

# LOW CARBON LOGISTICS GOOD PRACTICE AND GUILDLINES FOR SMES

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活動式貨物架配合不同形式的排列要求 Flexible cargo rack allows different layout requirement



精簡包裝的操作程序 Streamlining operation for packaging



已包裝的辦公室設備將會運去位於泰國 的生態製造中心 Packed office equipment to be shipped to ecomanufacturing centre in Thailand



將使用過的辦公室設備及耗材檢查、拆件及分類 Used office equipment and consumables being Inspected, disassembled and categorised



重用的填充和包裝物 Used packaging materials



電動鏟車 Electric forklift truck

### **Chapter 1 - Introduction of Low Carbon Logistics**

This chapter looks into the latest scientific evidence on the nature and extent of climate change. It covers international policies to address the problem of greenhouse gas (GHG) emissions, particularly those relating to Low Carbon Logistics.

#### Q1. Why small and medium enterprises (SMEs) are targeted?

A1. SMEs may not have recognised the importance of "low carbon" related to their businesses yet. The number of SMEs is huge and SMEs are critical members of the society for its sustainable development. Therefore, the involvement of SMEs is important for the success of "Low Carbon Logistics". However, the resources of SMEs are limited and they need a practical guidance to implement the "low carbon" concept.

#### Q2. Why Low Carbon Logistics?

A2. Low carbon has become a local as well as global issue that series of local regulations and global conventions are being developed for its implementation. The implementation of Low Carbon Logistics will add business opportunities to SMEs and yet the low carbon concept appears to be not-well-adopted by SMEs. Thus, there are substantial needs for them to understand the concept of low carbon.

### Q3. What kinds of business opportunities will be brought through Low Carbon Logistics?

- A3. Low Carbon Logistics can bring a wide range of business opportunities to SMEs. Logistics is the back-bone of supply chains and one of the important strategic tools. The low carbon concept will improve the logistics efficiency and enhance the company's reputation. Some products have been promoted with their low carbon emissions as selling point. Low carbon represents a new market.
- Q4. Is it difficult for SMEs to implement Low Carbon Logistics?
- A4. It is inevitable that SMEs will face some difficulties in achieving Low Carbon Logistics. Low carbon is a relatively new concept in logistics and SMEs will need some advice in implementation. In managerial aspect, low carbon

principles may be contradictory to their existing processes. In technical aspect, the Low Carbon Logistics may need certain capital investment to improve the carbon performance.

- Q5. What is greenhouse gas (GHG)?
- A5. GHG is a family of gases that can cause the greenhouse effects. The primary GHG is water vapour, carbon dioxide, methane, nitrous oxide and ozone.
- Q6. What is the relationship between climate change and GHG emissions?
- A6. Scientists found that atmospheric concentrations of carbon dioxide and methane in the atmosphere are remarkably correlated to atmospheric temperature. They further proved that the increase of GHG concentrations is the major reason of climate change.
- Q7. What are the major sources of GHG?
- A7. GHG is generated by two major processes: biogenic and anthropogenic. Biogenic processes denote decomposition of biological materials, forest fires and fermentation. Anthropogenic processes include burning of fossil fuels, deforestation, changes in wetland structure, emission fluorination gases in refrigeration systems, fire suppression systems, and agricultural activities by using nitrogen synthetic fertilisers. In the present, burning of fossil fuels is the most significant source of GHG.
- Q8. What are the common types of GHG? How are they related to human activities?
- A8. The following are the common types of GHG:

Name	Major Emissions from Human Activities
Carbon Dioxide (CO <sub>2</sub> )	Fossil fuels, rotting solid waste, cement production, chemical reactions, land use change
Methane ( $CH_4$ )	Fossil fuels, rice paddles, fermentation of organic and livestock waste in solid waste facilities
Nitrous oxide (N <sub>2</sub> O)	Fertiliser manufacturing, combustion, industrial processes
FHFC 23 (F-gases - CHF <sub>3</sub> )	Electronics manufacturing, used as refrigerants

#### Table 1.1 Summary of common types of greenhouse gas

Name	Major Emissions from Human Activities
HFC 134a (F-gases - CH <sub>3</sub> CF <sub>3</sub> )	Used as Refrigerants
HFC 152a (F-gases - CH <sub>3</sub> CHF <sub>2</sub> )	Industrial processes
Perfluoromethane (F-gases - CF <sub>4</sub> )	Aluminium production process
Perfluoroethane (F-gases – $C_2F_6$ )	Aluminium production process
Sulphur hexafluoride (F-gases – SF <sub>6</sub> )	Dielectric fluid
Water vapour (VOC)	-

#### Q9. How are the sources of GHG classified?

- A9. There are many ways to classify GHG sources. A popular way is to classify GHG sources according to energy consumption. To be more specific, Scope 1, 2 and 3 of the Kyoto Protocol are used to label the 3 emissions defined in ISO 14064, and they are direct emissions, energy indirect emissions, and other indirect emissions.
- Q10. Are there any international conventions to help countries fight against GHG emissions?
- A10. The most important international conventions are: Montreal Protocol and Kyoto Protocol.

#### Q11. What are the key issues of the Montreal Protocol?

- A11. The key issues of the Montreal Protocol are to protect public health and the environment from potential adverse effects caused by depletion of earth's ozone layer through reducing the abundance of those substances in the atmosphere; and to phase out the use of CFCs, halons and other manmade ozone depleting chemicals (ODC).
- Q12. How successful is the Montreal Protocol?
- A12. The Montreal Protocol is the most widely ratified treaty in the United Nations. The Montreal Protocol was agreed and signed by 24 countries and by the European Economic Community in 1987 and entered into force on 1 January 1989. To date, 197 States have ratified the treaty.

