



GREEN BOND REPORT

For the Financial Year 2024



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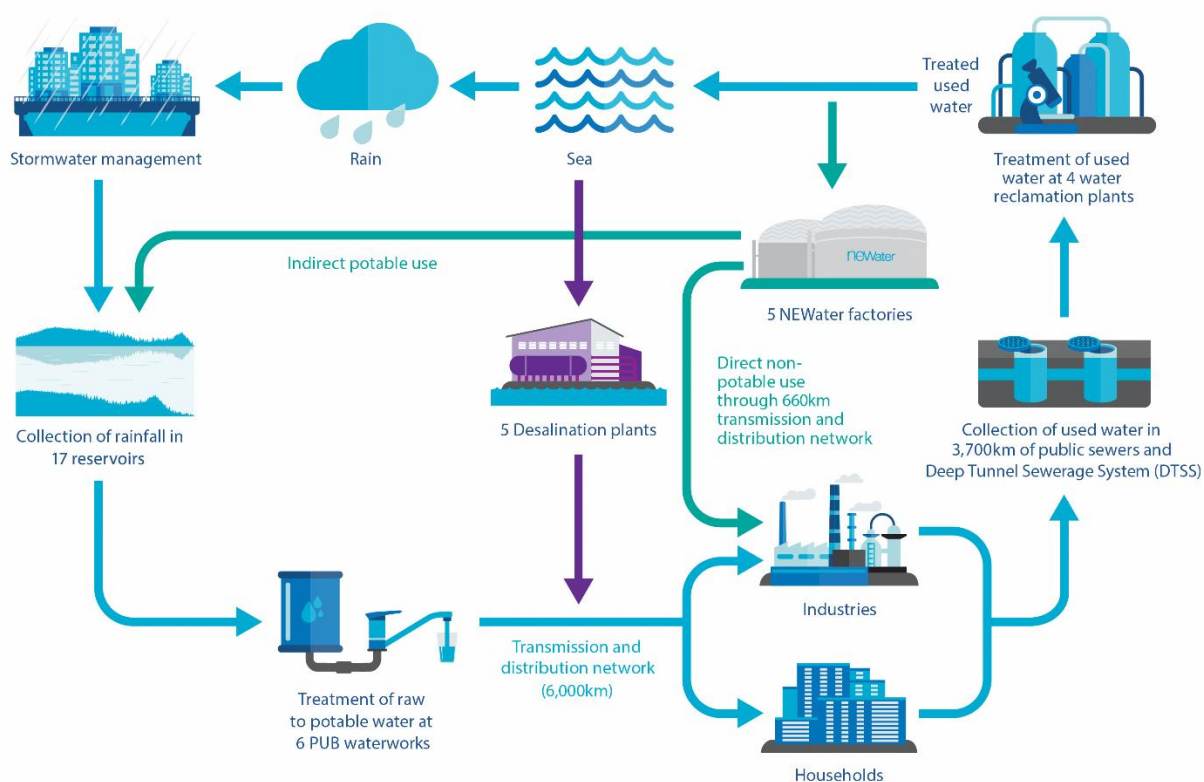
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1. Background

1.1 About PUB

PUB is a statutory board under the Ministry of Sustainability and the Environment (MSE) that oversees water issues in an integrated way. PUB's mission is to ensure Singapore has a reliable and secure water supply, and protect it from inland and coastal flooding.

Through the Four National Taps (local catchment water, imported water, NEWater, desalinated water), PUB has ensured a diversified and sustainable supply of water for Singapore. PUB also manages both inland and coastal flood risks holistically and leads and coordinates whole-of-government efforts in ensuring coastal and flood resilience.



1.2 Management's Message

Green Financing for a Sustainable Water System

I am pleased to present PUB's FY2024 Green Bond Report, which details the allocation and impact of proceeds from the green bonds issued under PUB's Green Financing Framework.

This report reflects our continued commitment to sustainable finance and climate action. Following our inaugural green bond issued in 2022, PUB has issued a second tranche of green bonds in 2024, signifying our continued efforts in financing green projects.

