HKQAA
HONG KONG QUALITY ASSURANCE AGENCY
香港品質保證局

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《Green Finance Implementation Guidebook – Food Manufacturing Industry》

HKQAA

Content

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.

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 and financial supervision departments, promote 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 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 - "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 Raised • Estimated Environmental Benefits
• Execute project risk management	• Environmental Compliance • Ability 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.

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

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

A. Environmental Challenges Facing

There are different environmental challenges in the food manufacturing industry. Often, the process of food processing and packaging inadvertently produces environmentally harmful by-products. From the environmental point of view, the biggest concerns or impacts of the food industry include water use, air pollution and noise, which are mainly the following three:

1. Generation of Wastewater

In the process of processing food products, food factories are bound to discharge wastewater, which, if not careful, may be discharged directly into the ground or into community water sources. To discharge commercial wastewater, a license should first be obtained from the Environmental Protection Department. To handle the sewage containing oil to meet the licensing requirements, it is inevitable that a grease trap will be used. A good grease trap must be properly designed and have sufficient capacity. The oil and grease separated from the grease trap is generally called grease trap waste, and grease trap waste needs to be removed regularly to ensure the effective operation of the grease trap. Simply put, when wastewater is injected into the grease trap, the flow of water slows down, allowing lighter materials to rise to the surface. The solid liquid grease and other lighter wastes remain in the grease trap, and the effluent is discharged through a pipe at the bottom of the trap.
In addition to the general grease trap, this article will later introduce a mature technology for grease trapping that is more effective today - the centrifugal water-oil separation system, thus achieving higher effluent discharge standards than legal regulations and becoming an immediate green technology application.
On the other hand, an innovative green technology will also be explored, using ozone technology to treat food and extend its food life, as well as to treat wastewater.

To find more information about effluent discharge, please refer to
https://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/water/guide_ref/files/wpc_gt_oil.pdf

2. The Generation of Oil Smoke

According to Section 10 of the Air Pollution Control Ordinance (APCO), if the fumes and/or odors from food and beverage manufacturing plants cause nuisance to the public, the EPD may issue an Air Pollution Abatement Notice to the owner or operator of the food and beverage manufacturing plant in accordance with Section 10 of the APCO, requiring improvement measures to be taken within a specified time frame. The food manufacturing industry has a high chance of generating grease and smoke during the cooking process due to the high temperature used. The way to control grease and smoke is to install grease hoods, which are generally divided into dry hoods, sprinkler type hoods and electrostatic type. The location of the exhaust vent should also be placed in a well-ventilated area to minimize the negative impact on the nearby residents.

3. The Generation of Noise

According to EPA regulations, if a food and beverage manufacturing facility emits excessive noise from its air conditioning or ventilation systems or other equipment, EPA may issue a Noise Abatement Notice (NAN) to the food and beverage manufacturing facility, requiring the facility to reduce the noise emitted by the facility to below the required level within a specified period. The noise reduction method can be done by adding Noise reduction can be achieved by adding silencers or enclosures to meet the legal requirements.

For more information, please refer to

https://www.hkpc.org/sites/default/files/2021-04/reind3_3dec2020.pdf

B. Green Project Selection and Evaluation

The choice to add an additional centrifugal water-oil separation system to treat wastewater or to use the new technology of ozone to treat food/wastewater as a green project has its own merits. The following will analyze the above two examples from several aspects as a guide to choose or evaluate a green project.

1. Legislation

The Water Pollution Control Ordinance (Chapter 358) was enacted in 1980 and subsequently amended in 1990 and 1993. The Ordinance empowers the Government to designate water control zones and establish water quality objectives (WQOs) for all waters of Hong Kong. The WQOs set targets for the protection and utilization of the water quality of Hong Kong waters in the public interest. The licensing system is implemented in each WCZ to control the discharge of effluent and sediment in the zone. The Technical Memorandum (TM) determines the discharge standard guidelines for the licence, which sets different standards for different zones and discharges to surface water and sewers, as well as different standards for different discharge flows, with higher flow standards generally being more stringent than lower flow standards. The use of good sewage treatment equipment can ensure that at least the licensing standards are met, and if the law is tightened, an advanced water-oil separator can first be more effective in separating oil and grease, and the need for and cost of a hard upgrade may be eliminated.

Under Hong Kong law, any person who intends to prepare and/or manufacture food for sale to the public in Hong Kong premises must obtain a food factory license from the licensing authority prior to commencing business. A variety of food preparation and manufacturing businesses in Hong Kong are required to apply for a food factory license, and the food is sterilized by ozonation, and the quality of the food needs to meet the license standards.

2. Technology

The centrifugal water-oil separator is now more common in the market and is not difficult to purchase in Hong Kong/Macau/Taiwan. The technology is vortex in action and the cone-shaped separator is the focus of the whole equipment, which requires low technical requirements.

