

2021 GREEN BOND REPORT

COMBINED REPORT FOR THE FOLLOWING TWO OUTSTANDING GREEN BONDS:

- 3.0% S\$ 500 million (Singapore dollars) subordinated debt due 21 November 2029, callable 21 November 2024
- 3.317% C\$ 600 million (Canadian dollars) subordinated debt due 9 May 2028, callable 9 May 2023

In 2017, Manulife became the 1st global life insurer to issue a green bond¹. This regular debt instrument with proceeds allocated to the emission-efficient assets aligns our investment and financing activities. Manulife's [Green Bond Framework](#)² (the "Framework") is governed by Manulife's Green Bond Council, and is consistent with the global best practice - Capital Markets Associations' Green Bond Principles, as confirmed by a 2nd party opinion³. Together with our second issuance in 2018, the two outstanding green bonds is over C\$1 billion⁴ with the estimated annual environmental benefit of 240,555 tons of avoided carbon dioxide emissions.

Green Bonds	Issuance Type	Allocation of Proceeds	Estimated Annual Environmental Benefit
1 st Green Bond issued 21 November 2017	MFC 3.0% S\$ 500 million subordinated debt due 21 November 2029	Wind and solar energy projects in Canada and the United States	55,063 tons of avoided carbon dioxide emissions annually, or 111 tons per S\$ 1 million allocated
2 nd Green Bond issued 9 May 2018	MFC 3.317% C\$ 600 million subordinated debt due 9 May 2028	Wind and solar energy projects in Canada, the US and Uruguay, energy efficiency of public buildings, and sustainably managed forestry	185,492 tons of avoided carbon dioxide emissions annually, or 310 tons per C\$ 1 million allocated.

About sustainable finance at Manulife

Manulife is a long-term investor committed to steering its investments towards net zero emissions. As of 2021, C\$42 billion or 9.8% of the C\$427 billion general account assets backing in-force liabilities was invested in long-duration, carbon emission-efficient assets. These green investments are a good economic fit to the Manulife's business model. They form part of an asset mix that optimizes risk-adjusted returns and matches the characteristics of the long-dated insurance liabilities, some of which continue for over 20 years.

Manulife Green Investments			
Manulife Green Investments	Holdings at 31/12/2021 [Canadian dollar billion]	Holdings at 31/12/2020 [Canadian dollar billion]	Description
Green Buildings	\$18.9	\$16.9	Direct equity investments and commercial mortgages backed by green building certifications Leadership in Energy and Environmental Design (LEED), Buildings Owners and Managers Association (BOMA Best), and Energy Star
Renewable Energy	\$9.5	\$9.8	Private debt and equity financing of solar/wind/geothermal/waste biomass/hydro energy
Sustainably-managed Timberland	\$4.3	\$4.0	Assets operated by Manulife subsidiary MIM Timberland and Agriculture and private placements certified to Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) standards
Energy Efficiency	\$3.4	\$3.9	Private debt financing of energy efficiency upgrades at US government sites
Clean Transportation	\$3.0	\$2.7	Private debt financing of electrified transport and mass public transit
Sustainably-managed Agriculture	\$1.6	\$1.3	Investments operated by Manulife subsidiary MIM Timberland and Agriculture and certified to the Leading Harvest Standard
Sustainable Management of Water Resources	\$0.7	\$0.6	Private debt financing of water recycling and purification businesses
Green Bond Investments	\$0.6	\$0.7	Mainly private green bond placements in renewable energy, energy efficiency, clean transport, and sustainably-managed forests
TOTAL	\$42.0	\$39.8	General Account investments only, no third-party funds Private debt and equity investments, no public securities, except for several green bond investments
Percent of Total General Account	9.8%	9.7%	Total General Account assets: Y2021: \$427 billion; Y2020: \$411 billion.