In FY2024, the proceeds from our green bonds have been allocated to Tuas Water Reclamation Plant (WRP) and Tuas NEWater Factory 1 (TNF 1). These projects incorporate advanced physical, biological and chemical treatment processes that coupled with PUB's renewable solar energy deployments, enable us to use less non-renewable energy in our operations.

In March 2025, PUB updated our Green Financing Framework (GFF), which is now aligned to the Singapore-Asia Taxonomy¹(SAT). Updates were made to the eligible green project categories and the impact reporting section to adopt the green metrics and thresholds of the SAT. Updates were also made to include green loans to provide PUB with an additional green financing option other than issuing green bonds. The Green Loan Principles 2023 by the Loan Market Association, Asia Pacific Loan Market Association and Loan Syndications and Trading Association have now been adopted in PUB's GFF.

PUB expects to continue pursuing green financing for upcoming water infrastructure for sustainable water and wastewater management. This infrastructure will deliver various environmental benefits, such as reduced emissions, reduced waste generation and increased water recycling. Through sustained investment in green infrastructure, PUB aims to contribute to Singapore's transition to a low carbon future.

To understand PUB's sustainability goals and strategies better, we encourage you to read this report in conjunction with PUB's Annual and Sustainability Report 2025, which shares our vision for a sustainable and resilient water future for Singapore.

Ong Tze-Chin
Chief Executive, PUB

¹ The SAT is issued by the Green Finance Industry taskforce convened by the Monetary Authority of Singapore, and with technical support and recommendations from the Climate Bonds Initiative (CBI).

1.3 PUB Green Financing Framework

Eligible project categories and qualifying criteria under PUB's GFF² are detailed in [Table 1](#). Please refer to PUB's GFF on PUB's website for more details on the framework for the 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	Water monitoring (e.g. <i>water quality monitoring systems, used water monitoring systems</i>)	<ul style="list-style-type: none"> Net-zero or reduction in greenhouse gas ("GHG") emissions relative to business as usual ("BAU") baseline Enables early detection and prompt intervention to prevent <ul style="list-style-type: none"> a) pollution of water sources b) water losses in system
Sustainable water and wastewater management	Water collection, storage and distribution (e.g. <i>stormwater management systems, water distribution systems</i>)	<ul style="list-style-type: none"> Net-zero or reduction in GHG emissions relative to BAU baseline Prevent water losses
Sustainable water and wastewater management	Water treatment (e.g. <i>water recycling systems, wastewater treatment systems</i>)	<ul style="list-style-type: none"> Net-zero or reduction in GHG emissions relative to BAU baseline Prevent pollution of water sources Conservation of resources through water recycling Reduced waste generation
Renewable energy	Renewable energy (e.g. <i>solar PV systems, biogas generators</i>)	<ul style="list-style-type: none"> Net-zero or reduction in GHG emissions relative to BAU baseline

1.4 PUB Green Bond Summary

Since PUB's issuance of the inaugural GFF in 2022, PUB has issued two green bonds totalling \$1.125 billion.

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

ISIN	Issue Date	Maturity Date	Tenor	Principal Amount	Coupon/Frequency
SGXF59503676	31 Aug 2022	30 Aug 2052	30 years	S\$800,000,000	3.433% (Semi-annual)
SGXF29084989	1 Oct 2024	1 Oct 2031	7 years	S\$325,000,000	2.502% (Semi-annual)

² PUB's Green Financing Framework is available at <https://www.pub.gov.sg/public/waterloop/sustainability/green-financing-framework>.

2 Allocation of Proceeds

In accordance with PUB's GFF, proceeds from PUB's green bonds will 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 Management-level Sustainability Committee, chaired by Deputy Chief Executive (Policy and Development), and comprising Deputy Chief Executive (Operations), Assistant Chief Executive and various Department Directors as committee members, has overall responsibility for implementing PUB's GFF. The main responsibilities with respect to green financing include reviewing nominated Eligible Green Projects, updating the process to ensure the purpose of the GFF remains relevant to PUB's business activities, amending the scope of financial instruments covered by the GFF, 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 two tranches of green bond proceeds (S\$800 million and S\$325 million) are 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 2025, the \$800 million green bond proceeds from the first tranche have been fully allocated, while 71% of the \$325 million from second tranche of green bond proceeds (or \$231.2 million) have been allocated. Please see [Table 3](#) below for the Eligible Green Projects financed or refinanced by the net proceeds of each issued tranches.

