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Chapter 1. 《Green Finance - SME Self-Assessment Guide》

A. Background

1. Definition of Green Finance

The regulatory details of green finance in Hong Kong are similar with those in the Mainland. Except for listed green bonds which are regulated by the Listing Ordinance, green loans are administered by financial institutions in accordance with the licensing ordinances and requirements of The Hong Kong Monetary Authority (HKMA). The HKMA is committed to promoting green and sustainable finance to address the risks of climate change. The HKMA considers climate change to be one of the major risks to human well-being. How the banking and financial systems operate clearly has an impact on how climate change risks are managed and mitigated.



The HKMA will promote green and sustainable banking in three phases.

- Phase I: Establish a common framework with the industry to assess the current Greenness Baseline for banks. The HKMA will also work with international organizations to provide technical support to local banks on the principles and methods of conducting "green checks";
- Phase II: Consultation with the industry and other stakeholders on the regulatory expectations or requirements for green and sustainable banking, with a view to establishing a set of specific objectives for enhancing the green and sustainable development of the banking sector in Hong Kong;
- Phase III: Once the objectives have been established, implement, review and evaluate the banks' progress in this area.

The HKMA is asking the banking industry to analyze the impact of climate change on them, implement timely countermeasures, and accelerate the development of green business. The HKMA is actively participating in international forums to support the global development of green finance. As a member of The Network for Greening the Financial System (NGFS), the HKMA participates in the Network's working groups on how to integrate climate risk and other green and sustainability factors into regulatory frameworks and macro-monitoring.



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The banking industry has responded positively to the HKMA's initiative to expand the focus of green finance from large listed enterprises to non-listed enterprises and even SMEs and will introduce policies and products to facilitate SMEs' access to loans. With the support of green finance, SMEs can develop new green businesses or improve the environmental performance of their products and business processes, which will not only increase their business volume and revenue and reduce the cost of production or service delivery, but also build a green brand and expand their customer base to companies or consumers who are concerned about environmental protection and climate change.

Hong Kong Institute for Monetary and Financial Research (HKIMR), established by the HKMA, released a report on November 24, 2020, entitled " The Green Bond Market in Hong Kong: Developing a Robust Ecosystem for Sustainable Growth ", an applied finance study. The report describes the current state of the green bond market in Hong Kong and globally and illustrates the benefits of green bonds for issuers and investors. Among the findings, existing market participants identified the strengths of the Hong Kong market as a large pool of international investors, supportive policies, the presence of many socially responsible issuers, and the implementation of transparent ESG disclosure. 71% of existing issuers surveyed and 100% of existing investors surveyed said they plan to participate in Hong Kong's green bond market in the future. SMEs can follow the trend of green finance and seize the opportunity of green capital from investors to prepare for green projects and help their business development.



China has provided a guiding and clear view on the definition of green finance, which will not only affect the orientation of green business and capital investment priorities of domestic financial institutions in Hong Kong. It can also provide a good definition of green finance. The People's Bank of China (PBOC) and the China Banking Regulatory Commission (CBRC) jointly promulgated the "Opinions on the Implementation of Environmental Protection Policies and Regulations to Prevent Credit Risks", which stipulates that environmental protection departments, PBOC, CBRC and financial institutions at all levels should put the State Council's implementation of the decision and environmental protection policies and regulations on their important agenda. Strengthen the cooperation and linkage between environmental protection with strict credit security by strengthening environmental supervision, support environmental protection with strict credit management, strengthen economic restraint and supervision of enterprises' environmental violations, raise the awareness of environmental rule of law in the whole society, promote the completion of energy conservation and emission reduction targets, and



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strive to build a resource-saving and environment-friendly society. It also stressed the need to strictly monitor the environment and credit management of new projects in accordance with the requirements of environmental laws and regulations. In addition, the environmental protection departments at all levels strictly approve the environmental impact assessment of construction projects and strengthen the management of environmental protection facilities in construction projects. "Environmental Protection Law," Article 41 came into force on 1 January, 2015 to supplement the construction of pollution prevention facilities, should be designed, constructed and put into operation at the same time as the main project. Pollution prevention facilities shall comply with the requirements of the approved environmental impact assessment file, shall not be dismantled or idle. The concept of "Three simultaneities" in other green projects also has good reference value.

The above regulations bring out the basic definition of green finance.

1. The enterprises financed must comply with applicable national and local environmental protection laws and regulations to avoid credit risks arising from environmental protection violations;

2. The funds should be used to support environmental protection industries and projects, and should bring benefits to the environment; and

3. To conduct environmental impact assessment and implement "Three Simultaneities" management.



The Hong Kong Quality Assurance Agency (HKQAA), with the support of the Hong Kong Government, launched Hong Kong's self-developed "Green Finance Certification Scheme" in 2018, which includes a definition of green finance and green projects. SMEs can use the information and documents mentioned above to prepare green projects to meet the requirements of financial institutions.

2. Green Standards

With regard to the second definition of green credit, the guiding catalog of green industries listed in the circular issued by the PRC National Development and Reform Commission, the People's Bank of China, the Ministry of Industry and Information Technology and other departments on February 14, 2019



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- "Circular on the Issuance of the Guidance Catalogue of Green Industries (2019 Edition)" (發改環資 (2019) No. 293) provides a suitable reference for the industries in which green finance is to be used.

As for assessing whether the use of loans by enterprises supports environmental protection projects, industries and projects that support environmental protection are generally referred to as eligible green projects in the capital market. The International Capital Market Association's Green Bond Principles (GBP) and the Loan Market Association's Green Loan Principles (GLP) provide the same indicative categories of eligible green projects. Compared to the existing national entities and international principles, the main difference between the People's Bank of China's Bulletin [2015] No. 39 Annex "Green Bond Support Project Catalogue" issued in 2015 and the GBP/GLP is the clean use of coal.

B. Evaluation Process

1. Purpose of self-assessment

Green Finance Self-Assessment is an assessment exercise conducted by enterprises or their delegates in accordance with these guidelines and using the tools provided by the Green Finance Knowledge Sharing Online Platform.

