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**ADB Working Paper Series**

**GREEN FINANCE IN SINGAPORE:  
BARRIERS AND SOLUTIONS**

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**Abstract**

Green finance, or the issuance of green bonds, has gained strong momentum around the world. Some Asian countries such as the People's Republic of China and Japan are very active in green finance. This study reviews how green finance in Singapore is working, examines existing barriers, and suggests some solutions. Singapore, a well-established financial hub in Asia, aims to be a hub for green finance in Asia. The Monetary Authority of Singapore (MAS), the central bank of Singapore, has formed a network with seven other central banks in the world called the Central Banks and Supervisors Network for Greening Financial System, which intends to promote sharing of experience and best practices in green finance with other countries. Along with forming the network, the MAS has established a Green Bond Grant scheme to promote and ensure the issuance of green bonds in Singapore. In parallel, the Association of Banks in Singapore published Guidelines on Responsible Financing to promote and support environmental, social, and governance (ESG) disclosures. The Singapore Exchange asks its member firms to strictly comply with the ESG disclosures. At an individual firm level in Singapore, City Development Limited (CDL), a real estate development company, and Development Bank of Singapore Limited (DBS), a commercial bank, issued Singapore's first and second green bonds in 2017. The proceeds of the CDL green bond are allocated to finance retrofitting and upgrading of a commercial building in Singapore, while the proceeds of the DBS green bond are to be invested in renewable energy and climate change adaptation, among other uses. How successful the two green bonds are in meeting their pronounced goals and how well and effectively they contribute to the diffusion of renewable energy remains to be seen.

**Keywords:** green finance, green bond grant scheme, guidelines of responsible financing, CDL green bond, DBS green bond

**JEL Classification:** G18, G28, G38

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# 1. INTRODUCTION

The green bond, as a financial loan but especially and exclusively designed for financing environmentally friendly projects, is gaining momentum in financial markets (BNP Paribas, 2016). The green bond market is rapidly growing. The volume of the market has increased from \$11 billion in 2013 to \$42 billion in 2015 (BNP Paribas 2016). In 2017, the market volume was \$161 billion and is expected to \$250 billion in 2018 (Climate Bonds Initiative 2018).

Upon noticing a strong growth potential in green finance, a few countries have acted on green finance. France announced the issuance of the first sovereign green bond in 2017 (BNP Paribas 2016). France is considered the largest green bond market in Europe and the third largest in the world (Climate Bonds Initiative 2018).

Following the strong movement in green finance, an exchange for trading green bonds has started. Luxembourg Green Exchange was the first platform in the world for listing green bonds. It started with 114 green bonds at over \$45 billion when it opened in 2016. The strict exclusivity clause, “used exclusively for financing or refining 100% green projects,” applies (BNP Paribas 2016). The exchange has issued S\$100 billion in total, has more than 180 securities denominated in 17 currencies, has achieved 110% growth since 2016, and has a 50% market share of green bonds listed worldwide (Luxembourg Green Exchange 2018).

There have been efforts to define principles of green finance or green bonds. The International Capital Market Association has presented Green Bond Principles, which are voluntary guidelines. The principles are geared to recommend bond issuers transparency and disclosure in issuing green bonds, and to promote integrity in the green bond market (International Capital Market Association 2018).

Apart from movements of and interest in green finance at the country level, individual banks have expressed interest in green finance. For instance, BNP Paribas aims to be one of the top three global players in the green bond market by 2018 (BNP Paribas 2016). BNP Paribas Asset Management joined the Climate Bonds Partner program on March 19, 2018 (BNP Paribas 2018).

In Asia, the People’s Republic of China (PRC) and Japan are active in green bonds. The PRC has adopted green finance as an engine of development and growth in its 13<sup>th</sup> five-year plan (2016–2020). Japan has moved toward more green financing and investments (Tay and Sim 2017). The Climate Bonds Initiative (2018) published a step-by-step guide regarding how to issue a green bond in the PRC for the preparation and issuance stage. There are three steps at the preparation stage: identify qualifying green projects and assets, arrange independent review, and set up tracking and reporting. There are two steps at the issuance stage. The fourth step is to issue the green bond, and the fifth step is to monitor use of proceeds and report annually.

UNEP Inquiry (2017) suggested 10 dimensions of sustainable financial centers: banking, debt capital markets, equity capital markets, insurance, investment, specialist, policy and public finance, local green initiatives, and professional services and knowledge.

