formulating national policy and establishing the appropriate institutional framework. As the economic regulator of the water sector, the RIC has a key role in establishing standards for the services provided by the utility to customers and ensuring that tariffs are cost reflective to send the appropriate price signals to customers and thus encourage efficient water use. In pursuit of these functions, the RIC has an obligation to ensure that WASA pursues the most efficient way of meeting customers' needs for water. The RIC expects WASA to pursue water efficiency vigorously, especially through leakage control and by promoting the efficient use of water by customers.

Role of the Service Provider

The RIC will provide specific directives in its Price Review for the water and wastewater sector, and believes that WASA should pay particular attention to the following:

A. Raising Awareness about Efficient Water Use through Public Education

It is important to frequently communicate with consumers and conduct outreach activities to promote water use efficiency. This may include the use of social media, mass media and print material (as appropriate) to raise public awareness about the importance and benefits of water efficiency and corresponding practices that consumers can adopt. Additionally, information on replacing existing fixtures with more efficient models can support the drive to reduce water consumption in the home, reducing per capita consumption significantly.

B. Improving Security of Water Supply by Upgrading the Water Infrastructure

A significant portion of customers receive an intermittent water supply. This leads to water use inefficiencies as many of these customers typically resort to storage and hoarding of water in tanks, barrels and buckets. Water stored in barrels and buckets is often discarded when a fresh supply is received. Additionaly, consumers occasionally discard large quatities of water to clean water tanks. These wasteful practices can be eliminated by improving the consistency of supply to customers through improved performance of the

supply network, educating consumers, implementing universal metering and charging cost reflective tariffs. Improving the security of water supply requires upgrades in the local water infrastructure which include increasing capacity of treatment plants, expanding the transmission and distribution infrastructure and increasing the capcity of water storage facilities.

C. Implementing a Water Loss: Leak Minimization Programme

Water loss through leaks in the water supply infrastructure is a significant challenge in the local water supply system. Thus, it is important to implement a programme that can effectively minimise and control leakage.

D. Implementing Water Accounting System: Supply Side and Demand Side

A useful tool for strategic long-term water management is a Water Accounting System (WAS). Such a system is used to monitor the dynamics of water inputs, outputs, demands, and supply constraints and aids in the management of the demand/supply balance of the water supply system. By limiting unnecessary or wasteful source water withdrawals, the water utility can improve water management and gain financial benefits through improved revenue recovery, less wear and tear on infrastructure, fewer service disruptions, and improved system integrity.

Role of the Regulator

The RIC acknowledges that customers need appropriate signals to encourage them to engage in appropriate behaviour and is of the view that tariffs ought to be cost reflective. Metering, which was addressed in the RIC's consultative document entitled ***Universal Water Metering in Trinidad and Tobago – A Concept Outline***, is a critical component of a cost reflective tariff structure. Therefore, the RIC will pay particular attention to the following:

A. Ensuring appropriate cost reflective tariffs

In its rate review undertakings, the RIC will ensure that tariffs reflect the true cost of providing the water supply service. In this endeavour, it is important to educate customers

about the benefits of having cost reflective tariffs and how this supports efficiency and sustainability of the service. The need for appropriate pricing and its relationship to metering in the water sector as a tool for reducing demand is well documented. Informing customers about the impact of water use efficiency on operational costs and how these costs are transferred through bills, is expected to send the right signals to customers to use water more efficiently.

B. Facilitating Funding Mechanisms for Capital Investments

The RIC is also cognisant that upgrades to WASA's infrastructure will require funding. WASA's current financial position does not allow for capital investments in infrastructure upgrades to be funded internally and will have to be addressed under a Price Review.

C. Implementing Performance Indicators

The RIC intends to implement performance indicators and targets, to foster continuous improvement from the utility.

Role of the Government

Under the RIC Act, the RIC has a duty to advise GoRTT with respect to the sectors that fall under the regulator's remit. GoRTT is responsible for policy matters in promoting water use efficiency, and the RIC expects that GoRTT will decide on the policy framework that it believes is most appropriate for T&T and articulate such to stakeholders. In this regard, the RIC takes the opportunity to identify the following key issues for active consideration:

I. ***Prioritising the Formalisation and Implementation of the National Integrated Water Management Policy***

The National IWRM Policy is expected to unify the various initiatives related to water and provide a strong direction and vision for the effective management of the nation's water resources in an integrated and sustainable manner.

II. ***Evaluating How Far Trinidad and Tobago is from Water Efficiency Best Practice***

It is important to identify water-efficient solutions and best practices and assess/measure Trinidad and Tobago's performance against these. One approach is to develop a national water dashboard, which should include various water efficiency indicators. GoRTT would be responsible for developing the national water dashboard for benchmarking and tracking progress. The dashboard will provide scores that will reflect opportunities for adjustment or development of specific strategies to improve water efficiency.

III. ***Developing National Indicators/Targets for Water Consumption per*** **Capita**

It is important to establish national indicators/targets for water consumption per capita and best practice. Approaches that assess best practice water use and water budgets at the household level should be used, and there should be nationwide comparative assessments.

IV. ***Prioritising the Creation of Appropriate Institutional Framework and Organizational Structures for Effective Water Management***

It is important to prioritise the enactment of the legislation for the National IWRM Policy to provide for the effective regulation of the water and wastewater sectors.

V. ***Developing a National Water Efficiency Plan for Trinidad and Tobago***

More effort should be made to incorporate explicit water efficiency measures within the National IWRM plan. A well designed water efficiency plan should set the stage for the successful implementation of measures to avoid water loss and to manage demand for effective water resource management. This water efficiency plan should work in tandem with a water conservation plan and should be integrated into infrastructure planning to ensure that the water utility optimises the use of existing resources before considering the development of additional resources. Additionally, a roadmap and financing strategy should be established for the implementation of the water efficiency plan.

VI. ***Implementing New Home Building Incentives/ Variable Infrastructure Charges for New Developments***

To encourage water efficiency uptake, consideration should be given to the development of mechanisms to incentivise local consumers who construct high performance buildings/homes. These can include incentives such as tax breaks, rebates, financing, education and training, information sharing and technical assistance.

VII. ***Establishing a Water Efficiency Labelling Scheme***

GoRTT can also mandate the Trinidad and Tobago Bureau of Standards to establish a water efficiency labelling scheme. The use of high efficiency fixtures and fittings in domestic plumbing installations can improve water use efficiency considerably in households in Trinidad and Tobago. Therefore, it is important to implement a water labelling scheme to inform and encourage consumers to buy more water-efficient devices.

The RIC invites comments on the issues raised in this consultative document.