The purpose of the self-assessment is to help SMEs understand whether they can finance their businesses through green finance, so that they can continue to grow their businesses while making some contribution to the environment and climate change. It involves three levels, including the readiness of the company's policies and capabilities, the rationale for supporting green projects, and the risk management of implementing the projects. Each dimension has different assessment focus and assessment items as follows.

Layer		Evaluation Highlights	
•	Readiness of the company's policies and capabilities	 Company Sustainable Development Strategy Sustainable Development Foundation Culture Promoting Sustainable Development Results 	
•	Rationale for the Green Project	Use of Funds RaisedEstimated Environmental Benefits	
•	Execute project risk management	Environmental ComplianceAbility to complete green projects	

2. Preparation for self-assessment

Before conducting the self-assessment, SMEs need to clearly identify the environmental laws and regulations that apply to their business and ensure that they are in compliance with the relevant requirements. In addition, collect (1) the technical specifications and indicators of the green project for which green funding is desired and (2) the practical experience of previous projects that are the same as or similar to the green project.

- 3. Login to the Green Finance Knowledge Sharing Online Platform (www.greenfinance.hk)
- 4. Activate the Green Finance Self-Assessment Tool
 - a) Corporate sustainability strategy, including
 - The linkage between the company's development and the solution of today's important environmental issues; and
 - The company's written commitment and plan for sustainable development.



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b) A culture of sustainability fundamentals, including

- Internal communication of the importance of environmental protection to the business; and
- The level of employee recognition of and participation in corporate sustainability.
- *c) Past achievements in promoting environmental protection, including*
- Results of environmental benefits achieved (e.g., carbon footprint, water footprint, energy consumption, pollutant emissions, waste/waste reduction, etc.); and
- Measurement of environmental benefits achieved.
- d) Use of proceeds, including
- Green project attributes; and
- Dedicated funds.
- e) The environmental benefits expected to be generated upon completion of the project, including
- Environmental benefit key performance indicators (KPIs); and
- Measurement of the environmental benefits to be generated.
- f) Environmental compliance, including
- Compliance management; and
- Compliance performance
- g) Ability to complete green projects, including
- Project experience;
- Personnel capacity and skills; and
- Environmental impact assessment



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Chapter 2. 《Green Project Selection and Evaluation and Green Technology Details》

A. Environmental Challenges Facing

In today's property management industry, there are different challenges every day and we are often involved in the construction of different activities and facilities, which may cause environmental problems.

1. Decoration project pollution problem

Renovation works include construction and demolition, the process will have an dust, noise and other impacts on the neighbors, noise generated by renovation is regulated by the Noise Control Ordinance, but it is still a nuisance to the nearby residents during the designated working hours, especially its knocking or demolition-related processes, some improvement methods such as the installation of effective sound insulation panels can reduce the sound, if the scale is larger, it is also recommended to be proposed as a green project. For dust prevention, the working place can be enclosed and the dust can be stopped from spreading by negative air pressure.



2. Pollution from building equipment

Some of the basic equipment of a building, including pump rooms, elevator rooms, and ventilation systems, etc., will emit varying degrees of noise that will disturb the occupants, and the installation and design need to take into account the proximity of the residential units. The design and construction of a building requires a lot of consideration of environmental issues, and the contract may have already set out some basic requirements, but if you want to go further and consider more energy reduction and pollution reduction, there is an authoritative tool for Hong Kong to neutrally assess the sustainability performance of buildings: BEAM Plus, considering sustainability in the planning, design, construction, commissioning, renovation, management, operation and maintenance of buildings. We will discuss this in more detail later.



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In addition to using green assessment methods, we can also propose a green improvement project, for example, to achieve energy saving and environmental protection by using innovative technologies for high performance building, such as air conditioning system, indoor temperature setting, indoor carbon dioxide detection, lighting system, etc. We will also explain in more detail later.

3. Sewage Treatment Facilities

Most of the buildings have sewage discharge and their treatment facilities must be regularly repaired and maintained. The property management units are required to put in place good internal management measures such as regular flushing and cleaning of access roads with water, maintaining adequate lighting and air circulation, etc., and to comply with the discharge license requirements approved by EPD and regulated by the Water Pollution Control Ordinance before discharging sewage from the treatment facilities. It is also recommended that an effective audit system be put in place to monitor the performance of the maintenance contractors/operators of the treatment facilities, such as hiring independent consultants to test the quality of the treated effluent.¹



¹ <u>https://www.hkgbc.org.hk/tch/beam-plus/introduction/</u> (viewed October 2021)



B. Green Project Selection and Evaluation

The choice to participate in the BEAM Plus program or to invest in a high performance building as a green project has its merits, and it is recommended that the decision be made on a case-by-case basis or according to the actual needs of the property manager, and that consideration be given to proceeding together, as the two projects will have similarities on the subject of sustainability, with no conflicts. The following is a more in-depth analysis of the various aspects as a guide to selecting or evaluating a green project.

1. Legislation

Noise from construction is regulated by the Noise Control Ordinance; air pollution nuisance caused by dusty materials is regulated by the Air Pollution Control Ordinance and the Air Pollution Control (Construction Dust) Regulation; disposal of construction waste is regulated by the Waste Disposal Ordinance; sewage discharged from sewage treatment facilities is regulated by the Water Pollution Control Ordinance, etc. Investing in high performance building design. There is no doubt that investing in the design of high performance buildings can achieve a higher standard than that required by law.

For example, in the 1.2 version for the site aspect part in BEAM Plus, one credit is awarded for not exceeding the government's minimum parking space requirement, and two credits are awarded if private cars are not allowed to be parked in general. The purpose is to encourage people to use fewer private vehicles, thus reducing air pollution and energy consumption.



2. Technology

These new technologies are not difficult to find in the market and can be very effective in helping property management to achieve more efficient energy use and effective monitoring to obtain more useful information about user habits.