As for the ozone technology, it is also used in beverage manufacturing, juice, etc. It is also used. However, since there are many disinfection technologies available, ozone may not be the first choice because of the need for careful handling. The installation, manufacturing and maintenance of the technology is slowly becoming mature, and its environmental protection and non-dependence on non-

renewable energy sources could become a new green proposed investment.

3. Investment Return

By using a centrifugal water-oil separator, more oil is isolated, which in effect increases the life of the drainage system and reduces the chance of clogging or chemical reactions in the pipes. In addition, the ability to handle more oil and dirt increases the variety of food products that can be processed.

Investing in ozone food sterilization technology can increase business profitability because the quality of the product increases. Because less waste is generated, the environmental impact and treatment costs of the facility are reduced.

4. Environmental and Social Impacts

The centrifugal water-oil separator reduces the amount of oil discharged into the sewer, in other words, it reduces the burden on our sewage treatment facilities, which contributes to water quality and society. Ozone is environmentally friendly and safe, with no harmful chemical residues, less water use, and no need to rinse the product at the end to ensure complete removal of residual chemicals, achieving water conservation and environmental protection.

There are 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.

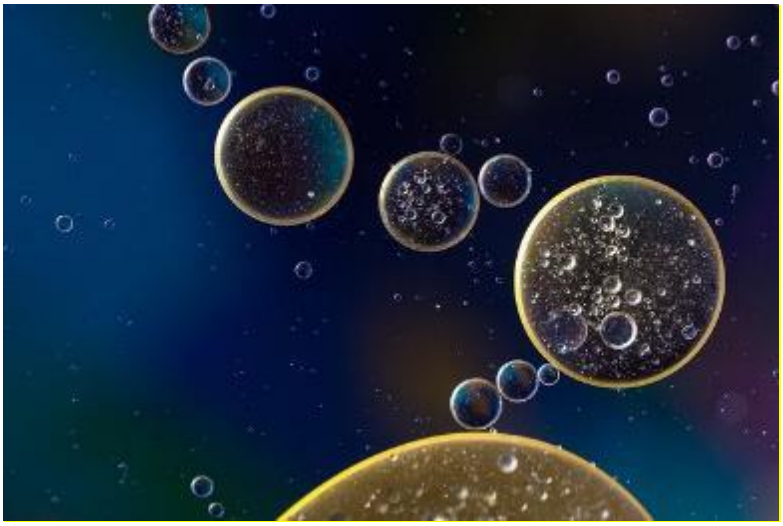
2. Green competitiveness of suppliers: For example, suppliers can improve the quality of supply chain management, increase corporate social responsibility in the supply chain, upgrade the environmental

management system of the supply chain, etc.

C. Green Technology Details - Centrifugal Water-Oil Separator

1. Market Situation

The Water Pollution Control Ordinance, which has been implemented in many parts of Hong Kong, establishes grease discharge limits for the discharge of sewage to sewers. Grease traps are common in food plants, usually with two to three compartments. The food manufacturing industry is a major source of grease, so the installation of a grease trap is very important. This installation effectively separates grease and oil before it is discharged into the sewer system. The basic design requirement for a conventional grease trap is to provide sufficient capacity to allow sufficient time for oil and wastewater to be separated to meet basic discharge requirements. However, food processing plants may require additional capacity or other more advanced grease traps to remove oil and grease to meet the discharge requirements, and expert advice should be sought on the details of a more efficient grease trap that can achieve better effluent quality than is legally required.



2. Scientific Background

Centrifugal water-oil separation systems use an active vortex created when oily water is injected into the tank at an angle. The centrifugal force accelerates as it forms a vortex or spiral shape. Since water is denser than oil, it is pushed to the outer edge and allowed to fall towards an outlet for further processing.

The lighter oil is pushed to the center and up through the top into the waste tank, where the core is forced out through the overflow by maintaining a pressure differential between the overflow and underflow. This type of separator is suitable for efficient oil removal from water, such as for use in factories and highly polluted waters. The rise rate of oil droplets is also governed by Stokes' law. If the size, specific gravity and viscosity of the continuous fluid are known, the rise rate can be calculated. In order to calculate the size of the gravity separator for an empty vessel, it is first necessary to calculate the rise rate of the oil droplets by using Stokes' law. As for the size of the separator, it is calculated by

considering the path of the droplet, which enters from the bottom of one end of the separator and exits from the other end of the separator. Consideration is given to the need to provide sufficient volume (residence time) in the separator so that the droplets entering the separator at the bottom of the inlet end of the separator have time to rise to the surface before the water carrying the droplets leaves the other end of the separator.

