



# GREEN BOND REPORT

For the Financial Year 2022



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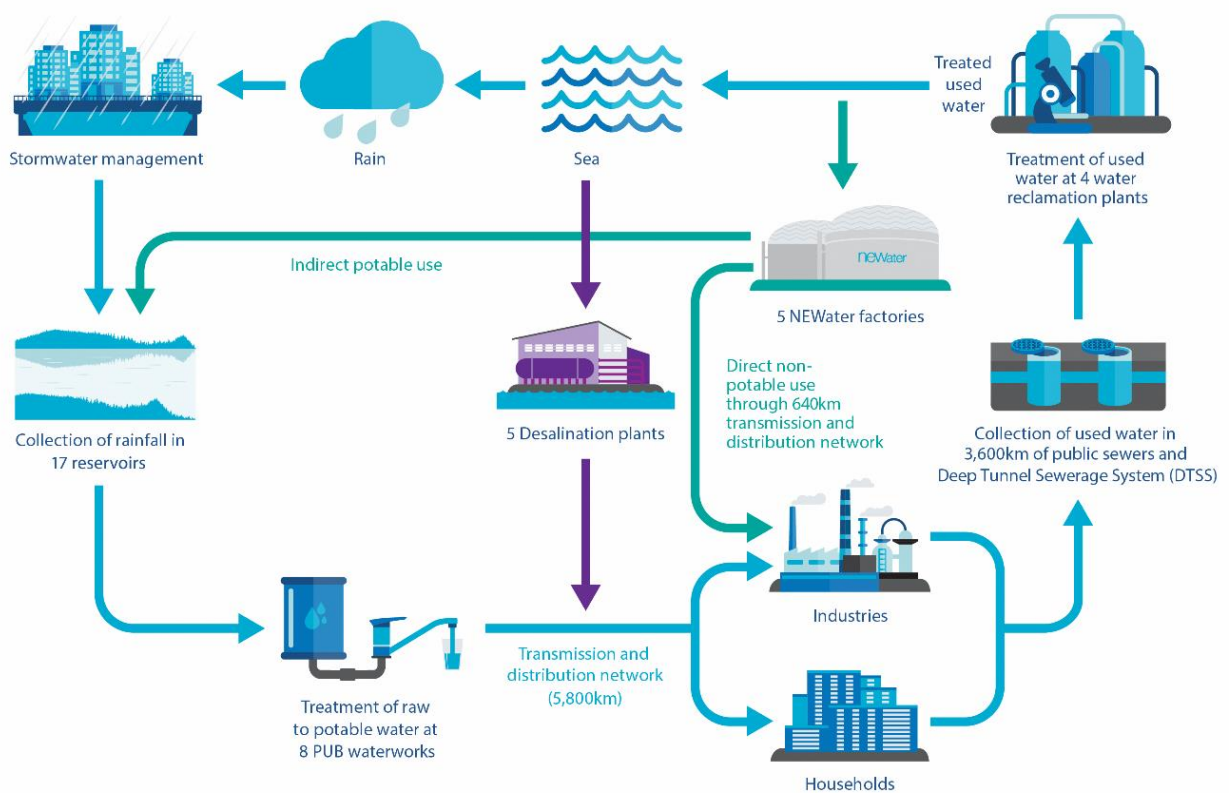
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# 1. Background

## 1.1 About PUB

PUB, Singapore's National Water Agency, is a statutory board under the Ministry of Sustainability and the Environment (MSE). PUB manages Singapore's water supply, water catchment and used water in an integrated way. From April 2020, PUB also took on the responsibility of protecting Singapore's coastline from sea level rise as the national Coastal Protection Agency.

PUB ensures a diversified and sustainable supply of water for Singapore with the Four National Taps (local catchment water, imported water, NEWater and desalinated water). PUB leads and coordinates Whole-of-Government efforts to protect Singapore from the threat of rising seas and the holistic management of inland and coastal flood risks.