If applying for BEAM Plus, the project is evaluated and checked by the BEAM Society Limited. The overall performance during the life cycle is assessed fairly and objectively, and the proposed indicators and their technical aspects are reasonable to the participants, such as indoor air environment and ventilation, etc.

3. Investment Return

Innovative green projects in high performance buildings have investment costs, but the facilities can save a significant portion of energy to save energy and reduce the operating costs of new and existing HVAC systems. The cost of supplying fresh air to the building becomes high due to the removal of heat from the fresh air, especially during the summer months. Lighting control reduces unnecessary costs by dimming or turning off lighting when sufficient ambient light is present or when the space is unoccupied.

4. Environmental and Social Impact

Innovative green projects in high performance buildings provide immediate environmental benefits, such as the use of constant indoor temperature, which reduces electricity consumption and carbon emissions and saves energy use, the use of CO2 level sensing, which reduces unnecessary ventilation rates based on actual occupancy, thereby reducing excess cooling of fresh air and energy used to move air, and lighting control, which reduces energy consumption throughout the building.

By participating in BEAM Plus and implementing various new measures to improve the energy efficiency and environmental performance of buildings, the performance of existing buildings of different ages can be enhanced, allowing flexibility to obtain certification for buildings based on actual conditions, and contributing to the goals set out in the Government's newly launched Urban Energy Efficiency Blueprint.²



² <u>https://www.hkgbc.org.hk/tch/beam-plus/beam-plus-existing-buildings/index.jsp</u> (viewed October 2021)



There are several additional basic factors to consider when choosing a green project:

1. Size of the green project department: The number of members or staff determines the size of the green project that can be planned and affects the operability of the project when it is running.

2. Green competitiveness of suppliers: For example, suppliers can improve the quality of supply chain management, increase corporate social responsibility in the supply chain, upgrade the environmental management system of the supply chain, etc.

C. Green Technology Details – BEAM Plus

1. Market situation

For the BEAM Plus Project Directory, the public can easily search for the details of all projects under BEAM Plus New Buildings, Existing Buildings, Interiors and Neighbourhood. For the BEAM Plus Statistics, we can also have a glance at the number of BEAM Plus registered and assessed projects, plus their distribution by types, owners, and ratings.

2. Scientific Background

The building sustainability performance comprises of the following assessment aspects:

- Integrated Design and Construction Management (IDCM) encourages the project team to enhance communication with stakeholders and adopt the integrated design approach throughout green building design and construction.
- Community Aspects (CA) focuses on the socio-economic impacts of the development to the neighbourhood that enhances the surrounding built environment, local character and social identity.
- Sustainable Site (SS), Site Aspects (SA) is about the location, design, infrastructural provisions and basic amenities of a building or a development.
- Green Building Attributes (GBA) is about selecting a BEAM Plus certified building or adopting best practices in operations.
- Management (MAN) concerns responsible management practices and provisions to encourage sustainable management of occupied areas.
- Energy Use (EU) relates to low energy design, energy efficiency practices and adoption of renewable energy.
- Water Use (WU) emphasises adoption of water efficient devices and practices, reduction of water use and the quality of potable water.
- Materials and Waste Aspects (MWA) encourages waste reduction and efficient use of materials of lesser environmental impacts.
- Innovations and Additions (IA) gives credits to projects with innovative designs that enhance environmental performance; and superior performance that greatly exceeds the prevailing requirements in the assessment.
- Health and Wellbeing (HWB), Indoor / Outdoor Environmental Quality (IEQ/OEQ) encompasses various environmental aspects of indoor/outdoor environment which have an impact on the



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health, comfort or wellbeing of the occupants and neighbours including daylight access, air quality, ventilation, and thermal comfort, etc.³

3. Advantages

In BEAM Plus Existing Buildings V2.0, the new assessment framework with two different Schemes are available. Applicants may apply for Comprehensive Scheme or Selective Scheme, according to the current circumstances of their buildings.

4. Cost requirements

To participate in BEAM Plus Assessment, you will be invited to pay a fee ranging from HK\$100,000 to HK\$250,000 or more depending on the size of the project.



³ <u>http://greenbuilding.hkgbc.org.hk/eng/posts/view/BEAMPlus_AssessmentAspects</u> (viewed on October 2021)



D. Green Technology Details – High Performance Building

1. Market situation (Existing technologies and pain points)

Buildings have a huge impact on the environment, accounting for 39% of global energy emissions.⁴ In Hong Kong, there are over 42,000 buildings, including about 8,000 high rises, of which more than 1,500 are skyscrapers. Over 90% of the territory wide electricity generation are consumed in the building sector; of which commercial buildings contribute about 66%.⁵ According to the Hong Kong Energy End-use Data published by EMSD, electricity consumption in the commercial sector rose by 19.5% from 23,589 GWh in 2003 to 28,189 GWh in 2013.² Without any proactive measures, the electricity consumption in commercial buildings in 2030 will reach 57,605 GWh under the business-as-usual (BAU) model. The Hong Kong Green Building Council (HKGBC) has proposed a demand side management approach, targeting to reduce building energy consumption by 30% in Hong Kong by the year 2030, using the 2005 consumption level as the baseline. It is equivalent to save over 33,000 GWh electricity if the target is achieved, and this initiative is fully supported by the Hong Kong Government.