Noting Singapore’s sustainability achievements such as the 14th position in the 2016 Environmental Performance Index and the low level of carbon intensity per dollar of economic output (123rd out of 142 countries or one of the 20 best performing countries), the Singapore Institute of International Affairs (2017) suggested that Singapore has a potential role in greening ASEAN and Asia.

Singapore lacks a green finance market, and there are suspicions of “green washing” against environmentally beneficial investments.<sup>1</sup> Proper rubrics of evaluating environmentally friendly investments are yet to be developed, and several definitions of green investments are emerging (Singapore Institute of International Affairs 2017). However, Singapore wants to be a hub for green financing, following its already established role as a financial hub in Asia and Southeast Asia (Tao and Jindal 2018). Singapore announced 2018 as the Year of Climate Action (Low 2018).

Singapore utilizes mainly two types of fossil fuels: crude oil and natural gas. Natural gas is transported in both piped and liquefied forms. It utilizes a very small amount of renewable energy, less than 3% of total primary energy, in the forms of incinerating municipal solid waste and solar photovoltaic (PV). Solar PV provides less than 1% of total electricity generation (Quek et al. 2018) in Singapore. Although the current status of utilizing green energy in Singapore is not active or high, the potential of green energy could be promising. Solar PV could supply up to 5% of total electricity generation in 2016, or 2.46 TWh (Quek et al. 2018).

Singapore has been aiming to be a green financing hub in the region. The Monetary Authority of Singapore (MAS), the central bank, has made several initiatives toward green financing. For instance, it implemented the Green Bond Grant Scheme in June 2017. It signed a memorandum of understanding between the MAS and IFC, a member of the World Bank Group, to boost the green bond market in Asia. And it has become a founding member of the Central Banks and Supervisors Network for Greening the Financial System.

This study reviews the barriers and explores solutions for unlocking green finance in Singapore. The rest of the paper proceeds as follows. Section 2 presents a snapshot of the energy mix in Singapore, including its current status and outlook, while Section 3 examines the status of green energy in Singapore. Following this, Section 4 reviews policies, incentives, and barriers for green financing in Singapore. Section 5 explores how financing flows from two green bonds in Singapore to affect the diffusion of renewable energy. Section 6 concludes the paper with policy recommendations.

## **2. ENERGY MIX IN SINGAPORE: CURRENT SITUATION AND OUTLOOK**

Singapore imported 176.3 million tons of oil equivalent (mtoe) in 2016 and exported 99.3 mtoe. Table 1 shows the details of the energy imports in Singapore. The majority of energy imports (approximately 94%) are petroleum (crude oil and petroleum products). Petroleum products are the largest energy imports, but they are also the largest energy exports, which indicates that Singapore is an energy trading hub in Asia. Singapore imports crude oil, refines it, and exports petroleum products out of it (EMA 2017).

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<sup>1</sup> “Green-washing” refers to a situation in which a form of marketing is deceptively used to promote a firm’s products as environmentally friendly.

**Table 1: Energy Imports and Exports in Singapore**  
(Unit: mtoe)

	<b>Imports</b>	<b>Exports</b>
Petroleum Products	113.3 (64.2%)	98.3 (99.0%)
Crude Oil	52.8 (29.9%)	1.0 (1.0%)
Natural Gas	9.7 (5.7%)	
Coal and Peat	0.4 (0.2%)	
Others	0.1 (0.1%)	
Total	176.3 (100%)	99.3 (100%)

Source: EMA (2017).

Table 2 shows the profiles of energy consumption in Singapore, categorized into two broadly defined energy sources: electricity and natural gas.

**Table 2: Energy Consumption Profile in Singapore**

	<b>Electricity (GWh)</b>	<b>Natural Gas (TJ)</b>
Industry	20,418.4 (42.0%)	47,133.7 (86.3%)
Commercial	17,699.0 (36.4%)	4,380.2 (8.0%)
Transport	2,639.5 (5.4%)	468.6 (0.9%)
Households	7,589.4 (15.6%)	2,547.8 (4.7%)
Others	280.0 (0.6%)	108.9 (0.2%)
Total	48,626.4 (100%)	54,639.3 (100%)

Source: EMA (2017).

Because natural gas is the main source of electricity generation, the second column of Table 2 presents the amount of natural gas used for other than the generation of electricity or directly used in various sectors of the economy. The current fuel mix for electricity generation in Singapore is natural gas (95.2%), incineration (3%), petroleum products (1%), and coal (0.8%) (EMA 2017).

