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# THE VIABILITY OF GREEN BONDS AS A FINANCING MECHANISM FOR GREEN BUILDINGS IN ASEAN

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**Abstract**

As the growth of energy demand outstrips that of energy supply in Southeast Asia, it becomes imperative for ASEAN member states to seek energy efficiency improvements for sustained energy security. While green buildings have an overall low penetration rate in ASEAN, when compared to the rest of the world, a relatively large proportion of green bond proceeds in ASEAN have been channeled to financing green buildings. Green bonds hold vast potential as a financing mechanism, and the importance of green bonds as a funding source for green buildings in ASEAN is projected to increase in the future. ASEAN governments can encourage the use of this source of finance to address underinvestment in green buildings through providing information on raising funds through green bonds, endorsing investment in green buildings through codifying green building standards, and promoting local currency bond financing through domestic investors.

**Keywords:** green buildings, green bonds, energy efficiency, ASEAN, green *sukuk*, ICMA green bond principles, ASEAN green bond standards, sustainable finance

**JEL Classification:** Q28, Q42, Q43, Q53, G2, G3

# Contents

# 1. INTRODUCTION

The building sector represents about 30% of global final energy use and its energy savings potential is massive. However, total spending on energy efficiency in the global building sector represented less than 9% of the USD4.6 trillion spent on construction and renovation in 2016 (International Energy Agency 2017b). Between 2015 and 2018, technical efficiency gains only avoided energy use equivalent to 0.7% of residential building final energy demand, while structural factors, such as increasing building floor area and adoption of appliances such as air conditioning, created additional energy demand equivalent to over 2% of final demand (International Energy Agency 2019a). Hence, it is essential to leverage innovative financing, technology, and policy tools to accelerate the transformation of buildings and construction across the world. Green buildings, which are buildings that, in their design, construction, or operation, reduce or eliminate negative environmental impacts, are a potential solution as they generate benefits for our climate and natural environment (World Green Building Council n.d.).

ASEAN has established collective targets of a 20% decrease in energy intensity (EI) by 2020 and a 30% decrease in EI by 2025, relative to the base year of 2005. As ASEAN countries experience a surge in energy demand driven by their growing populations, fast-growing economies, and improved living standards, controlling energy consumption through energy efficiency measures is a cost-effective option compared with heavy investments in energy infrastructure. Considering the massive demand for new floor area in the emerging economies, construction of green buildings and deep energy renovations of existing buildings could save around 330 exajoules in cumulative energy savings to 2060, more than all the final energy consumed by G20 countries in 2015 (International Energy Agency 2017a).

Despite such governmental efforts, in many ASEAN countries there has not yet been sufficient penetration of green buildings in the Southeast Asian region (Baker 2019). Meanwhile, the green bond market is emerging in ASEAN as an important source of financing for projects or assets with positive environmental or climate change mitigation benefits. Green bonds differ from conventional bonds because their proceeds are devoted to environmentally beneficial investments with specific impact achieved for a given period of time (Asian Development Bank 2018). In the ASEAN green bond market, green buildings are one of the main projects green bonds are issued to fund.

Might green bonds be a mechanism through which investment in green buildings in ASEAN can be increased? In this paper, we first discuss the current incentives for investment in green buildings and the reasons why investment in green buildings has remained lackluster despite these incentives. We then examine the outlook on green bonds in ASEAN and the potential of green bonds as a main source of funds for green building projects, finding that green bonds are a suitable funding source for green buildings in ASEAN. Thereafter, we turn to looking at the challenges that may present themselves in using green bonds to finance green building projects. Finally, we conclude with a discussion on recommendations for the future.

# 2. OUTLOOK ON INVESTMENT IN GREEN BUILDINGS

While there are various benefits to investing in green buildings, these benefits do not seem to be fully appreciated and thus internalized by the market. In both developed and developing economies, energy efficiency investments in buildings are often considered a risk. Financial incentives, including conventional loan and debt finance

and innovative green bonds, must be put in place to encourage the take-up of energy-efficient technologies and reward energy conservation practice. This section explores the current incentives for investment in green buildings, as well as the reasons why the market is not sufficiently moved by these incentives to realize the full benefits of green buildings through investing at the appropriate level.

## 2.1 Incentives to Invest in Green Buildings

### 2.1.1 Government Initiatives to Encourage Green Buildings

Across the world, there is still a lack of policy to drive energy efficiency investments in buildings. As of 2016, nearly 70% of final energy use in buildings globally was not covered by mandatory codes and standards, and currently two-thirds of countries still do not have comprehensive building energy codes to cover the construction of new buildings (International Energy Agency 2017b).

Increasingly, ASEAN governments are implementing policies to mandate and providing incentives to encourage green developments in the built environment. The Brunei Darussalam government implemented the Energy Efficiency and Conservation (EEC) Building Guidelines for the Nonresidential Sector in 2015, which mandates that the Energy Efficiency Index (EEI) for government buildings is set at 175 kWh/m$^2$ (Thambipillai and Pang 2019). In Cambodia, the National Policy, Strategy, and Action Plan on Energy Efficiency, established in 2013, encourages adherence to newly designed green construction guidelines (Asia Pacific Energy 2013).

In Jakarta, Indonesia, most new Grade A office buildings will have to achieve GREENSHIP certification. GREENSHIP is a local green rating tool for buildings (Noonan 2018). The Jakarta, Indonesia Ministry of Public Works and Housing (MPWH) Regulation No. 2 of 2015 also contains compulsory, voluntary, and recommended actions for energy efficiency improvements. To encourage green buildings, Malaysia has also adopted various rating tools, such as the Green Building Index (GBI) in 2009, and the Green Performance Assessment System in Construction (Green PASS) for government buildings in 2012 (Hamid et al. 2014). The Malaysian government additionally provides incentives, mostly in the form of tax breaks, to developers for buildings that meet the criteria to be certified under the GBI (Aliagha et al. 2013).