To realize this goal, substantial improvement on building energy efficiency over the current situation is crucial. New technologies focusing on energy efficient building and building services systems can be implemented in the following areas:

- i) Chiller system
- ii) Indoor air set point temperature
- iii) Carbon dioxide sensor
- iv) Lighting

	Conventional	New Technologies
Chiller System	Air cooled with COP 3	Water cooled with COP5
Indoor Air Set Point Temperature	24°C	26°C
Carbon Dioxide Sensor	No	Yes
Lighting and control System	No	Replace light Tube by T5 or LED
		fixture
		Daylighting control

It has been reported that energy saving could be up to around 70%⁶ using better designed technologies by coordinating the building demand with its Heating, Ventilation and Air Conditioning (HVAC) system capacity. In

⁴ Pan, W.; Garmston, H. *Energy Policy*, **2012**, *45*, 594

⁵ EMSD, Hong Kong Energy End-use Data **2013**, Electrical and Mechanical Services Department, the Hong Kong Special Administrative Region

⁶ Eillis, M.W.; Mathews, E.H. *Building and Environment*, **2002**, 37, 461



2015, Hong Kong Electrical and Mechanical Service Department (EMSD) encouraged the owners of commercial premises to use water cooled chiller system.⁷ Hong Kong Environmental Protecting Department (EPD) also suggested a recommended setpoint indoor temperature of 25.5°C to reduce energy use.⁸

2. Scientific background

a) Chiller System

Chiller systems are commonly used in air condition application that require large cooling capacity such as supermarkets, offices and factories. They are systems making use of water as their secondary refrigerant since water is non-corrosive, large heat capacity, non-toxic and cheap. Chilled water produced is circulated through other components for heat absorption which cool inside air for air conditioning system. Chiller system consists of the following major functional parts:

• <u>Chiller</u>

The chiller is the section where an exchange of heat occurred between the water that goes to the building and the evaporator. Water leaves the chilled water evaporator at a low temperature (around 7°C). This chilled water is circulated through the entire building using a pump. Inside the evaporator, as shown in **Figure 1**, liquid refrigerant at low pressure enters the distribution system inside the shell and moves uniformly over the tubes, absorbing heat from warmer water that flows through the tubes.



Figure 1: Cross section of a flooded shell and tube evaporator showing how chilled water is produced

The effect of leaving chilled water temperature change on power consumption is 2-4% per degree Celsius. It is noteworthy to mention that although cooler chilled water leaving the evaporator consumes more energy, it may reduce the overall system energy because less water is pumped through the system. Since the evaporator is sensitive to the water flow rate, excessive flow wastes more energy resulting in

⁷ EMSD. Hong Kong Energy End-use Data **2015**. EMSD. Hong Kong.

⁸ EPD 2006, Hong Kong



high water velocity, vibration or even noise nuisance. This explains why variable-speed chiller can lower energy costs and shrink a building's carbon footprint. However, variable speed chillers often are not included in chiller plant design because they are seen as an add-on or retrofit to conventional constant speed chiller plant.

• Variable speed chiller

U.S. Environmental Protection Agency (EPA) recommends installing variable speed chiller⁹ to run at lower speeds under part-load conditions, thereby yielding a higher efficiency than constant speed chiller. Figure 2 assumes a constant chilled water supply temperature at all operating conditions and illustrates two important performance differences between variable and constant speed chillers: 1. When the entering condenser water temperature is fixed, constant speed chillers have a relatively flat operating efficiency over 50% to 100% load range while variable speed chillers have better performance. 2. The efficiency of a variable speed chiller is more positively affected by reductions in the condenser water temperature than a constant speed chiller.



Figure 2: Performance comparison of constant and variable speed chiller

<u>Cooling Tower</u>

Cooling tower is one of the peripheral equipment in a chiller system. It serves to remove heat from hot water from the condenser of the compressor to the tower. Heat is removed by using air from the surrounding to reduce the temperature of the water. The capacity to cool the water depends on the evaporation of water when air contact with the water. Figure 3 shows the basic working principles of Cooling Tower. The hot water is sprayed through nozzles onto the fill material which in the shape of honeycomb, corrugated sheet or flat sheet. As the water flows through the fill materials, air from the surrounding which can be natural-draft or forced-draft through the materials by fans and water evaporates. This cools the water which is then collected at the collection basin before being circulated

⁹<u>https://facilitymanagement.com/variable-speed-chillers-savings-green/</u>(2021年9月訪問)



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back to the condenser. Most conventional commercial buildings in Hong Kong use air cooled chiller system with coefficient of performance (COP), i.e. the ratio of rate of heat removal to the rate of energy input of 3. Water cooled chiller can achieve COP of 5. Scenario adopting water cooled chiller system showed that it consumes much lower energy than a building adopting air cooled chiller system, significantly reduced 66% cooling energy of water cooled chiller (71.45 kWh/m2) from that of air cooled chiller (118.33kWh/m2).



Figure 3: Basic working principle of Cooling Tower

b) Indoor Air Set Point Temperature

According to the result of energy consumption simulation, for every 1°C increase in temperature setting, the reduction of chiller electricity consumption is about 3%. In recommending the indoor set point of 25.5°C initiative, the Hong Kong Government has taken into consideration of i) other countries' reference and ii) human thermal comfort.

Country	Australia	China	USA
Indoor Air Set Point	23-26	25-27	25.5
Temperature (°C)			

A study conducted by American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) aimed at investigating the relation of thermal comfort with high humidity environment such as Hong Kong. They concluded that "No significant psychological differences in human response to exposures between 60 to 90% RH for the temperature range 20 - 26 °C" and their result is summarized in the following **Figure 4**. With the indoor air set point temperature as 26 °C, it was found to lead an energy use saving by 4%.



Figure 4: Acceptable Ranges of Indoor Temperature (ASHRAE 55-2004)

c) Carbon Dioxide Sensor

Supplying fresh air to a building assuming maximum occupancy is a wasteful of energy if it is not fully occupied. Swinburne Ltd. showed how carbon dioxide monitoring can reduce building energy consumption. Reducing carbon footprint have raised interest in carbon dioxide control to save energy and reduce the running cost of new and existing HVAC systems. The cost of supply fresh air to buildings is high owing to remove the heat content of the fresh air, especially during summer time. Energy can be saved by reducing ventilation rate according to the actual occupancy by using carbon dioxide level which save energy by reducing cooling the fresh air and energy used to move the air. Carbon dioxide sensors are installed to modulate the flow dampers which affect the air supply flow rate of the primary air units (PAUs).