3. Advantages

This type of oil separator relies on a strong centrifugal force for oil separation. Other oil separators, such as coalescing plate packages, gasoline interceptors or similar oil separators, rely on weaker gravitational forces for oil separation. The centrifugal force generated in the separator can be up to a thousand times that of gravity, allowing for more efficient treatment of oily wastewater, even with emulsified oil droplets.

4. Cost Requirements

The smallest model of a centrifugal water-oil separator starts at about 3,000 liters per hour and ranges from US$20,000 to $30,000.[1] If there is a better discharge effect, in addition to avoiding fines for non-compliance, it can also avoid additional maintenance or cleaning costs due to blockage of drains caused by oil pollution. Compared to traditional high-capacity grease traps, which operate by geocentric suction, they naturally save a lot of space.

D. Green Technology Details - Ozone

1. Market Situation (Existing Technologies and Pain Points)

In the food manufacturing industry, the preservation of food, including extension of shelf life of raw materials or prepared foods beyond their natural decay time, has been a challenge. Inactivation of enzymes and killing of microorganism as a means of food preservation by using heat, particularly through cooking, has long been the conventional methods of eliminating pathogens. Continuous disinfection is a necessity to maintain both a high level of produce quality and social responsibility.

As cross-contamination of bacteria and other disease-causing microbiological growth might arise during the food handling process, new technologies including steam pasteurization, steam vacuuming, flash pasteurization and others continue to rely on heat to control or reduce harmful microorganisms in food.[2] While the effectiveness of heat processing is dependent on treatment temperature and time, it however would induce certain amount of nutrient loss, development of undesirable flavours and

[1] https://cleanawater.com.au/information-centre/oil-water-separators-a-price-guide (viewed Sep 2021)

[2] Majchrowicz, A *Food Review*, **1999**, *22*, 16.

deterioration of functional properties of food products[3] which may not meet the consumers' demand for nutritious and fresh-like products.

Non-thermal technologies, such as chemical rinsing and others works without heat, affect the composition and cellular activity of pathogens and ultimately killing them. There are different types of non-thermal technologies. Among them, sodium hypochlorite, a chlorine sanitizer that is commonly known as bleach, is widely used to treat the water used in washing, cooling, transporting, and storing products, as well as in treatment of equipment and food-contact surfaces in the processing facilities. The problem associated with chlorine sanitizers is the potential build-up of harmful chemical residues from its reaction with the organic materials in food, producing chlorinated by-products or trihalomethanes (THMs), which is a precursor of carcinogens.[4] Also, when sodium hypochlorite dissolves in water, hypochlorous acid will form and potentially further releasing the highly toxic chlorine gas[5] if the pH environment is not monitored carefully. There is a need for food manufacturing industry to develop safer and environmentally friendly alternatives to meet consumers' demand for safe and fresh-like products.

2. Scientific Background

It is important to identify another type of non-thermal technology that can address the problems associated with sodium hypochlorite while meeting the demand for safe and fresh-like products. Ozone is a powerful oxidising agent which is known to be 3000 times more germicidal than chlorine and an environmentally friendly sanitizer that can destruct micro-organisms by the oxidation process.[6] It has been in use for water treatment to disinfect the water and to help remove foul odour/impurities.[7] It was also declared as Generally Recognized as Safe (GRAS) for use in food processing by the United States' Food and Drug Administration (FDA) in 1997.[8] *The production of ozone requires no chemical substances, and it can be generated using only the natural resource of oxygen. Under high voltage or an ultra-violet light source, an oxygen molecule (O_2) is split to form two oxygen radicals (O.). The oxygen radicals then combine with other oxygen molecules to form ozone (O_3).*

Ozone can be applied to destruct pathogenic organisms on produce or be infused into distilled water to become a washing agent. Upon contact with microbes present on produce or in the water, ozone can penetrate cell walls of micro-organisms. It disrupts cells by breaking down the cell membrane (a process called Lysis) and then destroy them by oxidizing the cellular components and releasing its enzymes,

[3] Dolatowski, Z.J.; Stadnik, J.; Stasiak, D. *ACTA Scientiarum Polonorum, Technologia Ailmentaria*, **2007** 6, 89

[4] Fawell, J., *Food and Chemical Toxicology*, **2000**, *38*, S91

[5] https://ucfoodsafety.ucdavis.edu/sites/g/files/dgvnsk7366/files/inline-files/26437.pdf (viewed on Sept **2021**)

[6] Lenntech, https://www.lenntech.com/library/ozone/disinfection/ozone-disinfection-mechanism.htm (viewed Sept **2021**)

[7] Rice, R.G. *Science and Engineering*, **1999**, *21*, 99

[8] Graham, D.M. *Food Technology*, **1997**, *6*, 72

proteins and fatty acids. Rapid cell death results from the oxidation of internal cellular components thus achieving the purpose of disinfection.

