



Impact Report for Bonds and Loans Singapore Green Bond Framework

Impact Summary

Evaluation Date 21 September 2023

Issuer Location Singapore

Sustainalytics has calculated the estimated impact achieved by the 2022 Green Bond issued by the Ministry of Finance of Singapore. To date, SGD 709 million has been allocated in the clean transportation category to finance the Jurong Region Line and the Cross Island Line in support of the Singapore Green Plan 2030. For a representative year during the bond's term to maturity, Sustainalytics has calculated 1.23 - 1.84 kilotonnes of carbon dioxide equivalents in avoided GHG emissions.



SGD 709M

Allocated funds



1.23 - 1.84

Annual GHG emissions avoided (ktCO₂e)



2

Projects



268 - 400

Cars driven for one year



1

Country

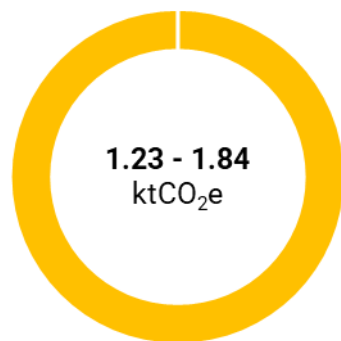


81K - 122K

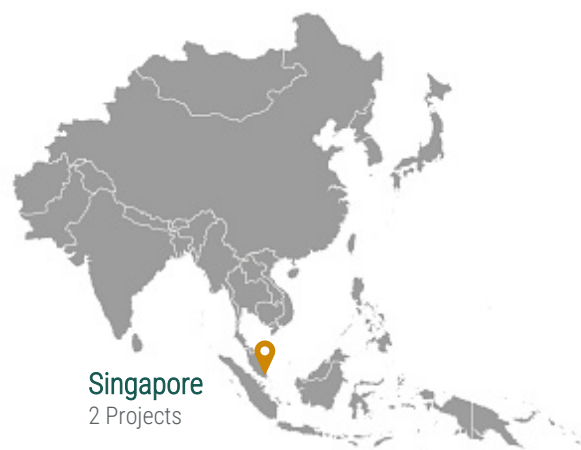
Trees, yearly sequestration



Avoided GHG Emissions by Project in tCO₂e



■ Clean Transportation



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Introduction

In August 2022, the Ministry of Finance of Singapore (“MOF”) issued a Green Bond (the “2022 Green Bond”) under the 2022 Singapore Green Bond Framework¹ to finance the Jurong Region Line (“JRL”) and the Cross Island Line (“CRL”) in support of the Singapore Green Plan 2030. MOF is responsible for managing the Singapore Government’s fiscal policies and the structure of the country’s economy. Sustainalytics provided a Second-Party Opinion on the Framework in May 2022, evaluating it as credible, impactful and aligned with the Green Bond Principles 2021 (GBP) and ASEAN Green Bond Standards 2018.

In May 2023, MOF engaged Sustainalytics to quantify the environmental benefits of the projects funded with proceeds from the 2022 Green Bond. Using established methodologies, Sustainalytics has estimated avoided emissions from MOF’s projects. This report presents the details of our findings, including a description of the methodology used to calculate the impacts.

Scope of Work and Limitations

MOF has engaged Sustainalytics to calculate the environmental impacts of the projects financed with proceeds from the 2022 Green Bond. For this work, Sustainalytics relied on the data provided by MOF on the amount allocated and the technical data on the projects financed. This report’s sole purpose is the transparent reporting of the projects’ impact created and emissions avoided and does not provide endorsement of projects nor their eligibility.

Sustainalytics’ impact reporting is aligned with ICMA’s June 2022 Harmonised Framework for Impact Reporting handbook.² The methodology and assumptions made for the impact calculation are outlined in the methodology chapter.

As part of this engagement, Sustainalytics exchanged information with MOF’s management team to understand the sustainability impact of its projects. Through these exchanges, MOF’s representatives have confirmed that:

- (1) They understand it is the sole responsibility of MOF to ensure that the information provided is complete, accurate and up to date;
- (2) They have provided Sustainalytics with all relevant information;
- (3) Any provided material information has been duly disclosed in a timely manner.