The Philippines, Singapore, Thailand, and Viet Nam have also adapted building energy performance measurement tools to their contexts, and respectively use Building for Ecologically Responsive Design Excellence (BERDE) (Culiao, Tae, and Kim 2018), the Building and Construction Authority (BCA) Green Mark scheme (Building and Construction Authority n.d.), Thai's Rating of Energy and Environmental Sustainability (TREES) (Thanakan and Inkarojrit 2018), and LOTUS (Nguyen and Gray 2016). In particular, Singapore's BCA Green Mark scheme is internationally recognized, used within many countries in ASEAN, and associated with a sale premium for certified buildings in Singapore (Poe 2017).

### 2.1.2 Economic Benefits of Investment in Green Buildings

Furthermore, green buildings are a lucrative investment (Eichholtz, Kok, and Quigley 2013). In ASEAN, green buildings appear to be a lucrative investment. Empirical evidence suggests that there are cost savings associated with green buildings in Malaysia (Dwaikat and Ali 2018). In the Singapore context, green buildings yield higher returns on investment than their counterparts (Addae-Dapaah and Chieh 2011; Deng and Wu 2014; Heinzle, Boey, and Low 2013; Ho, Rengarajan, and Lum 2013). Residential buildings that have achieved green certification also command a premium

in the housing market (Fesselmeyer 2018). This is consistent with trends in other countries, where occupants also prefer green buildings, as revealed by a higher willingness to pay (Robinson et al. 2016).

Despite the multiplicity of benefits that accrue from green buildings, there has been chronic underinvestment in green buildings in Southeast Asian cities, in which the green building penetration rate, like most other Asian cities, is lower than the global average (Hill 2017). The perception of high upfront costs, a mismatch between the life of the asset and its holding period in a portfolio, and misplaced incentives of market participants have adversely affected investment in green buildings.

## 2.2 Barriers for Investment in Green Buildings in ASEAN

In this section, we cover four barriers for investment in green buildings specifically before discussing three barriers for investment in energy efficiency in general.

One of the main overarching reasons for a lack of investment in green buildings is the split incentives in the buildings market: While owners and occupants may enjoy the cost savings associated with improved energy performance, developers have to bear the upfront costs of construction. Among developers, there exists a perception that the construction of green buildings would involve large upfront costs (Zweigwhite 2010).

Another reason for inadequate investment in green buildings is that incentives and benefits are structured to discourage such investment among market participants such as developers, bankers, and building owners. Developers are hesitant to absorb the additional upfront costs of green building design when the cost savings will only accrue for the owners (Deng and Wu 2014). Bankers are reluctant to release funds for additional capital costs, as they wish to avoid the increase in nonpayment risk by minimizing the capital investments. Furthermore, these market participants are unwilling to put systems in place to validate savings that result from energy-efficient equipment. Energy savings can only be visible with *ex post* assessment, and thus will not be fully materialized in the event that the green building pipeline is inadequately designed. The market value of these savings is also subject to energy price uncertainty. Hence, owners are deterred from investment due to uncertain savings from utilities, ambiguous long-term gains, and a focus on the immediate affordability of the building (IFC 2019).

A third reason for the funding gap for green buildings is that there is a mismatch between the longevity of buildings and the relatively short holding periods for real estate assets in investment portfolios. For instance, while the lifespan of a building is 70 to 100 years, financiers hold real estate assets mostly for 7 to 10 years while building owners hold them for 10 to 15 years. There is also a mismatch between these asset holding periods and when the building's lifespan might be disrupted by climate change and/or forced compliance with harsher regulations. Hence, market participants may not be incentivized to invest in green construction, since the costs for environmentally unsustainable construction and, on the flip side, the benefits for green buildings cannot fully materialize while the market participants are in possession of the asset (IFC 2019).

Finally, the landlord has minimal incentive to make an investment in energy-efficient equipment as long as the tenant is paying the utility bill. Unless there is strong interest in reducing operational and maintenance costs among tenants, landlords will remain unwilling to switch to more energy-efficient appliances. In Singapore, this problem was particularly pronounced as the split incentives ended up providing hardly enough motivation to switch to energy-efficient technologies (ACE 2019). On the other hand, for commercial tenants, energy costs are evaluated solely as a function of the space

occupied rather than an account of the total energy used, again leaving tenants with no incentive to lobby for more energy-efficient technologies since there are no potential cost savings to be reaped (UN ESCAP 2012).

For the above reasons, the market for green construction has punched below its weight, despite comprehensive policies to aid green building construction in many jurisdictions. This is also correlated with weak enforcement regimes, a lack of information provision, and a lack of technical capacity. Furthermore, the green building industry, being a subset of the energy efficiency space, further faces issues that are endemic in the energy efficiency market.

A lack of information about energy efficiency equipment and technologies results in financial institutions such as banks assessing their risk as too high, which leads to higher interest rates on loans (ACE 2019). The small size of energy efficiency projects also deters investors from financing such projects (ACE 2019). In the event that small energy efficiency projects cannot be bundled together to temper transaction costs, each of these small projects will remain unfinanced (Taylor et al. 2008). A final important barrier to investment in energy efficiency, including green buildings, is distorted energy prices and unfavorable tax regimes. The biggest damage arguably has been done by energy subsidies from various governments around the world, as these disincentivize the conservation of energy (UNEP 2002).

In conclusion, a combination of factors such as a lack of information about energy efficiency equipment, the small size of energy efficiency projects, and distorted energy prices are responsible for underinvestment in energy-efficient technologies. For green buildings specifically, factors such as the perception of high upfront costs, a mismatch between the life of the asset and its holding period in a portfolio, and structural incentives that incline market participants against investment in energy efficiency technology have precluded an expansion in investment.