## 1.2 Management's Message

### Green Financing for a Sustainable Water System

Access to safe and clean drinking water and sanitation is a basic human need. As a small island city-state, Singapore cannot achieve water security in a conventional way due to limited land to capture and store rainfall. Climate change and increased volatility in weather conditions are expected to exacerbate our water security, and we will increasingly rely on weather-resilient sources of water to meet growing water demand. These will further raise PUB's energy and emissions footprint if we do not innovate and deploy new mitigation measures. **To achieve PUB's goals of reaching net zero around 2045 in line with public sector targets**, we are investing in renewable energy and new, sustainable infrastructure.

PUB established our Green Financing Framework in 2022. The framework is aligned to the International Capital Market Association (ICMA) Green Bond Principles 2021 and the ASEAN Capital Market Forum (ACMF) ASEAN Green Bond Standards 2018. It allows PUB to issue green bonds and unlock additional sources of financing for upcoming infrastructure projects in sustainable water and wastewater management, and renewable energy. These projects will deliver environmental benefits, such as reduction in GHG emissions, increased recycling and reduced waste generation for a more sustainable water system.

PUB issued our inaugural tranche of S\$800 million of green bonds in August 2022, which have been earmarked for allocation to Tuas Water Reclamation Plant (WRP) and Tuas NEWater Factory 1 (TNF 1). These projects incorporate advanced physical, biological and chemical treatment processes which, coupled with PUB's renewable solar energy deployments, enable these plants to use less non-renewable energy in our operations. PUB is committed to keeping our stakeholders informed of our allocation of proceeds and the expected performance and impact of our projects, until the full allocation of these green bond proceeds.

To understand better PUB's sustainability goals and strategies, we encourage you to read this progress report in conjunction with PUB's Sustainability Report 2023, which shares our vision for climate resilience and a sustainable water future for Singapore.

Goh Si Hou  
Chief Executive, PUB

### 1.3 PUB Green Financing Framework

Eligible project categories and qualifying criteria under PUB's Green Financing Framework<sup>1</sup> are detailed in [Table 1](#). Please refer to PUB's Green Financing Framework on PUB's website for more details on the framework for use of proceeds, governance structure, process for project evaluation and selection and management of proceeds.

[Table 1 - List of Eligible Project Categories and Green Financing Criteria](#)

Project Category	Project Sub-category	Criteria
Sustainable water and wastewater management	<b>Water monitoring</b> <i>(e.g. water quality monitoring systems, used water monitoring systems)</i>	<ul style="list-style-type: none"> <li>• Net-zero or reduction in greenhouse gas ("GHG") emissions relative to business as usual ("BAU") baseline</li> <li>• Enables early detection and prompt intervention to prevent               <ol style="list-style-type: none"> <li>a) pollution of water sources</li> <li>b) water losses in system</li> </ol> </li> </ul>
Sustainable water and wastewater management	<b>Water collection, storage and distribution</b> <i>(e.g. stormwater management systems, water distribution systems)</i>	<ul style="list-style-type: none"> <li>• Net-zero or reduction in GHG emissions relative to BAU baseline</li> <li>• Prevent water losses</li> </ul>
Sustainable water and wastewater management	<b>Water treatment</b> <i>(e.g. water recycling systems, wastewater treatment systems)</i>	<ul style="list-style-type: none"> <li>• Net-zero or reduction in GHG emissions relative to BAU baseline</li> <li>• Prevent pollution of water sources</li> <li>• Conservation of resources through water recycling</li> <li>• Reduced waste generation</li> </ul>
Renewable energy	<b>Renewable energy</b> <i>(e.g. solar PV systems, biogas generators)</i>	<ul style="list-style-type: none"> <li>• Net-zero or reduction in GHG emissions relative to BAU baseline</li> </ul>

### 1.4 PUB Green Bond Summary

PUB has raised S\$800 million through the issuance of its inaugural green bond on 31 August 2022. The S\$800 million Fixed Rate green bond carries a coupon of 3.433% per annum, payable semi-annually. The bond received strong interest from investors and were about two times subscribed.

[Table 2: Details of PUB's Green Bond Issued](#)

ISIN	Issue Date	Maturity Date	Tenor	Principal Amount	Coupon
SGXF59503676	31 Aug 2022	30 Aug 2052	30 years	S\$800,000,000	3.433%

<sup>1</sup> PUB's Green Financing Framework is available at <https://www.pub.gov.sg/sustainability/green-financing-framework>.

