

Financing waste management, resource efficiency and circular economy in the green bond market

Waste management and resource efficiency are key factors in developing a global low-carbon economy. Yet the waste management sector is only the fourth largest category for green bond use of proceeds globally, indicating significant latent potential. Examples of issuance across the world show that capital markets can be further leveraged to finance assets and projects contributing to resource efficiency and circular solutions in a multitude of sectors.

Waste management sector

The imperative: There is widespread consensus that a more circular economy with extensive recycling and materials efficiency is needed to meet climate mitigation targets and build a sustainable global economy.^{1,2} According to estimates from the United Nations, managing municipal solid waste* in line with current resource demand levels accounts for approximately 5% of global greenhouse gas emissions – more than the estimated 3 – 4% from the aviation sector, for example.^{3,4} Furthermore, the world's total material resource demand is projected to double by 2060, indicating growing waste generation by as much as 70%, along with increasing emissions.⁵ The projected rise highlights the urgency and importance of preventing, minimising and managing waste efficiently on a global scale.

The opportunity: Current and forecasted levels of waste generation require extensive improvements in management infrastructure and techniques. These, in turn, require significant amounts of capital: for example, the investment gap for managing only plastic waste in the top five plastic-polluting countries – China, Indonesia, the Philippines, Thailand, and Vietnam – is estimated at approximately USD5bn per year.⁶ Directing additional capital to the waste management sector provides substantial opportunities for reducing CO₂ emissions. It also leverages increasing investor demand for investable projects and assets in this space: according to research recently published by Climate Bonds Initiative, more than two-thirds of European green bond investors are looking for opportunities to invest in the sector.⁷ Asset managers are also establishing dedicated products for addressing the issue: for example, **Fidelity** launched an USD-denominated equity fund focusing on waste management and water in November 2018, and expanded it to the UK a year later.⁸

universe for waste management, debt outstanding from fully- and strongly aligned issuers in the sector totalled approximately USD7.5bn (as at the end of June 2019).

In the labelled green bond market, issuers have allocated proceeds to fund waste management projects and related infrastructure, including substituting waste collection fleets with low-carbon alternatives such as electric vehicles (EVs). At the end of December 2019, USD6.8bn had been allocated to such assets and projects, corresponding to about 4% of total issuance volumes. Non-financial corporate issuers have been the most active, allocating a total of USD2.6bn (or 38% of the total) to waste management projects.

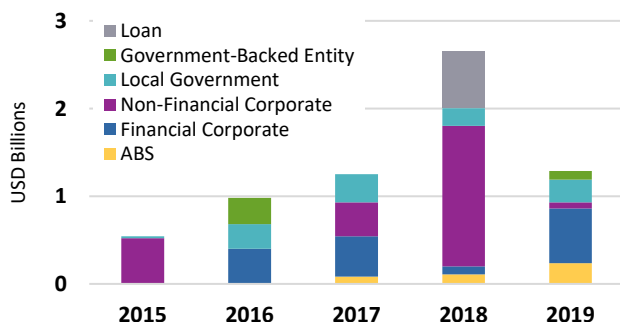
About this briefing

This briefing provides an overview on how fixed income instruments have been used to finance assets and projects in the waste management sector, as well as the overall resource efficiency space. Definitions are in line with the CBI Taxonomy.

Green bond proceeds can be fully allocated to projects in a specific sector, or they can be distributed across several sectors. Issuers typically set out their intention for allocating proceeds in pre-issuance documentation, including a green bond framework, an external review such as a Second Party Opinion (SPO), or other documents (e.g. bond prospectus).

To provide a representative picture of the sector, only green bonds whose proceed allocations to waste management exceed 50% have been accounted for. This means that reported figures do not reflect total green bond issuance amounts, but rather, of amounts specifically allocated to waste management. All data is as at 31 December 2019.