# 3. THE ISSUANCE OF GREEN BONDS TO FUND GREEN BUILDINGS

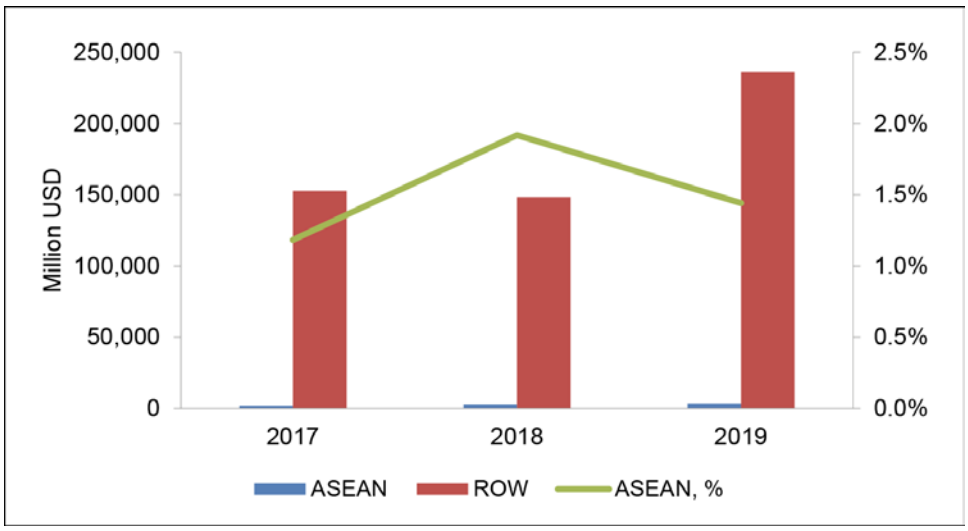
Green bonds may potentially be an important financing mechanism to encourage sustainability in the built environment. Globally, the demand for green bonds is high due to an increasing emphasis on impact investing (Castillejos-Petalcorin et al. 2018), and green bonds may be especially important as a tool for raising funds for environmental sustainability-related projects in developing countries (Banga 2019). The following section will provide an overview of the landscape of green bonds in ASEAN and beyond.

## 3.1 Landscape of Green Bonds in ASEAN

The global market for green bonds has also grown strongly since the first green bond was issued just over a decade ago. By November 2018, cumulative bond issuance had exceeded USD500 billion. Although this growth is encouraging, it is important to put it in perspective. In 2018, the global bond market was worth roughly USD100 trillion (Bank for International Settlements 2019). Green bonds represent only 0.5% of the total, and green bonds for energy efficiency accounted for a mere 0.05% of global debt security issuance in 2018 (International Energy Agency 2019b).

A total of 406 green bonds have been issued from 2016 to date as recorded in the Bloomberg terminal. As can be seen from Figure 1, the number of green bonds issued in ASEAN remains relatively small compared to the rest of the world.

**Figure 1: Amount of Green Bond Issuance in ASEAN Relative to Rest of World**




Source: Authors' own using data from Bloomberg.

However, there is strong institutional support for green bonds as a means of financing from the governments of Indonesia, Singapore, and Malaysia. In Indonesia, green bonds are issued by the government, while in Singapore and Malaysia, issuance of green bonds is supported by green bond grants that cover the cost of labeling bonds "green" (Azhgaliyeva, Kapoor, and Liu 2020; Azhgaliyeva, Kapsalyamova, and Low 2019; Azhgaliyeva and Liddle 2020). Indonesia issued nearly half (49%) of the green bonds in ASEAN (Figure 2), coming in as the largest issuer of green bonds in ASEAN over the period 2017–2019, followed by Singapore (19%) and Malaysia (15%). Issuance of green bonds in ASEAN is growing fast. It increased by half in 2018 and nearly doubled in 2019 compared to 2017 (Figure 2). Nevertheless, ASEAN issued only around 1%–2% of the annual global green bonds (Figure 1).

**Figure 2: Issuance of Green Bonds in ASEAN by Country (2017–2019)**

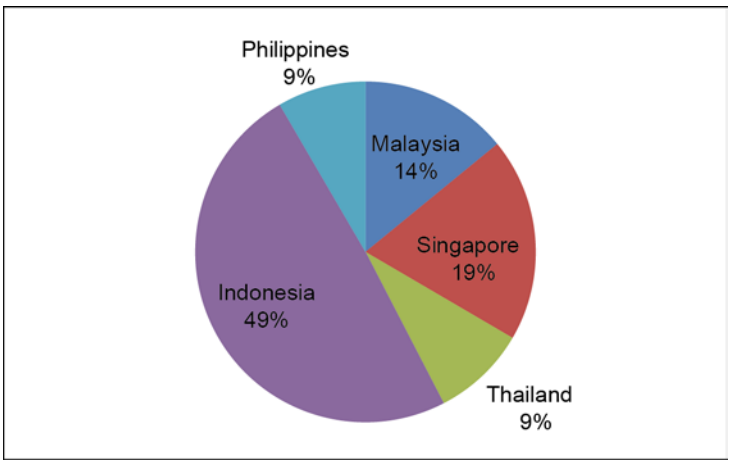
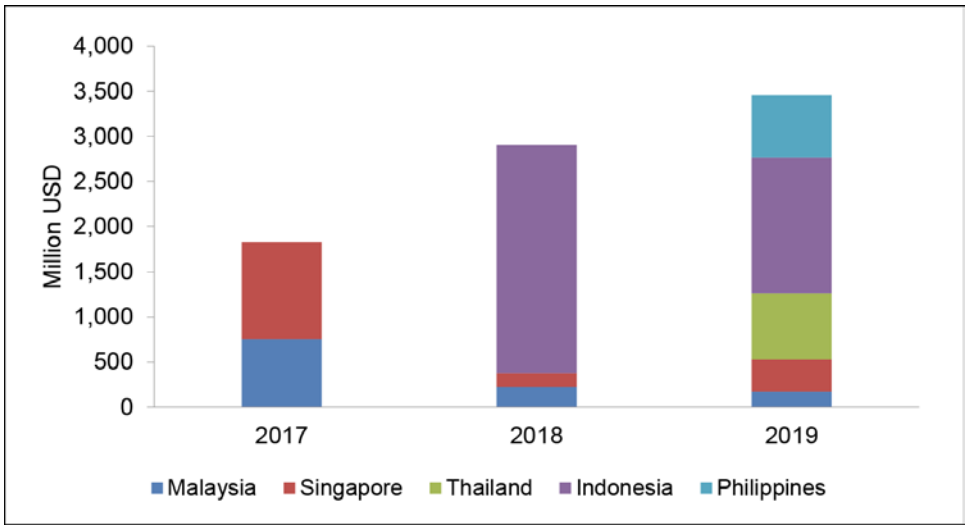


