SG Green I Issue 14.0

MARCH 2022

SG GREEN

SINGAPORE GREEN BUILDING COUNCIL

MCI permit number (MCI (P) 074/06/2021)

ACTIVATING SUSTAINABLE FINANCING

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SC (Sang Choy) International Pte Ltd

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ACTIVATING SUSTAINABLE FINANCE

The attention on sustainability has never been stronger, with global players finally recognising the urgent need to mitigate the impact of climate change. The challenges of the global pandemic have proven to the world that countries can set aside their differences and work towards a common goal, and no single ordeal in humanity's young history is as existential as the threat of climate change.

Regardless of nationality, gender, income level or social standing, climate change will affect every living thing on the planet. We are seeing increasingly erratic weather phenomena across the globe: heavier rainfall, stronger winds and rising temperatures are causing all manner of mayhem. The latest report released by the Intergovernmental Panel on Climate Change (IPCC) on 28 February 2022 highlights that fact that climate adaptation efforts are simply not proceeding fast enough, with measures – if implemented – too small-scale to have any reasonable impact on the status quo.

However, all is not doom and gloom. Cognizance of sustainability has reached an all-time high, with governments, key decision-makers and even the layman becoming increasingly aware of the need to steer development into a more sustainable trajectory. The built environment in particular is in a prime position to effect positive climate action.

Our buildings only occupy 3 percent of the world's total landmass, but are responsible for 40 percent of the world's carbon emissions and more than half of the planet's electricity use. Therefore, this is great opportunity for our places and spaces to help mitigate the impact of climate change by – quite literally – building a greener built environment.

Financing will continue to play a pivotal role in the green transformation of the built environment, able to catalyse and facilitate the built environment's transition towards one that is greener, healthier and low carbon. With the exponential growth of green finance in recent times, organisations will be able to tap on a greater variety of tools and instruments to further their sustainability efforts.

In this issue of SG Green, a selection of articles geared towards activating sustainable finance. On top of finding out more about the incentive schemes announced during Budget 2022 to help accelerate Singapore's built environment transformation, read more about bridging the real estate green financing gap, transitioning to a circular built environment as well as know a little more about green financing from an engineering perspective.

Yours Sincerely,
SG Green Editorial Team


SGBC Gives Back
Industry Engagement
Support build up of industry capabilities
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Encourage and enable next generation
SINGAPORE GREEN BUILDING COUNCIL
BUILDING SUSTAINABLE CITIES FOR BETTER LIVING

FORGING AHEAD BEYOND COP26

COP26 refocused the world's attention on global climate action to limit global warming to well below 2 degrees Celsius as compared to pre-industrial levels. With the discussions between countries done and dusted, have you ever wondered what implications COP26 has for businesses?

Forging Ahead Beyond Cop26

100 attendees obtained key insight on this during the SGBC Leadership Conversations - Forging Ahead Beyond COP26 event, which was held in-person at the Grand Copthorne Waterfront Hotel on 14 January 2022.

The insightful panel discussion was facilitated by Ms Farizan d'Avezac de Moran (SGBC Board Member and Senior Partner of GreenA Consultants) who engaged COP veterans Ms Esther An (Chief Sustainability Officer, City Developments Limited), Ms Pamela Phua (Product Director, AkzoNobel) and Ms Cheryl Cadelina Lee (Youth Delegate, Singapore Youth for Climate Action) in a hearty dialogue on the key takeaways of COP26 and how it affects the way companies operate.

The panellists spoke at length about their most memorable moments at COP26. Ms Esther An pointed out how there was more build-up of anticipation for COP26, as compared to the previous edition of the COP, with a greater emphasis on achieving net-zero emissions. COP26 broke historical ground by having one full day devoted to accelerating climate ambition for the built environment.

Representing the voices of younger generations, it was refreshing to find out youth perspective through the eyes of Ms Cheryl Lee. She shared, "The youths are not just the people on the streets. We are amongst you, we are your colleagues and your friends." Our youths therefore serve as an agent of change and are deeply involved in the conversation on how we address environmental issues. They will be able to build bridges between research sectors and unite different stakeholder groups towards a common purpose.

COP26 was also an opportunity to introduce new innovations in the building industry. Ms Pamela Phua shared with the audience the emergence of carbon fibre composite as a carbon-capturing innovation to replace steel. Taking a cautious approach towards simplifying carbon reduction, introducing sustainability initiatives goes beyond just the product design process. It is also about lowering the carbon footprint by working in collaboration with external stakeholders to establish a more sustainable supply chain, both upstream and downstream.

Ms Esther An also echoed a similar sentiment in making a business case to introduce sustainability into the supply chain. Companies are increasingly setting ambitious climate targets and adopting a clear pathway towards decarbonisation. What lies ahead is equipping employees with sustainability skills and clearly communicating what the company's action plan for sustainability is. She cautiously warned that not disclosing and delivering on sustainability reporting criteria could prove challenging for a business when it comes to sourcing of funding and financing from investors.

Rounding up the dialogue, Ms Farizan posed an explorative question to the panel: fast forward to 2030 and the effects of climate change are impending, what would they have done differently?

Ms Pamela Phua succinctly summarised her views in three key points: the importance of having a sustainability culture, necessitating environmental education from top leadership management and setting a standardised methodology for sustainability targets. Ms Esther An emphasised the importance of using community engagement to provide high-quality skills training to graduates. Tapping into a prevalent issue amongst the younger generation nowadays, Ms Cheryl laid out the case to prioritise taking steps earlier to calm the climate anxiety of youths.

As the world races to meet the recommendations of the Glasgow Climate Pact, organisations must fully embrace sustainability to forge ahead and emerge stronger in the new normal.

Contributed by:
GreenA Consultants


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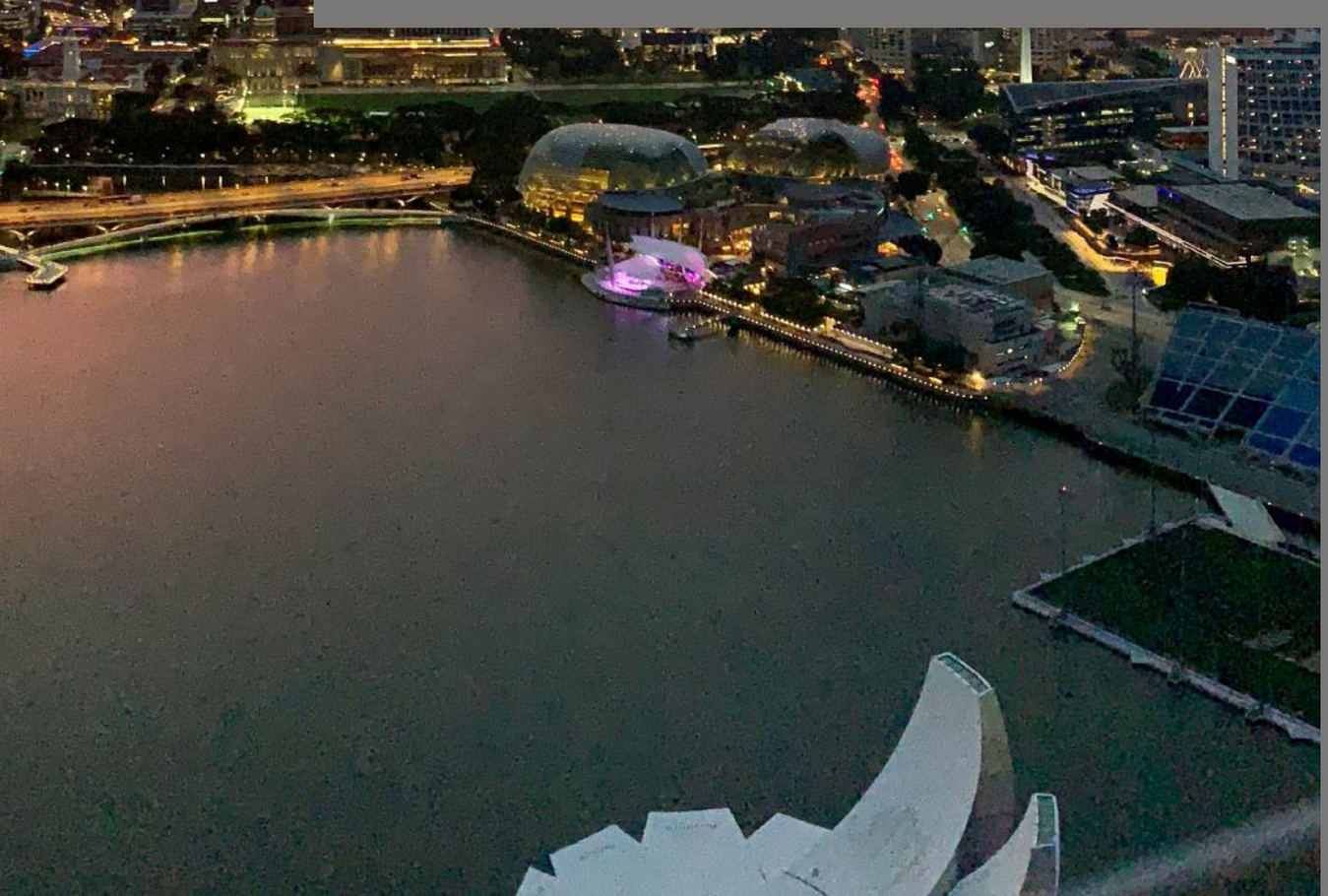
ACCELERATING BUILT ENVIRONMENT TRANSFORMATION

The Singapore building and construction sector can look forward to enhanced assistance to go green through a suite of incentive schemes and programmes announced during Budget 2022 are designed to accelerate built environment transformation.



The world must urgently accelerate decarbonisation in order to meet the Paris Agreement's and the Glasgow Climate Pact's targets, both of which were ratified at the 26th Conference of the Parties (COP). During the delivery of Budget 2022, Minister for Finance Mr. Lawrence Wong highlighted the nation's full commitment in the global movement to address climate change, but was constrained by a lack of natural renewable energy sources. Singapore, as a landlocked island state, simply does not have large rivers, deep hot springs or even the land area required for large-scale wind or solar deployment. Thankfully, green technologies have been improving tremendously, with low-carbon solutions such as carbon capture, utilisation and storage, becoming very viable. Carbon markets are also on the road to growth, with Singapore helping to finalise a landmark decision on Article 6 of the Paris Agreement during COP26 which allows for the trading of carbon credits on a global basis.

While Singapore is on track to achieve its 2030 targets through the Long-Term Low-Emissions Development Strategy (LEDS), which was to halve emissions from its peak by 2050 and to achieve net zero emissions as soon as viable in the second half of the century, the nation has announced its intention to do more. Singapore will now aim to reach net zero emissions by or around 2050 instead of the second half of the century.

IMPACT OF THE CARBON TAX

To achieve Singapore's net zero ambitions, the price of carbon must be set right to allow organisations to internalise carbon costs and take the necessary actions to reduce their emissions. The carbon tax, first introduced in 2019 at $5 per tonne of emissions, will be progressively raised to $25 per tonne in 2024-2025, $45 per tonne in 2026-2027 and $50-$80 per tonne by 2030.

During the Singapore Budget 2022: Key Insights webinar organised by the Singapore Green Building Council (SGBC) on 15 March 2022, Ms Cherine Fok, Director, Sustainability Services from KPMG, shared that while the raised carbon tax is a five-fold increase from the status quo, it will be difficult for Singapore to remain globally competitive without a significant change in its carbon pricing. A global transition to a low-carbon economy is taking place, with different nations putting in place a wealth of mechanisms to facilitate this transition and will lead to interplay between different government infrastructure frameworks as well as corporate behaviour.

While the raised carbon tax will lead to an increased operating expense (Opex) from indirect carbon cost, there are also opportunities for built environment organisations to tap on. For one, internal carbon pricing can be used as a mechanism to manage climate-related risks for the organisation and manage associated opportunities, such as identifying high-return investment opportunities in the areas of carbon, green building and sustainability.

GREEN FINANCING

Advanced green technologies will require substantial funding and financing to get them off the ground and to commercial viability. Mr. Kelvin Tan, Head of Sustainable Finance & Investments (ASEAN) from HSBC said during the Singapore Budget 2022: Key Insights webinar that green financing will be able help plug this gap and companies can leverage innovative green financial solutions to support their transition to more sustainable business operations. He also notes that green building certifications and standards are important to prevent greenwashing.

Different types of sustainable financing are available for organisations to leverage, including:

- Green Bonds, Green Loans, Green Trade Loans & Guarantees
  - Green projects with environmental benefits
- Social Bonds, Social loans
  - Social projects with social benefits
- Sustainability Bonds
  - Green & Social projects
- Transition Bonds & Loans
  - Projects that show significant improvement in emissions performance in carbon-intensive industries
- Sustainability – linked Bonds & Loans
  - General corporate purpose

INCENTIVE SCHEMES FOR BUILT ENVIRONMENT TRANSFORMATION

Buildings contribute to about 20 percent of Singapore's carbon emissions, and green buildings can contribute a major part to the nation's transition to a low-carbon and resilient future. While there has been considerable headway in promoting the development of green and sustainable buildings in Singapore, there is a need to step up efforts in transforming the built environment. Several key initiatives were announced in Budget 2022 and the subsequent Committee of Supply (COS) debates in support of the sectoral transformation to one that is more sustainable and climate resilient. These

incentive schemes will provide the impetus to drive further reduction in carbon emissions and support the industry's transformation journey.

On 8 March 2022, the Singapore Government announced a slew of initiatives totalling $184 million to accelerate industry transformation towards a more resilient and future-ready built environment. These include an enhanced Green Mark Incentive Scheme for Existing Buildings, the Built Environment Transformation Gross Floor Areas Incentive Scheme, additional funding for the Green Buildings Innovation Cluster Programme and the new Integrated FM/ Aggregated FM Grant. During the Singapore Budget 2022: Key Insights webinar, Ms Grace Cheok-Chan from the Building and Construction Authority (BCA) spoke at length on the new programmes.