## 2 Allocation of Proceeds

In accordance with PUB's Green Financing Framework, proceeds from PUB green bonds would be used to finance and refinance eligible sustainable water and wastewater management, and renewable energy projects, with a two-year look-back period for refinancing projects.

The Sustainability Committee, co-chaired by Deputy Chief Executives with Department Directors as committee members, has overall responsibility for implementing PUB's Green Financing Framework. The main responsibilities with respect to green financing include reviewing nominated Eligible Green Projects, updating the process to align the purpose of this Framework relevant to PUB business activities, and amending the scope of financial instruments covered by this Framework, and determining the eligibility for use of proceeds. All Eligible Green Projects will be reviewed by the Sustainability Committee and approved by the Chief Executive.

PUB's first tranche of green bond proceeds (S\$800 million) are fully earmarked for allocation to the Tuas WRP and TNF 1 projects, which are Eligible Green Projects under the sub-category of water treatment. As of 31 March 2023, **39% of these green bond proceeds (or \$311.7 million) have been allocated** to finance and refinance these Eligible Green Projects in [Table 3](#) below.

[Table 3: Allocation of Proceeds to Eligible Green Projects as of 31 March 2023](#)

Project Category	Project Sub-Category	Project Name	Amount
Sustainable water and wastewater management	Water treatment	Tuas Water Reclamation Plant	S\$290,392,375
		Tuas NEWater Factory 1	S\$21,312,900
<b>Total</b>			<b>S\$311,705,275</b>

The green bond proceeds have been allocated to finance and refinance the Eligible Green Projects' expenditure from April 2022 to March 2023. 69% of the allocated green bond proceeds were applied to refinancing the Eligible Green Projects from April 2022 to February 2023<sup>2</sup>.

The unallocated green bond proceeds were deployed at PUB's own discretion in cash instruments in accordance with PUB's approved cash investment policy in the interim, as outlined in PUB's Green Financing Framework. These unallocated green bond proceeds are expected to be fully allocated to Tuas WRP and TNF 1 projects in Financial Year (FY) 2024.

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<sup>2</sup> In accordance with PUB's Green Financing Framework, the identified projects were approved as Eligible Green Projects in March 2023.



### 3 Tuas Water Reclamation Plant and NEWater Factory – Closing the Water Loop while Maximising Energy and Resource Recovery

Expected to be completed in 2026, the Deep Tunnel Sewerage System (DTSS) Phase 2 will extend the existing deep tunnel sewerage system to cover the western part of Singapore, including the downtown area and major upcoming developments such as Tengah Town and Jurong Lake District. Up to 800 MLD of domestic and industrial used water will be channeled via DTSS Phase 2 to the upcoming Tuas WRP, which houses advanced treatment technologies such as biologically enhanced primary treatment and Membrane Bioreactor (MBR) system, to produce high quality effluent discharged to sea or as NEWater feedstock. The NEWater feedstock is subsequently sent to TNF, which will be able to achieve greater recovery rates of up to 85% NEWater from domestic used water through the use of flow reversal technologies.

One of the key highlights of Tuas WRP is its co-location with NEA's Integrated Waste Management Facility (IWMF), which allows both facilities to harness process synergies from used water and solid waste treatment.

- The co-digestion of used water sludge and food waste increases biogas production, compared to mono-digestion of each sludge stream.
- Biogas is subsequently processed in high efficiency superheaters at IWMF to generate more electricity.
- Digested sludge is sent to Sludge Incineration Facility (SIF) at IWMF for steam production, which facilitates sludge thermal hydrolysis when channeled back to Tuas WRP.

By harnessing water-waste-energy synergies, Tuas WRP and TNF are integral parts of Tuas Nexus that enable maximisation of energy efficiency and generation, resource recovery and footprint reduction for a more sustainable water future.