The system demand for electricity in Singapore was 39 TWh in 2006 and 52 TWh in 2016. The compound annual growth rate (CAGR) was 2.7%. The system peak demand was 5,624 MW in 2005 and 7,149 MW in 2016. The CAGR was 2.4% (EMA 2017). The annual system demand and peak demand are expected to grow at a CAGR of 1.3% to 1.9% from 2018 to 2028. The annual system demand is projected to be 60.6 TWh to 64.6 TWh in 2028. The system peak demand is projected to be 8,430 MW to 8,980 MW in 2028.

The projected total capacity of electricity supply in Singapore will be 11,400 MW in 2021, considering the retirement of 1,600 MW in 2019 and 500 MW in 2020 (EMA 2017). The reserve margin is still higher than 30%, which is the minimum reserve margin set by the government.

The total registered electricity generation capacity in Singapore was 13,348.4 MW in 2017. The share of generation capacity by technology type was as follows. The combined share of combined-cycle gas turbine (CCGT), co-generation, and tri-generation was 77.6%, steam turbine was 19.1%, open cycle gas turbine was 1.3%, and waste-to-energy was 1.9% (EMA 2017).



Electricity generation from renewable energy in Singapore comes from incineration (municipal solid wastes) and a tiny fraction from solar PVs (less than 1 %). The share of renewable energy in Singapore is very low because the country does not have any endowment or potential for renewable energy such as hydropower, wind energy, geothermal energy, or biomass. Although the current utilization of solar energy is low, solar energy is the renewable energy source with a strong potential. The solar potential in Singapore is 2.46 TWh, assuming a total panel area of 7.78 km<sup>2</sup> and a panel efficiency of 20%. The biomass potential is 0.397 TWh, assuming that the annual quantity of bio waste processed is 1.05 million tons and the land area occupied by the plant is 0.13 km<sup>2</sup> (Quek et al. 2018).

### 3. GREEN ENERGY IN SINGAPORE

As noted in Section 2, the share of renewable energy in electricity generation is no more than 4%. About 3% comes from incineration, and less than 1% comes from solar PV. In terms of primary energy perspectives, the level of renewable energy consumption in Singapore was 0.2 mtoe in 2016 and 0.3 mtoe in 2017 (British Petroleum 2018). The share was 0.24% and 0.35%, respectively.

The future renewable energy profile in Singapore, especially for solar energy, seems to be a bit encouraging, although the amount of solar energy utilized at an absolute level is still minimal. The adoption rate of solar PV systems is rapidly increasing. The capacity has increased almost fourfold in four years. The installed capacity of grid-connected solar PV systems in Singapore was 25.5 MWac in 2014, 46.0 MWac in 2015, 97.1 MWac in 2016, and 99.9 MWac at the end of the first quarter of 2017. There were 1,898 systems installations at the first quarter of 2017 (EMA 2017). The EMA (2017) data shows that the majority of systems installations were done by town councils and grassroots units that covered about 50.9% of total installations (966 installations); the residential sector accounted for 31.0% (589 installations), the private sector covered 13.2% (251 installations), and public service agencies accounted for 4.8% (92 installations).

The share of solar PVs is less than 1% of the total electricity generation. As Quek et al. (2018) noted, however, there is a strong potential of 2.46 TWh from solar PV systems, which could have translated into about 5% of the total demand for electricity in 2016 if the potential were fully utilized. Considering the area of land required for solar energy, 5% is the maximum possible for utilizing solar energy in Singapore, which is a city state with a land area of about 750 km<sup>2</sup> (Quek et al. 2018).

The western region of Singapore has the largest number of solar PV systems installed. It has a total capacity of 37.6 MWac with 387 installations. Its share was 37.6% as of the end of the first quarter of 2017.

City Development Limited (CDL) was the first company in Singapore to issue a green bond, in 2017. The bond raised \$100 million at a 1.98% fixed rate, maturing in 2019. Financial institutions and fund managers are the main purchasers of the green bond (CDL 2017). The Development Bank of Singapore (DBS) issued its inaugural green bond in July 2017. It raised \$500 million at a floating rate, due in 2022. The bonds were issued under DBS's USD 30 billion Global Medium Term Note Programme and bear a quarterly coupon of 3-month USD LIBO plus 0.62% (DBS 2017).