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Figure 5: Typical Arrangement of variable flow PAU using VSD & CO2 sensors

d) Daylighting Control

Daylight control is an energy management technique that reduces overhead lighting use by utilizing the natural light present in a space. Dimming or switching off lighting when sufficient ambient light is present or when the space is unoccupied. The control is crucial in open office area with plenty of windows. This technology has been proved to decrease overall building's energy consumption by around 11%.¹⁰ Figure 6 illustrates the concept of the Daylighting control system.



Figure 6: Concept of the daylight responsive dimming system

¹⁰ Kim, I.T.; Kim, Y.S.; Nam, H.; Hwant, T. Sustainability, **2018**, *10*, 4087



3. Benefits

By adopting the four new energy strategies, namely the chiller type, increase of indoor air set point temperature, carbon dioxide sensor and daylighting control can achieve energy saving in building. More specifically, replacement of water-cooled HVAC type and daylighting control system can reduce approximately 10% and 11% total energy consumption respectively. The increase of indoor air set point temperature can lead to an energy use saving my 4%. The use of carbon dioxide sensors to automate fresh air ventilation can save 5-27% energy usage in a typical office environment. Savings can be greater when the sensors is installed in spaces with high variability in occupancy such as conference room and cafeterias.

4. Conditions for application & limitations

Although the principles of some technologies are known to the industry, the actual performances of the energy saving technologies in real installations are limited and usually from building owners or equipment suppliers with little discussions on the encountered technical problems. New energy saving technologies are mostly limited to new buildings due to the limited plant room space and high installation cost for existing buildings. Furthermore, difficulties were found in quantifying the actual savings coming from specific technology because of the randomness in human behavior and climatic conditions.

5. Show case(s)

Background and Assumption			
Size of building	25 floors, total GFA 90,525 ft ²		
New chiller capacity	Water-Cooled with 2 x 185 Rton high efficiency chillers		
Annual Operating Cost for Existing Chillers (old)	HKD 905,000		
New Chillers Replacement cost	HKD 3,300,000		

Case 1: Commercial Building





Calculation of estimated payback period		
Annual operation cost savings for	HKD 905,000 * 45%	
	= HKD 407,250/year	
Estimated payback period	Initial investment $-\frac{\text{HKD 3,300,000}}{\text{HKD 3,300,000}} - 8.1 \text{ years}$	
Estimated payback period	Annual savings HKD 407,250 - 6.1 years	



. Medium Scale Water-Cooled Chiller

Case 2: Hotel

Background and Assumption



Size of building	20 floors, Total GFA 410,000 ft ² , 699 rooms five-star hotel
New chiller capacity	Water-Cooled with 4 x 500 Rton high efficiency chillers
Annual Operating Cost for Existing Chillers (old)	HKD 7,600,000
New Chillers Replacement cost	HKD 18,750,000

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Calculation of payback period			
Annual operation cost	HKD 7,600,000 * 40%		
savings for new chillers	= HKD 3,040,000/year		
Payback period	$\frac{\text{Initial investment}}{\text{Annual savings}} = \frac{\text{HKD 18,750,000}}{\text{HKD 3,040,000}} = 6.2 \text{ years}$		





Large Scale Water-Cooled Chiller

Chapter 3. 《Building a Green Finance Framework & Green Technology Application Notes》

A. Background

The International Capital Markets Association (ICMA) published its first Green Bond Principles in 2014, which included the overall environmental, social and governance framework of green bond issuers as one of the issues that investors in green bonds may consider. In June 2018, the Green Bond Framework appeared in the External Review section of the Green Bond Principles, recommending an external review to confirm that an issuer's green bond framework is consistent with the four core components of the Principles. The Green Bond Framework was further identified as a key recommendation to improve transparency by recommending that issuers summarize relevant information in the context of their overall sustainability strategy and the four core components of the Principles. Overall, there are five key recommendations for an issuer's green finance framework, namely, company profile, use of proceeds, process for evaluating and selecting projects, management of proceeds and reporting.





B. Details of the Green Financial Framework

1. Company Profile

In order to introduce a company to investors or those who may be interested in its green projects, it is important to remove the concerns of stakeholders about "greenwashing". According to Investopedia, a U.S. website, greenwashing is defined as "the process of conveying a false impression or providing misleading information about how a company's products are more environmentally friendly. Greenwashing is considered to be a claim that lacks evidence to deceive consumers into believing that a company's products are environmentally friendly. Green financing can be a marketing tool to build a company's green image, but it is critical to ensure that a strong link is established and maintained between green finance initiatives and the company's overall sustainability strategy. It may seem difficult to establish such a strategy and require professional advice, but it can actually be put into simple terms. This linkage can directly and easily describe how sustainability is one of the key success factors in achieving a company's long-term business success.

The ability to generate business ideas, control operating costs and build reputation are key elements of the small and medium-sized enterprise (SME) survival toolkit, and it should not be difficult to find good reasons to associate green projects with them. Property management SMEs can look to industry pioneers such as Sino Property Services to develop their sustainable development strategies.

[¬]Adopting the latest eco-friendly practices and incorporating universal environmental standards into our operating procedures. ∘Has achieved the ISO 14001 certification for Environmental Management System standards since 2007, Installed over 360 electric vehicle chargers at more than 50 car parks, Installed over 2,100 photovoltaic panels on building roofs and podiums, generating total rated power of more than 700kW, Innovated to enhance the energy efficiency of our operations, including adopting high-efficiency, variable speed tri-rotor screw chillers, electronically commutated motor, installation of band screen filtration system to improve sea water quality for heat exchanger of central chiller plant, installation of electromagnetic induction descaling device, 24-hour monitoring and automatic control system for condenser water circuits, etc. 」

Reference :

https://www.sino-propertyservices.com/en/sustainability/green-initiatives

[¬] As a manager of property projects during the operation stage, COPL is committed to reducing the negative impacts of operations on the environment through proper management on water consumption,