## 5 Impact Report – Tuas NEWater Factory 1



### Maximising NEWater Recovery with New Technologies

Metric	Estimated Project-Level Impact	Bond-Level Impact <sup>6</sup>
Operational GHG Emissions Avoided (kgCO <sub>2</sub> /m <sup>3</sup> ).	0.25 kgCO <sub>2</sub> /m <sup>3</sup> avoided from baseline	0.036 kgCO <sub>2</sub> /m <sup>3</sup> avoided from baseline <sup>7</sup>
Prevent Pollution of Water Sources.	N/A	
Conservation of Resources through Water Recycling.	25 million gallons per day (MGD) of NEWater production capacity.	3.65 million gallons per day (MGD) of NEWater production capacity.
Reduced Waste Generation (%).	16 percentage points decrease in NEWater reject produced from baseline.	2.34 percentage points decrease in NEWater reject produced from baseline <sup>9</sup> .

We have taken reference from ICMA's Harmonised Framework for Impact Reporting (June 2022) handbook to assess the impact of Eligible Green Projects.

<sup>6</sup> The described impact is derived by pro-rating the estimated total project impact based on the share of green bond financing (i.e. green bonds allocated as a proportion of total project costs). This would increase in future years as the share of green bonds allocated to the project increases over time. The described impact includes abatement from renewable energy consumption (e.g. PUB's solar deployments), and is subjected to change based on final design, actual commissioning results and plant output. The midpoint of the bond's term to maturity is assumed to be the representative year for which the annual financed emissions avoided is calculated. For the tranche of Green bonds issued in FY2022 with a tenor of 30 years, the representative year is assumed to be 2037.

<sup>7</sup> The baseline is the average performance of PUB's operational NEWater factories.

## 6 Looking Forward

### **Greening our Infrastructure, One Facility at a Time**

This inaugural green bond report is yet another milestone in PUB's green financing journey. PUB's green transition will not be easy because of our unique operating context; land scarcity and competing land use in Singapore forces us to build deeper and more compact water treatment facilities that are more energy intensive, while constraining the use of renewable energy such as solar energy to decarbonise our water systems.

Nonetheless, PUB remains committed to our decarbonisation and net-zero ambitions. We will continue to deploy best-in-class water treatment technologies at new and refurbished water infrastructure that will reduce our energy, waste and carbon footprint, while ensuring safe, reliable drinking water for all, and accelerate the deployment of renewable solar energy where possible so that we can obtain clean water from clean energy. We hope you will partner us on this green financing journey, as we seek to green our infrastructure, one facility at a time.

For queries or feedback about this report, please email [TIN\\_jing\\_jie@pub.gov.sg](mailto:TIN_jing_jie@pub.gov.sg) or [LIM\\_hwa\\_pheng@pub.gov.sg](mailto:LIM_hwa_pheng@pub.gov.sg)

## 7 External Reviewer's Report

Sustainalytics Pte. Ltd. ("Sustainalytics") was engaged as an independent external reviewer to assess whether the allocation of the green bond proceeds and the impact reporting of the allocated Eligible Green Projects for FY2022 were done in accordance with the use of proceeds criteria and reporting commitments in PUB's Green Financing Framework.

Based on the review, nothing has come to Sustainalytics' attention that causes Sustainalytics to believe that, in all material respects, the reviewed projects do not conform with the use of proceeds criteria and reporting commitments in the PUB Green Financing Framework. A copy of Sustainalytics' report is appended to PUB's Green Bond Report for FY2022 in Appendix.

# PUB

**Type of Engagement:** Annual Review

**Date:** 09 October 2023

**Engagement Team:**

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## Introduction

In August 2022, PUB, Singapore's National Water Agency ("PUB" or the "Agency") issued a green bond, (the "Green Bond") under the PUB Green Financing Framework<sup>1</sup> (the "Framework") aimed at financing sustainable water infrastructure that reduce emissions relative to baseline, prevent pollution of water sources, increase water recycling and reduce waste generation. The proceeds from the green bond issued in August 2022 have been identified for allocation to Tuas Water Reclamation Plant (WRP) and Tuas NEWater Factory 1 (TNF 1) projects. Sustainalytics provided a Second-Party Opinion<sup>2</sup> on the Framework in March 2022. In September 2023, PUB engaged Sustainalytics to review the projects funded between April 2022 and March 2023 with proceeds from the Green Bond and provide an assessment as to whether the projects met the use of proceeds criteria and the reporting commitments outlined in the Framework.