While new buildings are important in our green building aspirations, they are only the tip of the iceberg – our existing buildings hold the key to unlocking the potential for deep energy and carbon emissions reduction. Retrofitting existing buildings however come with their unique set of constraints, which include:

- Retrofitting challenges due to site constraints and considerations while trying to meet super low energy standards and minimise disruptions to building operations
- Higher upfront investment costs needed to deploy more advanced energy-efficient technologies such as renewable energy systems to meet top-tier sustainability standards
- Longer payback periods than traditional green retrofits to achieve best-in-class energy efficiency standards

GREEN MARK INCENTIVE FOR EXISTING BUILDINGS 2.0

The $63 million Green Mark Incentive for Existing Buildings (GMIS-EB) 2.0 is intended for the private sector to retrofit their buildings towards higher standards of energy efficiency and building performance. The scheme is outcome-based where building owners can get funding support based on the carbon emissions reduction achieved through green retrofits that minimally meet the Green Mark Platinum Standard. For instance, the funding factor is based on Green Mark rating to encourage the adoption of Super Low Energy and Zero Energy standards where possible to drive a further reduction in energy use and carbon emissions, while the funding cap is determined by energy efficiency measures such as the use of energy-efficient equipment and systems or innovative design solutions which contribute to energy savings. Building owners operating privately-owned buildings with a Gross Floor Area of 5000 square metres and more, commercial and institutional developments, residential buildings and light Industrial buildings can apply for the GMIS-EB 2.0 from the second quarter of 2022.

BUILT ENVIRONMENT TRANSFORMATION GROSS FLOOR AREAS INCENTIVE SCHEME

To create a more resilient built environment sector, BCA and the Urban Redevelopment Authority (URA) have jointly launched the Built Environment Transformation Gross Floor Areas Incentive Scheme which accords additional gross floor area (GFA) to projects that comply with all stipulated requirements outlined in the Construction Industry Transformation Map, namely Green Buildings (Sustainability), Design for Manufacturing (Productivity) and Integrated Digital Delivery (Digitalisation). The Scheme applies to new buildings and redevelopments with a GFA of more than 5000 square metres and can be residential, non-residential and mixed-use buildings.

GREEN BUILDINGS INNOVATION CLUSTER 2.0

An additional $45 million of funding support has been committed from the Research, Innovation and Enterprise (RIE) 2025 for the enhanced Green Buildings Innovation Cluster (GBIC) 2.0 programme. GBIC 2.0 will support the development, test-bedding and deployment of green technologies and solutions for buildings, with a focus on alternative cooling technologies, data-driven smart building solutions and next-generation building ventilation systems. GBIC 2.0 aims to be the one-stop integrated research, development and demonstration hub that covers research & development, prototyping, demonstration and a central repository for technology in the form of the SLEB Smart Hub.

INTEGRATED FM/ AGGREGATED FM GRANT

Facilities management is also crucial in Singapore's green building journey. Optimising building performance during building operations fosters better sustainability outcomes and reduces maintenance workloads for facilities management teams while enhancing their productivity. The new Integrated FM/ Aggregated FM Grant will fund up to 70 percent of the initial capital investment and retrofitting costs for the adoption of IFM/ AFM technologies. To qualify for the grant, FM companies and service buyers will need to transform their procurement models, and build capabilities in their workforce.

OTHER SUSTAINABILITY PROGRAMMES

On top of the incentive schemes specific to the built environment sector, organisations – especially small and medium enterprises (SMEs) – can also tap on two other programmes to help them on their sustainability journey. Launched in October 2021, the Enterprise Sustainability Programme (ESP) by Enterprise Singapore supports Singapore enterprises as they transform to be more sustainable and to capture opportunities in the green economy. The ESP supports sustainability courses and capability development projects that are focused on sustainability strategy, resource optimisation, sustainability standards adoption, and sustainable product/ service development. As part of the ESP, Enterprise Singapore also partners trade associations & chambers as well as corporates to drive sector-specific and supply chain initiatives, as well as foster a vibrant sustainability ecosystem through key enablers in areas such as certification and financing. The existing programmes by ecosystem partners include the Enterprise Financing Scheme Green (EFS-Green), LowCarbonSG Programme and TÜV SÜD's Sustainability-as-a-Service (SaaS) Programme.

The Advanced Digital Solutions (ADS) programme administered by the Infocomm Media Development Authority (IMDA) was first announced in March 2020 as part of the Resilience Budget to help enterprises deepen their digital capabilities, strengthen business continuity, and build longer term resilience. Solutions supported under the ADS address common enterprise-level challenges at scale, help enterprises to adopt digital technologies enable enterprises to transact more seamlessly within or across sectors. To date, there are at least 30 solutions for Construction, Facilities Management, Security, Healthcare, Trade & Sustainability, ranging from paperless trade, robotics operations, integrated value chains and aggregated data that

SMEs can apply for with up to 80 percent support from the ADS. More recently, IMDA has launched a Digital Tech for Sustainability Playbook – In Building Management, developed together with BCA and other industry partners, to raise awareness on sustainability as well as drive the adoption of digital technology to achieve sustainability outcomes in building management.

As Singapore move towards achieving its sustainability goals, there is immense opportunity and potential for green buildings to make a positive difference while creating a healthier, low-carbon living environment for everyone.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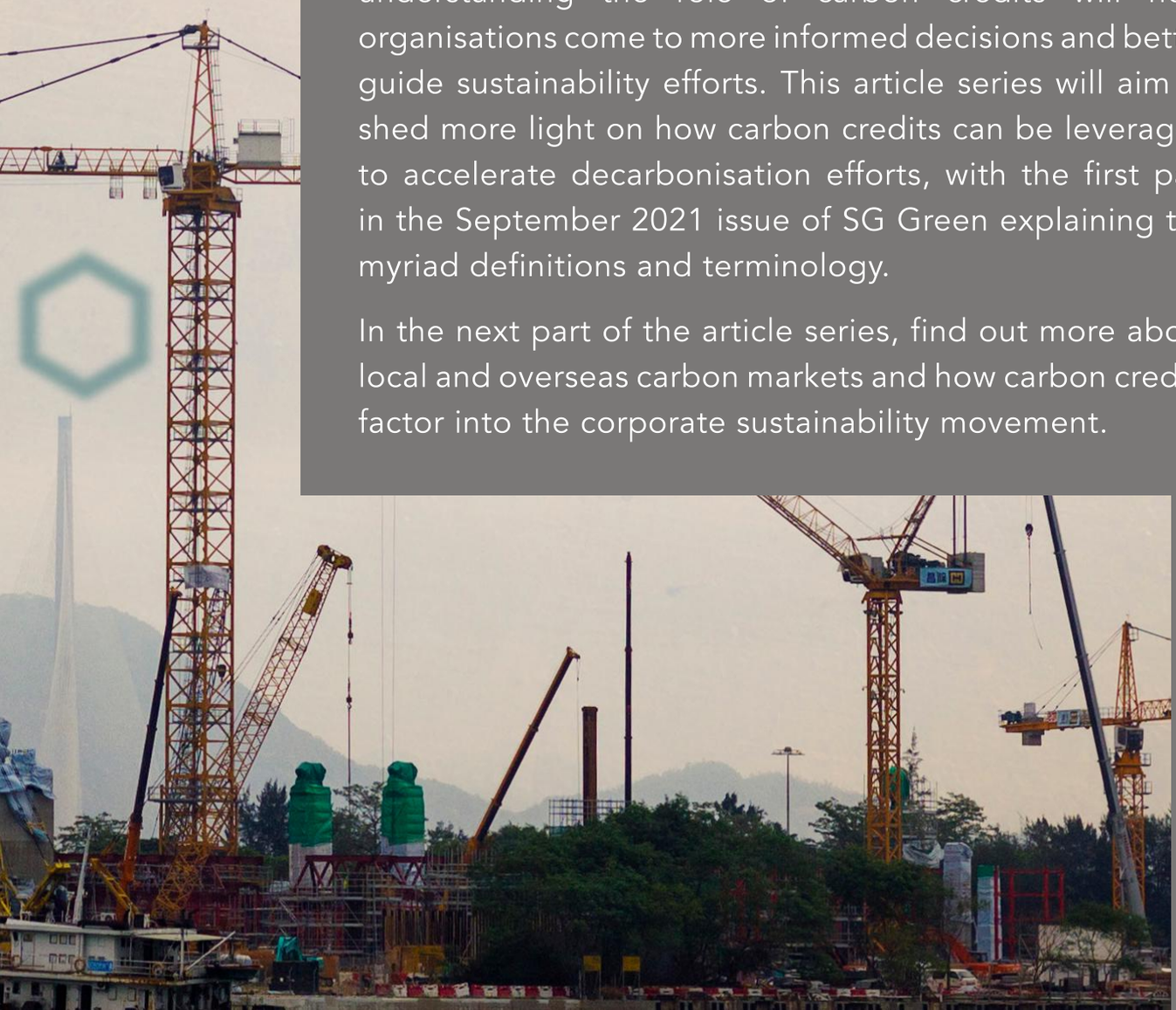
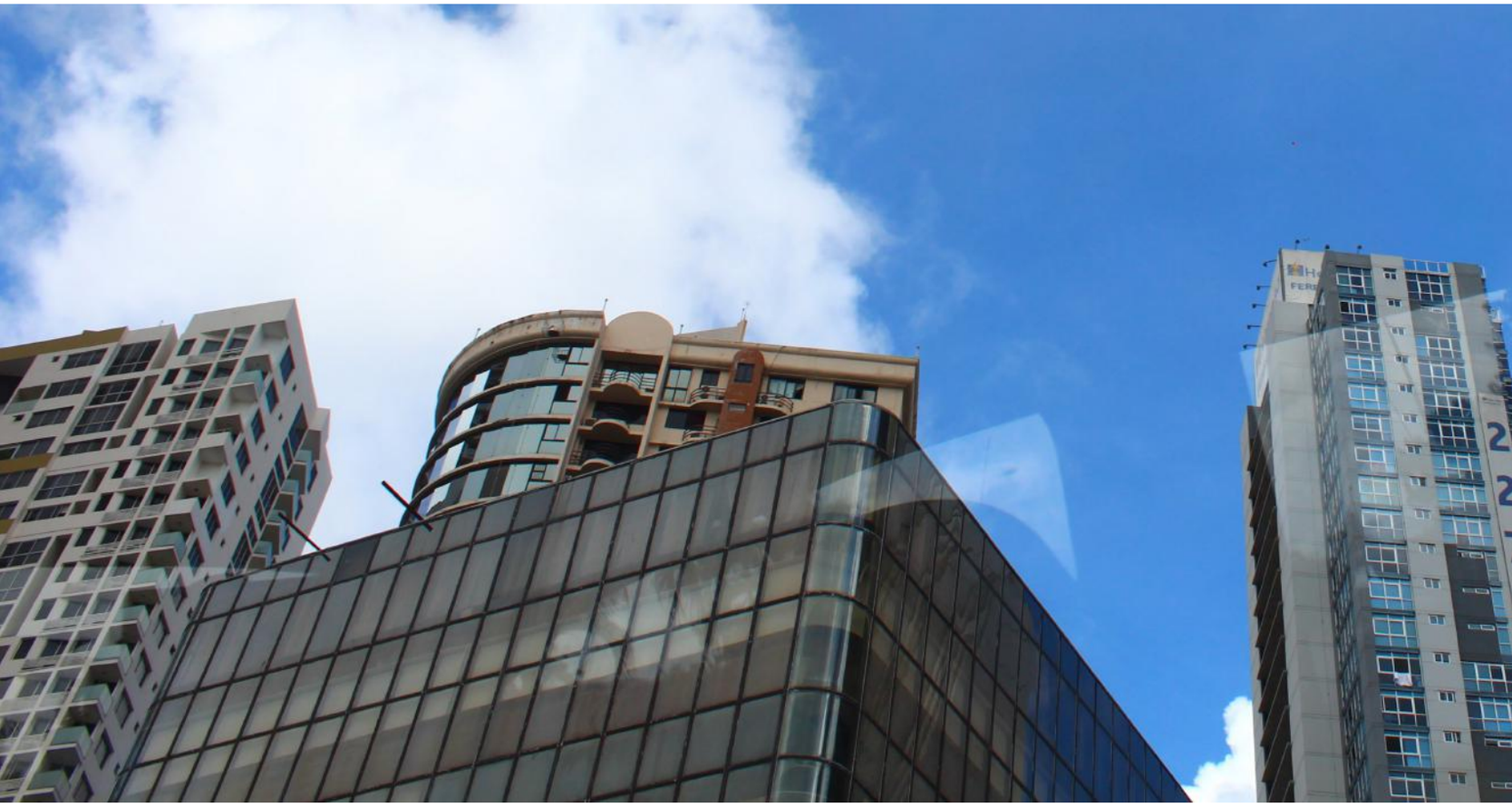
UNDERSTANDING CARBON CREDITS – PART 2

With heightened interest in how carbon credits and offsets factor into corporate decarbonisation efforts, understanding the role of carbon credits will help organisations come to more informed decisions and better guide sustainability efforts. This article series will aim to shed more light on how carbon credits can be leveraged to accelerate decarbonisation efforts, with the first part in the September 2021 issue of SG Green explaining the myriad definitions and terminology.

In the next part of the article series, find out more about local and overseas carbon markets and how carbon credits factor into the corporate sustainability movement.





OVERVIEW OF LOCAL AND OVERSEAS CARBON MARKETS

Carbon credits are currently traded in small, bilateral and typically project-specific deals, whereby the utilisation of these credits to offset emissions leads to the credit being retired or removed from the register. Moreover, the strong fragmentation of the voluntary carbon market, especially on the demand side, results in a lack of transparency. Therefore, the limited data and lack of price transparency, as well as the high costs to enter these markets (research costs, membership fees), makes it challenging for potential companies to even begin considering the utilisation of carbon credits and offsets. Moreover, some companies struggle to navigate the various standards and to find high-quality carbon credits at transparent prices.

On the other hand, some local carbon markets in Singapore like AirCarbon and Climate Impact X offer securitised carbon credits and standardised carbon contracts, which are not directly linked with particular or specific offset projects. These standardised, tradable products and contracts could help increased liquidity and scale transactions, provided that the quality of credits traded and the integrity of market participants are ensured. However, there is a need to ensure that buyers of such credits are able to effectively observe and understand the credible and verified environmental impact of the various projects involved in the contracts.

LOCAL CARBON MARKETS

There are a number of online platforms based in Singapore that facilitate the exchange and sale of carbon credits such as AirCarbon and CRX Carbon Bank and Climate Impact X.