¹ Manulife's green bond is a fixed income instrument with an amount equal to the net proceeds allocated to new and/or existing Eligible Assets defined in the Manulife's Green Bond Framework, for example - renewable energy, energy efficiency, sustainably managed forests and other investments that advance ecosystem improvements

² Manulife's Green Bond Framework is aligned with the International Capital Market Association's Green Bond Principles 2017, and directs the use of proceeds towards renewable energy, green buildings, sustainably managed forests, energy efficiency, clean transport, sustainable water management and/or pollution prevention and control: https://www.manulife.com/content/dam/corporate/global/en/documents/pas/MFC_GBF_2017_EN.pdf

³ The *Second-Party Opinion* on the Framework, and the *Annual Review* of this Green Bond report (the limited assurance procedure) are available on the Manulife Investor Relations webpage under Results and Report https://www.manulife.com/content/dam/corporate/global/en/documents/pas/MFC_GB_SPO_2017_EN.pdf It confirms a) the assets meet the Use of Proceeds the Eligibility Criteria outlined in the Framework, and b) Manulife reported on at least one Key Performance Indicator for each Use of Proceeds criteria in the Framework.

⁴ All amounts in Canadian dollars, unless otherwise stated, and for the year ending 31 December 2021

About Manulife's climate commitments and governance

Manulife is committed to steering our investment portfolio to be net zero by 2050. To ensure best practice in emission reduction target setting, measurement, and progress reporting, Manulife is committed to the [Science Based Targets initiative](#).

The net zero transition is managed by the general account's Climate Change Working Group chaired by the Head of Environmental, Social and Governance Integration and consisting of senior investment officers and members of the credit and portfolio management teams.

Manulife's Climate Action Plan is driven by the Executive Sustainability Council - the Chief Sustainability Officer and nine members of the Executive Leadership Team, including the Chief Executive Officer, and is overseen by the Board's Corporate Governance and Nominating Committee.

Manulife is also a member of global collaborations that advance integration of sustainability into financial decision-making:

- [Accounting for Sustainability](#) is a network of financial leaders that inspire action to shift towards resilient business models and a sustainable economy. In 2017, our Chief Financial Officer became the founding Chair of the A4S's Canadian Chapter
- [United Nations Environmental Programme – Finance Initiative](#) is a partnership between United Nations Environment and the global financial sector that promotes sustainable finance. Manulife has been a signatory since 2005
- [Equator Principles](#) are a set of voluntary guidelines that help financial institutions identify and manage environmental and social risks in project finance. Manulife committed to the principles in 2005.

For more information on Manulife's sustainability performance, please see our [Annual Sustainability Report](#).

About this report

Consistent with our Green Bond Framework, we committed to publishing an annual use of proceeds report. This report follows on our five historical reports published in November 2018, November 2019, May 2019, May 2020 and May 2021 which are available on the Manulife's [Investors Relations](#) webpage. This report combines the two annual use of proceeds reports into one, and shows relevant metrics by issuance, including allocation of proceeds, environmental performance indicators, and project examples. Sustainalytics - a provider of environmental, social, governance research to institutional investors - who issued the 2nd party opinion on the Framework, has reviewed this report and confirmed its alignment with the Framework⁵.

⁵ See *Limited Assurance Statement* accompanying this Y2021 Green Bond Report: <https://www.manulife.com/en/investors/results-and-reports.html#Green%20/%20Sustainable%20Bond%20Reports>

GREEN BOND 1: 3.0% S\$ 500 MILLION SUBORDINATED DEBT DUE 21 NOVEMBER 2029

Key elements

- Use of Proceeds: Renewable energy (wind and solar)
- Geography: Canada and United States
- Management of Proceeds: All proceeds allocated at issuance; no change in allocations since issuance
- Estimated Environmental Benefit: 55,063 tons of avoided carbon dioxide emissions or 111 tons CO₂ per S\$ 1 million

Use of proceeds by category on portfolio basis and environmental performance

Category as per Green Bond Principles	Criteria in the Manulife Green Bond Framework	Location	Green Bond amount originally allocated to renewable energy projects (\$ million)	% Original Allocation	Manulife's share of annual energy generation in Y2021, allocated to Green Bond (MegaWatt hour) ^a	Manulife's share of estimated annual avoided carbon dioxide emissions, allocated to Green Bond (tons) ^{a,b,c}	Data Quality Score ^e
Renewable Energy: Wind	Development, construction, operation, maintenance and upgrades of wind energy facilities and equipment	Canada	219	44%	296,607	41,146	2b
Renewable Energy: Solar	Development, construction, operation, maintenance and upgrades of solar energy facilities and equipment	Canada and US	278	56%	85,257	13,917	2b
Total	111 CO₂ tons/SG\$ 1 MM allocated		497^d		381,864	55,063	2b