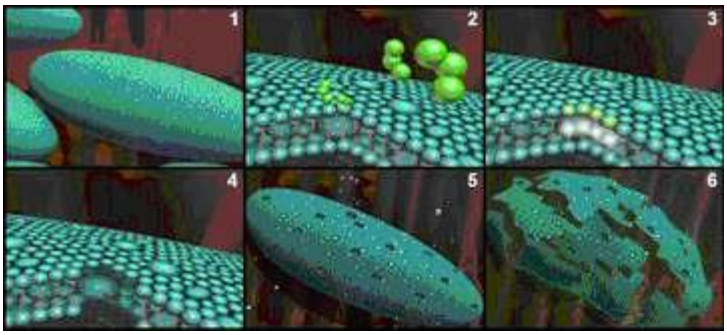


Figure 1: A representation of bacterial lysis by ozone

3. Benefits

There are several benefits to use ozone in the food manufacturing industry:

1. Ozone is environmentally friendly and safe – no harmful chemical residues like THM's or chlorinated by-products will form as no chemicals are utilized in the process and ozone will spontaneously decompose into oxygen shortly after generation.
2. No chemical storage required – less spending of resources on chemical hazard control and reduced risk of safety issues induced by improper handling of chemicals
3. Instant pathogen destruction – due to ozone's strong oxidizing power, which is 3000 times more germicidal than chlorine, it is thus able to degrade organic and inorganic pollutants in water
4. Less water usage, possible reduce of energy costs – ozone keeps wash water cleaner, longer and requires no final rinse of produce to ensure the complete removal of remaining chemicals
5. Improved output quality and possibly increased business profitability, with lowered environmental impact and disposal costs of production facilities

4. Key Functions & Specifications

There are two approaches available to generate ozone:

a) Ultra-Violet Lamp Method

When ambient air (20% O_2) or oxygen-enriched air is passed through the UV light source at a wavelength of 188nm, an oxygen molecule (O_2) consisting of 2 oxygens will spilt into two single O's and form ozone (O_3) upon collision with other available oxygen molecules. The ozone molecule can then degrade rapidly back into oxygen after a short period of time.[9]

[9] Duguet, J.P. *Ozone News*, **2004**, *32*, 15

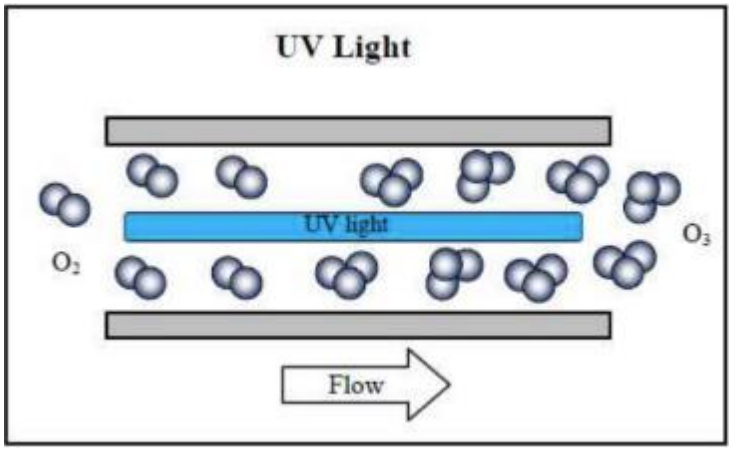


Figure 4. Ultra-Violet Lamp method for conversion of oxygen to ozone.

b) Corona Discharge Method

Splitting of oxygen molecules and collision of the split oxygen atom with other available oxygen molecules also happens in this approach. This method uses two electrodes, one is of high tension and the other of low tension.[13] The electrodes are placed with a narrow discharge gap and separated by a dielectric medium. When dry oxygen-enriched air or highly purified oxygen passes across the discharge gap with a high electric voltage (>5000V), ozone will form.

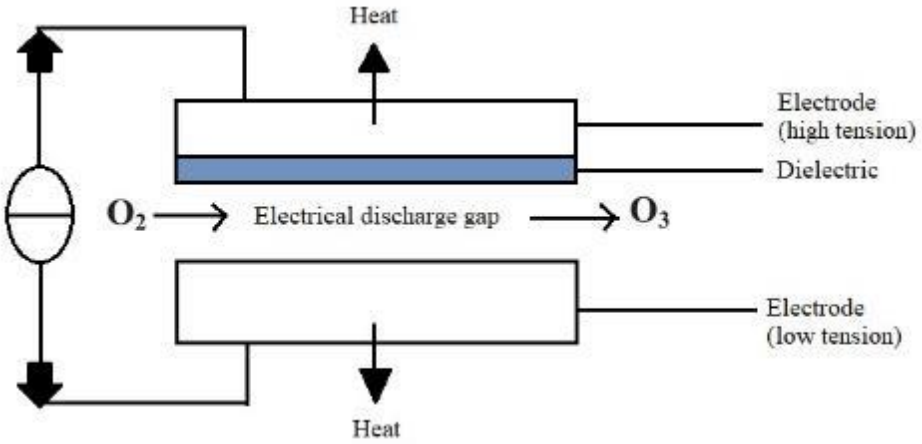


Figure 5. Configuration of the Corona Discharge Method

Some ozone gas generators can look like:

Figure 6. Examples (the grey and blue machine) of ozone generator instrument.

With a power supply requirement of 220V at 50Hz, generating ozone at 0-6.5g/hr and a flow rate of 3-5L/min.

For an ozonated water generator, it can look like:

Figure 7. The Biotek C-7120 ozone water generator

This example is taken from the C-7120 model produced by Biotek. It requires a power supply of 80 Watts, able to generate ozonated water with concentrations ranging from 1.0ppm to 4.0ppm. This model will operate with an output rate of 180-360L/hr and an output pressure of 0.1-0.3kg/cm^3.

5. Show Case(s)

The following tables compare the estimated annual costs between:

1) a conventional sodium hypochlorite water food sanitizing system and;
2) an Ozonated water food treatment system

(Assuming 1,000,000 kg of sanitizing water to be utilized per year for a food manufacturing plant)

Items	Comment	Estimated cost
Sodium Hypochlorite[10] (200ppm)	200kg/yr * HKD 150 @kg	HKD 30,000
Sodium Hypochlorite storage and environment monitoring cost [11] (500 sq.ft)	500 sq.ft * HKD 70 @sq.ft	HKD 35,000
Used bleach purification cost	1,000,000kg * HKD 0.01 @kg	HKD 10,000
Water charge	1,000,000kg * HKD 0.005 @kg	HKD 5,000
	Total	**HKD 80,000**

Table 1. Conventional sodium hypochlorite water food sanitizing system

Items	Comment	Estimated cost
Ozonated water generator (W-500A-m)	HKD 50,000 / 5 years expected lifespan	HKD 10,000
Ozone monitor (OZ-06b)	HKD 25,000 / 5 years expected lifespan	HKD 5,000
Electricity charge	1,500 kWh/yr * HKD 0.9 @ kWh	HKD 1,350
Water charge	1,000,000 kg * HKD 0.005 @ kg	HKD 5,000
Annual maintenance fee		HKD 1,500
	Total	**HKD 27,350**

Table 2. Ozonated water food treatment system

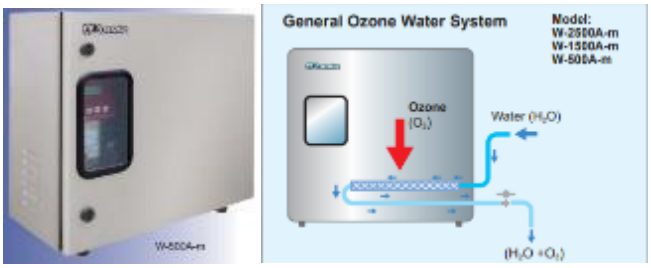


Figure 8. The PIE Ozonation monitor W-500A-m

Figure 9. The PIE Ozone Monitor OZ-06b

[10] National Food Processors Association. "Food Plant Sanitation, "Chapter 5 in Canned Foods: Principles of Thermal Process Control, Acidification, and Container Closure Evaluation, 6th ed. A Gavin and L.M. Weddig (Ed.), The Food Processors Institute, Washington D.C., pp. 35-47, 1995.

[11] W. McGlynn, Guidelines for the Use of Chlorine Bleach as

a Sanitizer in Food Processing Operations, 2010

In addition to its environmental benefits, Ozonated water food treatment system is also much cheaper than the conventional sodium hypochlorite water food sanitizing system resulting in . > 60% savings per year. The cost reduces greatly mainly due to the elimination of purification cost and storage cost of Sodium Hypochlorite.

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 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 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. Food Manufacturing Industry SMEs can look to industry pioneers such as Four Seas Group to develop their sustainable development strategies.