Sustainalytics also reviewed relevant public documents and non-public information.

¹ Ministry of Finance Singapore, “Singapore Green Bond Framework”, (2022), available at: <https://www.mof.gov.sg/docs/default-source/policies/fiscal/singapore-green-bond-framework.pdf>

² ICMA, “Handbook - Harmonised Framework for Impact Reporting” (2022), at: https://www.icmagroup.org/assets/documents/Sustainable-finance/2022-updates/Harmonised-Framework-for-Impact-Reporting-Green-Bonds_June-2022-280622.pdf

Impact Findings

For reporting, Sustainalytics follows the ICMA Harmonised Framework for Impact Reporting, which synthesizes market expectations and outlines recommendations for impact reporting to create a standardized reporting structure and to enhance the understanding of the impact to all stakeholders including investors.

Table 1 below provides a summary of the impacts at the portfolio level which Sustainalytics calculated from the allocation of proceeds from MOF's 2022 Green Bond. These metrics correspond to a representative year during the bond's term to maturity and are based on the share of project financing. Appendix 1 provides portfolio level avoided GHG emissions and Appendix 2 provides portfolio level avoided emissions from various sources of air pollutants.

Table 1: Summary of Impact – Portfolio level³

Allocated amount	Project lifetime	Passenger-kilometres travelled	Financed GHG emissions avoided ⁴
SGD	Years	Million pkm/year	tCO ₂ e/year
708,656,367	99	2,207 - 2,697	1,232 - 1,841

³ The data in this report is presented using a range rather than exact values due to confidentiality considerations of the project cost as well as uncertainty in the number of passenger-kilometers travelled on the JRL and CRL lines. The range of values presented in this report should be considered as a reasonable estimate of the actual impact of the green bond.

⁴ Financed emissions are pro-rated based on the share of project financing.

Methodology

Sustainalytics developed its own methodologies for quantifying GHG avoidance and other metrics, including leveraging publicly available best-in-class methodologies, protocols and frameworks that are currently industry best practice. Our estimation practices and general principles rely on the GHG Protocol.⁵ Our methodologies are based on guidance provided by the International Financial Institutions⁶ on calculation methodology and global emissions. In addition, we rely on the Partnership for Carbon Accounting Financials' Global Accounting Standard⁷ for guidance on estimation where data is not readily available and assumptions must be made. Finally, the United Nation's Clean Development Mechanism⁸ provides guidance and information, serving as the foundation for these and other methodologies, including those implemented in this report.

Clean Transportation

Clean transportation is assumed to displace a mix of existing and future transportation along the same travel distance. The carbon avoidance is calculated using:

- a) The emissions of the sustainable transport projects based on the best available data from MOF. To the extent available, calculations are based on fuel consumption or passenger-kilometre data. In the absence of such information, estimates are made based on mode of transportation, fuel type and average number of passengers per vehicle.
- b) The baseline emissions, which are the emissions associated with a basket of vehicles or modes of transport being replaced currently and in the future lifetime of the project.
- c) Financed project avoided emissions are calculated by using the share of project financing of the total project emissions avoided from above calculations.

Data Sources and Assumptions

- For the projects included in the report, the share of project financing and estimated passenger-kilometre data were provided by MOF.
- It is assumed that the JRL and CRL projects displace a mix of available public and private transportation modes in Singapore, including private vehicles, mass rapid transit (MRT), light rail transit (LRT), taxis, private hire cars, buses and active mobility.
- The midpoint of the bond's term to maturity is assumed to be the representative year for which Sustainalytics has calculated the GHG emissions avoided. For the 2022 Green Bond, the representative year is assumed to be 2047.
- To calculate the avoided GHG emissions for the representative year, Sustainalytics has estimated the emissions factors using forecasts. It is assumed that the downward trend observed in grid emissions since 2005 will continue in the future. This assumption is based on emissions factors provided by the Singapore Energy Market Authority ("EMA")⁹.
- For trends in public transportation fuel mixes, Sustainalytics leveraged policies outlined in the Land Transport Authority 2040 Land Transport Master Plan.¹⁰
- Project level emissions associated with electricity consumption were calculated using a national grid emissions factor sourced from the EMA⁹. To account for emissions from upstream activities, such as electricity transmission losses and the extraction and refining of primary fuels, Sustainalytics applies an additional, indirect emissions factor to the emissions directly emitted by the project and baseline vehicles.¹¹