AirCarbon

AirCarbon is a Singapore-based commodities exchange that securitises carbon credits into tradable securities with transparent pricing and real time settlement, compared to the traditional purchase of carbon credits from individual projects. Firms purchase Tokens from the Exchange, which are backed by 1 tCO2e carbon credits held in the Exchange's Trust. AirCarbon has a variety of

Tokens that are backed by carbon credits issued and verified by different carbon credit guidelines, including the Global Nature Tokens (GNT), which are backed by carbon credits registered under Verra's Verified Carbon Standard (VCS) under methodologies encompassing sectoral scope 14 covering activities related to wetlands, grasslands, forestry and agriculture. Another example is the CORSIA Eligible Tokens (CET), which are backed by a corresponding carbon credit eligible under the International Civil Aviation Organisation's (ICAO) Carbon Offset and Reductions Scheme for International Aviation (CORSIA).

All participants of the AirCarbon exchange must be a corporation or an accredited investor. The pricing of tokens and carbon credits, as well as their numbers and quantities, are not available publicly, but there will be a range of prices on the exchange. AirCarbon also takes a small commission fee, set at 1 percent of the transaction notional. For the verification of tokens and carbon credits, AirCarbon has engaged British Standards Institution (BSI), a pioneer in systems certification and International Organization for Standardization (ISO) training.

The verification process gives confidence that the reported information of a carbon credit is true and fair, and that they conform to the token specifications.

CRX CarbonBank

CRX CarbonBank is an online platform that allows sellers of carbon credits to contact and meet with buyers, in order to retire the credits or trade them on the secondary markets. It is a listing platform that allows buyers to find their ideal credits, while facilitating online settlements and over-the-counter transactions. CRX CarbonBank is an entity wholly owned and operated by SGBC Member Climate Resources Exchange International Pte Ltd, a carbon asset management consultancy based in Singapore. Sellers are held responsible for the accuracy and completeness of the descriptions and terms of their listings posted on the platform.

Membership is mandatory for companies and investors to participate on the CRX Carbon Bank platform, with a questionnaire given to potential members for the platform to conduct their 'know-your client' check. There is also a nominal non-refundable annual membership fee of SGD$1,000. Though prices of the credits are not available publicly, the seller and buyer will enter into a trade agreement with the platform when conducting a transaction, where the platform will charge a fixed transaction fee of 5 percent on the contractual price of the transaction.

Climate Impact X

Climate Impact X is a global exchange and marketplace providing the liquidity of high-quality standardised carbon credits, alongside premium, project-specific credits. The platform is backed by DBS Bank, the Singapore Exchange (SGX), Standard Chartered and Temasek. It consists of three components - the Exchange, the Project Marketplace and Auctions. The Exchange, which is a platform for buying and selling standardised contracts backed by eligible credits, will facilitate the sale of large-scale, high-quality carbon credits through standardised contracts to multinational corporations and institutional investors, with such contracts enabling the pooling of a high volume of credits across multiple projects that meet quality requirements. On the other hand, the Project Marketplace enables companies to purchase carbon credits directly from curated natural climate solutions (NCS) projects that deliver carbon offset credits through the protection and restoration of forests, wetlands and mangroves. Auctions bridges groups of qualified buyers to bid for selected carbon credit projects and portfolios of projects and is well-suited to facilitate larger-scale transactions of carbon credits.

The pricing of the carbon credits are indicative and not representative of real data. Climate Impact X is the world's first carbon exchange and marketplace to use satellite monitoring, machine learning and blockchain technology to enhance the transparency, integrity and quality of carbon credits featured on the platform. Finally, the platform will first focus on accelerating the market for Natural Climate Solutions in Singapore and the Asia-Pacific region, given the various benefits of such projects.

On 16 March 2022, CIX officially launched the Project Marketplace digital platform for businesses and carbon project suppliers to list, discover, compare, buy and retire quality carbon credits. The Singapore-based platform aims to accelerate the corporate sector's ability to take climate action through the provision of verified carbon projects.

Project Marketplace currently offers credits from nature-based projects, with the aim of expanding into other credits later in the year. One such project on the platform is the Tambopata-Bahuaja Biodiversity Reserve in Peru. The project creates an economic buffer zone around a 573,299-hectare forest that is home to 30 threatened species including the Giant Otter, Blue-Headed Macaw and

Giant Armadillo. It also helps smallholder farmers transition to sustainable cocoa production, restores degraded land and helps relieve deforestation pressures by working with local and indigenous communities.

The marketplace will help businesses participate in the voluntary carbon market by actively lowering barriers for companies to easily access quality carbon credits.

OVERSEAS CARBON MARKETS

Around the world, there are various carbon credit markets, a few of which will be examined below, including the European Union's (EU) Emission Trading System (ETS), the United Nations' (UN) Clean Development Mechanism (CDM) and Carbon TradeXchange.

European Union's Emission Trading System

The European Union (EU) established the Emission Trading System (ETS) in 2005, which is the bloc's flagship policy tool to cut greenhouse gas emissions. As the world's largest cap-and-trade market scheme, the EU imposes annually declining caps on the number of emissions for around 12,000 installations owned by manufacturers and utilities, as well as airlines. Companies that emit less emissions can sell their unused permits to heavier emitters, which gives them a financial incentive to become more environmentally friendly and sustainable. Moreover, such allowances are traded through an auction system and sold to the highest bidder, which makes it even more expensive for heavy emitters who have to purchase additional credits.

As the price of these permits rises, it becomes increasingly more expensive to pollute, and this forces these industries to look for cleaner ways to power their operations. The price of carbon in the EU has doubled over the past two years, with benchmark emission permits hitting a record of 56.9 euros per metric ton in May 2021, amidst an acceleration of Europe's climate actions and ambitions, which in turn attracted financial investors. The effectiveness of the ETS is reflected in how emissions from participating power plants and factories have dropped by 35 percent since the launch of the system, which is a greater decrease compared to other sectors not covered under the scheme.

United Nation's Clean Development Mechanism

As the first and largest carbon offsetting market, the United Nation's Clean Development Mechanism (CDM) allows industrialised countries with a greenhouse gas emission reduction commitment to invest in projects that reduce emissions in developing countries (as an alternative to more expensive emissions reductions in their own countries). Certified Emission Reductions (CERs) are a type of emission unit issued by the CDM Executive Board for emission reductions achieved by CDM projects and verified by a designated operational entity under the rules of the Kyoto Protocol. These CERs, each of which are equivalent to one ton of CO2, can be traded, sold and used by industrialised countries to meet part of their emission reduction targets. When a CER is utilised, it is retired from the CDM register and cannot be traded further, which helps prevent double-counting of emission reductions. The scheme has certified over 2 billion CERs that reflect 2 billion tonnes of CO2 reduction or avoidance through more than 8,100 projects in 111 countries.

However, even though the United Nations had established oversight bodies for the CDM, many believed that these bodies had failed to act as an independent and neutral referee with the capability to guarantee the environmental integrity of its credits. Moreover, concerns surrounded

the environmental integrity of credits generated from low-cost gas-reduction projects in Asia that accounted for about 45 percent of CERs, causing the European Union to ban their use for compliance in its Emissions Trading System in 2013. Given that the EU drove majority of the demand for CERs, and with no clear future for CDM credits as the necessary market trust has diminished, their prices have fallen and remained below US$1 for close to a decade. While a restructuring of the global CDM market is essential and the process to address the shortcomings of the original scheme has only just started, countries around the world continue to be unsure about how to treat the millions of old credits created.

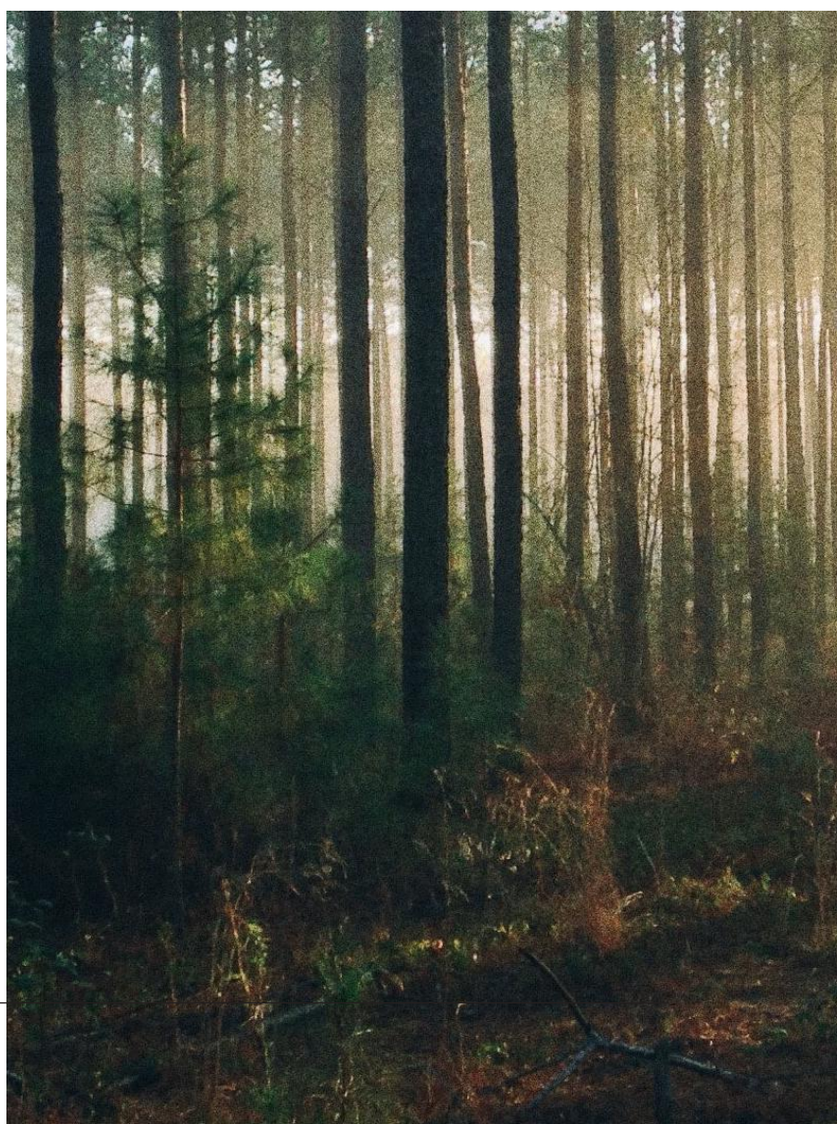
Carbon TradeXchange

The Carbon TradeXchange (CTX) is a UK-based electronic exchange for trading voluntary carbon credits/offsets, operated by Environmental Markets Services Ltd, a UK-based subsidiary of Global Environmental Markets. Carbon credits traded include those from all major credit standards and methodologies, such as the Gold Standard, Verified Carbon Standard and UN CDM. There are also pre-vetted, clearly indicated projects that fully meet the ICAO-CORSIA criteria.

CTX enables buyers and sellers to trade cash for carbon credits in real time, with prices driven by market supply and demand. Carbon credits range from under USD$1 to USD$20, with the website offering a breakdown of the credits listed on their platform, which is a rare sign of relative price transparency amongst the various voluntary carbon markets. The information showed that 34 percent of projects generated credits priced below USD$1.50, while 29 percent of credits were priced above USD$5. Membership and completion of an online application form is required for those planning to buy or sell carbon credits on the exchange, which costs USD$995 per annum with annual renewal fees of USD$495.

THE ROLE OF CARBON CREDITS IN CORPORATE SUSTAINABILITY

More companies and organisations have been adopting climate mitigation and emissions targets in recent years, with increased publicity and interest surrounding net-zero targets and carbon neutrality, such as the Net Zero Buildings Commitment put forth by the World Green Building Council (WorldGBC). Research has found that 482 companies accounting for an estimated annual revenue of US$16 trillion have adopted some kind of neutrality target as of April 2021, with carbon credits and offsets being a vital constituent of their climate change mitigation stratagem. Another paper found that 27 percent of buyers who utilised voluntary carbon credits did so to achieve corporate social responsibility, while another 25 percent did so to highlight their leading role in addressing and acting on climate concerns in the industry.

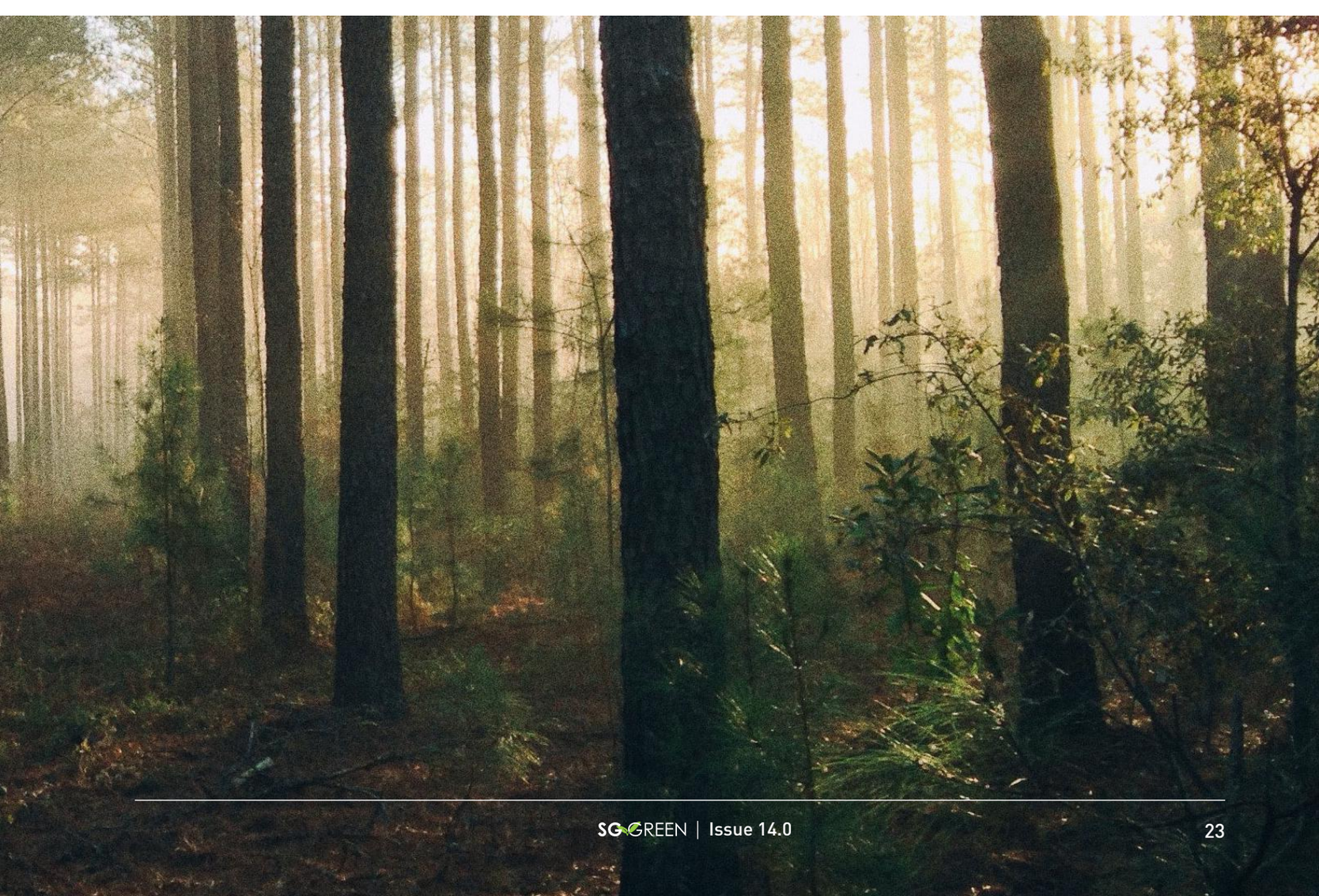


Understanding Carbon Credits – Part 2

Carbon credits have different roles and significance to various industries. For industries like the information and communication technology (ICT) or the financial sectors, the ease of reducing carbon and greenhouse gas emissions would mean that carbon credits and offsets would be a provisional and temporary solution for businesses and organisations in their journey to decarbonise their operations. However, some industries are unfortunately 'much more strongly linked to greenhouse gas (GHG) emissions, either because they feature very high GHG emissions per value added and have still a very long path towards decarbonization, or because zero emission alternatives are just not commercially available and, in some cases, not technically feasible. These industries include the energy sector, companies involved in steel and cement production, as well as the aviation industry. It seems for companies in these industries, the use of offsets seems to be the only viable option to achieve carbon or climate neutrality.