Notes:

a. Estimated avoided carbon dioxide emissions are based on Manulife's share of annual energy generation, whereby our share is the our outstanding debt and equity investments in the projects as a proportion of the projects' total enterprise value as of December 31, 2021. Because we over-allocated the assets to allow for amortization of debt investments over the course of the green bond term, the reported figures are scaled to the S\$ 497 million - the net proceeds from the green bond issuance.



b. Avoided carbon dioxide emissions were estimated based on the life-cycle emission avoidance factors for wind and solar technologies, as published by the International Renewable Energy Agency. Emission avoidance is a function of displacing emissions from the fossil fuels in the countries energy mix (see Methodology)

c. Estimated carbon emission avoidance does not constitute a transfer of right to any person of the tradable carbon credit or other offset that may be associated with all or part of the avoided emission.

d. S\$497 million is the net proceeds from the green bond issuance, namely SGD 500 million gross issuance amount net of SGD 3 million transaction costs.

e. Data quality score of 2b means emissions are estimated based on the project's energy production, per methodology by Partnership for Carbon Accounting Financials - The Global GHG Accounting and Reporting Standard for the Financial Industry, 2020, First edition, page 54. The overall scale is: high quality = 1; low quality = 5.

Examples of projects

Project	Location	Description
 Rivière-du-Moulin	Province of Quebec, Canada	<ul style="list-style-type: none"> • total installed capacity: 350 Megawatt • estimated to power 59,500 homes • 20-year agreement with Hydro Quebec since construction 2014 • largest wind energy facility in Canada under single PPA
 Grand Renewable	Haldimand County, Province of Ontario, Canada	<ul style="list-style-type: none"> • total installed capacity: 100 Megawatt • 800-acre farm with 450,000 solar panels, powering 17,000 homes • 20-year feed-in-tariff contract with HydroOne since 2015 • one of the largest solar farms in Canada

GREEN BOND 2: 3.317% C\$ 600 MILLION SUBORDINATED DEBT DUE 9 MAY 2028

Key elements

- Use of Proceeds: Renewable energy (wind & solar), energy efficiency of public buildings, sustainably managed forestry
- Geography: Canada, US, Uruguay, Peru
- Management of Proceeds: All proceeds allocated at issuance and an additional asset was added in 2021 due to underlying loan amortization
- Estimated Environmental Benefit: 185,492 tons of avoided carbon dioxide emissions, or 310 tons CO₂ per C\$1 million





Use of proceeds by category on portfolio basis and environmental performance

Category per Green Bond Principles	Eligibility Criteria in the Manulife Green Bond Framework	Location	Green Bond Original Allocations (C\$ million)	% Original Allocation	Manulife's share of annual energy production, energy savings, and certified acreage, allocated to Green Bond ^a	Manulife's share of estimated annual avoided carbon dioxide emissions, allocated to Green Bond ^{a,b,c,d,e}	Data Quality Score ^e
Renewable Energy: Wind	Development, construction, operation, maintenance and upgrades of wind energy facilities and equipment	Uruguay	19.8	3%	31,503 [energy generated in MegaWatt hour]	315	2b
Renewable Energy: Solar	Development, construction, operation, maintenance and upgrades of solar energy facilities and equipment	Canada, US and Peru	333.9	56%	83,593 [energy generated in MegaWatt hour]	17,656	2b
Energy Efficiency	Development, construction, acquisition, installation, operation, upgrades to reduce energy consumption/improve resource efficiency	US	171.6	29%	41,589 [energy savings in MegaWatt hour] 15% average efficiency vs. baseline	56,754	1b
Sustainably-Managed Forestry	Purchase and operation of forest holdings certified by credible third-parties such as FSC and PEFC	US	72.6	12%	36,243 [acres 100% certified to the PEFC standard] ^f	110,767	1a
Total	310 CO2 tons/C\$ 1 MM allocated		597.9^g			185,492	

Notes:

- a. Estimated avoided carbon dioxide emissions are based on Manulife's share of annual energy generation, energy savings, and forest acreage, whereby our share is the our outstanding debt and equity investments in the projects as a proportion of the projects' total enterprise value as of December 31, 2021. The reported figures were scaled to the C\$ 597.9 million allocation of the net proceeds from the green bond issuance.
- b. Avoided carbon dioxide emissions were estimated based on the life-cycle emission avoidance factors for wind and solar technologies, as published by the International Renewable Energy Agency. Emission avoidance is a function of displacing emissions from the fossil fuels in the countries energy mix (see Methodology)
- c. Avoided carbon emissions from our energy efficiency projects were estimated by the project originator Hannon Armstrong. Their CarbonCount® methodology used the estimated kilowatt hours ("kWh"), gallons of fuel oil, million British thermal units ("MMBtus") of natural gas and gallons of water saved as appropriate, for each project. The energy savings were converted into an estimate of metric tons of CO₂ equivalent emissions based upon the project's location and the corresponding emissions factor data from the U.S. Government and International Energy Agency.
- d. Avoided carbon emissions from our forestry projects were estimated using carbon accounting protocol by our 100%-owned timber subsidiary Hancock Natural Resource Group [see Methodology]. The net greenhouse gas emission profile can fluctuate largely as a result of ongoing forest management activities, such as fertilization, herbaceous weed control, and harvesting schedules. The year-on-year change in the profile may be positive or negative.
- e. The environmental benefit estimated by Manulife in the form of avoided carbon dioxide emissions does not constitute a transfer of right to any person of the tradable carbon credit or other offset that may be associated with all or part of the environmental benefit.
- f. PEFC: the Programme for the Endorsement of Forest Certification, an international non-profit, non-governmental alliance of national forest certification systems dedicated to promoting sustainable forest management through independent third-party certification.
- g. C\$ 597.9 million is net proceeds from the green bond issuance, namely C\$ 600 million gross issuance amount net of C\$ 2.1 million transaction costs.
- e. Data quality score per methodology by Partnership for Carbon Accounting Financials - The Global GHG Accounting and Reporting Standard for the Financial Industry, 2020, First edition, page 54. Score 1a means verified emissions from the developer; 1b - unverified emissions from the developer; 2b - emissions estimated based on the project's energy production. The overall scale is: high quality = 1; low quality = 5.

Examples of projects

Project	Location	Description
 Campo Palomas	Department of Salto, Uruguay	<ul style="list-style-type: none"> installed capacity: 70 Megawatt estimated to power 13,573 households annual power generation: 200,000 MegawattHour in August 2017, Manulife participated in the USD 136.8 million financing
 Axium Infinity Solar	Province of Ontario, Canada	<ul style="list-style-type: none"> installed capacity: 76 Megawatt portfolio of eight solar facilities across the province in December 2017, Manulife provided debt financing for C\$540 million portfolio acquisition
 Smithsonian Institution's National Zoological Park	Washington D.C., United States	<ul style="list-style-type: none"> energy efficiency upgrades to the park hosting pandas Tian Tian, Mei Xiang, and her new cub Xiao Qi Ji: high-efficiency air-cooled chillers, solar shades on skylights, 625kiloWatt solar plant, LED lighting US Government building of 1,088,000 square feet and 163 acres of parkland annual energy savings 5,852 MegaWh; carbon dioxide emissions avoidance 4,340 tons
 Vinegar Bend	Alabama and Mississippi, United States	<ul style="list-style-type: none"> 18,940-acre timberland property of pine and bottomland hardwood plantations 100% of property certified to PEFC (Programme for the Endorsement of Forest Certification) pine plantation is managed on a 27-30 year rotation age, and hardwood is typically age 50 years+ merchantable timber totals approximately 690,000 tons of which 70% is pine

Methodology

We have aligned our reporting with the International Capital Markets Association's Green Bond Principles 2021⁶. The selection of the environmental impact metrics was informed by the Harmonized Framework for Impact Reporting⁷ published by a consortium of the global development banks. This framework sets out market practices for green bond reporting, including such metrics as annual energy generation, annual energy savings and reduced/avoided carbon dioxide emissions for renewable energy and energy efficiency projects. Additionally, based on our literature review, industry practice, including the Climate Bond Initiative's criteria for forestry, we also elected to report percentage acreage under the forest certification system and carbon removals for our timberland projects.

Renewable Energy: Avoided emissions are emissions from fossil-fuel-powered electricity generation that are displaced by renewable energy production. As a rule, we use the project developers' reported carbon dioxide emission avoidance figures, where available. Where not available, we estimate by multiplying our share of the renewable energy project's production by the carbon dioxide emission avoidance factors.