**Figure 3: Issuance of Green Bonds in ASEAN by Year**




Source: Authors' own using data from Bloomberg.

There are also special forms of green bonds, such as green *sukuk*, that have been introduced in the market. Green *sukuk*, which are green Islamic financial certificates that function in the same way as green bonds, are gaining popularity in Indonesia and Malaysia (Climate Bonds Initiative 2019). Green *sukuk* allow issuers to tap into the burgeoning Islamic finance market, and the objective of such instruments is aligned with the Islamic tenet of environmental protection (Alam, Duygun, and Ariss 2016; Muhmad and Muhmad 2018).

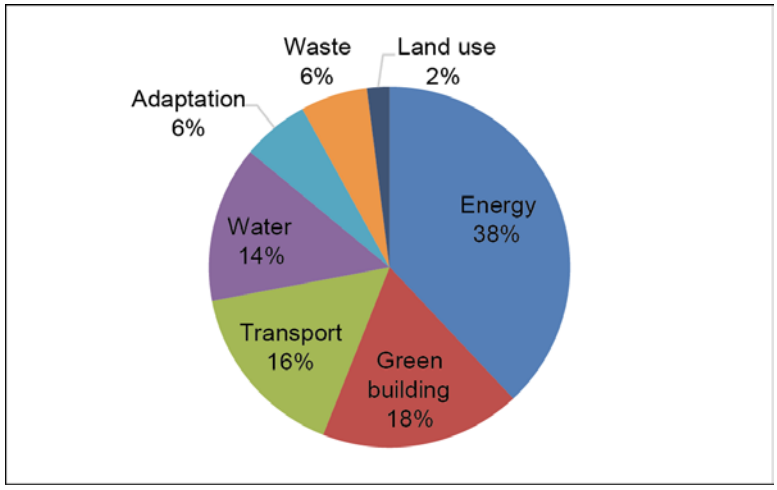
## 3.2 Green Bonds Issued to Fund Green Building Projects in ASEAN

In ASEAN, the number of green bonds issued to fund green building projects is projected to increase (Climate Bonds Initiative 2018a). Green buildings are recognized as a legitimate project that may be financed through green bonds under the International Capital Market Association Green Bond Principles (ICMA GBP) and the ASEAN Green Bond Standards (GBS). The ICMA GBP, a set of voluntary guidelines that seek to codify recommendations for transparency in the issuance of green bonds, states that green bonds may be issued to fund green building initiatives, energy efficiency improvements, and research and development in renewable energy, as well as the installation of renewable energy technology (ICMA 2018). Under the ASEAN GBS, a code of elective principles developed for the ASEAN context based on the ICMA GBP, green buildings are explicitly designated as a possible project that may be funded using green bonds (ACMF 2018).

In the ICMA Green, Social, and Sustainability bonds open-access database, of the bonds issued in ASEAN countries in 2016 or later, approximately 36% were issued specifically for green building projects. The ICMA Green, Social, and Sustainability bonds database is a compendium of resources on green bonds issued in 2016 or later. A list of green bonds and the projects they were issued to fund, as recorded in the database and with additional elaboration, is available in Table 1 in the Appendix. Another source puts the percentage of green bond proceeds going towards financing green building projects at 44% (Filkova et al. 2018). Either number obtained from the two sources is substantially above the global total, in which 18% of green bond

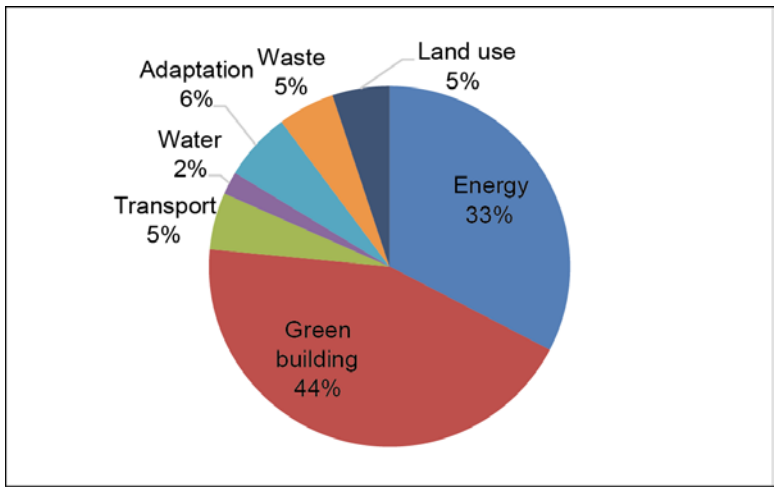
proceeds are put towards funding green building projects. Figures 4 and 5 compare the use of green bond proceeds in ASEAN with that of the rest of the world.