Corporates lead waste management green bond issuance



Green capital flows to waste management: According to Climate Bonds analysis on the size of the climate-aligned bond investment

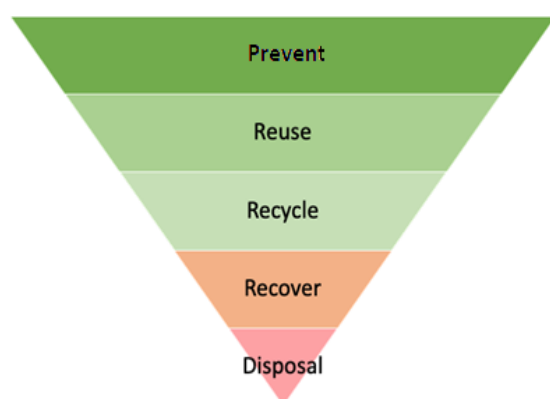
Sector overview

In the green bond market, waste management projects and assets have been financed by a range of entities since 2015. **Financial** and **non-financial corporates** have played a significant role in the sector, contributing close to a third (61%) of total allocations.

Local governments, particularly **US municipalities,** are also active: the first deal with a significant waste management sector allocation (50%) was a USD22m solid waste green revenue bond from the **City of Tacoma,** Washington, issued in March 2015.

Suitable projects for waste management and resource efficiency investments span across the **waste hierarchy;** a well-known framework illustrating different waste management options from prevention to disposal roughly in order of their relative environmental impact.⁹

The Waste Hierarchy



Projects financed with green bond proceeds typically fall in the **recycling and recovery** levels of the hierarchy, often involving improvements in existing solid waste management facilities. Such facilities extend to a variety of methods of waste treatment, with recycling taking the lead. Further, corporate issuers also use green bond financing to fund the acquisition of new waste treatment facilities, as well as to purchase other companies that for example operate existing recycling plants. French waste management company **Paprec** is an example of the latter (see below).

Examples of waste recovery projects financed with green bonds include the expansion of a biomass pellet mill in the City of Ridgeland, South Carolina, USA. The issuer, **South Carolina Jobs-Economic Authority**, sought USD12.5m of green bond funding from the market to expand the plant's capacity fivefold from 30,000 to 150,000 metric tonnes. The primary feedstock is sawdust and residue wood chips from the forestry industry.

Other examples of uses of green bond financing in the sector fall into the waste disposal category. For example, issuers use debt financing to invest into incineration facilities, including waste-to-energy plants. The disposal methods and processes financed cover organic as well as inorganic waste streams. An example of organic waste processing comes from the **City of Napa** (CA, USA). The Californian city tapped into the green US muni bond market in October 2016, raising USD12m to finance a large-scale composting facility. The project involved implementing a new process for breaking down organic waste streams, in which finished compost covers fresh waste to improve air quality and a roof shields the facility to limit any stormwater contamination.

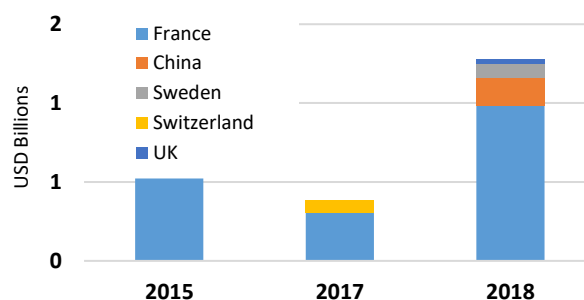
Although waste disposal is eligible for green bond financing, constructing new landfills does not qualify under Climate Bonds definitions. However, issuers can fund projects for capturing harmful greenhouse gases from existing landfills or as part of post-landfill closure management. An example of this comes from US municipal issuer **King County** (WA, USA), whose USD31m bond from October 2017 financed the treatment of seven landfill sites across the county to bring them to a stable state.

Additionally, a share of green bond proceeds has been spent on upgrading transportation fleet related to waste management. This typically involves replacing waste collection vehicles with, for example, electric vehicles (EVs). Inaugural green US muni waste management bond issuer **City of Tacoma** is an example of this: part of the 2015 green issuance financed the purchase of a fleet of new hydraulic hybrid waste collection trucks.

Waste management companies started issuing in 2015

In total, waste management companies have raised USD2.3bn to fund projects in across six countries: China, France, Sweden, Switzerland and the UK. France tops the rankings at USD1.8bn or a whopping 71% of the total, solely contributed by **Paprec's** pioneering issuances in the sector.