[Table 3: Allocation of Proceeds to Eligible Green Projects as of 31 March 2025](#)

Project Category	Project Sub-Category	Project Name	Tranche #1	Tranche #2
Sustainable water and wastewater management	Water treatment	Tuas Water Reclamation Plant	S\$752,716,054	S\$214,828,727
		Tuas NEWater Factory 1	S\$47,283,946	S\$16,407,154
Total			S\$800,000,000	S\$231,235,881

The green bond proceeds have been allocated to finance and refinance the Eligible Green Projects' expenditure from April 2022 to March 2025. 27% of the allocated green bond proceeds from Tranche #1 were applied to refinancing the Eligible Green Projects from April 2022 to February 2023³.

The unallocated green bond proceeds were deployed in the interim at PUB's own discretion in cash instruments in accordance with PUB's approved cash investment

³ In accordance with PUB's Green Financing Framework, the identified projects were approved as Eligible Green Projects in March 2023.

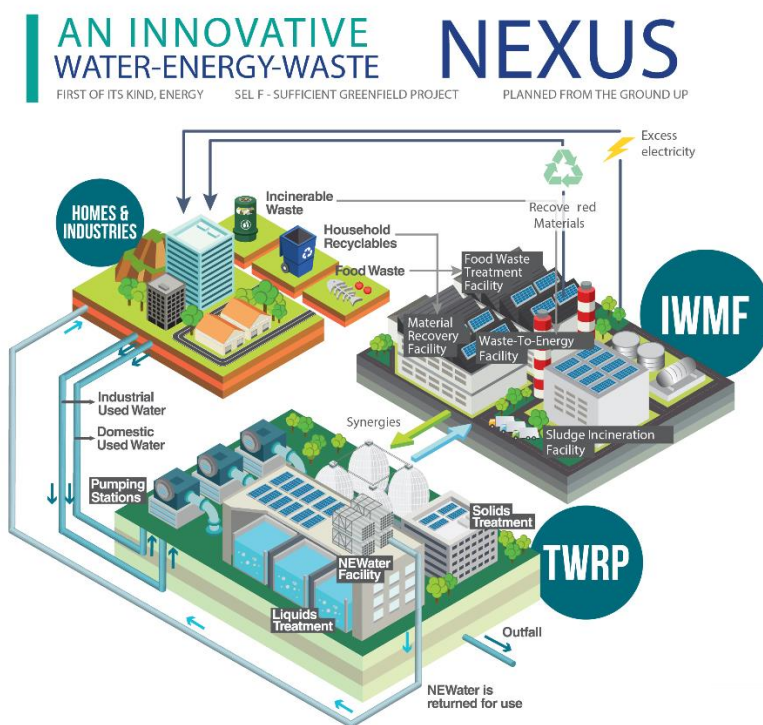
policy, as outlined in PUB's GFF. These unallocated green bond proceeds are expected to be fully allocated in FY 2025.

3 Tuas Water Reclamation Plant and NEWater Factory

The Deep Tunnel Sewerage System (DTSS) is Singapore's underground superhighway infrastructure, designed for sustainable management of used water collection, treatment, reclamation and discharge. The second phase of DTSS, with tunnelling works completed in August 2023, extends the network to cover Singapore's western region. This expansion enables gravity-driven conveyance of wastewater to Tuas WRP, ensuring a sustainable and energy-efficient solution for Singapore's long-term wastewater collection, treatment, reclamation, and discharge needs.

At the heart of the DTSS phase 2 project is Tuas Nexus. This is where PUB's innovative Tuas Water Reclamation Plant (WRP) and the National Environment Agency's Integrated Waste Management Facility (IWMF) will operate in seamless synergy. This groundbreaking facility showcases the integration of wastewater and solid waste treatment processes, maximising resource recovery through the water-energy-waste nexus. An example of this synergy is in how the co-digestion of Tuas WRP's used water sludge and IWMF's food waste generates more biogas than stand-alone facilities. This biogas is then harnessed to produce renewable energy.