However, many of the carbon and climate targets set by companies currently lack much transparency, accuracy and certainty. Despite assurances that carbon credits will be used to offset residual emissions that cannot be reduced, there continues to be little information publicised publicly on the steps taken by companies to reduce their own emissions, and the role of carbon credits and offsets in achieving net-zero and carbon targets. The same research from the preceding paragraph found that while 216 companies explicitly intend to offset some remaining emissions and a small minority of 36 companies have explicitly excluded the use of offsets, the role of offsets and credits is not clear for the remaining 230 companies analysed.

Despite these concerns surrounding the role and use of carbon credits and offsets, there are some suggestions for organisations to improve the transparency of their sustainability journey.



Firstly, companies need to take a comprehensive look at their climate/ sustainability targets and actions. To illustrate, climate actions undertaken by companies can be placed under three main categories: reduction; reporting; offsetting of hard-to-abate GHG emissions. A report from McKinsey Insights highlights how a credible corporate climate commitment begins with setting an emissions reduction target that covers both a company's direct and indirect greenhouse gas emissions, where the target 'needs to be in line with the level of decarbonisation required to limit global warming to well below 2 degrees Celsius above preindustrial levels at a minimum. By doing calculations for the companies' current and estimated future climate impact and carbon emissions, companies will be encouraged to move on to the second and most important step of avoiding and reducing their own emissions.

Secondly, there needs to be an understanding of the role carbon credits can and should play in corporate climate strategies. While carbon offsets play an important complementary role, direct emissions reductions must be the main focus of companies as they move to mitigate climate change, with the most ideal outcome of net-zero in terms of energy and emissions. This is especially given that company emissions cannot simply be balanced out by purchasing carbon credits as

emissions remain in the atmosphere for a much longer period of time compared to the permanent sequestration and removal of carbon emissions by carbon projects and credits. Therefore, the best way to lower climate impact is to reduce the companies' emissions.

Finally, in order to address the potential issue of voluntary carbon credits being utilised as an 'easy' way out of their responsibility to act on climate change and an alternative to establishing carbon mitigation efforts for their own operations, there is a need to clearly define and delineate the role of carbon credits in corporate climate strategies. One suggestion would be to 'make the use of carbon credits conditional on the adoption of science-based targets set for individual companies.

Overall, there is a lot of potential that carbon credits have in terms of helping companies transit to a lower-carbon or net-zero future, especially for those who find it extremely difficult or technically impossible to significantly lower their emissions. In order to ensure that one is maximising the potential of carbon credits while ensuring that they are effectively mitigating and addressing climate change, companies have to be careful and transparent in their use of carbon credits and offsets.

COMPLEMENTING CORPORATE CLIMATE ACTION

Carbon offsets and credits can and should play a complementary role to more direct climate and carbon actions, given their benefits highlighted above. One important role also involves high prices of credits in the (hopefully near) future helping to incentivise organisations to adopt greener and more sustainable alternatives and technology.

Moreover, there have been various market responses to address the costs and disadvantages of carbon credits and voluntary carbon markets highlighted above, including improvements to verification methodologies, criteria to prevent over-estimation of emission reductions and reconsidering the eligibility of certain project types. There have also been efforts to create more transparent and reliable markets with high-quality carbon offset credits with the use of cutting-edge technology. The positive impact and role of carbon offsets and credits is set to be amplified to help address climate change and enable immediate reductions of carbon emissions.

All sources can be found on the SG Green webpage.

BRIDGING THE REAL ESTATE GREEN FINANCING GAP

As the climate crisis rages on, countries around the world are committing to "net-zero" goals to keep the worst effects of global warming at bay. A large part of meeting these targets hinges on the very buildings that we live and work in.

Buildings represent 38 percent of global greenhouse gas emissions, including 28 percent in operational emissions and 10 percent in building materials and construction, according to the United Nations (UN) Environment Programme's 2020 Global Status Report for Buildings and Construction[1].

Furthermore, the world's urban population is set to double by 2050 where nearly seven in 10 people will live in cities[2]. This is expected to double floor space additions of buildings, especially in developing regions like Asia Pacific – where the addition of 1.2 billion new urban residents[3] would lead to further rising emissions, should nothing be done to reduce the carbon footprint of buildings.

But while investments into improving the energy efficiency of buildings have grown – increasing by 3 percent to US$152 billion in 2019 from the year before – it is still a small fraction of the US$5.8 trillion spent in the building and construction sector[4].

To put this into perspective, for every US$1 spent on energy efficiency in the building sector, US$37 is spent on conventional construction approaches.

According to the International Energy Agency (IEA), global investments in energy projects need to more than double from current levels by 2030 in order to meet net-zero emission goals by 2050. Meanwhile, a study by Boston Consulting Group found that the volume of climate financing will have to grow by roughly five to eight times the current amounts issued over the next three decades[5].

To close the green building investment gap, there is a need to leverage green finance to accelerate the development of more energy-efficient buildings.

Resources:

[1] https://globalabc.org/sites/default/files/inline-files/2020%20Buildings%20GSR_FULL%20REPORT.pdf

[2] https://www.worldbank.org/en/topic/urbandevelopment/overview#1

[3] https://www.unescap.org/publications/future-asian-and-pacific-cities-2019-transformative-pathways-towards-sustainable-urban

[4] https://globalabc.org/sites/default/files/inline-files/2020%20Buildings%20GSR_FULL%20REPORT.pdf

[5] https://www.mas.gov.sg/news/speeches/2021/what-we-need-to-do-to-make-green-finance-work

GREEN FINANCE BURGEONING IN ASIA

The first observation is hopeful: things are improving.

Based on data from the Climate Bonds Initiative, green bond issuances last year might outstrip that of 2020, with US$219.7 billion issued for the first half of the year compared to the US$290.1 billion issued in 2020. Of the green issues issued in the first half of last year, more than a quarter, or US$51.9 billion, were issued from Asia Pacific, just shy of the US$53.2 billion issued for the entire year of 2020[6].

In Singapore, green finance forms a part of Singapore's Green Plan 2030 – the whole-of-nation movement to advance Singapore's national agenda on sustainable development – which includes greening 80 percent of buildings here by 2030[7]. Last September, Minister of Finance Lawrence Wong also announced the setting up of the Green Bonds Programme Office under the Ministry of Finance, which will work with statutory boards and develop a framework for green bond programmes[8].

At DBS, we have taken an active role in catalysing green finance both here and in the region. We have made good progress, committing S$12.4 billion of sustainability-linked loans and S$6.9 billion of green loans in 2021. Cumulatively we have concluded S$39.4 billion in sustainable financing transactions, against our sustainable financing target of S$50 billion by 2024. This was also the second consecutive year that we topped the Asia Pacific (ex-Japan) league table for arranging green and sustainability-linked loans.

On the built environment front, we have observed that green finance products are increasingly being used by a wider spectrum of organisations and not just real estate companies. We now see demand for financing towards green buildings from universities, logistics companies and data centres, to building material producers and contractors.

For instance, DBS was the sole lead manager and bookrunner for the National University of Singapore's inaugural green bond issuance in 2020, where it raised S$300 million to be channelled towards green projects such as green buildings and precincts as well as renewable energy and energy efficiency infrastructure[9].

© NEA Waste Management Facility shot (sourced from NEA)

But we can and should do more – especially when it comes to thinking more creatively about how to use green finance in different ways.

As green finance becomes more mainstream, there will also be a need to develop innovative ways to meet the varying needs of customers. A customer with dedicated capex needs for a certified green building could simply need a green loan. But should they be after a holistic set of changes aiming for a longer-term vision to reach net-zero emissions, a key performance indicator-linked structure would be more suitable.

In 2019, we worked with real estate company City Developments (CDL) to pioneer a three-year revolving credit facility. Under the facility, the company will be eligible for a discount on the interest rate of the loan when it achieves sustainability-related performance targets mutually agreed on with DBS – on innovations that contribute positively to the UN's Sustainable Development Goals[10].

Resources:

[6] https://sbr.com.sg/financial-services-markets-investing/exclusive-in-focus/green-finance-in-apac-grow-amidst-data-and-disclosure-gaps

[7] https://www.greenplan.gov.sg/key-focus-areas/key-targets

[8] https://www.straitstimes.com/business/banking/new-office-set-up-to-accelerate-green-bond-efforts-lawrence-wong

[9] NUS raises S$300 million in its inaugural green bond issuance

[10] CDL and DBS set benchmark on innovation focused financing for sustainable development

FROM CUTTING OPERATIONAL CARBON TO GREENING THE GRID

The next evolution of the green financing strategy involves expanding green considerations when it comes to real estate.

Green financing will increasingly consider the lifecycle impact of a building. This means not just financing new buildings, but also the retrofitting of our existing stock of buildings. To this end, we expect more action to be taken on embodied carbon, the emissions arising from the selection and use of building materials.

But doing so will mean tackling many difficult questions.

For instance, how can we increase the adoption of green building materials such that the premiums attached to their use will come down?

We use a lot of steel, concrete, and glass in Singapore. Can they be produced with fewer natural resources? In 2019, buildings accounted for 55 percent of global electricity use. How can we green our grid to then green Singapore's real estate?

Developers, asset owners and investors together with financial institutions and governments will need to tackle these difficult questions together.

And in so doing, they will beat a new path towards sustainability, help close the green financing gap, and build more sustainable urban landscapes for all.

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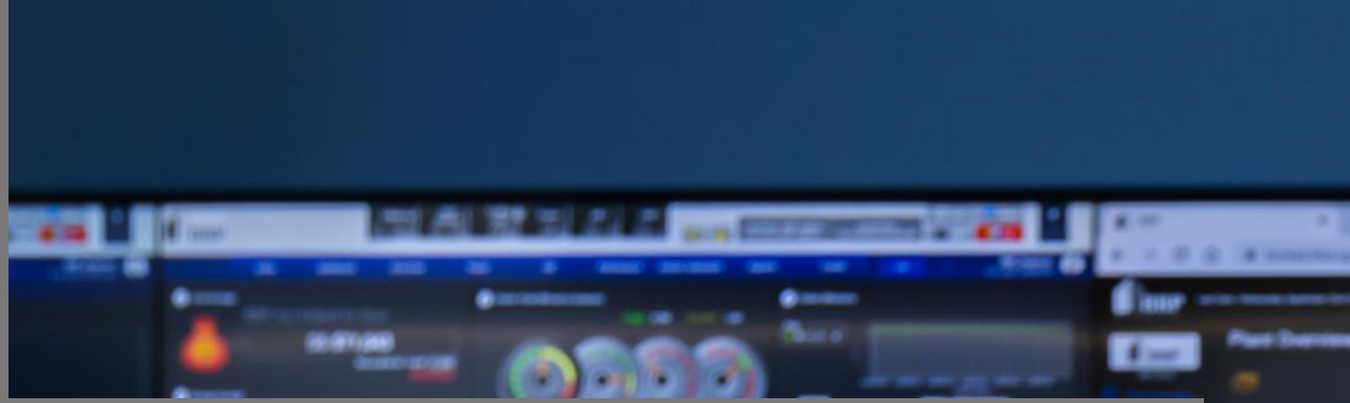
Head of Sustainability, Institutional Banking Group
DBS Bank



A REVOLUTIONARY APPROACH TO ENERGY EFFICIENCY

A decade ago, optimising energy efficiency for buildings was a process that involved long-term payback and high audit fees. Many companies found it hard to justify putting in large upfront investments where savings and returns were not guaranteed. But things changed when energy performance contracting firms such as BBP came into the market, offering asset owners energy savings with minimal to zero investment costs.

A Revolutionary Approach to Energy Efficiency

Since then, companies like LumiLeds, Hewlett Packard, Resorts World Sentosa have achieved up to 40 percent of cost and energy usage savings – made possible with patented HVAC optimisation technologies, proprietary software algorithms, Internet of Things (IoT) and machine learning.

BBP's unique business model allows customers to optimise their existing chiller plant without changing out their equipment, revolutionising the energy efficiency industry across Asia. This model also allows customers to pay via actual achieved savings that are independently verified by 3rd party energy auditor on an annual basis.