European countries make up nearly all of corporate waste management issuance



Paprec (France) was the first non-financial corporate and first waste management company to enter the green bond market in March 2015. To date, it has issued three green bonds with a total volume of USD1.8bn. The bonds' proceeds have financed waste collection and treatment facilities, as well as contributing to the acquisitions of smaller recycling companies operating in France.

Helvetia Environnement Group (Switzerland) issued its debut green bond in 2017. The USD77m deal was also the inaugural corporate green issuance from Switzerland. The funding went to the construction of the country's most modern recycling centre at the time of issuance: the fully automated Sortera centre in Geneva, with an annual processing capacity of 77,000 tonnes. Part of the proceeds also financed an in-house biodiesel production branch, which uses a variety of recyclable materials as feedstock.

Stena Metall Finans AB (Sweden) issued a SEK800m (USD91m) green bond in June 2018 to fund the company's recycling operations at the Stena Nordic Recycling Center in Halmstad, Southwest Sweden. The Center's focus is on closing the loop on materials that are currently the most difficult to recycle, such as plastic packaging film, non-ferrous metals, cables and functioning components like screens from electronic devices. Stena assessed that in the 2018/19 financial year, the operations funded with the green bond helped avoid nearly a million tonnes (925,000tCO_{2e}) of GHG emissions compared to a virgin raw materials baseline.

Renewi (UK) is an example of a pureplay waste management corporate issuing green bonds (and loans – see spotlight section below). Their debut green bond hit the market in June 2015 and financed projects related to recycling waste into usable products; treating contaminated water and soil as a result of hazardous waste exposure; treating organic waste by converting it into energy or fertiliser; and reducing the emissions from transporting waste. The firm, whose aim is to be the leading "waste-to-product" company, has since issued two further green bonds and one green loan to a total of USD864m equivalent. Its latest deal from July 2019 was a USD75m green retail bond with a minimum denomination of EUR1,000, aimed exclusively at Belgian investors.

Chinese banks are active in the waste sector

A total of six Chinese banks have issued green bonds to finance mostly waste management assets and projects. The first one came from **Industrial Bank** in January 2016: the USD401m equivalent ABS deal comprised an asset pool of 42 green loans from 29 borrowers selected against strict criteria from the Bank's overall loan portfolio and covering areas such as pollution control and materials recycling. **Huishang Bank** adopted a similar approach for its USD154m equivalent bond from September 2017. Two out of the six eligible project categories related directly to waste management (pollution prevention and resource conservation & recycling) and received half of the total green bond proceeds.

Local and national governments fund waste management projects through green bonds

Local governments play a key role in financing basic infrastructure. Funding waste management via green bonds is therefore a natural fit. Indeed, local governments have so far allocated approximately USD1.1bn to waste management assets and projects, corresponding to 2% of their total green bond issuance volume. Most of this has come from municipal issuers across the US.

The **California Pollution Control Financing Authority** has issued four green bonds with a total volume of USD419m. The inaugural deal from June 2017 financed a rice straw recycling facility with several benefits related to preventing pollution – both by abating the emissions of potent GHGs such as methane, as well as avoiding volatile organic compound (VOC) emissions. The agricultural waste rice straw is treated and then reused for making non-toxic medium-density fibreboard (MDF), a material commonly used in furniture and building components.

The **City and County of Honolulu** issued a USD20m green bond in September 2017 and USD190m a year later to refinance the expansion of the H-Power waste-to-energy facility. The plant converts some 2,000 tonnes of waste into electricity daily, powering 60,000 homes on the island of Oahu. The expansion added a third boiler and enabled the plant to begin processing sewage sludge and associated bulky waste. Overall, the facility allows the city to divert nearly 90% of non-recycled waste from landfill and makes it one of the highest-ranking in the country.

The **Pennsylvania Economic Development Financing Authority** issued a USD50m green bond in August 2019 to lend funds onward to a waste-to-energy company called Covanta operating across several counties in the Authority's jurisdiction. The proceeds were allocated to improving the recycling of non-ferrous metals as well as on a processing system that allows for the beneficial re-use of ash from the waste-to-energy operations. The system will allow the company to recover both small metal fractions as well as aggregate for construction material, thereby reducing the amount of ash going to landfill by an estimated 65%.