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GHG emissions and waste treatment in its daily operations. The Group has formulated a number of environment related policies, including the Waste Water/Exhaust Gas Control Procedures,

the Solid Waste Control Procedures, the Hazardous Chemicals Control Procedures and the Energy Saving Assessment Method, so as to manage the Group's emissions such as GHG, exhaust gas, waste; resource consumption such as electricity, water, and natural resources. In addition, the Group has obtained the certification of ISO 14001 Environmental Management System. \Box

Reference :

http://www.copl.com.hk/UploadFiles/2021/05/281827042F2B34C5.pdf

[¬]Hong Yip will establish related environmental objectives and management plans to effectively control and improve environmental issues arising from work and service and to strengthen the environmental awareness of our staff. Hong Yip will establish relevant energy saving objectives and energy management plans and ensure availability of sufficient resources, technical backup and information in order to increase energy efficiency. Hong Yip will support using energy saving products and services and consider improving the design of energy performance. Hong Yip will maintain control, communication and supervision with regard to the occupational safety and health as well as environmental aspects of all contractors, their workers and other related parties. Hong Yip will establish an effective means of communications and consultation with all related parties on occupational safety and health, environmental and complaint management issues.]

Reference :

https://www.hongyip.com/Abouts/ims_policy

2. Use of Proceeds

In order to implement the sustainability strategy described in the previous section, it is necessary to describe the types of eligible green projects that the Company wishes to qualify for the use of the funds raised. The list of eligible green project categories is a core part of the first core component of the Green Bond Principle (GBP) and the Green Loan Principle (GLP). Eligible green projects should have clear environmental benefits that are evaluated by the company and, where feasible, quantified, measured and reported.

Typical examples of the types of eligible green projects related to the logistics sector as listed in GBP and GLP.

• Renewable energy (including production, transmission, appliances and products).

• Energy efficiency (e.g. new and renovated buildings, energy storage, district heating, smart grids, appliances and products).

• Pollution Prevention (including air emission reduction, greenhouse gas control, soil remediation, waste prevention, waste reduction, waste recycling, and energy/emission efficiency waste).

• Clean transportation (e.g., electric, hybrid, public, rail, non-motorized, intermodal, clean energy vehicle infrastructure, and hazardous emissions reduction).

• Green buildings that meet regionally, nationally or internationally recognized environmental performance standards or certifications.



The description of restrictions on the use of proceeds is also expected to be stated in the Green Finance Framework. Typical restrictions are that the funds raised may not be placed on the IFC's published exclusion list (Reference : https://www.ifc.org/wps/wcm/connect/ topics_ext_content /ifc_external_corporate_site/ sustainability-at-ifc/company-resources/ifcexclusionlist)



3. Process for Project Evaluation and Selection

After identifying the types of eligible green projects, the next step is to evaluate potential green projects against a set of selection criteria that will help the company apply the funds raised to the projects desired by the company and the investors/lenders. The purpose of this section of the Green Finance Framework is to provide investors/lenders with detailed information on the environmental sustainability objectives of eligible green projects, the process of evaluating and selecting potential green projects, and the process of identifying and managing the social and environmental risks expected to be associated with the evaluated green projects. Typical details on related topics can be found in the following table:

Topic	Typical Content	Remark
Responsibility	The evaluation of the technical and quality characteristics of the project can be provided by the supplier or contractor, and the SME operator can make the final approval.	Cross-functional groups (if applicable) are desirable, but not required.
Environmental efficiency KPIs (KPI)	Typical KPIs include annual electricity generation (kWh per year), annual electricity savings (kWh per year), reduction in air emissions (mg/kg km), fuel savings (liters per km), and green certification.	There is expected to be a clear link between the environmental benefits of qualifying green projects and the company's overall sustainability goals. Where possible, KPIs can be translated into an annual reduction in greenhouse gas emissions.



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Environmental Risk	Conduct environmental impact assessments in accordance with applicable regulatory requirements or internal methodological requirements to identify and mitigate significant risks related to environmental aspects (pollution of air, soil and water, solid waste, noise and depletion of natural resources).	Significant risk may mean that the risk will lead to legal violations and objections in the public domain.
Social Risk	Conduct environmental impact assessments in accordance with applicable regulatory requirements or internal methodological requirements to identify and mitigate significant risks related to the welfare and well-being of the community (population displacement, unemployment, and occupational health and safety issues).	Significant risk may mean that the risk will lead to legal violations and objections in the public domain.
Investment Return	Where applicable, the project savings over time can be estimated and used to calculate the return on investment.	In addition to saving money, environmental benefits are also a key factor in determining returns.
Process	The self-assessment mechanism and selection criteria described in Chapter 1 can be used.	Selection rules may define a minimum self-assessment score for eligible green projects and/or all eligible projects are prioritized for selection based on the self- assessment score until funds are used.

4. Management of Proceeds

In order to allay investor/lender concerns about the actual use of the proceeds, particularly the placement of proceeds in non-qualified green projects that could affect the Company's ability to complete qualified green projects, it is necessary to explain how the utilization of the proceeds will be controlled and tracked. Temporary use of uncommitted proceeds is permitted, but the proceeds can be withdrawn if necessary, to ensure that progress on eligible green projects is not compromised. The types of investments that should be made available in the green finance framework for temporary use of proceeds.





5. Reporting

Regular updates on the use of funds raised are expected to be the minimum requirement, with typical reporting intervals being once a year. In addition to the return on investment, environmental benefits are the most expected return on green finance projects. The GBP and GLP describe the value of transparency in communicating the expected impacts of the project. For investors/lenders to understand the progress of eligible green projects and the achievement of Key Performance Indicators (KPIs), the description of project monitoring in the Green Finance Framework will provide more confidence to investors/lenders. Further guidance on project management and project monitoring is provided in the next chapter.

As carbon neutrality is at the top of the investor/lender agenda, the ability to report on the project's impact in terms of carbon emissions is another feature that may be welcomed by investors/lenders. Translating KPI results into carbon reductions is one thing, another challenge is to measure these results without spending too much resources and effort on data measurement, collection and calculation. Therefore, it is recommended that smart metering and automated systems be used to report impacts and carbon emissions, and that these costs can be included in the funding of eligible green projects.