**Figure 4: Global Use of Green Bond Proceeds**




Source: Authors' own based on data from Filkova et al. (2018).

**Figure 5: Use of Green Bond Proceeds in ASEAN**




Source: Authors' own based on data from Filkova et al. (2018).

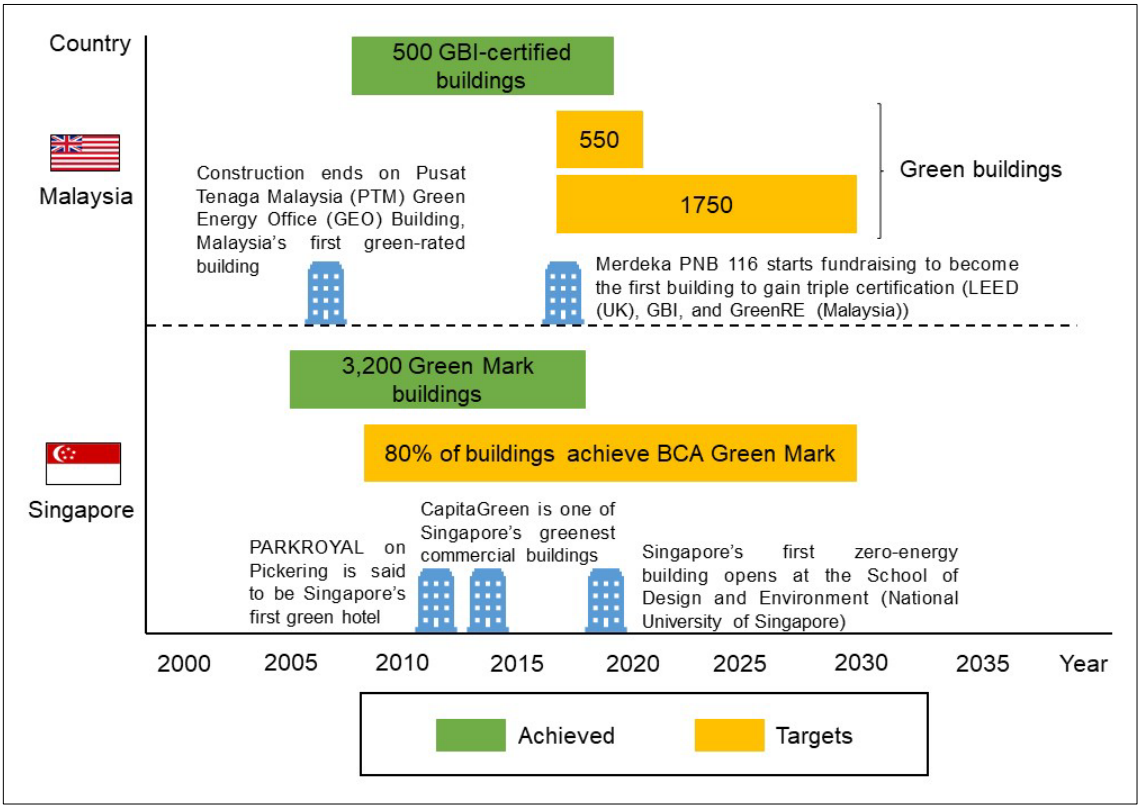
## 3.3 Green Bonds as an Effective Instrument for Financing Green Buildings in Singapore and Malaysia

What factors may explain the relatively higher rate at which green bonds have been issued for green building projects in ASEAN, as compared to the rest of the world? We interpret this phenomenon through a demand-focused lens. One of the factors driving demand is that building design has a more sizeable impact on the energy efficiency of buildings in ASEAN member states than in many countries in the rest of the world, since Southeast Asia is in the equatorial belt, whereas many countries in the rest of the world are located in temperate zones. Differences in climate impact the effectiveness of building design choices, such as building finishes (Shi and Zhang 2011). A second reason is that there is a more urgent need for ASEAN countries,

which experience warmer temperatures, to adapt to the pressures of climate change through emphasizing sustainability in the built environment. Global warming reduces the warming load of buildings located in colder regions, but increases the cooling load in buildings in warmer areas (Wan et al. 2011).

Green bonds appear to be a promising financing mechanism for green building projects in ASEAN, considering that a large proportion of green bonds are currently being issued to fund such projects. In this subsection, we will focus our discussion on how green bonds may help overcome existent barriers to investment in green buildings as discussed in Section 2.2, with particular reference to three green building projects for which green bonds have been issued in Malaysia and Singapore: gateway@klia2 and Merdeka PNB118 Tower in Malaysia, and Marina Bay Financial Center Tower 3 (MBFC T3) in Singapore. We first highlight green building rating schemes in the Malaysian and Singaporean contexts to foreground later analysis of these case studies.

**Figure 6: Developments in Green Buildings in Malaysia and Singapore**




Source: Authors' own based on information from government agencies' websites and news articles.

Malaysia and Singapore are the only two countries in ASEAN that have adopted green building targets. Figure 6 above summarizes the current status of green buildings in these two countries, the targets that they have set in this sector, and a few key achievements in their progress towards achieving higher energy efficiency in their built environment.

Malaysia established its Green Building Index (GBI) in 2009 and Green Real Estate (GreenRE) in 2013. The GBI is a rating tool for recognizing sustainable developments in the built environment. Developments may be rated "Certified," "Silver," "Gold," or "Platinum" according to the number of points they are awarded in the rating system (Tan 2009). The Malaysian government has implemented incentives, such as tax exemptions, for GBI-certified buildings. These include investment tax breaks for costs incurred in the construction of GBI-certified buildings. There is evidence that the GBI has accelerated the movement towards environmental sustainability in the built environment in Malaysia (Aliagha et al. 2013).