New Jersey state's **Union County Improvement Authority** tapped into the green bond market to finance a sludge and solid waste processing plant. Its October 2019, USD50m green muni bond funded a facility that uses a specific gasification technology to process sludge waste and convert it into thermal energy along with biochar – a charcoal-like substance that can be used to sequester carbon. The facility is estimated to be able to convert about 430 tonnes of wet sludge into 19 tonnes of useable biochar every day and is expected to be fully operational by Q1 2021.

The labelled loans market

In addition to bond issuance, waste management projects have also been financed through the labelled loans market. There has been ample activity, particularly in the broader European market and the Nordic region more specifically. Examples of borrowers range from local governments to food retailers, steel producers and real estate companies. On the lender side, regionally specialised development banks have taken a leading role in providing capital for county, city and municipality-level infrastructure projects; on the corporate side, commercial banks often represent the key sources of funding.

Green and KPI-linked loans for waste management and resource efficiency

Green and sustainability loans are issued by financial institutions to fund green projects and assets, often in line with a recognised set of principles such as the **Loan Market Association's (LMA) Green Loan Principles**. An emerging trend in the labelled loan space is the KPI-linked model, where the margin is tied to the borrower meeting a set of sustainability-related Key Performance Indicators (KPIs) within a set timeframe. The LMA has published the **Sustainability Linked Loan Principles** as guidance to lenders and borrowers.

Lenders include, for example, Japanese **Mizuho Bank**. The Bank was part of a syndicate issuing a SGD65.4bn (USD47bn) green loan in May 2016 to a special purpose company contracted by the **Singaporean National Environment Agency** to construct a large-scale waste-to-energy plant. The SPC is a joint venture of Singapore's **Hyflux Group** and Japan's **Mitsubishi Heavy Industries**. The plant will be able to process up to 3,600 tons of waste per day, generating 120 megawatts (MW) of electricity.

Denmark's **Danske Bank** issued a green loan to Finnish waste management firm **Kuusakoski Recycling** in June 2019. The funding will enable the expansion and improvement of the firm's recycling operations in the Heinola Plant in southern Finland. The investment is estimated to increase the amount of metals recycled by approximately 2,000 tonnes per year.

On the borrower side, European waste management companies have actively utilised the green loan structure. **Tradebe** (Spain) was the first to seek a green syndicated term loan in June 2017 to finance general corporate purposes as a pureplay company. Spanish bank **BBVA** headed the syndicate.

In the **KPI-linked loan** space, **Renewi**, also a green bond issuer, made headlines when it converted its EUR550m banking facility into a syndicated "sustainability improvement loan" in May 2018 – said to have been the first of its kind for a UK company.

Italian multi-utility company **Hera** agreed on a syndicated EUR200m ESG-linked revolving credit facility in May 2018. The facility included a price adjustment mechanism contingent on three KPIs: reduced CO₂ emission intensity, increased waste recycling rates, and lower energy consumption.

French waste utility **Séché Environnement** sought green financing through a EUR150m revolving credit facility and a EUR50m term loan in July 2018. Both incorporated environmental, social and governance (ESG) objectives as a requirement for more favourable financing terms.

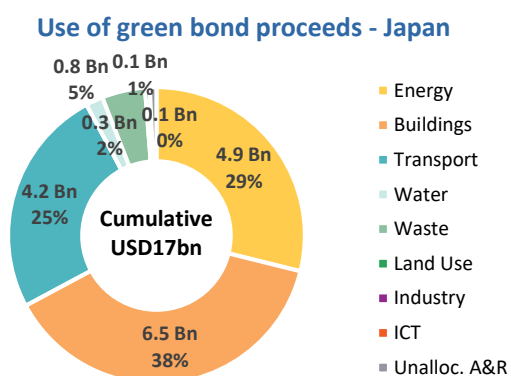
Asia's waste management leader

Japan's expertise in resource efficiency has deep roots. The country currently recycles approximately 44% of all the waste generated, with the rate for specific waste streams such as metals reaching up to 98%.¹⁰ The country has enacted long-term legislation on the issues: the Law for the Efficient Use of Resources and the Basic Act for Establishing a Sound Material-Cycle Society entered into force in 2000. The first Fundamental Plan for the latter was enacted in March 2003, and the fourth edition of entered into force in June 2018. It includes a Plastic Resource Circulation Strategy, stipulating a country-wide goal to recycle or reuse 60% of all plastic packaging by 2030.¹¹