C. Green Technology Application Notes

1. High Performance Building – Main Application

A water-cooled chiller is a type of HVAC equipment which consists of 4 main body parts – compressor, evaporator, condenser and the expansion valve. A water-cooled chiller should be installed with cooling towers and Air Handling unit (AHU) which lowers the temperature of water and moves the warmed water out of the space.

The compressor lowers the pressure of the refrigerant in the evaporator and raises the temperature and pressure of the refrigerant gas which helps circulate the refrigerant in the system. A condenser transfers heat from the refrigerant to the outdoor cooling medium which is water, condenses the refrigerant, changing it from gas to liquid. The evaporator transfers heat from the cooled water through boiling process the refrigerant, allowing refrigerant to change from low pressure liquid to high pressure vapor and chilled water. The expansion valve allows the dropping of pressure, resulting refrigerant liquid dropping from high to low pressure and separating the high and low pressure side of the whole system.

The newly developed water-cooled chiller works together with the variable speed chilled water pump, which the speed of the chilled water flow could be managed, controlling the cooling speed of the HVAC system. Centrifugal, reciprocating, rotary and absorption are 4 different types of water-cooled chiller. Taking a centrifugal water-cooled chiller as an example, it is a variable-volume compression using centrifugal force. Normally, this type of water-cooled chiller is small in scale with no vibration. This chiller's initial cost is around \$500 to \$700 per Ton of cooling with a medium level of maintenance cost. A centrifugal water-cooled chiller could provide 90-1000 Tons of cooling which is around a maximum of 35000kW of cooling output. Chilled water would be ranging from 5 °C to 20 °C and cooling water would be ranging from 20 °C to 40 °C.

Items	Case 1	Case 2
Rated Cooling Capacity	49.2kW	66.2kW
Input Power	11.87kW	18.83kW
Throttle Mode	Expansion Valve	
Power Supply	380/400/415V-50Hz	
Safety Protection	Pressure, Overload, Anti-freeze, Delay, Over-temperature,	
	Water flow protection	
Refrigerant	R407C/R410A	

In terms of specification for water-cooled chiller, there are 2 cases that can be shown:



Total Weight

Dimension (LxWxH)

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600kg

2000mmx950mmx1650mm

Cooling liquid flow10.13 m³/h13.60m³/hChilled liquid flow8.47 m³/h11.39m³/hPower of water pump2.2kw2.2kwRunning noise64dB64dB

1850mmx900mmx1650mm

300kg

Moreover, carbon dioxide sensors, lighting and control system are installed in the whole system which smart controlling could be made with the new technology. Carbon dioxide could be tracked by the sensors and the system could be managed automatically to lower the carbon dioxide concentration level, with the HVAC system.

2. BEAM Plus – Main Application

BEAM Plus is designed to assess the physical performance of buildings and property management practices, covering building management, operation, maintenance and improvement, and can be applied for at any time during the building's operation.

In response to the 2025 target set by the Hong Kong Government in the Urban Energy Efficiency Blueprint, the latest version BEAM Plus 2.0 has been significantly revised to provide a more flexible assessment approach to encourage more than 42,000 existing buildings in Hong Kong to participate in the assessment to further improve their energy efficiency and environmental management practices in a wide range of categories, including commercial, education, government, industrial, office, residential, and commercial buildings. The assessment will cover a wide range of categories, including commercial, education, government, including commercial, education, government, industrial, office, residential, hotel, shopping mall, etc., regardless of the age of the building. In addition, tenants' long-term environmental performance of the building is also an important part of the assessment, and participation in the assessment can earn additional points for the applicant.

Version 2.0 provides more flexibility for applicants to customize the assessment approach according to their needs, budget and technical capabilities, and to participate in either the Comprehensive Scheme or the Selective Scheme to assess the condition of the building.¹¹

¹¹ https://www.hkgbc.org.hk/eng/beam-plus/beam-plus-existing-buildings/index.jsp (viewed October 2021)



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Chapter 4. 《Green Project and Fundraising Management & Green Technology Operation and Maintenance》

A. Background

Green projects have the same characteristics and risks as other types of real-life projects, and every green project should be managed properly to ensure that it produces the desired results. In 2020, the International Organization for Standardization (ISO) published the international standard ISO 21502 to provide guidance on project management. Project management is described in the standard as "the coordinated activities that guide and control the achievement of consistent objectives" and further elaborates that "project management is necessary for the execution of a given project through a series of processes and methods that include systematic design and practice". The key themes to be discussed in this chapter will be the agreed objectives and the systems to achieve them.

B. Green Project Management and Fundraising Management

1. Key Performance Indicator (KPI)

First, project objectives and KPIs should be defined. In the direct capital market, investors/lenders place great importance on KPIs linked to environmental benefits, and expected returns are as important as repayment. When defining KPIs for eligible green projects, it is important to understand the company's overall sustainability objectives and the concept of environmental benefits. ICMA, the International Capital Markets Association, published a "Handbook - Harmonized Framework for Impact Reporting" in June 2021 for setting metrics for eligible green projects (reference): https://www.icmagroup.org/assets/documents/Sustainable-finance/2021-updates/Handbook-Harmonised-Framework-for-Impact-Reporting-June-2021-100621.pdf. The Handbook can provide SMEs with useful guidelines and examples to determine the appropriate KPIs for their projects. In addition, it is important to map the results of eligible green projects in relation to the UN-advocated Sustainable Development Goals (SDGs) (ref: https://sdgs.un.org/goals) to showcase projects that ICMA has published the "Green, Social

and Sustainable Development" bond: High Level Mapping of SDGs June 2020, where SMEs can find useful tips for mapping their eligible green projects to SDGs. Typical examples are:

Qualified Green Projects	KPI	SDG
Certified from BEAM Plus Scheme	 The Certified Grading Greenhouse gas emissions reduced/avoided per year (tonnes of CO2 equivalent) 	SDG7 Affordable Clean Energy
Using High Performance Energy Building	 Annual fuel saving energy (GJ) Greenhouse gas emissions reduced/avoided per year (tonnes of CO2 equivalent) 	SDG7 Affordable Clean Energy

2. Evaluation and selection of green technologies

Since eligible green projects involve green technology, SME staff who understand the technical details need to know information about the compliance, feasibility, benefits, reliability, timing and lifecycle, and operational requirements of the equipment involved in each project. The information is then evaluated by the SME owners and their staff responsible for finance, operations, and sales and marketing.