## Evaluation Criteria

Sustainalytics evaluated the projects and assets funded with proceeds from the 2022 Green Bond based on whether they:

1. Met the use of proceeds and eligibility criteria defined in the PUB Green Financing Framework; and
2. Reported on at least one key performance indicator (KPI) for each use of proceeds category defined in the PUB Green Financing Framework.

**Table 1: Use of Proceeds Categories, Eligibility Criteria and Associated KPIs**

Use of Proceeds Category	Eligibility Criteria	Key Performance Indicators
Sustainable Water and Wastewater Management	<p><u>Sub-category:</u></p> <p>Water monitoring including water quality monitoring and used water monitoring</p> <p><u>Criteria:</u></p> <ul style="list-style-type: none"> <li>• Net-zero or reduction in GHG emissions relative to business-as-usual baseline</li> <li>• Enables early detection and prompt intervention to prevent pollution of water sources and water losses in system</li> </ul>	<ul style="list-style-type: none"> <li>• GHG emissions avoided (tCO<sub>2</sub>e)</li> <li>• Sensor numbers/system coverage</li> </ul>
	<p><u>Sub-category:</u></p> <p>Water collection, storage and distribution including stormwater management systems and water distribution systems</p> <p><u>Criteria:</u></p> <ul style="list-style-type: none"> <li>• Net-zero or reduction in GHG emissions relative to business-as-usual baseline</li> </ul>	<ul style="list-style-type: none"> <li>• GHG emissions avoided (tCO<sub>2</sub>e)</li> <li>• Number of leaks avoided</li> <li>• System distribution losses (%)</li> </ul>

<sup>1</sup> The PUB Green Financing Framework is available on PUB's website at: <https://www.pub.gov.sg/sustainability/green-financing-framework>

<sup>2</sup> PUB Second-Party Opinion is available at: [https://mstar-sustops-cdn-mainwebsite-s3.s3.amazonaws.com/docs/default-source/spos/pub-green-financing-framework-second-party-opinion.pdf?sfvrsn=304383aa\\_1](https://mstar-sustops-cdn-mainwebsite-s3.s3.amazonaws.com/docs/default-source/spos/pub-green-financing-framework-second-party-opinion.pdf?sfvrsn=304383aa_1)

	<ul style="list-style-type: none"> <li>Prevent water losses</li> </ul>	
	<p><u>Sub-category:</u>                  Water treatment including water recycling systems and wastewater treatment systems</p> <p><u>Criteria:</u></p> <ul style="list-style-type: none"> <li>Net-zero or reduction in GHG emissions relative to business-as-usual baseline</li> <li>Prevent pollution of water sources</li> <li>Conservation of resources through water recycling</li> <li>Reduced waste generation</li> </ul>	<ul style="list-style-type: none"> <li>GHG emissions avoided (tCO<sub>2</sub>e)</li> <li>Amount of wastewater treated (m<sup>3</sup>)</li> <li>Recovery rate of wastewater recycling process (%)</li> <li>Amount of waste avoided/reduced (kg or m<sup>3</sup>)</li> </ul>
<b>Renewable Energy</b>	<p><u>Sub-category:</u>                  Renewable Energy projects including solar PV systems and biogas generators</p> <p><u>Criteria:</u></p> <ul style="list-style-type: none"> <li>Net-zero or reduction GHG emissions relative to business-as-usual baseline</li> </ul>	<ul style="list-style-type: none"> <li>GHG emissions avoided (tCO<sub>2</sub>e)</li> <li>Amount of renewable energy generated (MWh)</li> </ul>

## Issuer’s Responsibility

PUB is responsible for providing accurate information and documentation relating to the details of the funded projects, including description of projects, amounts allocated and project impact.

## Independence and Quality Control

Sustainalytics, a leading provider of ESG research and ratings, conducted the verification of the use of proceeds from PUB’s Green Bond. The work undertaken as part of this engagement included collection of documentation from PUB and review of said documentation to assess conformance with the PUB Green Financing Framework.

Sustainalytics relied on the information and the facts presented by PUB. Sustainalytics is not responsible nor shall it be held liable for any inaccuracies in the opinions, findings or conclusions herein due to incorrect or incomplete data provided by PUB.