Plastic waste is a globally growing concern, but particularly in the southeast Asian region. Not only has Japan set ambitious domestic targets to tackle this, but the country has also begun to emerge as a regional leader. The government has been active in forming public-private partnerships with corporates such as **Hitachi Zosen** – also a green bond issuer – to export the waste-to-energy (WTE) model and actual plants along with waste collection, sorting and management expertise and solutions to parts of the ASEAN region where waste infrastructure is lacking. This includes for example Indonesia, the Philippines and Vietnam. Currently at least three model projects exist, and plans are in place for 10 model communities to benefit from WTE technology by 2023.¹²

Waste management green bonds in Japan

Green bonds could be further leveraged to finance new initiatives aimed at achieving these goals. However, the market in Japan is still relatively small at USD17bn, as at the end of December 2019 (9th in global green bond issuer country rankings). Proceeds allocated to waste management represent about 5% of total issuance, or around USD800m.



Corporate issuers prevail in the Japanese green bond market overall, as well as in the waste sector allocations. ** The three main issuers are non-financial corporates: the first ones were **Hitachi Zosen** and **Daio Paper Corporation**, which entered the market in September and October 2018, respectively. Hitachi's JPY5bn (USD44m) deal funded eligible WTE plants. Similarly, Daio's JPY20bn (USD178m) bond financed a recycling and biomass power plant using black liquor (waste from the pulp extraction process) as its primary feedstock.

Daiken Corporation followed in September 2019 with a JPY5bn (USD46m) green bond. The bond financed the manufacturing plants of circular-economy adapted products, namely insulation boards produced reusing construction waste materials, Rock Wool Inorganic Board made out of the by-products mineral resources

used for steel manufacturing, and a wall base double glaze board that utilises volcanic soil ("Sirasu").

Circular economy opening new opportunities

Circular economy (CE) is widely understood as a necessary component of achieving the global low carbon transition.

Furthermore, according to estimates from management consultancies McKinsey & Co. and Accenture, CE could represent a USD4.5trn business opportunity globally.^{13,14} Despite this, the latest Circularity Gap Report from Circle Economy found that the world is currently only 8.6% "circular".¹⁵ A push for CE is already well underway in Japan: for example, as part of its G20 presidency in 2019, Japan took a pioneering role in calling for the introduction of global circular economy initiatives.¹⁶

CE business models and financing

Circular economy can also facilitate resource independency. As a major industrial player, Japan needs to ensure continuity of raw material supply, which is limited domestically. An example of such recovery is a collaboration between carmaker **Honda** and **Japan Metals and Chemicals Co., Ltd.** The firms recovered rare earth metals extracted from old nickel-metal hydride batteries for use in new ones to be installed in hybrid vehicles.¹⁷ Other companies working on diversifying their materials base and **designing CE compatible products** include **Kaneka Corporation**: a chemical manufacturer, which recently issued a green bond to finance scaling up its manufacturing capability of 100% plant oil-based, marine biodegradable polymers.¹⁸ Similarly, printing company **Ohkawa** makes print products out of other fibrous waste materials besides recycled paper, including banana plants.¹⁹

Research indicates that circular approaches to manufacturing are the main force of developing an overall circular economy, which makes such approaches particularly attractive to Japan.²⁰ A potent example of this is **remanufacturing** – i.e. rebuilding products to their original specifications using mainly repaired and/or reused parts. This is done, for example, by car part remanufacturer **SHINE** (Shin-Etsu Denso Co., Ltd).

An important part of designing whole value chains that do not generate waste is **reverse logistics**. A Japanese conglomerate utilising this approach is **Ricoh**, which re-integrates used products into its supply chain and reuses their materials and components. Reverse logistics service providers include domestic **Hitachi Transport Systems** and **Suzuyo**, as well as multinational **UPS**.