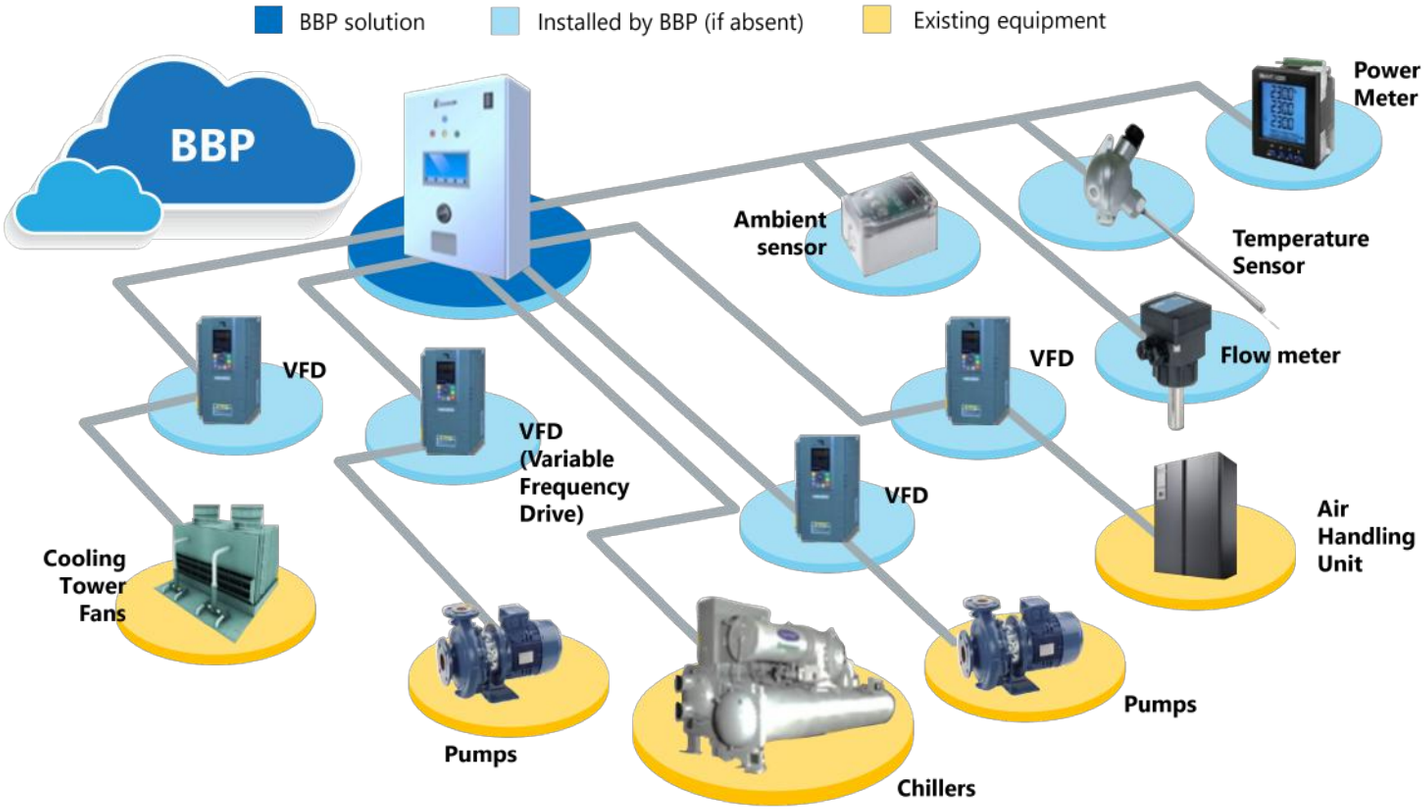


Figure 1. BBP's holistic solution with sensors, controls, programming, software, and asset management

SUCCESS AMONG LOCAL COMPANIES

Lumileds Singapore

When Lumileds set out to improve the overall operational efficiency of the plant in 2014, its facilities that operate round the clock across gross floor area of 41,716 m2 is cooled by a 14-year-old chiller plant. One possible approach was to replace the existing chiller plant at significant expense to achieve better chiller plant efficiency. However, that will incur significant expense for Lumileds.

At that juncture, Lumileds was offered an alternative to deliver the desired level of optimisation without upfront investment or equipment replacement. The solution includes installation of a comprehensive suite of intelligence and controllers as well as a dedicated data acquisition interface to deliver best in class optimisation. The data obtained from installed sensors and controllers are then connected to a cloud-based central system, which enables Lumileds Singapore as well as the BBP command centre to access remote monitoring, auto reporting and other features to improve day-to-day operations.

As a result of all these efforts, Lumileds Singapore achieved a 27 percent improvement in the chiller plant's efficiency, without any disruption to operations at the plant. With sustained savings of 30 percent of initial energy consumption, Lumileds Singapore was able to realise a reduction of 2.9 GWh in annual energy usage.

Lumileds Singapore became the first and only manufacturing plant in Singapore to receive BCA (Building Construction Authority)'s Green Mark Platinum Award for existing buildings in 2015, achieving NEA (National Environment Agency)'s mandatory Minimum Energy Efficiency Standard (MEES) even before it was introduced locally. Seven years on, Lumileds continue to enjoy improved savings with BBP's support.

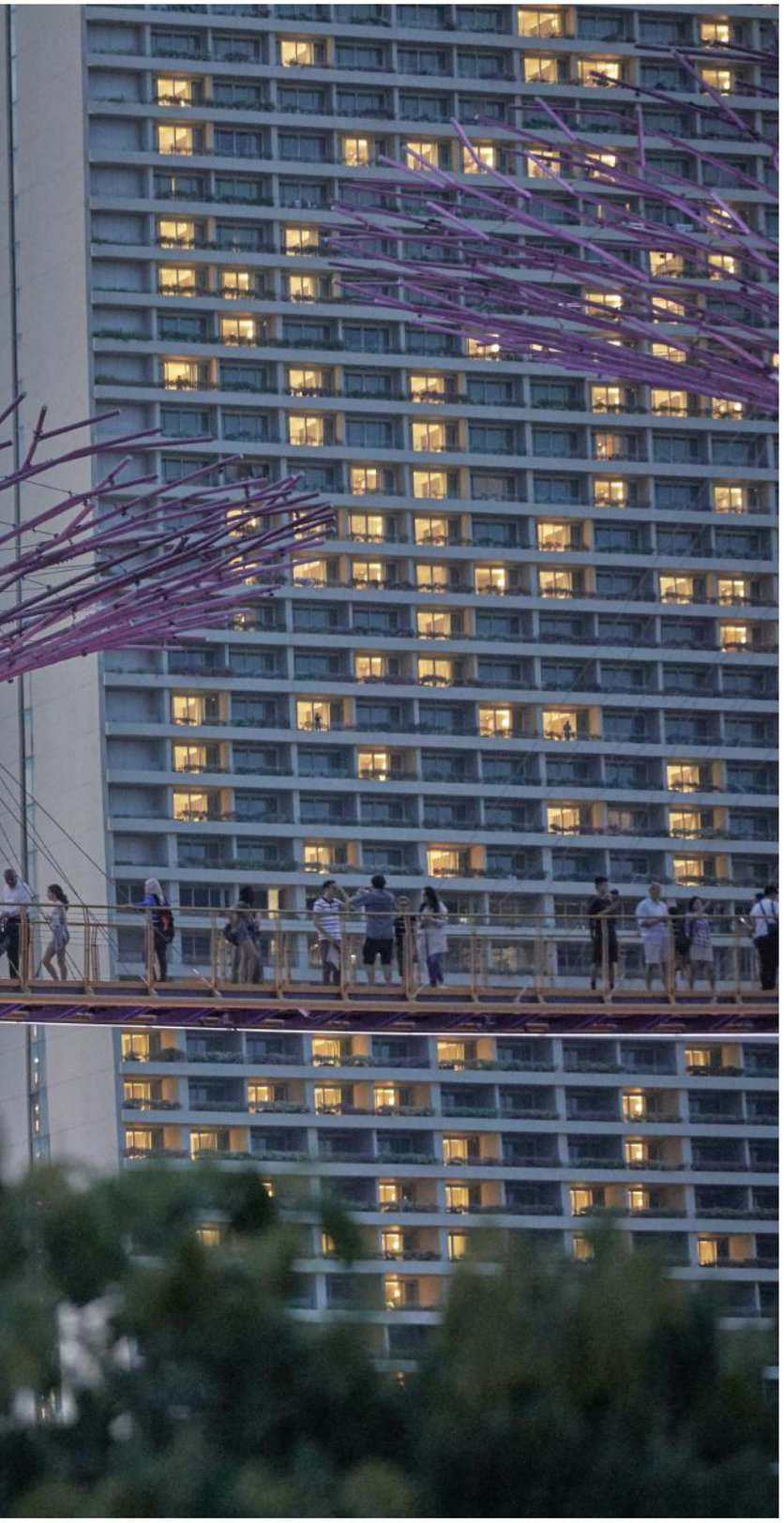
Resorts World Sentosa District Cooling Plant

The District Cooling Plant (DCP) managed by Resorts World Sentosa (RWS) supplies chilled water to the entire RWS property including the casino, hotels and Universal Studios Singapore for cooling purposes. Despite having undergone equipment upgrading as well as performance improvement, RWS engaged BBP in 2015 to explore and evaluate further energy efficiency improvement opportunities for its DCP.

RWS and BBP worked closely to customise and install a chiller optimisation solution, keeping in mind the critical operation of a district cooling plant. The installed system optimised the energy use of chillers, pumps and cooling tower fans using an algorithm-based dynamic control to achieve and maintain improved plant efficiency across varying load profiles without affecting the comfort of occupants and visitors. It also allows for continuous improvement through remote monitoring, daily performance reports and data analytics that led to immediate corrective actions whenever necessary.

The successful implementation of this optimisation project resulted in a 10 percent improvement in plant efficiency, or 5.5 GWh of annual energy savings without disruption to the operations of the plant. The DCP and BBP were jointly recognised in the Best Practices (Honourable Mention) category in the 2017 NEEC ceremony organised by NEA (National Environment Agency).

For both Lumileds and RWS, BBP's solutions helped create a strong pipeline of usage and equipment data independent of their existing building management system. The harvested data provided valuable insights for data analytics, predictive maintenance, and further energy optimisation. These solutions do not discriminate type and age of chiller plant and aims to provide building owners an accessible option in the market to reduce their carbon footprint.



SMARTER AND GREENER BUILDINGS FOR SUSTAINABLE FUTURE

Global energy usage in buildings makes up over one-third of global final energy consumption and nearly 40 percent of total direct and indirect carbon dioxide emissions. Cooling specifically, which accounts up to 40 percent of energy usage in buildings, will be an area of opportunity which businesses can tap on to address their sustainability goals.

BBP's holistic offerings is intended to set customers up for guaranteed long term success in today's world where energy usage in buildings continues to rise. Since its founding, BBP placed strong emphasis on developing its analytics and machine learning capabilities to help building owners address their operational challenges. At present BBP offers fault detection and diagnosis through its advanced analytics platform, BBP Analyse+, which helps buildings to reduce false alarms, operational anomalies and extends equipment life cycle. All these on top of existing chiller plant energy efficiency optimisation.

As smart buildings evolve, overall building management demands will shift from reaction problem solving to predictive maintenance. In recent years, experts have pointed out that the concept of achieving a fixed gold standard efficiency is fading away as buildings look for solutions and platforms to anticipate real time impact and risks. In that future, it is a world of endless possibilities where energy efficiency will be delivered in ways we have not seen or experienced. And till then – companies can look to kickstart their decarbonisation journey with BBP.

Contributed by:
BBP

TRANSITIONING TO A CIRCULAR BUILT ENVIRONMENT IN SINGAPORE

More than two-thirds of the world's population will live in urban areas by 2050. Increasing urbanisation leads to an increase in resource consumption, approximately half of which is currently due to the construction industry. In Singapore, buildings account for 20 percent of our carbon emissions and as a small island state with limited natural resources, it is imperative that we keep our resources in use for as long as possible, extracting their maximum value.

A circular built environment allows for this to happen, with materials and resources in a closed cycle of extended use, reuse and recycling. This would reduce carbon emissions from building materials and the industry's impact on nature and biodiversity. The built environment's transition to circularity is hence key to tackling our current nature-climate emergency.

There are five business models that have been identified as enablers for this transition: resource recovery, product lifetime extension, circular supplies, sharing platforms and product as a service (Figure 1).

RESOURCE RECOVERY

Resource recovery is using waste from used products, resources and processes to make new raw materials and products. Singapore is adept at this business model, recycling nearly 100 percent of our construction and demolition waste, which makes up the largest percentage of our country's total waste produced . This has led to the development of new materials made from demolition waste, like recycled concrete aggregate. Even after incineration, material is being harvested to maximise resource recovery. For example, NEWSand is being developed from incinerated bottom ash for use in non-structural construction such as road base or sub-base materials.

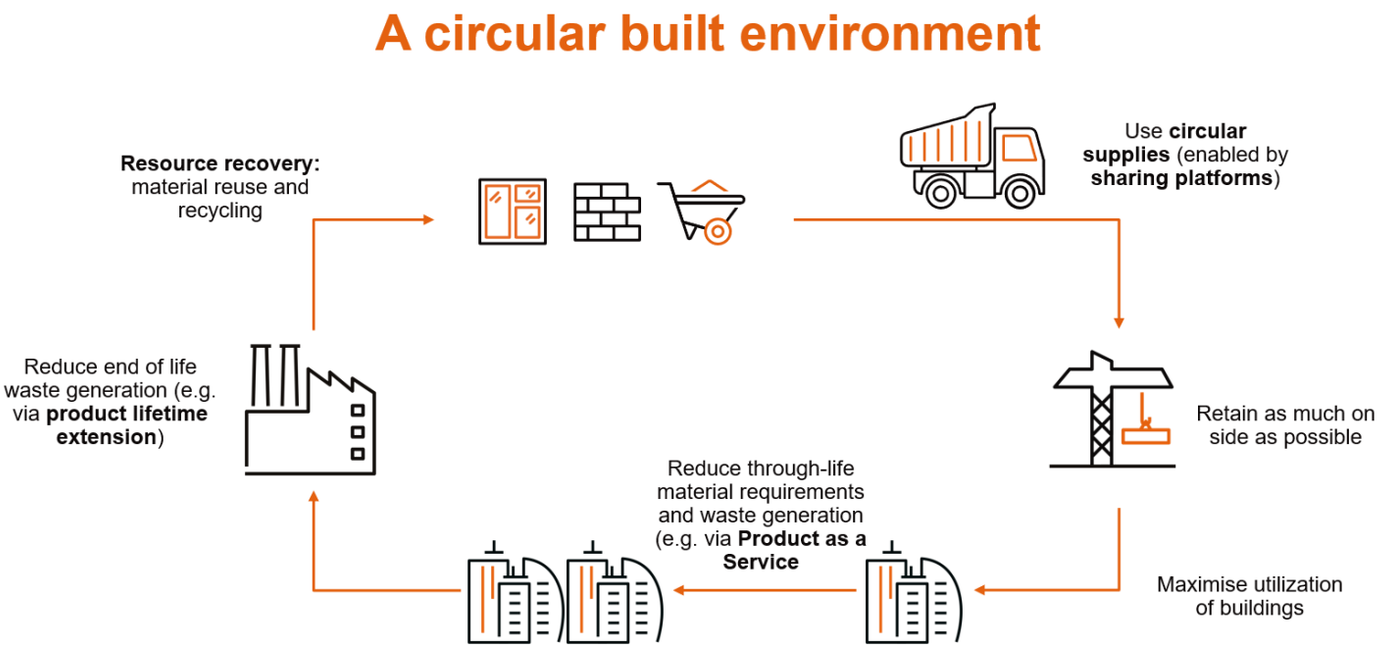


Figure 1: Five business models (in bold) of the circular built environment

PRODUCT LIFETIME EXTENSION

However, recycling materials is at the lower order of priority in the 10 Rs of Circularity (see Figure 2) as it does not maximise the residual value of materials. There needs to be a mindset shift from demolition to deconstruction. What materials can be salvaged and to do so, can materials and products be designed for disassembly? Singapore has rapid urban renewal, with buildings demolished before the end of their potential asset life. Buildings should be designed with adaptability in mind, such that they can go through multiple use cycles, encouraging refurbishment or asset repositioning, rather than premature demolition – even if demolition waste will be recycled.