Tuas WRP stands as a testament to advanced water treatment technology, with the capacity to treat 800 Million Litres per Day (MLD) of domestic and industrial used water. Housing the world's largest membrane bioreactor facility, the plant will combine cutting-edge physical, biological and chemical treatment systems to achieve superior efficiency. This modern design not only reduces the facility's footprint compared to traditional WRPs but also ensures the production of high-quality feedstock for the adjacent TNF 1. Through advanced flow reversal technologies, TNF 1 achieves remarkable NEWater recovery rates of up to 85% from domestic used water, effectively closing the water loop. Tuas WRP will be commissioned progressively from 2027.



4 Impact Report – Tuas Water Reclamation Plant



Harnessing Nexus synergies and new used water treatment technologies for improved energy efficiencies

Metric	Estimated Project-Level Impact	Tranche #1 Bond-Level Impact ⁴	Tranche #2 Bond-Level Impact
Operational GHG Emissions Avoided (kgCO ₂ /m ³)	0.09 kg CO ₂ /m ³ avoided from baseline ⁵	0.023 kgCO ₂ /m ³ avoided from baseline ⁵	0.006 kgCO ₂ /m ³ avoided from baseline ⁵
Prevent Pollution of Water Sources.	800 Million Litres Per Day (MLD) of Used Water Treatment Capacity.	198.4 Million Litres per Day (MLD) of Used Water Treatment Capacity.	56.8 Million Litres per Day (MLD) of Used Water Treatment Capacity.
Conservation of Resources through Water Recycling.	N/A ⁶		
Reduced Waste Generation (kg/m ³).	0.01 kg/m ³ reduction from baseline.	0.002 kg/m ³ reduction from baseline ⁴ .	0.001 kg/m ³ reduction from baseline ⁴ .

We have taken reference from the International Capital Market Association's (ICMA) Harmonised Framework for Impact Reporting (June 2022) handbook to assess the impact of Eligible Green Projects. The project achieves 0.17 kWh/m³ specific energy consumption, excluding Deep Tunnel Sewerage System pumping and renewable energy consumption.

⁴ 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. biogas and PUB's solar deployments), and is subjected to change based on final design, biogas offtake volumes and thermal efficiencies, actual commissioning results, plant output and onsite / offsite solar energy deployments. 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.

⁵ The baseline is a standalone water reclamation plant without Nexus synergies or enhanced biogas recovery.

⁶ The recycling of used water into NEWater is discussed in the impact report for TNF 1. In Tuas WRP, water recycling is achieved by utilising membrane filtrate water for internal usage (e.g. chillers, cooling, washdown, flush and spray systems).

5 Impact Report – Tuas NEWater Factory 1



Maximising NEWater Recovery with New Technologies

Metric	Estimated Project-Level Impact	Tranche #1 Bond-Level Impact ⁷	Tranche #2 Bond-Level Impact
Operational GHG Emissions Avoided (kgCO ₂ /m ³).	0.25 kgCO ₂ /m ³ avoided from baseline ⁸	0.079 kgCO ₂ /m ³ avoided from baseline ⁸	0.027 kgCO ₂ /m ³ avoided from baseline ⁸
Prevent Pollution of Water Sources.	N/A		
Conservation of Resources through Water Recycling.	25 million gallons per day (MGD) of NEWater production capacity.	8.10 million gallons per day (MGD) of NEWater production capacity.	2.80 million gallons per day (MGD) of NEWater production capacity.
Reduced Waste Generation (%).	16 percentage points decrease in NEWater reject produced from baseline.	5.18 percentage points decrease in NEWater reject produced from baseline ⁷ .	1.79 percentage points decrease in NEWater reject produced from baseline.

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

⁷ 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, plant output and onsite / offsite solar energy deployments. 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.

⁸ The baseline is the average performance of PUB's operational NEWater factories.