## 4. GREEN FINANCING IN SINGAPORE: POLICY, INCENTIVES, AND BARRIERS

### 4.1 Policy

Singapore focuses on three key areas with respect to green finance: the deeper integration of environmental, social, and governance (ESG) issues into financial institutions in Singapore, more R&D in ESG products, and the expansion of available green finance products and growth of the asset class in the region (Tan 2017).

The Singapore government pushes ESG integration in the financial sector (Tay and Sim 2017). The Singapore Exchange (SGX) has also mandated strict compliance with the ESG principles for all listed companies starting in 2018 (Tao and Jindal 2018).

The Association of Banks in Singapore (ABS) published the ABS Guidelines on Responsible Financing on October 8, 2015 and revised the guidelines on June 1, 2018 (ABS 2015 and 2018; Tao and Jindal 2018). Responding to a call for promoting a low-carbon future following the Nationally Determined Contribution by individual countries to the Paris Agreement 2015, the ABS published the guidelines to support more transparent “Environmental, Social and Governance (ESG) disclosures.” The disclosure adopts a “comply or explain basis” in reporting.<sup>2</sup>

The scope of responsible financing considers the ESG criteria more explicitly and includes the industries with elevated risks to which the banks should pay attention and take account. The environmental criterion includes “greenhouse gas emissions, deforestation and forest degradation, loss of biodiversity and critical ecosystem services, water, air and soil pollution and contamination, and resource efficiency.” The social criterion covers “labor standards, community relations and stakeholder engagement, human rights, health and safety, food security, other necessities of local communities and indigenous people.” The governance criterion handles “corporate ethics and integrity, reputation, management effectiveness, risk management and reporting.” The industries with elevated risks are agriculture, chemicals, defense, energy from fossil fuels, forestry, infrastructure, mining and metals, and waste management. These industries have a higher priority when responsible financing policies are formed with respect to their business models and the level of exposure to the risks.

Following the scope of responsible financing, there are three principles on responsible financing: disclosure of senior management’s commitment to responsible financing, governance on responsible financing, and capacity building on responsible financing.

The first principle has four specific rules, according to which banks are to

- “publish their management position and organization support on responsible financing together with their strategies”;
- “publish their chairman’s or CEO’s commitment to support and implement responsible financing”;
- “publish their responsible financing policy framework”; and
- “publish the above information in their Sustainability/Annual Reports and make them available on their websites.”

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<sup>2</sup> The description of ABS Guidelines on Responsible Financing is based on Release Version 1.1 (1 June 2018).

The second principle of governance on responsible financing has two specific rules, according to which banks

- “are to allocate resources with clear roles and responsibilities to support the implementation of responsible financing”; and
- “must ensure governance and internal controls that support responsible financing are implemented by either ‘having a separate set of responsible financing policies and procedures’ or ‘embedding responsible financing practices into their existing policies and procedures.’”

The third principle of capacity building on responsible financing has two specific rules:

- “banks are to raise staff awareness and build management capacity on responsible financing by training staff and inculcating an ‘ESG’ mind set”;
- “the ABS will work with the relevant stakeholders such as international organizations, regulatory bodies, non-governmental organization (NGOs) and civil society to conduct seminars for bank staff to strengthen the management of prevailing issues and trends related to responsible financing.”

Singapore intends to share its experiences and best practices in green finance with the central banks of other countries. Eight central banks on December 12, 2017 formed a green-focused network called Central Banks and Supervisors Network for Greening the Financial System, which addresses climate change and sustainability. The eight founding members are the central banks of the PRC, the United Kingdom, France, Germany, Mexico, the Netherlands, Singapore, and Sweden. The network is a voluntary platform and forum to share views and best practices of dealing with climate-related risks for the financial sector and to develop green finance (Central Banks and Supervisors Network for Greening the Financial System n.d.; Lim 2017).

The network neither intends to set new standards nor presents binding policy recommendations. It aims to promote “a close coordination between the various ongoing global initiatives on the issues of common interests such as the financial risks and opportunities of climate change.” The network had its first meeting on January 24, 2018 in Paris. The members of the network agreed upon “a governance framework” and discussed programs on which they will work in the future, such as “experience sharing and identification of best practices on the supervisory and macrofinancial dimensions of climate-related and environmental risks as well as on options to scale up green financing.” Frank Elderson, member of the Governing Board of De Nederlandsche Bank, was appointed as chair of the network, and Banque de France serves as the network secretariat (Central Banks and Supervisors Network for Greening the Financial System 2018).