CE also entails business model innovation. For example, leasing companies already provide an alternative to traditional ownership of assets, such as cars, through the **"as-a-service"** model. Seven Japanese leasing companies have entered the green bond market, issuing a total of USD2.6bn equivalent. * However, most of them have financed renewable energy generation assets as opposed to core business assets or related expenditure. Utilising service-based business models offers interesting sustainable funding prospects not only to leasing firms, but also to the Japanese automotive industry. Car companies could finance new service-based business lines through green or sustainability bonds as part of their broader low carbon transition.

Finally, often linked to CE is the **sharing economy (SE)**. Japanese companies in this space include peer-to-peer skill sharing platform **Anytimes**, subscription-based clothing rental service **airCloset**, and **Spacee**, a "space-matching service" for unused meeting and conference rooms. The **Japan Sharing Economy Association** has

also created the **Sharing Economy Trust Mark**: an indicator aimed at evoking consumer confidence, a lack of which has been quoted as a barrier to more widespread adoption of the SE applications in the country.^{21,22} As this segment of the Japanese economy expands – as is expected along with its upcoming integration to the country’s GDP calculations – green and other labelled bonds and loans can support the growth of SE companies.²³

Green and sustainable bonds

In addition to the Japanese examples of **Daiken Corporation** and **Kaneka Corporation**, there are ample examples globally of firms embracing CE and green bonds. For example, Italian and Dutch banks **Intesa Sanpaolo** and **ING**, Norwegian seafood producer **Mowi**, Dutch electronics conglomerate **Philips** and US-based glass packaging manufacturer **Owens-Illinois** have all issued green / sustainability bonds to finance CE activities in their own industries or, in the cases of the banks, across multiple ones. Typical examples of assets and projects include CE adapted products aiming to integrate recovered and/or reused resources; research and development work into new materials that sometimes rely on wastes or otherwise more sustainable feedstock alternatives; as well as service and sharing based new business lines.

Other investment products

The wider financial services industry is also taking note of the CE trend. Over the last few years a number of index providers have launched specialist products: for example, **ECPI** launched a CE equity index, **Solactive** established a sharing economy focused index and **MSCI** introduced a CE and renewable energy index.^{24,25,26} On the investment management side, US-based **BlackRock** and Swiss peer **RobecoSAM** recently launched dedicated CE equity funds.^{27,28} The asset management arm of French bank **BNP Paribas** created an exchange-traded fund (ETF) that tracks the ECPI Circular Economy Leaders Index.²⁹

Green investment barriers and enablers

Although there is clear investor demand for green products, including those specific to waste management, a lack of supply persists. Based on Climate Bonds research, the key barriers relate to a lack of common standards around what constitutes green (definitions) and the issuance process itself, including framework design; external reviews; and ongoing transparency and disclosure. Standardising definitions and the process itself could help issuers to more easily identify a sufficiently large pipeline of green assets – including for waste management as well as resource efficiency and circular economy more broadly – whilst avoiding greenwashing and boosting investor confidence. A more streamlined approach would also likely bring down the transaction costs of issuing green debt especially for debut issuers – another perceived barrier highlighted by several market participants.³⁰

The role of policymakers and regulators is crucial in addressing the obstacles to scaling up the green bond market. A well-known example of a specific policy initiative expected to accelerate market growth comes from the **European Commission**. In 2016, the Commission set up a **High-Level Expert Group on Sustainable Finance**. The HLEG published a **Sustainable Finance Action Plan**, which recommended the adoption of a common classification system for sustainable economic activities. A Technical Expert Group (TEG) tasked with proposing technical performance criteria

was set up in 2018, and published a draft EU Taxonomy on Sustainable Finance in June 2019, and a final version in March 2020.³¹ The proposed Taxonomy sets out a framework for assessing the contribution of an economic activity to climate change mitigation and adaptation. Additionally, it requires that economic activities “Do No Significant Harm (DNSH)” to the following areas:

- Sustainable Use and Protection of Water and Marine Resources
- Transition to a Circular Economy, Waste Prevention and Recycling
- Pollution Prevention and Control
- Protection of Healthy Ecosystems

Initiatives specific to circular economy financing have been pioneered by, for example, the **FinanCE Working Group** set up by a consortium of European banks, investment funds and academia in 2014. The Group published an in-depth study of the role of capital in achieving a circular economy in March 2016.³² Furthermore, a subset of the Group led by Dutch banks **ABN AMRO**, **ING** and **Rabobank** released the **Circular Economy Finance Guidelines** in July 2019. The document provides guidance for financiers on definitions, as well as outlining the requirements for CE companies and projects to access equity and credit markets, including through green bond issuance.