On the other hand, GreenRE was set up by the Real Estate and Housing Developers' Association (REHDA) of Malaysia to drive the sustainability of the real estate industry. GreenRE is fully supported and recognized by the Malaysian government and local authorities, including the Ministry of Energy, Science, Technology, Environment, and Climate Change (MESTECC), the Malaysia Green Technology Corporation (MGTC), and the Malaysian Investment Development Authority (MIDA). Certified projects qualify for income tax allowances and incentives under the Green Tax Incentive Scheme of MIDA and the Ministry of Finance (MOF). Currently, GreenRE has a portfolio of projects covering more than 100 million square feet across Malaysia.

Singapore's Building and Construction Authority (BCA) established the Green Mark scheme in 2005 (Building and Construction Authority n.d.). This scheme certifies buildings in the Singapore built environment according to a codified set of criteria based on international best practices in green buildings, and further provides incentives for energy efficiency improvements made in buildings. There is evidence that suggests that the Green Mark rating scheme has made advances both in terms of improving the monitoring system for the energy efficiency performance of buildings and increasing awareness of the importance of green practices in the building industry. A questionnaire distributed online found that the Green Mark scheme has improved awareness of environmental issues pertaining to the built environment among professionals in the construction industry (Ng and Runeson 2008).

We now examine the difference between green bonds and traditional sources of funding, such as loans and equity investments. First of all, the advantages of bond financing should be investigated from the perspective of financing costs. Since bonds offer the opportunity to disperse ownership of the debt across a group of investors, financiers find it easier to invest through bonds as opposed to investing through loans or equity ownership. Dispersed ownership translates to distributed risks, thus contributing to a lower risk premium and therefore lowering financing costs. Furthermore, the presence of a secondary market for bonds promotes liquidity, thereby offering financiers a short-term exit strategy and a shorter payback period. Due to the capital-intensive nature of green buildings, the initial years of the project life cycle is likely to experience negative cash flows. Bond financing allows for delayed principal repayments, which enable projects to generate returns and cover the capital costs across the payback period (Yang, Park, and Zhong 2020).

For instance, on 8 November 2017, asset management firm Permodalan Nasional Berhad (PNB) issued a green *sukuk* to fund the 118-storey Merdeka PNB118 Tower, a green mixed-use building that will tap energy-efficient technology to become certified as a LEED Platinum building (Suruhanjaya Sekuriti (Securities Commission) Malaysia and World Bank Group 2019). Green features include chilled water energy storage, solar panels, daylight sensors, tenant submetering, and energy-efficient lighting (PNB 2017). At the time of issuance, this was the third-largest green *sukuk* issued in Malaysia (Wahab and Mohamed-Naim 2019). The cost of this project is projected to be fully recovered only after a decade (Kana 2019). The longer term to maturity makes

green bonds more suitable as a source of finance (Asian Development Bank 2018), and the risk involved in this project makes green *sukuk* particularly appropriate for risk sharing between PNB and investors. While green building financing may be considered too risky by bank lenders, risk sharing between project developers and investors coheres with the tenets of Islamic financing, and green *sukuk* may fill a funding gap in this market (Asian Development Bank 2018). Second, lenders are reluctant to lend to green building projects due to the small ticket size, the often untransparent service contracts, and a lack of expertise on energy efficiency. In this sense, bonds are better able to draw on various sources of long-term institutional and household savings, since the bond market requires higher transparency in the provision of financial and other relevant information, thereby increasing the need for disclosure and access to information for all market participants (Peterson 2003).

Green bonds are more suited to green project financing than loans, as bank lenders may lack technical knowledge on energy efficiency financing (Woodroof 2009), and not prioritize environmental sustainability as a criterion in offering loans. Comparatively, investors in the green bond market are specifically interested in the greenness of the projects that they are supporting, and indicate that they favor the targeted nature of project financing, as they are able to perform their due diligence and learn more about how the projects they are considering funding contribute to sustainability (Wood and Grace 2011).

With regard to Singapore's case, transparency may have resulted in strong demand for a green bond issued by the Development Bank of Singapore (DBS). In July 2017, ahead of the issuance of a green bond for the financing of projects including MBFC T3 (Yoon 2017), DBS released its Green Bond Framework, a five-page document outlining criteria for the selection of green projects that will be funded by green bond proceeds (DBS Sustainability Council 2017). This document commits DBS to annual project audits and impact reporting (DBS Sustainability Council 2017), which increases transparency for investors.

Furthermore, the fact that the construction of MBFC T3 had been completed earlier in 2012 and the building had been awarded the Green Mark Gold Plus for sustainability measures built into the design of the structure increases the ability of investors to assess the impact of the building (MBFC n.d.). Indeed, MBFC T3 uses special glass, landscaping, sky terraces, and gardens to reduce the amount of heat absorbed by the surface, thereby reducing the cooling load. The building also monitors outdoor temperatures to adjust indoor air conditioning. Lighting, taps, toilets, and escalators are controlled by sensors. There is a system in place to collect condensed water droplets for the cleaning of the building facilities. The energy and water use of the building is also monitored and reported frequently (Chua 2015).

In Malaysia, Segi Astana Sdn Bhd issued their first ASEAN Green Bond, for MYR415 million (USD103.7 million), in January 2018. The proceeds are designated for the refinancing of the medium-term notes guaranteed by Danajamin Nasional Berhad to fund gateway@klia2 (Chandra and Ng 2017). Segi Astana Sdn Bhd has committed itself to reporting on the energy consumption, carbon emissions, and water use of the building annually so energy efficiency improvements may be monitored (Climate Bonds Initiative 2018c). In 2014, gateway@klia2 was provisionally given a GBI Gold rating ("Homegrown chain receives gold rating from Green Building Index" 2014). The green features of gateway@klia2 include rainwater harvesting and stream waste disposal, as well as daylight sensors in the parking lot and carbon dioxide sensors in the interior of the retail building (gateway@klia2 n.d.).