When Singapore hosted the G20 Green Finance Conference on November 15, 2017, the government identified Singapore’s role in deepening regional green finance. Upon recognizing that “the journey towards mainstreaming of sustainability practices will not be an easy one,” it found that “good sustainability practices are good for business” and saw “the increasing growth momentum in global green finance.” The government identified “the scope for Singapore’s financial sector to play a useful role in catalyzing sustainable and green finance in the region.” The government declared, “we pushed for the adoption of industry best practices,” and announced that the MAS would introduce a green bond grant scheme in March 2017 (Ministry of Finance, Singapore 2017). The details of the scheme are to be discussed in Section 4.2.

## 4.2 Incentives

The MAS initiated the green bond market and is now leading it (Tao and Jindal 2018). The MAS started Singapore's green bond market with the green bond grant scheme in March 2017, which resulted in a relative success; CDL, DBS Bank, and Manulife Financial issued green bonds in 2017 (Tan 2017; Tao and Jindal 2018).

The green bond grant scheme aims to assist bond issuers in relieving the cost incurred and helping them obtain an external review. To get the grant, the bonds must meet three conditions regarding qualifying issuers, eligible expenses, and qualifying criteria. The grant scheme specifies how a bond issuer can be a qualifying issuer. It states that "an issuer satisfies the Qualifying Issuer test if it is a corporate entity or financial institution issuing green bonds." The sovereign issuers are not qualified for the scheme (Ferris and Spence 2018).

The eligible expenses for the green bond grant scheme are related to appointing an external reviewer for acquiring an independent assessment of bonds. The appointment procedure is based on "internationally recognized standards, such as the International Capital Market Association's Green Bond Principles, the Climate Bond Standard by the Climate Bond Initiative or the ASEAN Green Bond Standards by the ASEAN Capital Market Forum" (Ferris and Spence 2018). The external reviewer must provide "an independent assessment of the bond's green credentials" and should consider the following conditions:

- "use of the proceeds of the bond issuance";
- "the processes to be used by the issuer to evaluate and select green projects";
- "the issuer's processes for managing and tracking the use of the bond proceeds"; and
- "the framework established by the issuer for reporting details of the projects (funded by the bond proceeds) to investors." (Ferris and Spence 2018)

The scheme states that "100% of any costs incurred by an issuer in relation to the external reviewer's provision of an independent assessment will be reimbursable, subject to a cap of S\$100,000." To assess whether bond issuers are the qualifying issuers with the eligible expenses is the necessary procedure to confirm if the bonds are green in nature evaluated by internationally recognized principles. The scheme allows first-time or repeated issuers to apply for the scheme, and the same issuer can apply for the scheme multiple times given that "each application relates to a different green bond issuance" (Ferris and Spence 2018).

Apart from the qualifying issuers and the eligible expenses, there are a few more critical criteria for being a qualified issuer. They include the following conditions:

- "the bonds must be issued in Singapore and listed on the SGX but the issuer itself needs not to be a Singapore company";
- "the principal amount of the issue must be at least S\$200 million or the equivalent in any other currency";
- "the tenor of the bonds must be at least three years and, with limited exceptions, the bonds must be non-redeemable during such three-year period";
- "the bonds must be a qualifying debt security under Singapore's Income Tax (Qualifying Debt Securities) Regulations (ITR)";

- “the lead manager must be a Financial Sector Incentive (FSI) company in Singapore”;
- “more than half of the gross revenue earned for work undertaken in arranging the issuance of the bonds, must be attributable to a FSI”; and
- “an independent external review or rating, based on internationally recognized green bond standards, must be performed.” (Ferris and Spence 2018)

The time of applying for the scheme is after the bonds have been issued. But those bond issuers who intend to apply for the scheme must be aware that the above criteria must be met to apply for the grant, and hence seeking external advice is encouraged at the pre-issuance stage. For ensuring the eligibility of the bond for the scheme, a lead manager who must be an FSI company in Singapore has to be appointed by the issuer to exercise “due diligence on the proposed bond issue.” With the external advisers, the lead manager has to submit an application form to the MAS within three months of the issue date of the bonds. The scheme began on June 1, 2017 and runs until May 31, 2020 (Ferris and Spence 2018). It is a bit early to evaluate the effectiveness of the green bond grant scheme, and how well it works remains to be seen.