「The Group has established comprehensive environmental policies, which ensures all relevant legislation is followed and abided. We are also committed to regular review of these policies to ensure they are in line with our goals for ESG excellence, to reduce the impact of our operations on the environment and strive towards continuous improvements in our environmental performance. Overall, for the year ended 31 March 2020, the carbon emissions of each unit of product from our operations is 0.43 kgCO2 e, and our absolute carbon emissions decreased by 13% from last year Reducing energy consumption contributes to fewer greenhouse gas emissions and less climate change impacts. As purchased electricity represents approximately 74% of our carbon emissions, the Group fully understands the efforts required and has been working to reduce the use of energy in our facilities as far as possible.」

Reference：http://www.fourseasgroup.com.hk/us/investor-relations/annual-report

Dairy Farm:「In six months, our machines saved over 50,000 plastic bottles from going to landfill. This ensures that more plastic bottles are recycled properly whilst making it easier for the public to participate in environmentally friendly practices. In other plastic reduction efforts, we have reviewed tray thickness in our Hong Kong Fresh Food Centre, reducing plastic usage by 14% without compromising on food hygiene. We have sought to reduce plastic usage in stores, resulting in a 24% reduction from the previous year.」

Reference：https://ar2020.dairyfarmgroup.com/PDF/ar2020-06-Sustainable-Transformation-at-Dairy-Farm.pdf

Vitasoy International Holding Ltd.:「In our plastic, glass, and carton paper packaging, we have also committed to using as many recycled materials as possible. Vitasoy continues to collect, sanitise, and reuse our glass bottles. Through our efforts, we have achieved a 94% glass bottle recycling rate, meeting our 2025/26 goal of maintaining or surpassing 90%.From our commitment to minimising the impacts of our packaging, we have implemented the use of 100% rPET bottles for all distilled water products across our operations. Given the positive results of this initial project, with careful consideration to product quality and safety, we are currently in the process of expanding our use of rPET bottles to other product offerings, which will commence towards the end of 2021.」

Reference：https://www.vitasoy.com/sustainability/cms/reporting/report/Sustainability_Report_2020-21.pdf

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.
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. Ozone – Main Application

Some micro-organisms that are proven to be disrupted by ozone treatment include but not limited to: coliforms, pseudomonas fluorescents, yeast, lactic acid bacteria and grey mould.[12] Besides the naturally present micro-organisms, ozone can also deactivate synthetic substances like detergents, herbicides and pesticides.[13] In the context of food manufacturing, ozone is useful in food preservation and wastewater treatment.

Ozone treatment is applicable to fresh fruits and vegetables, which can be carried out by using a spray or fume system. Since ozone is highly reactive and can easily decompose into oxygen in a very short time, it needs to be generated *in situ*. The concentration settings, mode of ozone delivery (whether in gaseous or aqueous form) and exposure time to ozone will vary depending on the type of the produce and the micro-organisms present. However, high concentration of ozone can induce metal corrosion and a prolonged human exposure to ozone is harmful and should be avoided. The threshold limit value for exposure to ozone is 0.1ppm for up to 8 hours and 0.3ppm for up to a short-term of 15 minutes.[14] At concentrations above 4ppm, ozone would be fatal to humans.

With optimized and appropriate operating procedure, post ozone-treated products will result in a prolonged shelf life for up to well above a week under normal storage circumstances. Application of ozone can also be used to treat liquid-based foods such as apple cider and orange juice.[15] For liquid-based foods like fruit juice and milk, ozone treatment is carried out in bubble columns. The bubble column is a vertically-arranged cylindrical vessel filled with the liquid-based food, with gaseous ozone being diffused into the column through a gas diffuser (Sparger) attached to the bottom (Figure 2). In the bubble column, ozone reacts with liquid-based food where it is consumed and followed by a chemical reaction that involves oxidation, thus achieving sanitization of the liquid-based food. Excess amount of ozone could be captured and then destroyed by using a UV light source of wavelength 254nm with a catalytic agent or granular activated charcoal.[16]

[12] Tzortzakis, N.; Singleton, I.; Barnes, J. *Postharvest Biology and Technology*, 2007, 43, 261.; Selma, M.V.; Ibanex, A.M.; Cantwell, M.; Suslow, T. *Food Microbiology*, **2008**, *25*, 558

[13] Guzel-Seydim, Z.B. ; Greene, A. K.; Seydim, A.C. *LTW-Food Science and Technology*, **2003**, *37*, 453

[14] Olmes, H. & Kretzschmar, U. *Food Science and Technology*, **2009**, *42*, 686

[15] Williams, R.C.; Sumner, S.S.; Golden, D.A., *Journal of Food Science*, **2006**, *70*, M197

[16] Sukarminah, E.; Djali, M.; Andoyo, R.; Mardawati, E. *KnE Life Sciences*, **2017**, *2*, 459

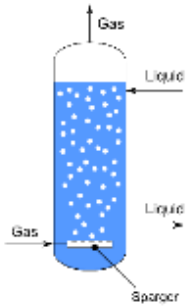


Figure 2. Configuration of the ozone bubble column for liquid food sanitization.