6 Looking Forward

Continuing Efforts to Adopt Green Financing

Following the update to the PUB GFF in March 2025, which now aligns with the Singapore-Asia Taxonomy, PUB's projects will need to meet stringent criteria in metrics such as specific energy consumption to qualify for green financing in line with the Singapore-Asia Taxonomy.

PUB will continue to deploy best-in-class water treatment technologies that will reduce our energy, waste and carbon footprint, whilst ensuring safe, reliable drinking water for all. We will accelerate the deployment of renewable solar energy wherever possible, so that we can obtain clean water from clean energy. This will not be easy because of our unique operating context. Land scarcity in Singapore means more compact water treatment facilities, resulting in higher energy intensity, and means less available land to deploy renewable solar energy.

Nonetheless, PUB remains committed to our decarbonisation and resource efficiency efforts. We trust you will continue to partner us on our green financing journey.

For queries or feedback about this report, please email Joewin_koh_yang@pub.gov.sg or Lee_Xiang_Ling@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 FY2024 were done in accordance with the use of proceeds criteria and reporting commitments in PUB's Green Financing Framework.

Based on the limited assurance 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 FY2024 in Appendix.

PUB

Type of Engagement: Annual Review

Date: 29 July 2025

Engagement Team:

Layla Ng, layla.ng@morningstar.com

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Introduction

PUB, Singapore's National Water Agency, issued two tranches of green bonds in August 2022 (the "2022 Green Bond") and October 2024 (the "2024 Green Bond"; collectively the "Green Bonds"). PUB raised a total of SGD 1.125 billion to finance and refinance eligible sustainable water and wastewater treatment projects. In July 2025, PUB engaged Sustainalytics to review the projects financed with proceeds from the Green Bonds (the "Nominated Expenditures") and provide an assessment as to whether the projects meet the use of proceeds criteria and the reporting commitments in PUB's 2022 Green Financing Framework (the "Framework").¹ Sustainalytics provided a Second-Party Opinion on the Framework in March 2022.² This is Sustainalytics' third annual review of allocation and reporting of the instruments issued under the Framework, following previous reviews in October 2023 and August 2024.^{3,4}

Evaluation Criteria

Sustainalytics evaluated the Nominated Expenditures and PUB's reporting based on whether they:

1. Meet the use of proceeds and eligibility criteria defined in the Framework; and
2. Reported on at least one key performance indicator (KPI) for each use of proceeds category defined in the 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>Water treatment, including water recycling systems and wastewater treatment systems, that meet the following criteria:</p> <ol style="list-style-type: none"> Net zero or reduction in GHG emissions relative to a business-as-usual baseline Prevent pollution of water sources Conservation of resources through water recycling Reduced waste generation 	<ol style="list-style-type: none"> GHG emissions avoided Amount of wastewater treated Recovery rate of wastewater recycling process Amount of waste avoided or reduced

¹ PUB, "Green Financing Framework", (2022), at: <https://www.pub.gov.sg/-/media/PUB/PDF/PUB-Green-Financing-Framework-document.pdf>

² Sustainalytics, "Second-Party Opinion: PUB Green Financing Framework", (2022), at: https://mstar-sustops-cdn-mainwebsite-s3.s3.amazonaws.com/docs/default-source/spos/pub-green-financing-framework-second-party-opinion0e2d0366-2f64-484d-83e2-185dff554379.pdf?sfvrsn=834c9b60_1

³ PUB, "PUB's Green Bond Report for the Financial Year 2022", (2023), at: <https://www.pub.gov.sg/-/media/PUB/PDF/To-Publish-PUBs-Green-Bond-Report-for-FY2022-Final-v3a.pdf>

⁴ PUB, "PUB's Green Bond Report for the Financial Year 2023", (2024), at: <https://www.pub.gov.sg/-/media/PUB/PDF/PUB-Green-Bond-Report-for-FY2023.pdf>

Issuer's Responsibility

PUB is responsible for providing accurate information and documentation relating to the details of the projects, including descriptions, amounts allocated and 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 Bonds. The work undertaken as part of this engagement included collection of documentation from PUB and review of said documentation to assess conformance with the 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,⁵ nothing has come to Sustainalytics' attention that causes us to believe that, in all material respects, the Nominated Expenditures do not conform with the use of proceeds criteria and reporting commitments in the Framework. As of 31 March 2025, 100% of the proceeds from the 2022 Green Bond (SGD 800 million) have been fully allocated, while 71% of the 2024 Green Bond (SGD 231.2 million) have been allocated. The remaining 29% of the 2024 Green Bond proceeds (SGD 93.8 million) are expected to be allocated by March 2026.