### 4.3 Barriers

Green finance in Singapore is at an early stage, and there are still critical challenges. Small and medium-sized enterprises do not have access to the process of issuing green bonds, as they are small and not capable of taking on such projects that can be financed by green bonds. As seen above, MAS, ABS, and SGX have led the green financing movement in Singapore (Tao and Jindal 2018). There is still a long way to go for Singapore to become a hub for green financing. Lack of awareness may be one reason, but more critically the main barrier is the difficulty in converting awareness into action (Tao and Jindal 2018). Relating to the lack of awareness, Singapore does not have large potential for renewable energy that can be financed by green bonds. In other words, the domestic market for green bonds is small in Singapore. The key to making Singapore a hub for green financing is to embrace sustainability proactively in the financing sector.

Apart from the low level of awareness and inactiveness, transparency and reporting are the main risks in the green bond market. The ASEAN Green Bond Standards comprise qualifying standards, which have been recognized by Singapore (Tan 2017).

As a way of overcoming such barriers identified above, Tay and Sim (2017) suggested how to jump-start (or initiate the next step of) green financing in Singapore: establishing clarity for what constitutes “green,” releasing more information on bond issuers’ ESG performance, enhancing the transparency of the quality of projects or financial instruments for green investments, and creating demand for green investments by establishing “green pockets.” They suggest four steps for green finance: urge the government to set direction, build and share knowledge and capacity, jump-start green finance markets and investment, and define the value of green.

## 5. FINANCING FLOWS AND DIFFUSION OF RENEWABLE ENERGY

Proceeds from green bonds are managed and allocated to finance more climate-resilient infrastructure projects, which could in turn promote development of renewable energy. As noted earlier, two green bonds have been issued in Singapore. The first was issued by CDL in April 2017, and the second was issued by DBS in June 2017. The CDL green bonds seem not to help, but the DBS green bonds are expected to help the diffusion of renewable energy.

### 5.1 CDL Green Bond<sup>3</sup>

The green bonds issued by CDL aim to improve the efficiency of an existing office building (Republic Plaza) through retrofitting toilets and chiller plants, and upgrading lighting systems. The proceeds from the bonds will be channeled to refinance retrofit projects, and the proceeds from all future bonds will be invested in financing new retrofit projects. Specifically, the current proceeds will be used for “repayment of [a] S\$100 million loan extended by CDL to CDL Properties (CDLP), which financed retrofit and upgrading projects for Republic Plaza.” Future proceeds will be allocated to “funding projects for new retrofits of Republic Plaza.” The applied eligibility criteria are as follows:

- “expenditures related to the installation or upgrade of equipment that reduces energy consumption of Republic Plaza”;
- “expenditures related to the installation or upgrade of equipment that reduces water consumption of Republic Plaza”; and
- “expenditures related to the installation or upgrade of equipment that reduces food and general waste from Republic Plaza.”

CDL aims to achieve three targets that are set along with the eligibility criteria, by reducing

- “carbon intensity by 22% by 2020 and 25% by 2030 from the baseline of 2007”;
- “energy intensity by 22% by 2020 and 25% by 2030 from the baseline of 2007”; and
- “water intensity by 22% by 2020 and 25% by 2030 from the baseline of 2007.”

The project reduced carbon emissions intensity by 19% in 2015 from the 2007 baseline. It also reduced energy use intensity by 27% in 2015 from the 2007 baseline. In addition, it reduced water intensity by 17% in 2015 from the 2007 baseline (CDL 2017).

The selection of the current issuance is made by the following procedure. “Eligible projects below S\$1 million will be selected for refinancing through bond proceeds by the CEO and CFO. Eligible projects over S\$1 million will be selected by the Tender Committee, which is made up of the Group General Manager, CEO and CFO.” The selection of future green bond issuances is to be made by the Property and Facilities Management and Sustainability departments of the CDL after the eligibility of the green bond is ascertained (CDL 2017).

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<sup>3</sup> The description of the CDL green bond is based on City Development Limited Green Bond: Framework Overview and Second Opinion by Sustainalytics, published on April 5, 2017.

Proceeds from the current issuance are to be managed by CDLP, a CDL subsidiary. The proceeds are allocated to pay back a S\$100 million loan from CDL that are used to finance retrofit projects of Republic Plaza. Proceeds from future issuances are to be managed by CDL, and the proceeds are to be used to finance eligible projects (CDL 2017).

