

2019 Annual Green Bond report

Combined report for the two green
bond issuances

- 3.0% SGD 500 million subordinated debt due 21 November 2029
- 3.317% CAD 600 million subordinated debt due 9 May 2028

About sustainable finance at Manulife

Manulife invests its general funds in assets that include long-duration, carbon emission-efficient assets that support the transition to the lower-carbon economy. For example, Manulife holds over C\$14 billion, or 3.7% of the total general funds portfolio, in renewable energy and energy-efficiency projects; certified 25.7 million square feet, or over 70% of its \$14.3 billion real estate portfolio to sustainable building standards; and manages its entire \$3.4 billion timberland portfolio to third-party sustainability standards.¹ These long-duration assets are integral to Manulife's business model, as they provide a good economic fit for our long-dated insurance liabilities.

In 2017, Manulife became the first global life insurer to issue a green bond.² This regular debt instrument with proceeds allocated to emission-efficient assets aligns our investment and financing activities. [Manulife's Green Bond Framework](#)³ is governed by Manulife's executives on the Green Bond Council and is consistent with the global best practice — the International Capital Markets Association's Green Bond Principles — as confirmed by the second party opinion.⁴ Together with our second issuance in 2018, our total green bond issuance to date is over \$1 billion with an estimated annual environmental benefit of 150,311 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% SG\$500 million subordinated debt due 21 November 2029	Wind and solar energy projects in Canada and the United States	53,741 tons of avoided carbon dioxide emissions annually, or 108 tons per SG\$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	96,570 tons of avoided carbon dioxide emissions annually, or 162 tons per C\$1 million allocated

Sustainability at Manulife is driven by the Executive Sustainability Council 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 inspires 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](#).

¹ All amounts in Canadian dollars, unless otherwise stated, and for the year ending 31 December 2019

² Manulife's green bond is a fixed income instrument with an amount equal to the net proceeds intended to be used to finance or re-finance new and/or existing Eligible Assets consistent with Manulife's Green Bond Framework that directs proceeds towards renewable energy, energy efficiency, sustainably managed forests and other investments that advance ecosystem improvements

³ 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:

<http://manulife.force.com/servlet/servlet.FileDownload?file=00P5000000u15GVEAY>

About this report

Consistent with our Green Bond Framework, we committed to publishing an annual use-of-proceeds report. This report follows on our three historical reports published in November 2018 and 2019 and May 2019 available on the [Manulife's Investors Relations](#) webpage. This report combines the two annual issuances' reports into one and continues to show 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 – which issued the 2nd party opinion on the Framework, has reviewed this report and confirmed its alignment with the Framework.⁴

Methodology

We have aligned our reporting with the International Capital Markets Association's Green Bond Principles 2018.⁵ The selection of the environmental impact metrics was informed by the Harmonized Framework for Impact Reporting⁶ 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. In addition, based on our literature review and industry practice, including the emergence of the Climate Bonds' criteria for forestry, we elected to report metrics for sustainably managed timber projects such as percentage acreage under the forest certification system and avoided carbon dioxide emissions.

As a rule, we use project developers' avoided carbon dioxide emission estimates where available. Where not available, we estimate, using the methodology described below. In this reporting instance, environmental metrics for energy efficiency projects were available from the project originator Hannon Armstrong. The forest-related avoided emissions were estimated by our 100%-operating subsidiary Hancock Natural Resource Group.

Renewable Energy: Avoided emissions are estimated by multiplying annual renewable energy production (in megawatt-hours) by the carbon dioxide emissions factors (tons per one megawatt hour). Emission factors reflect emissions from fossil-fuel-powered electricity generation that are displaced by wind or solar technologies in the local country energy mix. We used emission factors for Canada and the U.S. from the tool developed by the International Renewable Energy Agency [IRENA].⁷ We relied on Natural Resources Canada,⁸ the agency of the Government of Canada for the Canadian energy mix, and the U.S. Energy Information Administration for the U.S. energy mix. IRENA's dataset is based on the life-cycle assessments by the Intergovernmental Panel on Climate Change, documented in the Special Report on Renewable Energy Sources and Climate Change Mitigation.

Our avoided emissions estimation provides a general indication of avoided emissions. We expect the estimation to evolve over time, as better information on countries' electricity use and technology displacement options becomes available.

Sustainably Managed Forestry: Annual changes in the Hancock Timber Resource Group (HTRG) greenhouse gas (GHG) 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) 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 and nitrous oxide from fertilizer application. 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.