In both of the above two examples, green bonds are a viable source of finance, because clear documentation of the sustainability features of the building makes investment attractive to market participants who place emphasis on environmental impact as an outcome of their investment. The codification and promulgation of local rating schemes for the greenness of buildings, Green Mark and the GBI, has also certainly contributed to acknowledging the environmental impact of energy efficiency features in these two buildings. Local certification schemes are useful as they benchmark the environmental impact of green building projects for which green bonds are issued against other buildings in the country, thereby providing investors with an objective and standardized basis for comparison. Furthermore, while investors may not be able to assess what absolute quantity of energy performance improvement should be considered large, green building certification provides a normative interpretation of the environmental impact of various buildings. Such features may not command a premium in other financing markets but are appreciated in the green bond market.

## 3.4 Challenges for the Widespread Adoption of Green Bonds to Finance Green Buildings

Green bonds address more financing barriers to energy efficiency than other financing instruments. The remaining challenges to unlock the full potential of the bond market are mainly twofold.

First, as project sponsors that wish to raise funds may not possess experience in creating a green bond framework, they may be averse to utilizing this financing mechanism, particularly in jurisdictions where a policy framework has not yet been established. Indeed, the process of creating such a framework has proved difficult and onerous, as it requires both a relatively advanced bond market and green building certification schemes (Lai 2019). Therefore, the costs of acquiring information on the process of issuing a green bond and the requirements to be met in such a process may deter potential market participants from entering, and these costs are compounded by inconsistency across, and ambiguity in, green bond standards (Ehlers and Packer 2017).

On the other hand, although green bonds are increasingly penetrating the ASEAN market, it is found that the current investors are more motivated by a green reputation or corporate social responsibility rather than a higher yield. Available literature finds that on average, there is no robust and significant yield premium or discount on green bonds, when comparing liquidity-adjusted yield premiums of green bonds to conventional bonds. However, green bonds certified by an external reviewer enjoy a discount of about 6 bps. Furthermore, green bonds that obtain a Climate Bonds Initiative certificate show a discount of around 15 bps. The findings suggest that a universally accepted greenness measure can benefit the development of the green bond market (Hyun, Park, and Tian 2020). Banga (2019) identifies perceived high transactional costs as one of the factors that deter firms from issuing green bonds. These barriers to adoption may all be overcome with a robust institutional framework and an increasing number of green bonds issued in ASEAN nations to build local capacity and expertise.

# 4. RECOMMENDATIONS AND CONCLUSION

While green bonds have been successfully issued to raise funds for several green building projects, it is evident that, as laid out above, there remain issues in their widespread adoption as a financing mechanism for green buildings. This section concludes with policy recommendations for future use of green bonds for funding green building projects.

## 4.1 Enabling the Demand for Green Bonds Through Information Provision

There remains an information gap in the ASEAN market for green bonds since, as impact investing and the green bond market are in their nascent stages, market participants lack the technical expertise and institutional memory to appropriately assess the potential payoffs (Castillejos-Petalcorin et al. 2018). Castillejos-Petalcorin et al. (2018) further find empirical evidence that information on the environmental sustainability of the projects the green bond is meant to fund is associated with a payoff in market premium. Therefore, green bond issuers should increase the amount of information provided to potential investors, such that participation becomes more transparent and is associated with less risk.

As explained above, green building projects may enjoy an advantage in this regard, due to the available certification schemes through which they may gain credibility. However, since, under most rating systems, projects are only certified after completion, a pre-assessment of the building design and conditional conferment of a rating may be in order so as to fully capitalize on existing certification schemes. Additionally, a general increase in familiarity with green building certification schemes may make information on green building projects more accessible to investors, since certification validates the environmental impact of the project.

There are several ways through which ASEAN governments can facilitate local issuance of green bonds. One of the ways is to increase the number of consultations and information-sharing sessions to disseminate information on green bond standards and what constitutes greenness in accordance with such standards, in order to demystify the project requirements for issuing a green bond. Second, within the regional bloc, ASEAN corporations may establish a network to pool expertise and information on key green bond issuance tasks that may be difficult for first-time issuers such as the drafting of a green bond framework and the marketing of green bonds. A third solution that governments may implement is to subsidize the transaction costs incurred in the issuance of a green bond, as suggested in Banga (2019). Such a scheme already exists in Singapore, where the Monetary Authority of Singapore (MAS) began the Sustainable Bond Grant Scheme that subsidizes eligible costs associated with the issuance of a green bond (Monetary Authority of Singapore n.d.).

## 4.2 Endorsement of Green Buildings Through Building Codes

In addition to increasing access to, and the amount of information on, projects, we further note that it is no coincidence that Malaysia and Singapore, the two countries in ASEAN with the largest focus on green building initiatives and which have established supplementary incentive schemes, have the highest number of green bonds issued for green building projects. Governments in all ASEAN member states should actively encourage higher environmental sustainability in the built environment and cooperate with local building developers to increase environmental awareness and knowledge of

developments in green buildings. Where possible, incentive schemes may also be initiated to further defray the costs associated with energy efficiency improvements in buildings.