As the evaluation of interim performance shows, the CDL green bond has had an important role in shaping CDL's sustainability strategy in terms of carbon emissions and energy and water management. It also helped Republic Plaza get Green Mark Platinum certification from the Building and Construction Authority of Singapore. Apart from this, it also has emphasized the importance of "green real estate"; this has helped Singapore with its effort to mitigate climate change and place importance on water management for Singapore, which is one of the "highest water stress" countries in the world (CDL 2017).

A verification report based on pre-issuance requirements of the Climate Bond Standard concluded that all criteria are conforming to the standard (KPMG 2017). As shown in the above evaluations of the CDL green bond, however, little attention has been paid to the diffusion of renewable energy. Rather, the bond is more likely designed and directed to improve the level of efficiency in energy and water use through retrofitting and upgrading. It well serves the meeting of sustainability criteria but has little impact on the development and diffusion of renewable energy.

## 5.2 DBS Green Bond<sup>4</sup>

The DBS has issued green bonds of \$500 million. The net proceeds have been allocated toward financing green assets, including DBS's Marina Bay Financial Centre Tower 3). The project has acquired a certified Green Mark Platinum rating given by the Building and Construction Authority of Singapore. The proceeds are allocated to finance green buildings, sustainable transportation, renewable energy, energy efficiency, waste management, and climate change adaptation. The estimated energy savings in 2017 were 11,423 MWh based on gross floor area of 151,777 m<sup>2</sup>. The amount of CO<sub>2</sub> abated was 4,848 tons (DBS 2018).

The DBS green bond (DBS 2017) has six eligibility criteria: green building, sustainable transportation, renewable energy, energy efficiency, waste management, and climate change adaptation.

For being eligible as a green building, the "purchase, construction or renovation of commercial and residential buildings" needs to meet recognized standards (DBS 2017).

Eligibility for sustainable transportation involve three criteria: public transportation; clean, private, light-duty vehicles; and clean, private, electric, or hybrid heavy-goods vehicles. The public transportation criteria comprise "operation of low-emissions mass transportation, production of public transport vehicles and development of infrastructure for mass transportation." The clean, private, light-duty vehicles criteria include "production and distribution of clean or environmentally friendly vehicles, and purchase of clean vehicles by consumers." The clean, private, electric, or hybrid heavy-goods vehicles criteria cover "production of clean or environmentally-friendly vehicles, and purchase of clean vehicles by consumers" (DBS 2017).

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<sup>4</sup> The description of the DBS green bond is based on Green Bond Framework, published by DBS Sustainability Council (n.d.) and DBS Green Bond Framework: Framework Overview and Second Opinion, published by Sustainalytics on July 23, 2017.

The renewable energy criteria comprise five conditions:

- “construction and operation of wind and solar infrastructure”;
- “production of components destined for wind and solar projects”;
- “purchase of wind and solar energy production by consumers”;
- “construction and operation of run-of-river hydro projects” whose generation capacity is lower than 25 MW; and
- “construction, production, operation and consumer purchase of other generally accepted sources of renewable energy recognized by the International Renewable Energy Agency (IRENA).” (DBS 2017)

The rest of the criteria are energy efficiency, waste management, and climate change adaptation. The energy efficiency criteria comprise two conditions: “development and production of products or technologies that reduce industrial energy consumption, such as improved chillers, improved lighting technology and enhanced battery capacity”; and “purchase and installation of such products or technologies by consumers.” The waste management criteria have two conditions: “construction, operation or upgrade of recycling infrastructure, including waste minimization, filtering, management, recycling and reuse”; and “construction, operation or upgrade of waste-to-energy power plants that use environmentally-friendly technologies, such as methane capturing.” The climate change adaptation criteria have two conditions as well: “development, production and purchase/installation of products or technologies that enable adaptation to climate change, including information support system, such as climate observation and early warning system”; and “construction, investment or operation of adaptation related-projects that contribute to a reduction in vulnerability to climate change” (DBS 2017).

Apart from these stated criteria, proceeds can be used within DBS’s own operations that could bring a “positive environmental impact.” The eligible operations are “installation of solar panels or other renewable energy equipment” for the renewable energy criteria, “purchase and installation of products or technologies that reduce energy consumption, such as improved lighting technology and enhance battery capacity” for the energy efficiency criteria, and “purchase and installation of recycling infrastructure, including waste minimization, filtering, management, recycling and reuse” for the waste management criteria (DBS 2017).