For seafood like fresh fishes, shrimps and shucked mussels, they can be soaked and washed in ozonated water for sanitization. Ozonated water can be prepared by continuously bubbling ozone into distilled water for at least 5 minutes until saturation is reached.[17] Treating seafoods in such method can effectively help minimize the characteristic 'fishy' smell, reduce microbiological flora and still maintain the quality of the product with a prolonged storage life.[18]

Grain products also will benefit from ozone treatment for its effectiveness in mycotoxin destruction, insect killing and microbial inactivation while placing no effect on the grain quality, which is a huge advantage over the traditionally employed harmful pesticides. For example, treatment of soft and hard wheat can be done with ozonated water. A significant reduction of total bacteria and yeast/mould population can be achieved, the chemical and physical properties of the parent flour will still remain unchanged.[19]

Ozone treatment also applies to the suppression of bacterial activity in meat and poultry products, hence increasing the products' shelf-life.[20] (how about the freshness and nutrient loss?) When treated with ozone, microbes like *Salmonella infantis, Salmonella typhimurium, E.coli* and *Pseudomonas aeruginosa* populations can be greatly reduced while colour and odour characteristics of meat can remain unchanged.

Quality of wastewater from processing plants can be improved if ozone treatment is employed. Ozonation describes the water treatment process that reduces the number of micro-organisms and organic/inorganic pollutants from wastewater treatment plants.[21] An ozonation system is mainly consisted of an ozone generator and a contact tank where bubbling of ozone into the wastewater source will occur. (Figure 3) The contact tank will allow sufficient contact time between the ozone gas bubble and wastewater

[17] Kontominas, M.G.; Badeka, A.V.; Kosma, I.S.; Nathanailides, C.I. *Animals-MDPI*, **2021**, *11*, 92

[18] Goncalves, A.A. *Brazilian Archives of Biology and Technology*, **2009**, *52*, 1527

[19] Ibanoglu, S. *Journal of Food Engineering*, **2001**, *48*, 345

[20] Jaksch, D.; Margesin, R.; Mikoviny, T.; Skalny, J.D.; Hartungen, E.; Schinner, F.; Mason, N.J. *International Journal of Mass Spectrometry*, **2004**, *239*, 209

[21] Margot, J.; Magnet, A.; Thonney, D.; Chevre, N.; De Alencastro, F.; Klenie, C.; Abeggien, C.; Barry, D.A. Rossi, L. **2011** *in: SETAC Europe 21st Annual meeting, Milano, Italy*.

to be disinfected. The off-gases (remaining ozone) can be recycled for reuse or collected to the ozone destruction unit before releasing into the atmosphere. The quality of disinfection is largely dependent on the transfer of ozone to the wastewater. Ozonation system should be properly calibrated for optimal flow rate, mixing and contact time for the desired disinfection effect and meeting local wastewater discharge regulations.