It is critical for SMEs to identify operational risks and determine whether they can be managed to a reasonable level in terms of legal and financial liabilities. SMEs need to be prepared to meet the challenges of investors/lenders regarding the reasons for choosing green technology. SMEs need to be aware of the possible options in the market and justify their decision that "business as usual" or compliance with legal and regulatory compliance may not be welcome.

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3. Project planning and monitoring

To demonstrate an SME's ability to execute green projects, a well-thought-out project plan is required. Given the small size of eligible green projects for SMEs, a simple project plan with a list of tasks and control points, assignment of responsibilities and timeline is sufficient.

Project Name:	High Performance Building			
Project Reference Number:	GF_2021_HEB			
Project Members:	Peter, Paul, Mary			
Jobs	Output	Responsible person	Start Date	Completion Date
Project Launch	Project plans, specifications, project monitoring report forms	Paul	2021.6.1	2021.6.7
Procurementofequipmentandconstruction services	Quotations	Mary	2021.6.9	2021.7.14
Quotation evaluation (Control Point 1)	Equipment and Contractor Services	Peter, Paul, Mary	2021.8.1	2021.8.5
Project kick-off meeting with suppliers and contractors	Method statements and drawings, equipment lists, test plans and test acceptance criteria for functional testing, operation and reliability	Peter, Paul, Mary	2021.8.21	2021.8.23
Fauipment Testing	Fauinment Test Results	Peter Paul	2021 10 15	2021.1.5
(Milestone 1)	Equipment rest results	Mary	2021.10.13	2021.1.5
Installation Engineering	Installed water cooling system, CO2 sensor and lighting control system	Vendors and Contractors	2021.10.22	2022.1.30
Complete installation test (Milestone 2)	Installation test results	Paul	2021.11.15	2022.2.10
Equipment testing and installation supervision	Notes for reporting at project supervision meetings	Paul	2021.10.15	2022.2.10
Quarterlyprojectmonitoring meetings(Control Point 3)	Follow-up and improvement measures	Peter, Paul, Mary	2021.9.1	2022.2.15

An effective project monitoring mechanism will further gain investor/lender confidence and should ensure that the project is on the right track and that project tasks and milestones are completed as planned. If delays or quality issues arise, immediate remedial action will be required.

The following table provides details of a typical project monitoring report:

Project Monitoring Report						
Project Name:		High Performance Building		Project Reference Number:	GF_2021_HEB	
Responsible Pers	son:	Paul		Commencement Date:	2021.6.1	
Monitoring Distance:		Every two months			Project Completion Period:	2022.2.15
Monitoring Schedule	Executive		Satisfactory progress?	Output Satisfaction?	Questions, corrective measures follow-up of results	
2021.8.1						
2021.10.5						
2021.12.3						
2022.1.3						

4. Fund Raising Management

Typical management is to keep the proceeds in a dedicated account and record all incoming and outgoing transactions in a register of proceeds. This requires a staff responsible for compilation and verification. An example of a book of proceeds is as follows:

Fund Raising Capital Register					
Green Finance Reference:		GF_2021			
Amount of registered capital		HK\$10 million			
raised:					
Qualified Green Projects 1:		High Performance Building	Project Reference:	GF_2021_HEB	
Qualified Green Projects 2:		Certified in BEAM Plus	Project Reference:	GF_2021_BP	
Date	In, Out	Marker Reference	Trading Instructions	Amount	

July 2, 2021	In	GF_2021_1	First drawdown of funds raised	3,000,000
July 2, 2021	Out	GF_2021_3	Fixed Deposit	1,000,000
July 5, 2021	Out	GF_2021_HEB_1	Water cooling, lighting, sensor equipment purchase	500,000
July 10, 2021	Out	GF_2021_BP_1	Equipment Improving for BEAM Plus	100,000

Producers:	Mary
Verifiers:	Paul

C. Green Technology Operation and Maintenance Manuals

The use of green technology is bound to have a series of operational needs and occasional damage situations, so a procedure or code of practice needs to be developed, including for dealing with unexpected events, the following will provide a detailed example of a high performance building as a reference for the operation and maintenance manual.

The following are some cautions for water cooling systems:

- During the operation of the equipment, pay attention to the system's exhaust and suction pressure system. If there is any abnormality, find the cause and troubleshoot it.

- Do not arbitrarily adjust the settings of the control and protection components.

- Check if the wire is loose. If loose, repair promptly.

- Regularly check the reliability of electrical components and replace ineffective or unreliable components.

After a long period of operation, calcium oxide and other minerals will accumulate on the heat transfer surface of the shell and tube heat exchanger. Excessive scaling can affect heat transfer performance and lead to increased power consumption and exhaust pressure. Organic acids such as formate, citric acid and acetic acid can release this material. Make sure the refrigerant is charged by checking the suction and discharge pressures. If there is a leak, refill the refrigerant. When refilling the refrigerant or replacing components of the circulating system, perform an airtightness test.

Carbon Dioxide Sensor Unit Repair Reference:

A good strategy may be to first perform a field inspection against a reference instrument, as these inspections can be performed relatively quickly. Based on the discrepancy observed during the field inspection, a simple adjustment guideline for air conditioning or lighting applications could be based on the following:

- If the observed variance is 2% RH or less, no treatment is required.

- If the variance is 2-4% RH, a spot adjustment is performed; and

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- If the variance is more than 4% RH, the equipment is sent for repair or replacement of the measurement module.