The lack of investment in green buildings and energy efficiency may be attributed to these investments being "less visible" than renewable energy investments, primarily due to the lack of a credible, uniform, and standardized building energy performance certification and rating system adopted in many countries. Due to the asymmetry in visibility, banks are disproportionately more interested in funding renewable energy than energy efficiency investments due to the former's clear revenue streams and benefits. In Malaysia, it was noted that a noticeable lack of transparency in service contracts between project developers and financial institutions, as well as ambiguous project approvals, led to underinvestment in energy-efficient technologies (ACE 2019). In the absence of visibility, energy efficiency investments become hard to value (UN ESCAP 2012).

## 4.3 Promoting Local Currency Bond Financing Through Domestic Institutional Investors

There are few responsible, sustainable, or green investment mandates among domestic institutional investors across ASEAN. The size of the domestic finance sectors, particularly nonbank institutional investors, is relatively small relative to the needed infrastructure investments (ADB 2018). Therefore, increasing the demand of domestic institutional investors for green bonds is essential for catalyzing the market-driven development of domestic green bond issuance. For this, there is a need to link the importance of green bond markets to the countries' nationally determined contributions as part of the Paris Agreement or overall Sustainable Development Goals. This would lead to increased awareness of various institutional investors accessing local markets.

Meanwhile, it is also important to develop a sound framework for public and private partnerships (PPPs) in the domestic market. PPPs are known for their efficiency in delivering public infrastructure and services. Technical skills and experience may be lacking within many public entities responsible for infrastructure development, and thus collaboration with the private sector to pool expertise is in order. A shift away from a low-bid approach in infrastructure procurement towards evaluating life cycle costs is recommended to improve the quality of infrastructure projects. The PPP model works well to embed life cycle costs of green buildings in the procurement process. A survey of the literature finds that PPP is more costly than public procurement (Petersen 2019). Makovšek (2013) finds evidence that risk cannot fully account for this increase in cost. Theoretically, firms with relevant expertise should be better able to assess and optimize life cycle costs in further maintenance and operation of green buildings (Makovšek 2013).

In conclusion, the potential for green bonds as a funding source for green buildings in ASEAN is not to be underestimated. While the green bond market in ASEAN is currently small, there is large potential for growth. Green bonds can complement traditional modes of financing for green buildings, such as bank loans. This paper highlights the need for the market to provide information on greenness. Extant certification schemes for green buildings lend to the credibility of green building projects and information availability with the green bond markets, increasing the attractiveness of green bonds issued for green building projects. Individual bond issuers should work towards audits of their projects, and government agencies should consider conditionally certifying projects based on the blueprints for construction.

Furthermore, government endorsement through establishing green building targets and promoting awareness of, and attention to, the energy efficiency of buildings will be a further step towards tapping green bond markets as a source of financing for green building projects in countries in ASEAN. Finally, governments should encourage local currency bond financing through institutional investors. Overall, green bonds are a suitable mechanism for financing green buildings, and governments and building developers should give closer scrutiny to this source of funding.

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# APPENDIX

**Table 1: Green Bonds Issued in ASEAN Since 2016**

| Country | Bond Issuer | Year | Type | Purpose |
|---|---|---|---|---|
| Indonesia | PT Sarana Multi Infrastruktur | 2018 | All | To fund projects in renewable energy, energy efficiency, sustainable pollution management and prevention, sustainable natural resources and land use management, clean transportation, and sustainable water and sewage management (PT SMI 2018). |
| Indonesia | Republic of Indonesia | 2018 | All | To fund projects that mitigate the impact of climate change, reduce the environmental footprint, and conserve biodiversity (BioDiversity Finance Initiative 2018). |
| Indonesia | Star Energy Geothermal (Wayang Windu) | 2018 | Renewable energy | To fund the Wayang Windu geothermal power plant (Climate Bonds Initiative 2018d). |
| Malaysia | Segi Astana | 2018 | Energy efficiency – Green Buildings | To fund gateway@klia2, a green building (Climate Bonds Initiative 2018c). |
| Malaysia | Mudajaya Group Berhad (Sinar Kamiri) | 2018 | Renewable energy | To fund a solar PV plant in Perak, Malaysia (Climate Bonds Initiative 2018b). |
| Malaysia | Tadau Energy | 2017 | Renewable energy | To fund a solar project in Sabah, Malaysia (CICERO 2017). |
| Philippines | AC Energy Finance International | 2019 | Renewable energy | To fund renewable energy and thermal energy generation facilities (AC Energy n.d.). |
| Philippines | Arthaland Corporation | 2020 | Energy efficiency – Green Buildings | To fund the development of green buildings (Arthaland Corporation n.d.). |
| Philippines | Bank of the Philippine Islands | 2019 | All | To fund projects that fall under the Bank of the Philippine Islands' Green Finance Framework (Patrini 2019). |
| Philippines | Rizal Commercial Banking Corporation | 2017 | All | To fund loans disbursed for green projects (Dumlao-Abadilla 2019). |
| Singapore | City Developments Limited | 2017 | Energy efficiency – Green Buildings | To repay a S$100 million (approximately US$70.8 million) loan it took to retrofit Republic Plaza to make sustainability improvements (Shah 2017). |
| Singapore | Oxley Holdings Limited | 2020 | All | To fund projects in (i) Green Buildings, (ii) Renewable Energy, (iii) Energy Efficiency, (iv) Clean Transportation, (v) Pollution Prevention and Control, (vi) Sustainable Water and Wastewater Management, and (vi) Climate Change Adaptation. |
| Singapore | Sindicatum Renewable Energy Company | 2018 | Renewable energy | To fund renewable energy projects, waste-to-energy projects, and bagasse cogeneration projects (Sustainalytics 2017). |
| Singapore | Soilbuild Group | 2019 | Energy efficiency – Green Buildings | Soilbuild Group, a Singaporean real estate developer, will be using the bond proceeds to build a Green Mark Platinum business space, Solaris @ Tai Seng (Climate Bonds Initiative 2020). |

Source: Climate Bonds Initiative 2020 data.