In 2021, we implemented the methodological change to the calculation of our share in the projects, consistent with the carbon accounting standard Partnership for Carbon Accounting Financials⁸. Namely, our share of production is a function of our year-end outstanding debt and equity investment in the project over the project's enterprise value. Historically, in the previous reports, we calculated our share of production as percentage of our deployed capital to the project's enterprise value at the time of origination.

We use emission avoidance factors published by the International Renewable Energy Agency⁹ that are specific to renewable energy technologies, such as wind and solar, and to countries, such as Canada, US, Uruguay and Peru. They are based on lifecycle assessments by the Intergovernmental Panel on Climate Change - the Special Report on Renewable Energy Sources and Climate Change Mitigation. Namely, avoided emissions are net of renewable energy project's own emissions. We made adjustments for the country-specific fossil-fuel power generation mix: for Canada, as published by the Natural Resources Canada¹⁰ - the agency of the Government of Canada; and for the US, as per the U.S. Energy Information Administration¹¹.

We note our estimation provides a general indication of avoided emissions, and we continue to evolve our methods over time, as better information on countries' electricity use and technology displacement options becomes available.

Energy Efficiency: Environmental metrics for energy efficiency projects were available directly from the project originator Hannon Armstrong.

Sustainably Managed Forestry: Carbon removals from timberland were estimated by our 100%-operating subsidiary Hancock Natural Resource Group. Annual changes in the greenhouse gas inventory are estimated using a standardized methodology developed by forest carbon accounting experts and tailored for location-specific circumstances. Final results reflect the change in carbon stored in the forest carbon 'pools' over the year as well as GHG emissions associated with certain timber operations. In essence, the net greenhouse gas profile = change in carbon stock within standing forest inventory (biogenic growth) + carbon stored in harvested wood products - nonbiological emissions.

Change in carbon stored is calculated as the difference in carbon stored in the forest at the beginning and end of each year. Standard industry timber inventory and appraisal approaches (e.g., timber cruising, light Detection and Ranging [LiDAR]) are used to estimate 'opening' and 'closing' growing stock volumes, and these volumes are then converted into amounts of carbon stored. The equations and factors used draw from relevant reference sources (United States Forest Service, peer-reviewed scientific papers, among others) and are selected based on the locations and types of species in question. In addition to live tree carbon, carbon stored in standing deadwood, understory, debris, and/or harvested wood products is also considered, depending on the geographic location.

Emissions quantified from timber operations include carbon dioxide from fuel combustion in vehicles and equipment, nitrous oxide from fertilizer application, and methane and nitrous oxide from biomass combustion during prescribed burns. Fuel combustion emissions are estimated using assumed amounts of fuel use per acre based on past sampling of HTRG operations and standard emission factors. Fertilizer nitrous oxide emissions are estimated using typical HTRG fertilizer application rates per acre, or measured quantities where available, and emission factors published by the Intergovernmental Panel on Climate Change (IPCC) and others. Emissions from prescribed burns are calculated using biomass consumption values provided by the IPCC for temperate forests, which describes all of HTRG-managed forests.

We expect the net greenhouse gas profile to fluctuate largely because of ongoing forest management activities, such as fertilization, herbaceous weed control, and harvesting schedules. The year-on-year change in the profile may be positive or negative.

⁶ International Capital Markets Association, *Green Bond Principles*, June 2021
<https://www.icmagroup.org/assets/documents/Sustainable-finance/2021-updates/Green-Bond-Principles-June-2021-140621.pdf>

⁷ The World Bank, *Harmonized Framework for Impact Reporting*, 2015
<https://www.ifc.org/wps/wcm/connect/35c1cd76-b75f-474c-815a-dfb876543a22/Updated+logo+FINALPROPOSALIRH+CLEAN.pdf?MOD=AJPERES&CVID=mHrR8w4>

⁸ PCAF (2020). *The Global GHG Accounting and Reporting Standard for the Financial Industry*. First edition.
<https://carbonaccountingfinancials.com/files/downloads/PCAF-Global-GHG-Standard.pdf>

⁹ International Renewable Energy Agency, *Avoided Emissions Calculator*, 2018
<http://www.irena.org/climatechange/Avoided-Emissions-Calculator>

¹⁰ Natural Resources Canada, Government of Canada, assessed 20 April 2022. Latest available data is for 2014
<https://www.nrcan.gc.ca/energy/electricity-infrastructure/about-electricity/7359#generation>

¹¹ US Energy Information Administration, 2021
<https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>

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