Sustainalytics made all efforts to ensure the highest quality and rigor during its assessment process and enlisted its Sustainability Bonds Review Committee to provide oversight of the review.

## Conclusion

Based on the limited assurance procedures conducted,<sup>3</sup> nothing has come to Sustainalytics’ attention that causes us to believe that, in all material respects, the reviewed projects do not conform with the use of proceeds criteria and reporting commitments in the PUB Green Financing Framework. PUB has disclosed to Sustainalytics that as of 31 March 2023, of the total SGD 800 million (USD 586.3 million)<sup>4</sup> raised, 39% of the proceeds (SGD 311.7 million) have been allocated towards financing and refinancing of the eligible projects. The Agency has communicated that full allocation of Green Bond proceeds towards the Tuas Water Reclamation Plant and Tuas NEWater Factory 1 projects is expected in Financial Year 2024.

<sup>3</sup> Sustainalytics’ limited assurance process includes reviewing the documentation relating to the details of the funded projects, including description of projects, their estimated and realized costs and impact, as provided by the issuing entity, which is responsible for providing accurate information. Sustainalytics has not conducted on-site visits to projects.

<sup>4</sup> The amount of loan balance is rounded to the nearest million. The exchange rate from October 9, 2023 was used in converting SGD to USD



## Detailed Findings

**Table 2: Detailed Findings**

<b>Framework Requirements</b>	<b>Procedure Performed</b>	<b>Factual Findings</b>	<b>Error or Exceptions Identified</b>
<b>Use of Proceeds Criteria</b>	Verification of the projects funded with proceeds from the 2022 Green Bond to determine if projects aligned with the use of proceeds criteria outlined in the Framework.	All projects reviewed complied with the use of proceeds criteria.	None
<b>Reporting Criteria</b>	Verification of the projects funded with proceeds from the 2022 Green Bond to determine if impact was reported in line with the KPIs outlined in the Framework.	All projects reviewed reported on at least one KPI per use of proceeds category.	None

## Appendices

### Appendix 1: Allocation Reporting by Eligibility Criteria

PUB has raised SGD 800 million through the issuance of its inaugural Green Bond. Of the SGD 311.7 million allocated, 69% of the proceeds were used for refinancing eligible projects. Sustainalytics notes that the remaining proceeds would be deployed at PUB's discretion in cash instruments in accordance with PUB's approved cash investment policy until full allocation.

**Table 3: Allocation Reporting**

Use of Proceeds Category	Project Category	Project Name	Net Proceeds Allocation (SGD)
Sustainable Water and Wastewater Management	Water Treatment	Tuas Water Reclamation Plant	290,392,375
		Tuas NEWater Factory 1	21,312,900
		Total Allocation	311,705,275

### Appendix 2: Impact Reporting by Use of Proceeds Criteria

**Table 4: Impact Reporting**

Use of Proceeds Category	Project Name	Indicators	Impact Reported <sup>5</sup>
Sustainable Water and Wastewater Management	Tuas Water Reclamation Plant	Operational GHG Emissions Avoided (kgCO <sub>2</sub> /m <sup>3</sup> ) from baseline <sup>6</sup>	0.004
		Prevent Pollution of Water Sources (million litres per day of Used Water Treatment Capacity)	82.4
		Reduced Waste Generation from baseline (kg/m <sup>3</sup> )	0.001
	Tuas NEWater Factory 1	Operational GHG Emissions Avoided (kgCO <sub>2</sub> /m <sup>3</sup> ) from baseline <sup>7</sup>	0.036
		Conservation of Resources through Water Recycling (million gallons per day of NEWater production capacity)	3.65
		Reduced Waste Generation from baseline (percentage points decrease in NEWater reject produced)	2.34

<sup>5</sup> The impact has been reported as per the amount allocated from the Green Bond by pro-rating the estimated total project impact based on the share of Green Bond financing.

<sup>6</sup> The baseline is a standalone water reclamation plant without Nexus synergies or enhanced biogas recovery.

<sup>7</sup> The baseline is the average performance of PUB's operational NEWater factories.

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For more information, visit [www.sustainalytics.com](http://www.sustainalytics.com)

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