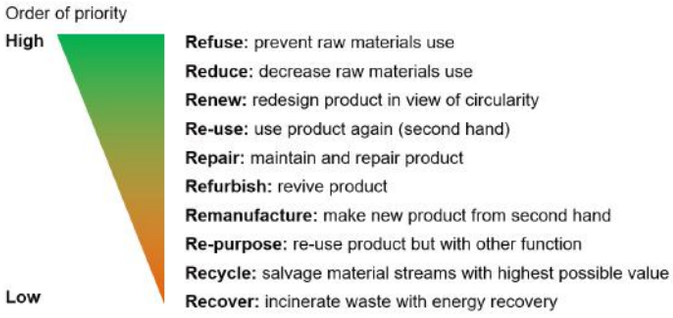
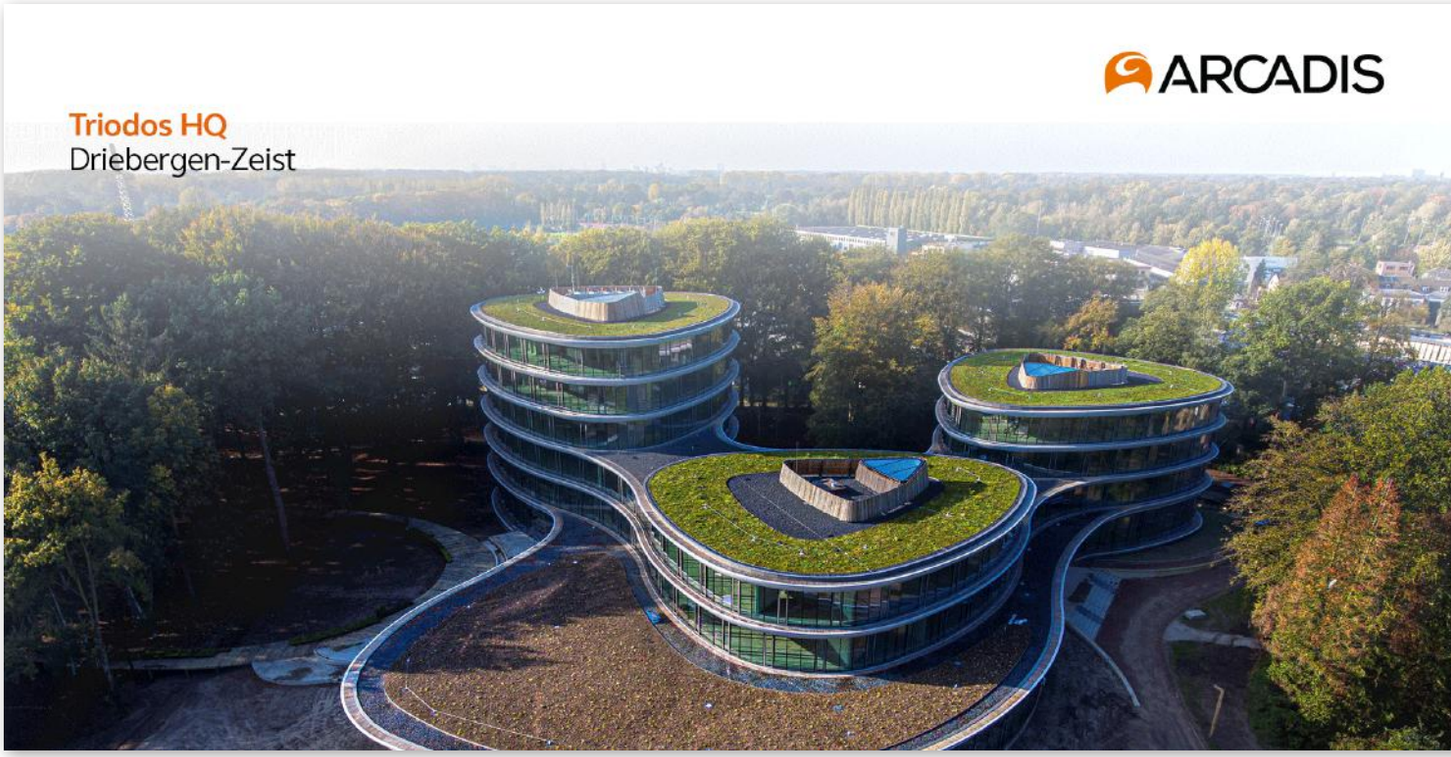


Figure 2: The 10 Rs of Circularity

In the Netherlands, Arcadis supported one such project: Triodos Bank is one of the world's first large-scale, 100 percent timber, reconstructable office buildings. Materials were selected and planned with reuse in mind, and as a building held together by screws, it is possible to dismantle the building without producing waste. Arcadis has also assisted our clients in the creation of material passports: a document that consists of a set of data on the circular potential of building materials, products and components, in turn supporting reversible design.

Smart maintenance, repairs, upgrades and renovation should be prioritized to avoid waste streams. If real estate investors update their business model to include residual material value and product streams, investing in buildings as material banks, there will be a shift towards maintenance and extending the residual value of their assets.



CIRCULAR SUPPLIES

The highest order of priority in the 10 Rs of circularity is refuse and reduce: the consumption of raw materials should be kept low. Materials that can be reused and recycled, or renewable materials that are bio-based or biodegradable, should be used instead.

In another Netherlands example, Arcadis, as the project manager for the design and construction of an international coach terminal in the Dutch village of Duivendrecht, introduced circularity principles through advice on the use of reusable materials. Through Arcadis' identification of a reusable material source via a power supplier, the final design was based around discarded wind-turbine blades, which have low recyclability and are typically disposed at landfills. The qualities of the wind-turbine blades make them very well suited as a canopy for the bus stops - hence this design solution was applied throughout the terminal, extending the lifespan of the blades by giving them a completely new function as a shelter for travelers.

In Singapore, the adoption rate of such circular supplies remains low. There is potential for demolition and deconstruction companies to become suppliers of materials that can be reused, refurbished, or repurposed, not just recycled. For recycled materials, there is an inter-agency Building Innovation Panel which expedites regulatory clearance for use of innovative materials. Nonetheless, life cycle thinking is still not widely used in the evaluation of material choices. More suppliers and vendors need to transparently disclose the sustainability performance of their products, for example, through an environmental product declaration or EPD, that communicates the product's environmental impact through Whole Building Life Cycle Assessment (LCA).

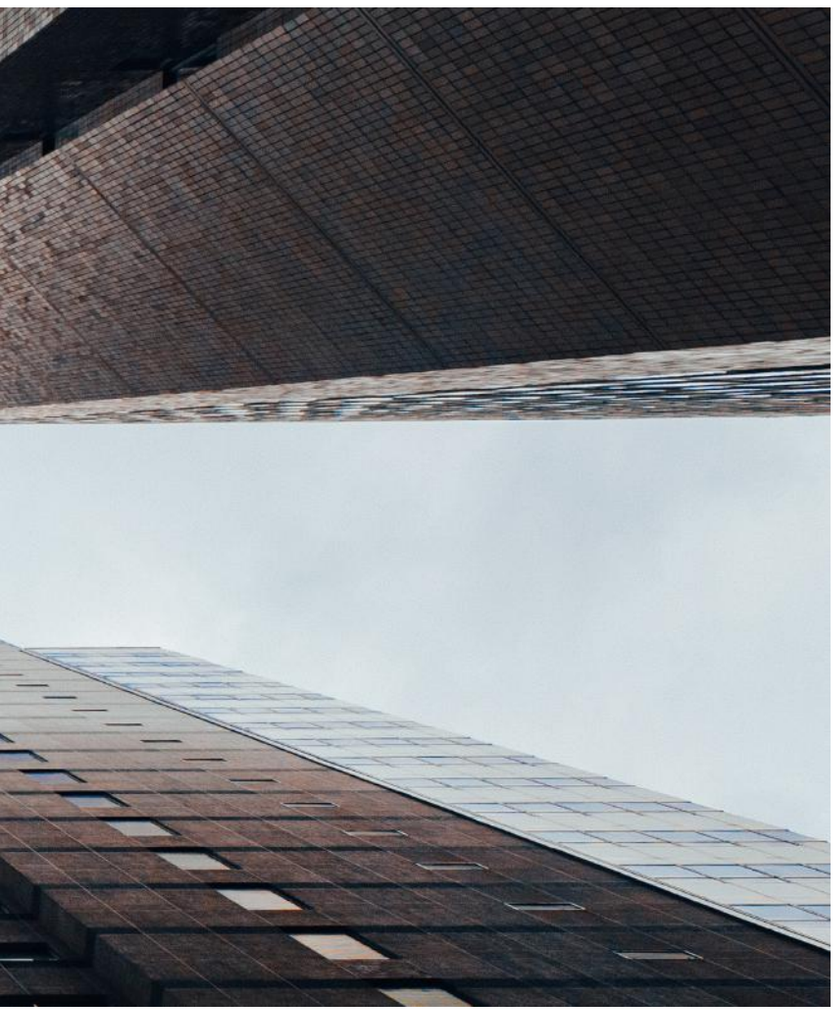
To elaborate, LCA is a methodology used to evaluate the sustainability of a building by finding out how a product will affect the environment from the extraction of raw materials to construction stage, use and demolition and disposal. Many green building certification schemes such as LEED, BREEAM and BCA's Green Mark are including LCA assessment credits in their evaluation.

In most green building certifications, Building LCA is combined with building Life Cycle Cost Analysis (LCCA) which is used to estimate the costs of owning a facility by anticipating spend profile for capital and through life costs over the building's lifespan including subsequent operational and disposal costs, to help design more sustainable buildings from an environmental and financial standpoint. It is therefore more beneficial to start the assessments at the design phase, where design alternatives could be analysed prior to design detailing and construction. Building onto our capabilities in LCCA, Arcadis can help clients in LCA reviews throughout the project life cycle from inception stage.

To this end, SGBC's Singapore Built Environment Embodied Carbon Pledge sets out an industry call to create demand for such disclosure, through encouraging the use of building materials with lower embodied carbon. Arcadis' quantity surveyors are also keen to expand our current service of providing insight on cost drivers, the estimated overall cost of a project, and the current state of the construction materials market, to include the cost of embodied carbon.

SHARING PLATFORMS

The creation of a sharing economy and co-creation through industrial symbiosis allows for waste materials or products of third parties to be used as



inputs for construction projects. The Jurong Island Circular Economy Study for example, has mapped out the water, energy and chemical waste flows on Jurong Island chemical park, and identified opportunities in the areas of clean energy use, water recycling and recovery, and the sustainable recovery and treatment of chemical waste. Similarly, for buildings, with sufficient disclosure of the circular potential of materials as aforementioned, sharing platforms can be set up to facilitate collaboration across the value chain. UK developer Grosvenor, for example, has a material re-use network where users can contribute or request for specific materials.

PRODUCT AS A SERVICE

This emerging business model allows for a company to deliver a service instead of a product and the client pays through a leasing formula or a repurchasing clause is established. As the ownership of the product is retained by the supplier, product obsolescence is disincentivized, thereby securing the residual value of materials. For example, Philips developed a lighting as a service business model where users pay per lux instead of per lamp and Mitsubishi offers elevators as a service. Building owners whose assets are furnished using these models benefit from an entire maintenance service as the service providers maintain the ownership of the set-up.

CONCLUSION

Transitioning to a circular built environment requires collaboration across the entire value chain, considering whole life cycle of buildings. Collaboration with peers is key. Industrial symbiosis for example, requires companies to identify potential partners who can share materials. In turn, common standards for circular materials need to be developed to allow companies to collaborate using a common language. Co-creation is also necessary. Through design thinking with sponsor users for example, companies can design solutions that are the most suitable to the use and users of a building. This can for example, help the industry move beyond adaptive reuse of only heritage buildings to retrofit and flexible space designs of other types of buildings, reducing the need for new buildings.

As Project Managers and Cost/Commercial Managers, Arcadis can help establish and manage the implementation of its clients' Circularity Development Plans, forming part of an overarching Project Management Plan. The Circularity Development Plan would inform the processes and KPIs applicable to the entire lifecycle of the built asset to assure the principles of circularity, from feasibility/concept stage, through to procurement of consultants, design, construction, maintenance and repositioning/disassembly/demolition.

Given the urgent need for future fit buildings, and the financial business case for this transition, we need to get the whole value chain together to identify obstacles, remove barriers and collectively take a bold leap forward in adapting circular principles.

Contributed by:
Pei Ya Boon, René Hillig
Arcadis


SEVEN FEATURES FOR HEALTHIER AND GREENER OFFICES
01
101%
02
6%
03
46 minutes
04
66%
05
06
7-12%
07

EXPERIENCING SUSTAINABILITY

The Sustainability Experience Centre @ Nanyang Polytechnic is a platform for the industry and community to access and experience sustainability.

Sustainability has permeated every aspect of society, and our educational institutions are actively greening their approaches to equip students with the necessary knowledge for the new normal. To further accentuate its focus on sustainability, local tertiary education institution Nanyang Polytechnic (NYP) worked with the Singapore Green Building Council (SGBC) and other industry partners to create a one-stop Sustainability Experience Centre to ease local companies into accessing sustainability action.