⁵ Greenhouse Gas Protocol, About Us, at: <https://ghgprotocol.org/>

⁶ International Financial Institutions, "Members of the International Financial Institutions on Greenhouse Gas Accounting", at: https://unfccc.int/sites/default/files/resource/IFIs_membership_for_UNFCCC_%27white_pages%27_0.pdf

⁷ Partnership for Carbon Accounting Financials, About, at: <https://carbonaccountingfinancials.com/>

⁸ UNFCCC, CDM Methodology Booklet, (2021), at: <https://cdm.unfccc.int/methodologies/documentation/index.html>

⁹ Energy Market Authority, Electricity Grid Emissions Factors and Upstream Fugitive Methane Emissions Factors at: https://www.ema.gov.sg/statistic.aspx?sta_sid=20140729MPY03nTHx2a1

¹⁰ Land Transport Authority, 2040 Land Transport Master Plan at: https://www.lta.gov.sg/content/ltagov/en/who_we_are/our_work/land_transport_master_plan_2040.html

¹¹ Government of the UK, Department for Business, Energy & Industrial strategy, "Government conversion factors for company reporting of greenhouse gas emissions", at: <https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting>

- For electric vehicles, Sustainalytics modeled SO_x, NO_x, PM₁₀ and PM_{2.5} emissions factors using data on emissions and electricity generation in OECD countries as a proxy due to lack of local emissions factors.¹²
- Where possible, Sustainalytics estimated SO_x, NO_x, PM₁₀ and PM_{2.5} emissions based on the air pollution regulations set by the Singapore National Environment Agency (“NEA”) for non-electric vehicles.¹³ Sustainalytics acknowledges that the NEA does not distinguish between PM₁₀ and PM_{2.5} emissions, but instead considers overall PM emissions. Consequently, it is assumed that the PM₁₀ and PM_{2.5} ratio observed in the OECD data can be applied to approximate the permissible PM₁₀ and PM_{2.5} limits.

¹² OECD Stat – Emissions of air pollutants, at: https://stats.oecd.org/Index.aspx?DataSetCode=AIR_EMISSIONS

¹³ National Environment Agency – Air pollution regulation, at: <https://www.nea.gov.sg/our-services/pollution-control/air-pollution/air-pollution-regulations>

Appendix 1: Portfolio level impact of Clean Transportation projects

Allocated amount	Passenger-km travelled	Project Direct GHG emissions	Project Indirect GHG emissions	Financed direct GHG emissions	Financed indirect GHG emissions	Project GHG emissions avoided	Financed GHG emissions avoided	GHG Emissions avoided per million	Relative GHG emissions avoided ¹⁴
SGD	Million pkm	tCO ₂ e/year	tCO ₂ e/year	tCO ₂ e/year	tCO ₂ e/year	tCO ₂ e/year	tCO ₂ e/year	tCO ₂ e/year/ M SGD	%
708,656,367	2,207 - 2,697	19,869 - 24,284	4,180 - 5,108	245 - 366	52 - 77	99,906 - 122,107	1,232 - 1,841	1.7 - 2.6	81

Appendix 2: Portfolio level impact of Clean Transportation projects (air pollutants)

Project air pollutants reduced	Financed air pollutants reduced
kg/year	kg/year
SO _x : 20,494 - 25,049	SO _x : 253 - 378
NO _x : 26,132 - 31,939	NO _x : 322 - 482
PM ₁₀ : 1,311 - 1,602	PM ₁₀ : 16 - 24
PM _{2.5} : 940 - 1,149	PM _{2.5} : 12 - 17

¹⁴ Compared to the baseline.

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