The DBS green bond has environmental sustainability objectives, namely responsive banking, responsible corporate citizenship, creating social impact, and employer of choice. For these objectives, it has chosen four out of 17 sustainable development goals (SDGs). They are SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). DBS uses a two-step approach to project evaluation and selection. The first step is that “relative business units are responsible for the screening and selection of assets or projects.” The second step is that “the DBS Sustainability Council is responsible for the review and approval of the assets or projects proposed.” The proceeds are managed according to the related and relevant criteria and the selection process mentioned above (DBS 2017).

For reporting impact, the DBS green bond employs the impact metrics for eligibility criteria shown in Table 3.



**Table 3: Eligibility and Suggested Impact Metric**

<b>Eligibility Criteria</b>	<b>Suggested Impact Metric</b>
Renewable Energy	kWh of power generation from renewable energy Tons of carbon dioxide (CO <sub>2</sub> ) equivalent avoided
Energy Efficiency	Energy saved per year (kWh/year) Percentage energy efficiency achieved
Certified Real Estate	Energy consumption reduced per square foot List of all eligible buildings that received third-party-verified green building certification
Public Transport	Greenhouse gas (GHG) emissions savings/tons of CO <sub>2</sub> equivalent avoided

Source: DBS (n.d.).

An Independent Limited Assurance Report by Ernst & Young (2017) concluded that “the proposed use of proceeds, policies and procedures for project evaluation and selection, policies and procedures for management of proceeds, and policies and procedures for reporting on use of proceeds and project performance” is well conformed “in all material respects.”

The DBS green bond states clearly how proceeds are used to finance projects of developing renewable energy, especially solar infrastructure. The suggested metrics for the renewable energy criteria will promote the development of solar energy, the most promising type of renewable energy that Singapore can develop. Considering the favorable possibility of developing and utilizing solar energy in Singapore, the DBS green bond is expected to increase the development of renewable energy.

## 6. CONCLUSIONS AND POLICY RECOMMENDATIONS

Green finance has gained strong momentum in the world. Luxembourg established an exchange for green bonds in 2017. France became the first country to issue a sovereign green bond. The PRC has adopted green finance as an engine of growth in its economic growth plans. Japan is moving toward green finance and investment. The International Capital Market Association published Green Bond Principles, voluntary guidelines for issuing green bonds.

As an established financial hub in Asia, Singapore sets “making the city state a hub for green financing in Asia” as its goal, along with its sustainable development path. The MAS implemented a green bond grant scheme, and the ABS published Guidelines on Responsible Financing for spearheading green financing in Singapore. The guidelines require companies to strictly comply with ESG disclosures when they finance. The guidelines provide the principles of financing for issuing green bonds. The MAS’s green bond grant scheme is geared to relieve potential bond issuers from the financial burden of issuing green bonds so that the scheme promotes more eligible entities to participate in green finance.

Two private companies in Singapore—CDL, a real estate development company, and DBS, a commercial bank—in 2017 issued Singapore’s first and second green bonds. The target areas of the CDL green bond are to improve efficiency of using energy and water and to lower carbon intensity for a commercial building through retrofitting and upgrading. The proceeds from the first issuance of the CDL green bond show that its goals have been achieved. The target areas of the DBS green bond are to use more renewable energy, to improve energy efficiency, to get a certified green building mark,

and to decrease carbon intensity. The proceeds from the DBS green bond show that it has achieved its goals, verified by CO<sub>2</sub> reductions and improved energy efficiency.

The two green bonds issued by private companies could lead to the expectation that green bonds will work successfully in the Singapore context. However, Singapore has a long way to go before it becomes a hub for green financing in Asia. It lacks a green finance market and proper rubrics for environmentally friendly investment and suffers from public perceptions of “green washing.” Following the evaluation of the current status of green finance in Singapore, a few suggested steps that could lead to full-blown green financing in Singapore are the government’s more proactive initiation, setting a clear vision about green finance, creation of a green finance market, bringing positive interaction between standards and innovation, and linking the global market to regional markets (Singapore Institute of International Affairs 2017). From the evaluation of green finance in Singapore and a few suggestions, this study has presented the following policy recommendations: Singapore needs to clearly define “green”; it should release more information on bond issuers’ ESG performance to enhance the transparency of project quality and financial instruments of green investments; and it needs to create the demand for green investments.

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