Nestled within the School of Engineering, the Sustainability Experience Centre @ NYP is quite unlike the other laboratories and equipment-laden facilities in its immediate vicinity. The Centre was designed and fitted out with a heavy emphasis on sustainability, blending a myriad of green building features and solutions into a user-centric facility inspired by co-working spaces. All building materials used in the Centre have a strong sustainability focus, most of them highly-rated products under the Singapore Green Building Product (SGBP) certification scheme administered by SGBC. The products work together with the other features to address all seven features of a green and healthy workplace put forth by the World Green Building Council's Better Places for People project, namely

- Biophilia & Views
- Good Lighting
- Noise & Acoustics
- Thermal Comfort
- Interior Layout & Active Design
- Indoor Air Quality
- Location & Access to Amenities

BIOPHILIA & VIEWS

Human beings are attuned to nature, and having access to greenery in the built environment goes towards reducing stress and enhancing cognitive function. At the back of the Centre is an extensive indoor green wall populated with a selected mix of plants that are able to thrive in indoor environments. This provides users with a ready view of greenery, effectively bringing the outdoors in.

GOOD LIGHTING

Exposure to natural daylight supports the human body's circadian rhythm and helps improve concentration. The Centre has generous access to natural daylight thanks to a double-volume ceiling with high window glazing, supplemented by LED lighting that are controlled by occupancy sensors to boost energy efficiency. The hues of paint used are also light and vibrant to promote a visually soothing environment, working with the deliberately-incorporated wide-open spaces to evoke a sense of roominess and spaciousness.

NOISE & ACOUSTICS

Excessive and jarring noise can be extremely counter-productive, especially in modern workplaces where hotdesking is more commonplace. The Centre is zoned into two distinct sections, with one most suited for group discussions while the other is more for task-oriented working. Two purpose-built collaborative pods are also constructed to allow users a more enclosed area to have discussions, while an acoustically-isolated phone pod allows users to take calls or have meetings with a little more privacy.

THERMAL COMFORT

We all have different thresholds when it comes to thermal comfort: one's sub-arctic temperature preferences may be too warm for others. Research has shown a 6 percent dip in staff performance if a workplace is too warm and 4 percent if it is too cold. The Centre's temperature is set at 24 degrees Celsius to provide comfort while not compromising on energy efficiency.

INTERIOR LAYOUT & ACTIVE DESIGN

Modelled after a co-working space, the Centre has a variety of workspaces for users to utilise. Other than the aforementioned discussion and phone pods, there are counter seats, workshop tables for break-outs as well as a sofa and bean bags for lounging. Most of the furniture in the Centre are procured with modularity in mind, allowing for different configurations to cater to almost every need and situation.

INDOOR AIR QUALITY

One of the topmost factors that impact occupant health and wellbeing, studies have shown that staff members tend to focus better in green, well-ventilated workplaces with low levels of volatile organic compounds (VOCs) and carbon dioxide. Almost all of the high-volume building materials (paint, laminates, etc.) used in the Centre bear the highest possible 4-ticks Leader rating under the SGBP certification scheme, meaning that the materials have been verified to be green and eco-friendly through the necessary documentation, test reports and proven benchmarks. The SGBP criteria also necessitates a low carbon footprint (backed up by the relevant reports) for products seeking the highest possible rating, ensuring that the products that eventually found use in the Centre have the lowest possible carbon footprint, especially for high impact materials.

Air-purifying plants like the Chinese evergreen and snake plants housed in low-carbon composite planters are also strategically placed throughout the Centre, helping to remove indoor air pollutants and enhance air quality.

The Centre's building management system also visualises key indoor environmental quality parameters into user-friendly graphics, allowing even non-technical personnel to make sense of the data and take the necessary remedy action if needed.

LOCATION & ACCESS TO AMENITIES

As the Centre is sited within the sprawling campus of Nanyang Polytechnic, it is well-connected to main roads, public transportation networks as well as park connectors. Healthy food options and other ancillary services are widely available within the campus itself, including exercise facilities to promote healthier lifestyles and practices.


old and collective action to tackle climate change, to keep Singapore a green and liveable home.
NANYANG
Energy Reset
Use cleaner energy and increase energy efficiency
een Economy
sustainability as a new
f jobs and growth
Resilient Future
Build up Singapore's climate resilience, including enhancing our food security


Smart Panel 3.0
EcoStruxure POWER

EXPERIENCING SUSTAINABILITY

True to its name, the Centre serves as a platform for organisations to showcase their green solutions. Schneider Electric, one of the key collaborators for the Centre, has its solutions for sustainable facilities management on full display. Augmented reality is tapped for instant diagnosis, and when coupled with contactless and predictive maintenance, the overall power efficiency of a venue is significantly improved. This helps SMEs operate more sustainably and enhances the productivity of maintenance crew, as repairs and rectifications can reliably predicted and preventive maintenance be made ahead of time. NYP's School of Engineering's students, especially from the Diploma in Electronic and Computer Engineering, will be further trained to integrate multiple systems and devices to collect and analyse relevant data, becoming a vital talent source as demand for such solutions grow.

Another focus at the centre is the finding of solutions to optimise power usage and conserve energy. For example, with deft application of automation and sensors, lights can be activated only in areas where needed. Data usage patterns can also be analysed in real-time. According to e2Singapore, occupancy sensors for lighting controls can result in at least 50 percent energy savings after implementation at workplaces. Implementing such energy efficient measures helps SMEs reduce operating costs and become more competitive.

Smaller-scale, more immediate green solutions are also on display at the Centre. These include a powerful bladeless hand dryer by Dyson that is energy efficient with high efficacy in moisture removal, as well as an atmospheric water dispenser that condenses ambient water vapour into potable drinking water. More of such solutions will be progressively added to the Centre to raise awareness and accessibility.

Along with hosting visits and learning journeys for visitors to experience sustainability first hand, the Sustainability Experience Centre @ NYP will also be conducting regular workshops to help SMEs better analyse, identify and adopt green solutions.

SGBC President Ar. Tang Kok Thye is confident that the Centre will help inspire stakeholders downstream to embark on their own sustainability endeavours. "Going green is not just the work of the building and construction industry, everyone is a stakeholder and beneficiary of a greener, healthier built environment. By putting together such a showcase of proven sustainability solutions for students and industry to learn from, we will be able to move the needle towards greater adoption and advance the environment that we live, work and learn in to one that is better for not just ourselves but for the next generation and beyond."


SUSTAINABILITY EXPERIENCE CENTRE
NANYANG
416.36 V
415.33 V
411.14 V
0.03 A
0.09 A
0.04 A
0.02 kW
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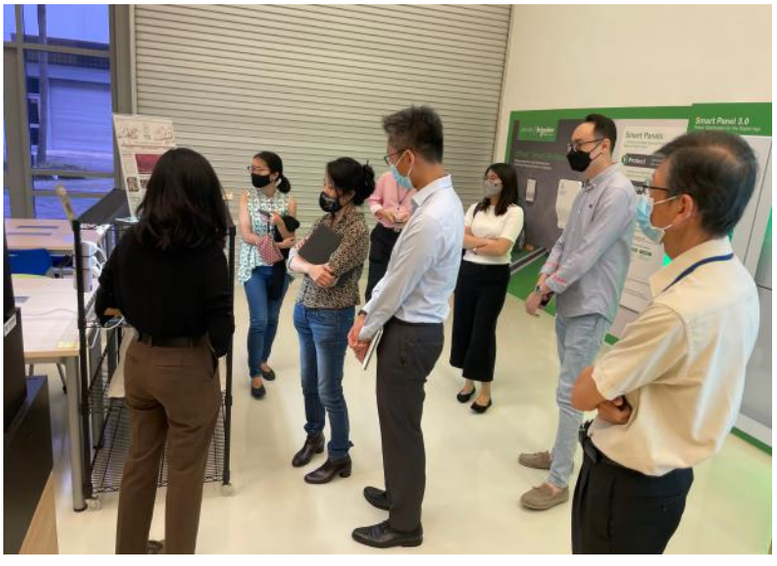
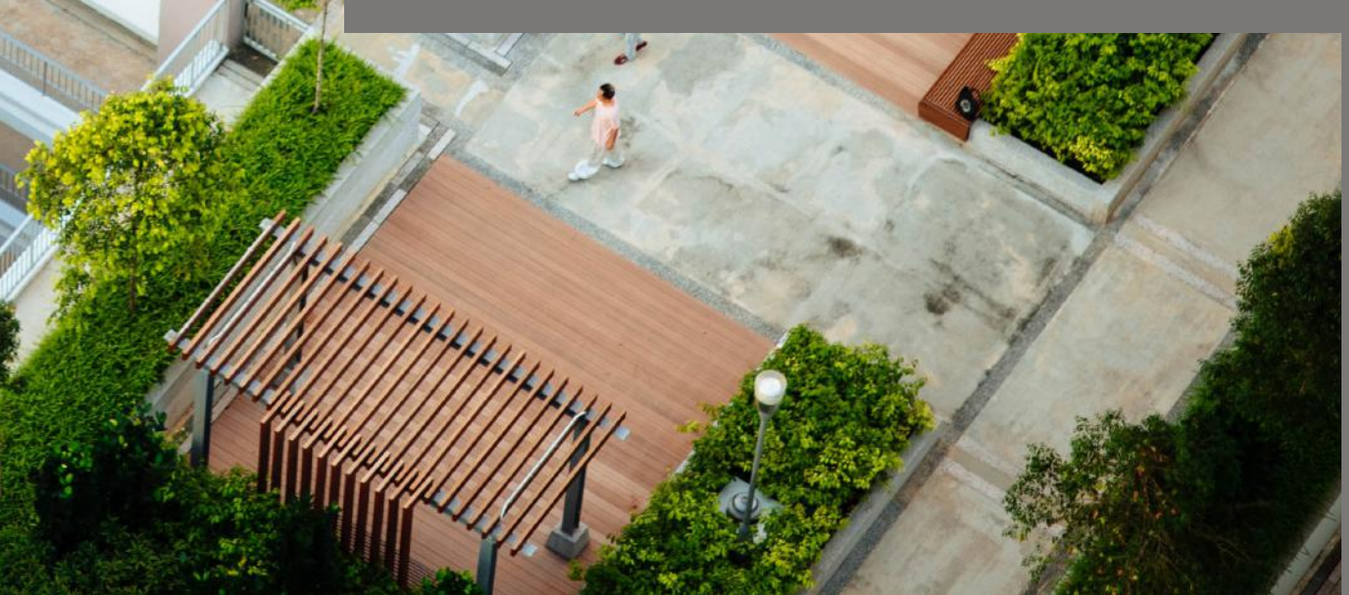


GREEN FINANCING: AN ENGINEERING PERSPECTIVE

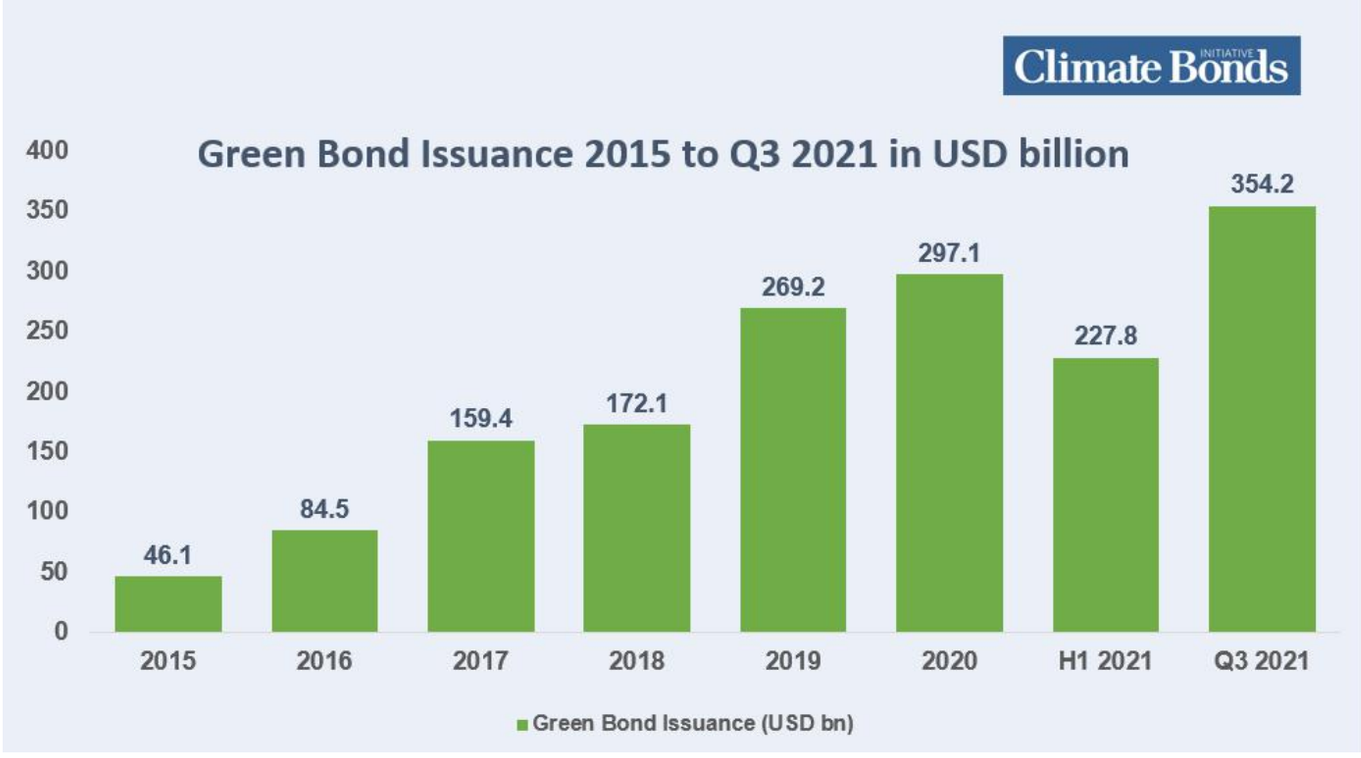
Green financing has become quite a buzzed word recently. In his Budget 2022 speech on 18th February 2022, Singapore Finance Minister Lawrence Wong highlighted that "green finance is one the fastest growing segments in the financial services sector". "The government is looking at positioning Singapore as the green finance hub in the region", he had said earlier at the CNBC Evolve Global Summit in June 2021. But is green financing a topic of interest only for bankers, financiers, and investors? What role does the engineer play and how can engineers, architects and consultants exploit the opportunities under green finance for sustainable and green buildings?