Detailed Findings

Table 2: Detailed Findings

Framework Requirements	Procedure Performed	Factual Findings	Error or Exceptions Identified
Use of Proceeds Criteria	Verification of the Nominated Expenditures to determine alignment with the use of proceeds criteria outlined in the Framework.	The Nominated Expenditures comply with the use of proceeds criteria.	None
Reporting Criteria	Verification of the Nominated Expenditures to determine if impact was reported in line with the KPIs outlined in the Framework.	PUB reported on at least one KPI per use of proceeds category.	None

⁵ Sustainalytics' limited assurance process includes reviewing documentation relating to details of projects, as provided by the issuing entity, which is responsible for providing accurate information. These may include descriptions of projects, estimated and realized costs, and reported impact. Sustainalytics has not conducted on-site visits to projects.

Appendices

Appendix 1: Allocation of Proceeds from Green Bonds

Use of Proceeds Category	Project Category	Project Name	Net Proceeds Allocated from the 2022 Green Bond (SGD million)	Net Proceeds Allocated from the 2024 Green Bond (SGD million)
Sustainable Water and Wastewater Management	Water Treatment	Tuas Water Reclamation Plant ⁶	752.7	214.8
		Tuas NEWater Factory ⁷	47.3	16.4
Total Allocated Proceeds			800.0	231.2
Total Unallocated Proceeds			0	93.8
Total Net Proceeds			800.0	325.0

⁶ The upcoming Tuas Water Reclamation Plant is expected to receive up to 800 million litres per day of domestic and industrial used water. The plant is also co-located with a waste management facility in Tuas Nexus, which will allow it to capitalize on the integration of used water treatment and solid waste treatment processes to maximize energy generation and resource recovery, such as the co-digestion of used water sludge and food waste to produce biogas.

⁷ The upcoming Tuas NEWater Factory 1 will receive treated used water from the Tuas Water Reclamation Plant to produce up to 25 million gallons per day of NEWater.

Appendix 2: Reported Impact from Green Bonds

Use of Proceeds Category	Project Name	Key Performance Indicator	Reported Impact from the 2022 Green Bond ⁸	Reported Impact from the 2024 Green Bond ⁹
Sustainable Water and Wastewater Management	Tuas Water Reclamation Plant	Operational GHG emissions avoided from baseline ¹⁰ (kgCO ₂ /m ³)	0.023	0.006
		Amount of wastewater treated (million litres per day of used water treatment capacity)	198.4	56.8
		Amount of reduced waste generation from baseline ¹¹ (kg/m ³)	0.002	0.001
	Tuas NEWater Factory 1	Operational GHG emissions avoided from baseline ¹² (kgCO ₂ /m ³)	0.079	0.027
		Recovery rate of wastewater recycled (million gallons per day of NEWater production capacity)	8.10	2.80
		Amount of reduced waste generation from baseline ¹³ (percentage points decrease in NEWater reject produced)	5.18	1.79

⁸ The impact has been reported as per the amount allocated from the 2022 Green Bond by pro-rating the estimated total project impact based on the share of the 2022 Green Bond financing.

⁹ The impact has been reported as per the amount allocated from the 2024 Green Bond by pro-rating the estimated total project impact based on the share of the 2024 Green Bond financing.

¹⁰ The baseline refers to a standalone water reclamation plant without Tuas Nexus' synergies in water, energy and waste treatment processes.

¹¹ Ibid.

¹² The baseline refers to the average performance of PUB's operational NEWater factories.

¹³ Ibid.

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