We expect the net greenhouse gas profile to 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.

⁴ 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 <https://www.manulife.com/en/investors/results-and-reports.html>. It confirms a) the assets meet the Use of Proceeds 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.

⁵ Green Bond Principles, June 2018 <https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/>

⁶ 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>

⁷ International Renewable Energy Agency, Avoided Emissions Calculator, 2014 <http://www.irena.org/climatechange/Avoided-Emissions-Calculator>

⁸ Natural Resources Canada, 2016 <https://www.nrcan.gc.ca/energy/electricity-infrastructure/about-electricity/7359#generation>

⁹ US Energy Information Administration, 2017 <https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>

Green bond 1: 3.0% SGD 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: 53,741 tons of avoided carbon dioxide emissions or 108 tons CO₂ per SG\$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 allocated to renewable energy projects (SGD million)	% Allocation	Manulife's share of annual energy generation, 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}
Renewable Energy: Wind	Development, construction, operation, maintenance and upgrades of wind energy facilities and equipment	Canada	219	44%	277,003	38,485
Renewable Energy: Solar	Development, construction, operation, maintenance and upgrades of solar energy facilities and equipment	Canada and US	278	56%	59,272	15,276
Total	108 CO₂ tons/SGD 1 MM allocated		497^d		336,275	53,741

Notes:


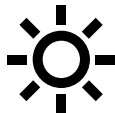
^a Manulife's share of installed capacity, annual energy generation and estimated avoided carbon dioxide emissions was based on our debt and equity investments deployed in the projects as a proportion of the projects' total enterprise value at the time of investment. The reported figures were scaled to the SGD 497 million allocation of the net proceeds from the green bond issuance.

^b Avoided carbon dioxide emissions were estimated based on the energy mix in local country grids and the life-cycle emission factors for wind and solar technologies (see Methodology)

^c 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.

^d SGD 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.

Examples of projects

Project	Location	Size
 Rivière-du-Moulins	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% CAD 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
- Management of Proceeds: All proceeds allocated at issuance; no change in allocations since issuance
- Estimated Environmental Benefit: 96,570 tons of avoided carbon dioxide emissions, or 162 tons CO₂ per C\$ 1 million

Use of proceeds by category on portfolio basis and environmental performance

Category as per Green Bond Principles	Eligibility Criteria in the Manulife Green Bond Framework	Location	Green Bond Allocations (CAD million)	% 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}
Renewable Energy: Wind	Development, construction, operation, maintenance and upgrades of wind energy facilities and equipment	Uruguay	19.8	3%	30,867 (energy generated in MegaWatt hour)	926
Renewable Energy: Solar	Development, construction, operation, maintenance and upgrades of solar energy facilities and equipment	Canada and US	333.9	56%	73,405 (energy generated in MegaWatt hour)	19,711
Energy Efficiency	Development, construction, acquisition, installation, operation, upgrades to reduce energy consumption/improve resource efficiency	US	171.6	29%	32,635 (energy savings in MegaWatt hour)	44,535
Sustainably Managed Forestry	Purchase and operation of forest holdings certified by credible third-parties such as FSC and PEFC	US	72.6	12%	28,440 (acres 100% certified to the PEFC standard) ^f	31,398
Total	162 CO₂ tons/C\$ 1 MM allocated		597.9^g			96,570

Notes:

^a Manulife's share of actual energy generation, energy savings, sustainably managed forest acreage and estimated avoided carbon dioxide emissions are based on our debt and equity investments in the projects as a proportion of the projects' total enterprise value at the time of investment. The reported figures were scaled to the CAD 597.9 million allocation of the net proceeds from the green bond issuance.

^b We estimated avoided carbon dioxide emissions for renewable energy projects based on the energy mix in local country grids and the life-cycle emission factors for wind and solar technologies (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 CAD 597.9 million is net proceeds from the green bond issuance, namely CAD 600 million gross issuance amount net of CAD 2.1 million transaction costs.

Examples of projects

Project	Location	Size
 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 megawatt hours • 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	Front Royal, Virginia, United States	<ul style="list-style-type: none"> • Energy-efficiency upgrades: high-efficiency air-cooled chillers, solar shades on skylights, 625 kilowatt solar plant, LED lighting • US Government building of 1,088,000 square feet and 163 acres of parkland • Annual energy savings 5,852 megawatt hours; 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.

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