Other European entities have been active in this space as well: for example, the **European Investment Bank (EIB)** supports both the public and private sectors in CE activities. They engage in risk-sharing in financing CE projects, define funding gaps through market studies, and structure and implement investment platforms applicable to CE-focused companies and projects.

The European Commission’s activities in the CE arena have been focused on research and information provision. For example, the EC published a paper titled “Accelerating the Transition to the Circular Economy”, which investigated the barriers of access to finance for CE projects and companies. It found issues similar to those that apply to the wider green finance universe, namely the lack of proper standards, definitions and classifications (taxonomy) for circular economy green bonds and other investment. However, as noted in the paper, the EU TEG and the Sustainable Finance Taxonomy offer a potential avenue for implementation: the TEG could “*develop a definition of what constitutes circular economy activities that could be financed through bond issuances*”.³³ The definitions could then be integrated into the EU Green Bond Standard, and the model could be replicated and adapted to other regions across the world.

Other examples of widely applicable green bond policy instruments include incentives for making green bond issuance cheaper. For instance, governments could introduce tax deductions (see Malaysian example below) or grants to cover issuance expenses, such as obtaining an external review. Further, especially for increasing waste management allocations, the importance of government issuance at various levels cannot be understated. Demonstration issuances across the world can help to grow existing markets and catalyse new ones. Paired with clearer definitions, they can also help to facilitate additional capital allocations to the sectors (waste management) and themes (CE) with the largest investment gaps.

Examples of green bond incentives

Hong Kong's Green Bond Grant Scheme provides up to HKD800k subsidy to offset the cost of obtaining a Green Finance Certification Scheme (GFCS) established by the Hong Kong Quality Assurance Agency. Additionally, the Hong Kong Monetary Authority announced a three-year Pilot Bond Grant Scheme in May 2018, which provides grants of up to half of the issuance expenses of each green bond (up to HKD2.5m) for qualifying issuers.

Japan's Financial Support Programme for Green Bond Issuance offers subsidies of up to JPY50m/JPY40m (USD4.5m) to cover the costs of issuing green bonds in compliance with the Green Bond Guidelines, which are consistent with international standards and definitions, such as the Green Bond Principles.

Malaysia offers SRI Sukuk tax deduction on issuance costs until 2020. While not related just to green bonds, it also offers tax incentives for green technology activities across several key industries, including waste management as well as energy, buildings and transportation. It also offers financing incentives under the Green Technology Financing Scheme (GTFS).

Singapore's Green Bond Grant Scheme assists eligible issuers with 100% of the costs of an external review up to SGD100k (USD73k).

Conclusions and outlook

Recent years have seen increasing movement towards the **diversification** of both the issuer base as well as the industry sector mix of projects and assets financed with green bonds. Although investments into waste management remain small, the broader emerging trends of resource efficiency and circularity are likely to facilitate growth.

The **green finance universe is characterised by innovation**, evidenced by some of the new circular economy and resource management focused products, such as funds and indices, that have already emerged. Once these become better defined and more mature, corporates relying on traditional debt financing are likely to take note. This trend is already visible in companies across several industry sectors ranging from chemicals manufacturing to banking quoting “circular economy” in their green bond frameworks and applying the concept to their products, services and operations.

Japan is already at the forefront of advancing the circular economy agenda, including a focus on minimising and managing different types of waste. The country is well placed to benefit from leveraging its leadership to scale up activity and financing in this area. However, this requires a continued, concerted effort across sectors to create a regulatory framework within which there are clear definitions of what circular economy means and how different actors in the economy can seek financing for assets, projects and activities that qualify under such definitions.

Furthermore, there is a continued need for additional consumer education to eliminate possible negative connotations and emphasise the variety of benefits of using, for example, remade products, sharing platforms or goods as a service. Not only could all the above provide essential climate mitigation benefits, but also help to navigate uncertain global economic conditions, facilitate resource independency, and alleviate the challenges of changing domestic demographics.