Let's first look at what exactly is green financing and how it all works. Green financing can be defined as any form of structured financial product or service designed to ensure sustainable environmental outcome that can help mitigate or adapt to the adverse effect of climate change. It can be viewed as a way of meeting the needs of environmentalism and capitalism simultaneously. Earlier this year, a new analysis from McKinsey & Co. estimated that the investment in new infrastructure and systems needed to meet international climate goals by 2050 could be $9.2 trillion a year. While the environmentalist is looking forward to this fund being mobilised as soon as possible to achieve stable planetary conditions, the capitalist is thinking about how this can be achieved at reasonable financial return on investment.

Green financing can include a wide array of financial mechanisms such as debt, equity investment, securities, bonds, derivatives, etc. A 'green bond' is one popular green finance instrument that has a fixed income or return, on investments that can be used to fund specific green projects. For example, it was announced in the Singapore Budget 2022 that the government aims to issue up to $35 billion of green bonds by 2030 to exclusively fund public sector green infrastructure projects such as green buildings, renewable energy adoption, and providing electric vehicle charging stations. Private sector investors have also increasingly become aware of the risks of climate change to their portfolios and stakeholders are pressuring the investment community to employ heighted environmental, social, and governance (ESG) policies. With a boost from public sector political resolve and increased investor appetite, the green financing market is set to grow rapidly in the next few years. Green bonds enjoyed a 49 percent growth rate in the five years before 2021, according to Climate Bonds, whose analysis suggests the green bond market annual issuance could exceed the $1 trillion mark by 2023.

The key takeaway for engineers, architects and green building practitioners is that: (a) green financing is meant to be exclusively used for green projects and (b) the market is growing exponentially. This means that more and more funds will be available for green projects in the coming years. It is coming up much more rapidly than what we are



Source: Climate Bonds Initiative

used to in the past. Very soon, the days of waiting to get money for executing green projects related to energy efficiency and sustainability will be gone and there will be a huge influx of funds looking for green projects. To capitalise on this opportunity, engineers have to be ready to be able to speak the language of the capitalist much more fluently, or risk being left behind watching other people riding the green financing wave to new heights. If an engineer can clearly articulate the financial or economic benefits of green projects or be able to talk about both the financial risks and returns of the project confidently, then that really appeals to the financial world.

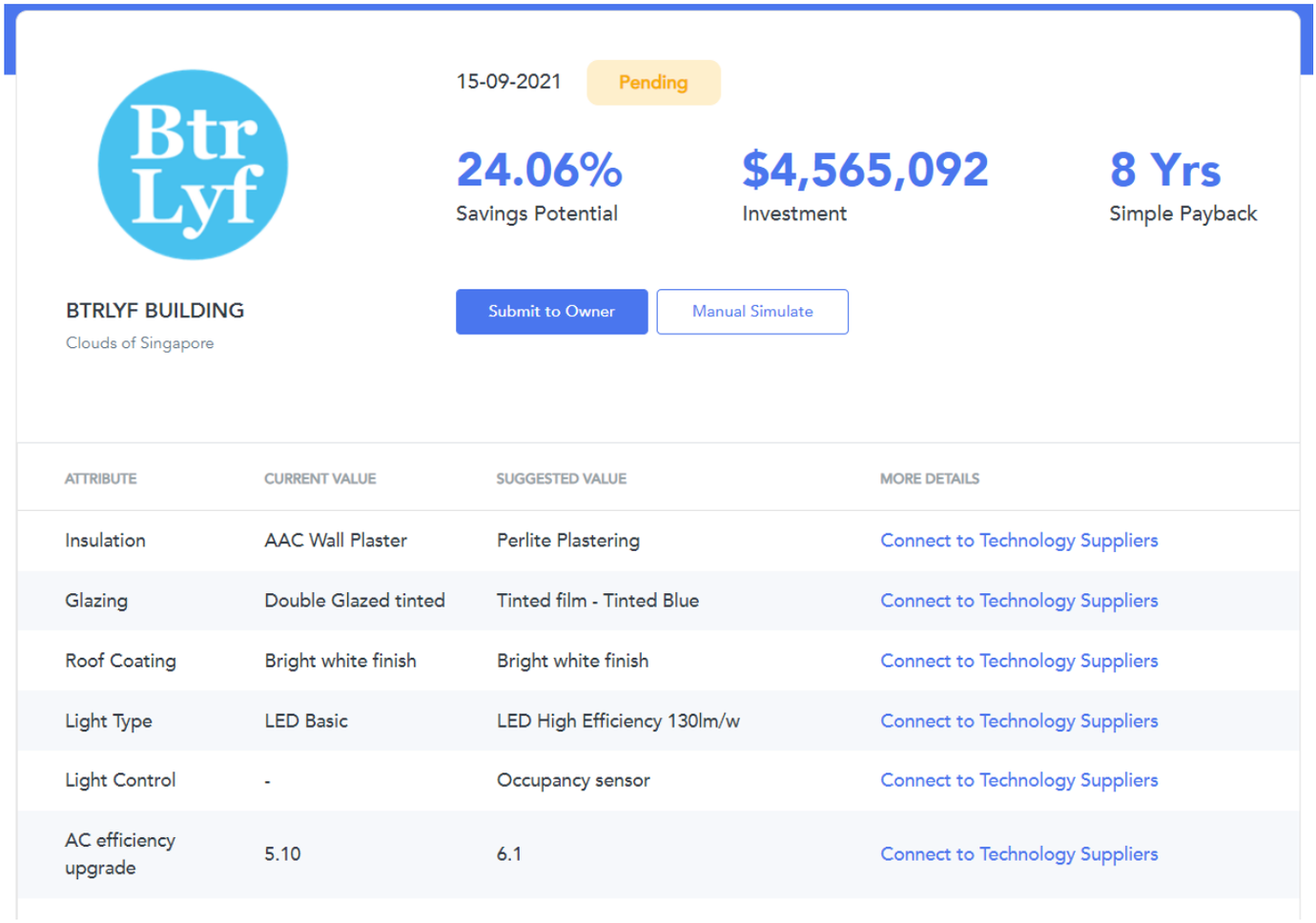
One of the concerns of the financial regulators and cautious investors is 'greenwashing' i.e., project owners making false or misleading claims on the green project credentials. This is being addressed by developing regulatory guidelines and initiatives to enhance project transparency and credibility. This is an area where engineers and practitioners can help with doing the essential technical feasibility and assessment of green project credential.
A good qualification and quantification of the green measures suggested to be adopted in the project needs to be done. This needs to be also translated into financial calculations such as capital expenditure (Capex), operating expenditure (Opex), annual savings and carbon emission impacts, wherever relevant. There also has to be multiple scenarios evaluation, benchmarking and a sensitivity analysis done to ensure robust prediction of project performance and financial returns. Often time this green assessment work is done by an engineering consultant or an environmental sustainability design (ESD) consultant, as they are popularly known in Singapore.

Green assessments involve data collection, building modelling/simulations, retrofit calculations, and post-project measurement and verification of actual performance are expensive and time-consuming activities for consultants. They limit the number of scenario calculations or sensitivity analyses that can be done, with costs of doing so that can even exceed project savings in some cases. This is where digital tools such as the BtrLyf® platform developed by Qi Square, a spin-off company of the Nanyang Technological University (NTU), can help. BtrLyf (pronounced 'better life') is an open and unified digital platform that helps the co-creation of green building projects by enabling collaboration and AI-enabled instant assessment.

BtrLyf®-EDGAR (enhanced digital green assessor) tool can be used to streamline the data collection, perform retrofit design calculations, and measurement and verification for green projects. It has an open and user-friendly non-technical interface that triggers alignment of priorities, enables data sharing, and increases productivity of a green assessment by 10-50x. The AI-powered building simulation engine of EDGAR has been developed through several years of Research & Development by Qi Square. The BtrLyf platform aggregates multiple sources of building data, including open-source information, design data, standards, API linked data from third-party providers, and user-entered data to create useful 'digital assets' or 'digital twins'. This data is then processed through physics-based simulation and machine-learning-based analytics engines to deliver building-specific as well as city-wide aggregate insights to improve the performance of buildings.

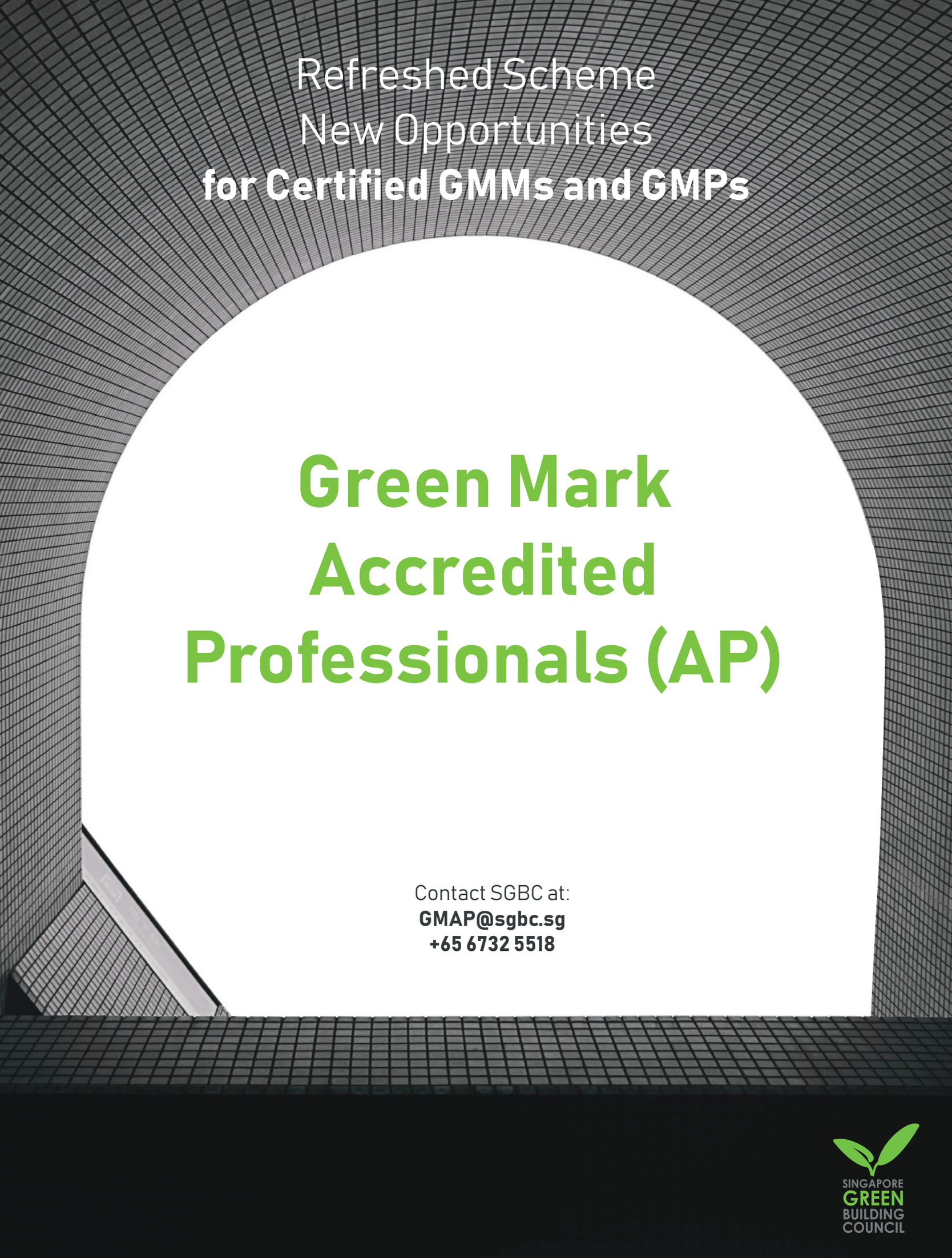
Green Financing: An Engineering Perspective

Digitalisation is also recognised as an important strategy in Singapore's economic growth. Also in the recent Singapore Budget 2022 speech, the finance minister stated that in terms of investing in new capabilities for Singapore, "our first priority is to strengthen our digital capabilities". He announced an additional $200 million over the next few years to enhance schemes that build digital capabilities in our businesses and workers. In line with this, the Infocomm Media Development Authority (IMDA) is offering support under the Advanced Digital Solutions (ADS) scheme to help enterprises deepen their digital capabilities, strengthen business continuity measures, and build longer term resilience. Recently (in December 2021) the 'sustainability' category was added in the list of pre-approved list of supported ADS projects. Enterprises can receive up to 80% funding support for the qualifying costs of digital solutions. BtrLyf® Digital Built Environment Ecosystem platform is on of the pre-approved solutions under this scheme. The world renowned IESVE energy modelling and simulation tool that is used by many ESD consultants in Singapore for Green Mark certification projects is also available for the funding support via the BtrLyf digital package under ADS.



In closing, the engineering perspective on green financing reveals the pivotal role of green assessment in supporting the growth of growth finance. Inaccurate assessment and analysis of green projects can lead to erroneous decisions and the threat of the project being labelled as 'greenwashing'. Engineers on the other hand need to be able to ride the green finance wave by equipping themselves with the necessary tools and basic financial calculations. Digital tools such as BtrLyf® can help engineers and ESD consultants to gear up for green building projects and increase their productivity significantly through digitalisation. It enables local enterprises to compete more efficiently in the green buildings market and help achieve the vision of Singapore becoming the green financing hub for the region.

Contributed by:
Qi Square



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SINGAPORE GREEN BUILDING COUNCIL

green means

G

comfortable

SINGAPORE GREEN BUILDING COUNCIL

What's a Green Home?

It goes beyond living in a certified green building, it's about reframing your lifestyle and how you live at home to create a more comfortable and healthier home that's **good for the environment and you.**

Here are some small changes you can do for your home that could make a big difference:

G natural

Maximise the natural resources around you.

save up to **10-30%** energy consumption

increase productivity by **up to 15%**

improve indoor air quality for **better sleep and health**

G healthy

Make decisions that optimise the home for your body.

set the right **mood** in each room

1000x reduction in indoor air pollutant levels

improve air quality & save electric bills

G smart

Use smart technology and energy-efficient appliances.

84% **drop in symptoms** like eyestrain, headaches

save as much as **10%** on electricity bills

save up to **20%** energy consumption for your home

Build Green Into Your Home

There are a number of things you can do in your home to build green into your home, and often times **small actions can create a big difference.** And when you're ready to renovate your home to make bigger changes, be sure to check out the various green home renovation loans offered by local banks.

Visit greenbuildings.sg to learn more aboutwhat you can do for your home.