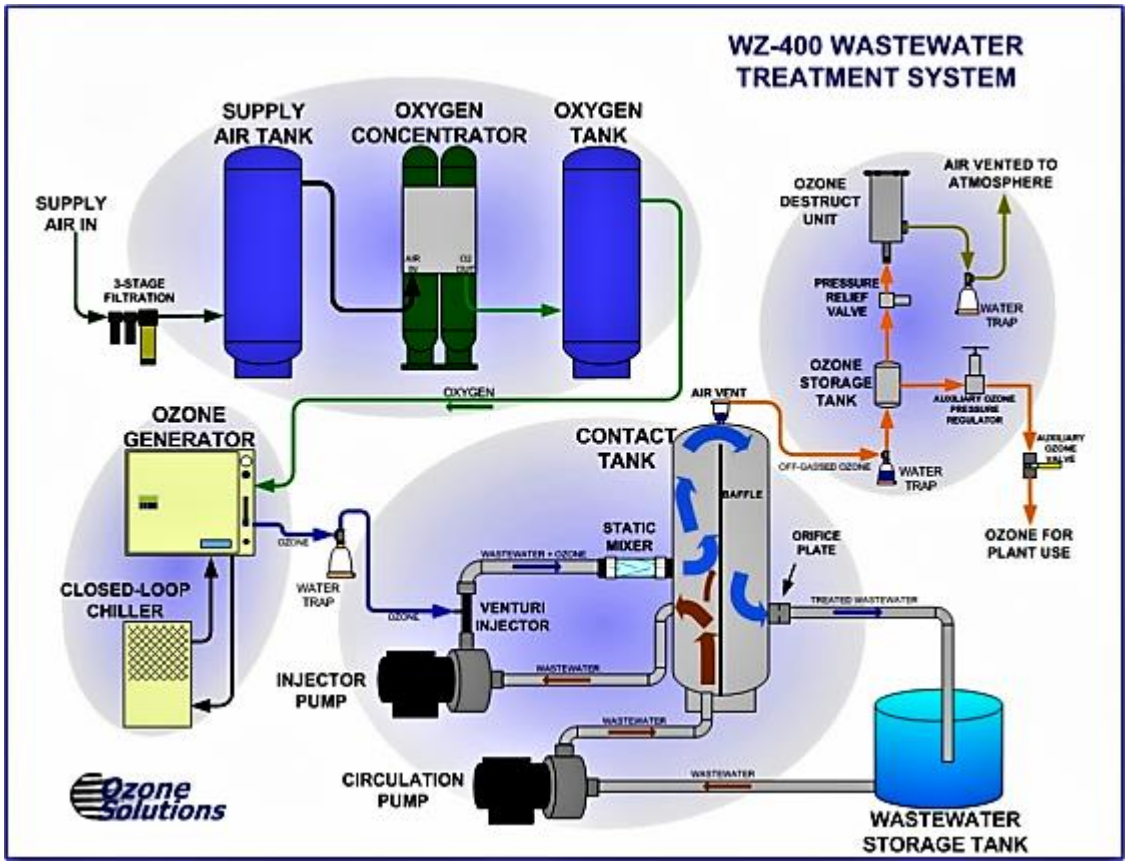


Figure 3. Scheme of the ozonation process for wastewater treatment, illustrated by Ozone Solutions.

It should be noted that ozone is a corrosive substance that can erode metal when the concentration reaches above 1.0ppm. Employers shall choose a suitable design and beware of the treatment conditions if ozone is chosen as the disinfectant in the manufacturing process.

2. Centrifugal Oil-Water Separator – Main Applications

Centrifugal oil separators are used for wastewater treatment and cleaning up oil spills at sea or on lakes, as well as for filtering diesel and lubricating oils to remove waste particles and impurities. No matter in the catering industry or food manufacturing industry, as long as the function of oil separation is needed, the oil separator can be installed and applied.

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
Ozone Disinfection	1) Annual Reduction of THM emissions (tonnes) 2) Water Use reduced/avoided per year (Gallon)	SDG7 Affordable Clean Energy
Centrifugal Oil-water Separator	1) Annual Treated Water Volume (Gallon) 2) Oil/Grease reduced/avoided from discharging into communal per year (Gallon)	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.

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:	Ozone Disinfection and Wastewater Treatment			
Project Reference Number:	GF_2021_OD			
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
Procurement of equipment and construction 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 (Control Point 2)	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

Equipment Testing (Milestone 1)	Equipment Test Results	Peter, Paul, Mary	2021.10.15	2021.1.5
Installation Engineering	Installed ozone equipment	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
Quarterly project monitoring 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:	Ozone Disinfection and Wastewater Treatmemt	Project Reference Number:	GF_2021_OD
Responsible Person:	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 and 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 raised：	HK$10 million		
Qualified Green Projects 1：	Ozone Disinfection	Project Reference：	GF_2021_OD
Qualified Green Projects 2：	Centrifugal Oil-water Separator	Project Reference：	GF_2021_OS

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_OD_1	Project Design and Equipment Purchase for Ozone Disinfection First Installment	500,000
July 10, 2021	Out	GF_2021_OS_1	Deposit for Centrifugal Oil Separator	100,000

Producers: Mary

Verifiers: Paul

C. Green Technology Operation and Maintenance Manuals

The use of green technology will certainly have a series of operation needs and occasionally there is a chance of damage, so it is necessary to develop a program or code of practice, including the response to unexpected events, the following will provide reference to the operation and maintenance of ozone disinfection method.

1. Operation and General Maintenance of the UV lamp method

The UV lamp method, described earlier, relies only on the UV light source plus air, and the device must be cleaned once or twice a year. If algae and/or scale increases, the quartz glass tube that holds the lamp must be cleaned with a soft cloth dipped in spirit vinegar or acid.

After any maintenance operation, make sure that all components are as they were and that there are no leaks after the entire system has been operated. The UV lamp must be replaced at the end of its service life. Be sure to turn off the power when replacing the lamp. Do not touch the lamp with your hands and use soft fabric or cotton gloves to handle or clean the lamp. If the lamp has been touched, it is recommended that it be cleaned again with a soft fabric and some alcohol.

2. Operation and General Maintenance of the Corona Discharge method

Each ozone module should be replaced after approximately 15,000 hours of operation, as the ozone module is a key consumable. Also, the ozone supply tube needs to be checked periodically for cracks or wear, and the ozone supply tube should be replaced if necessary, and the "ozone check valve" should also be checked periodically for good sealing. Replace the "Ozone Check Valve" every 15,000 hours or as needed. When operating, check for air bubbles entering the water. The life of the Ozone Cleaner can be maximized through a proper operation and maintenance program.