Author: Krista Tukiainen, Climate Bonds Initiative

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Footnotes

1. Ellen MacArthur Foundation, 2019. *Completing the Picture: How the Circular Economy Tackles Climate Change*. 2. Wit, M., J. J. Verstraeten-Jochemsen, J. Hoogzaad, and B. B. Kubbinga, 2019. *The Circularity Gap Report 2019: Closing the Circularity Gap in a 9% World*. 3. Bogner, J., M. Abdelrafie Ahmed, C. Diaz, A. Faaij, Q. Gao, S. Hashimoto, K. Mareckova, R. Pipatti, T. Zhang, 2007. *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. 4. Kaza, S., Yao, L., Bhada-Tata, P. and Van Woerden, F., 2018. *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. World Bank Publications. 5. Oberle, B., Bringezu, S., Hatfield-Dodds, S., Hellweg, S., Schandl, H., Clement, J., Cabernard, L., Che, N., Chen, D., Droz-Georget, H. and Ekins, P., 2019. *Global Resources Outlook 2019: Natural Resources for the Future We Want*. 6. Merkl, A., Stuchtey, M., Russel, S., Crow, A., Simon, E., Wooster, J., & Erdmann, H., 2015. *Stemming the Tide: Land-Based Strategies for a Plastic-Free Ocean*. 7. Climate Bonds Initiative, 2019. *Green Bond European Investor Survey*. 8. Baxter-Derrington, J., Investment Week, 2019. *Fidelity Brings Sustainable Water & Waste Fund to the UK*. 9. Climate Bonds Initiative, 2019. *Climate Bonds Standard: Waste Management Criteria*. 10. Ministry of Environment, Japan, 2018. *4th Fundamental Plan for Establishing a Sound Material Cycle Society*. 11. Inoue, Y., 2018. *Japan's Resource Circulation Policy for Plastics*. 12. Nikkei Asian Review, 2019. *Southeast Asia's Trash, Japan Inc.'s Power-Generating Treasure*. 13. Accenture, 2015. *Waste to Wealth: Creating Advantage in a Circular Economy*. 14. McKinsey & Co., 2017. *Mapping the Benefits of the Circular Economy*. 15. De Wit, M., Hoogzaad, J., and Von Daniels, C., 2020. *Circularity Gap Report 2020*. 16. The Japan Times, 2019. *Full text of the G20 Osaka Leaders' Declaration*. 17. Green Car Congress, 2013. *Honda develops process to reuse rare earth metals extracted from old NiMH batteries for new NiMH batteries for hybrid vehicles*. 18. Kaneka Corporation, 2019. 19. Ohkawa Paper, 2019. 20. GAO, L., 2016. *International Business and Management*, 13(2), pp.1-6. *An Analysis on Japan's Circular Economy and its Effects on Japan's Economic Development*. 21. Japan Sharing Economy Association, 2020. 22. The Economist, 2018. *Can share, won't share – Why Japan's sharing economy is tiny*. 23. Asia Nikkei Review, 2019. *Japan to count sharing economy in official GDP*. 24. ECPI Circular Economy Leaders Equity Index. 25. Solactive Sharing Economy Index, 2020. 26. MSCI World Select ESG Circular Economy and Renewable Energy Index. 27. BlackRock BGF Circular Economy Fund. 28. RobecoSAM Circular Economy Equities. 29. BNP Paribas Easy ECPI Circular Economy Leaders. 30. Climate Bonds Green Bond Treasurer Survey – upcoming (April 2020). 31. EU Technical Expert Group on Sustainable Finance, 2020. *Sustainable finance: TEG final report on the EU taxonomy*. 32. FinanCE Working Group, 2016. *Money makes the world go round (and will it help to make the economy circular as well?)*. 33. European Commission, 2019. *Accelerating the Transition to the Circular Economy: Improving access to finance for circular economy projects*. *The companies include Fuyo General Lease Co., Ltd; Hitachi Capital Corporation; Mitsubishi Electric Credit Corporation (Mitsubishi Electric Group); Orix; Ricoh Leasing Company; Tokyo Century Corp; Toyota Finance Corporation and Toyota Motor Credit Corporation (Toyota). **Data source: Climate Bonds Initiative Green Bond Database – figures as at 31 December 2019