The Protocol is a trigger of international cooperation on negotiating and debating the issues of global warming by holding annual meetings to review, amend, and update the Protocol such that some new chemicals will be included under control.

- Q13. What are the major responsibilities of ratified countries in the Montreal Protocol?
- A13. The major responsibilities of ratified countries are defined in Article 2 and 4. Article 2 states that the level of consumption and production of the controlled substances with reference to 1986 baseline year. Article 4 hinders the trade of controlled substances and technology for production.
- Q14. How does the Montreal Protocol ensure the conformity of the Protocol from the ratified countries?
- A14. Article 6 and 7 of the Montreal Protocol require the ratified countries to provide the statistical data of production, consumption and trading to the secretariat annually with possible assessment. Article 11 states that the meeting shall be held by parties regularly.
- Q15. What are the aims of the Kyoto Protocol?
- A15. The Kyoto Protocol is an international treaty to bind countries for taking domestic action against climate change by reducing emissions. It aims at stabilising GHG concentrations in the atmosphere at the level that will ensure sustainable development, strengthening the global response to climate change, and assisting countries in adapting to the inevitable effects of climate change by exchanging best practices, e.g. facilitating the development of techniques.

### Q16. Which are the ratified countries of the Kyoto Protocol?

- A16. The Kyoto Protocol has divided ratified countries into two groups according to differing commitments. 37 industrialised countries and European Community have committed under the Kyoto Protocol, Annex I. Other countries, mostly developing countries, are listed in the non-Annex I.
- Q17. Which GHG is controlled by the Kyoto Protocol?
- A17. GHG consists of: carbon dioxide  $(CO_2)$ , methane  $(CH_4)$ , nitrous oxide  $(NO_2)$ , sulphur hexafluoride  $(SF_6)$ , hydrofluorocarbons (HFCs), and perfluorocarbon (PFCs).

## Q18. What are the major responsibilities of ratified countries of the Kyoto Protocol?

A18. Annex I Parties (developed countries) commit to limit or reduce their emissions of the 6 GHG at 5.2% on average for the period of 2008-2012 against the level either in 1990 or 1995. The emission level of 1990 is calculated with figures of GWP (global-warming potential), where Non-Annex I Parties, mainly developing countries, participate in Kyoto Protocol via the Clean Development Mechanism (CDM).

#### Q19. What is the major philosophy of the Kyoto Protocol?

- A19. The Kyoto Protocol recognised that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activities. Therefore, a heavier burden has been put on developed countries through legally binding them to emission reduction targets, based on the principle of 'common but differentiated responsibilities'.
- Q20. Are there any significant measures to enhance the target achievements by different countries?
- A20. Developed countries listed in Annex I are encouraged to use marketbased mechanisms, for example, emission trading (Article 17), clean development mechanism (Article 12), and joint implementation (Article 16).
- Q21. What are the major similarities and differences between Clean Development Mechanism (CDM) and Joint Implementation (JI)?
- A21. Both Clean Development Mechanism (CDM) and Joint Implementation (JI) are project-based. JI are those projects jointly carried out by developed countries. CDM is a mechanism to encourage developed countries to invest sustainable projects in developing countries.
- Q22. What are the responsibilities of ratified countries of the Kyoto Protocol?
- A22. Article 4 and 12 of Kyoto Protocol require that Annex I Parties have to submit an annual national GHG emission inventory by 15 April each year to the secretariat. National GHG inventories include emissions by sources and removal of 6 GHG. The total emissions over the commitment period should be less than or equal to its total assignment amount.

# Q23. Are there any penalties in the Kyoto Protocol if the ratified countries cannot keep their emission commitments?

- A23. Article 3 establishes a Compliance Committee to consider and determine cases of non-compliance. If any ratified country fails to perform, it is required to prepare a compliance action plan with the reason for the non-compliance and scheduled actions. The compliance action plan is to show the party's intention to meet its emission commitment in the subsequent period. The enforcement branch will suspend the Party's eligibility in the next commitment period to transfer units to other parties though emission trading.
- Q24. How are the minimum emission commitments set by international conventions?
- A24. In the COP16 held in December 2010 by UNFCCC in Cancun of Mexico, Parties agreed to link the emission target to the global temperature such that future global warming is limited to 2 degrees or below with reference to the pre-industrial temperature level. In other words, the atmospheric concentrations of GHG should be below 450 parts per million (PPM) CO<sub>2</sub>e.

### Q25. How successful is the Kyoto Protocol?

A25. The Kyoto Protocol is generally regarded as an important first step towards a truly global emission reduction regime that will stabilise GHG concentrations by Parties' commitment. At COP17 in Durban in December 2011, the second commitment period seamlessly follow the first commitment period. At COP18 in Doha in December 2012, the length of the second commitment period is 8 years long and ranges from 2013 to 2020.

# **Q26.** How significant does international transport industries contribute to global GHG emissions?

A26. Both maritime and aviation transport contribute the global GHG emissions significantly. Maritime contributes 3% of global GHG emissions and will grow by 150% to 250% in 2050 if no action is taken. Aviation transport contributes 3% of global GHG emissions and will grow by 300% to 700% in 2050 if no action is taken. The growth of emissions is mainly due to economic growth and globalisation.

# **Q27.** Are maritime and aviation excluded from the industrial binding of the Kyoto Protocol?

A27. Yes, maritime and aviation are excluded from national GHG emission targets of the Kyoto Protocol, because of the globalised nature of maritime and aviation operation.

# Q28. Are there any organisations responsible for GHG emissions from maritime and aviation?

- A28. Article 2 in Section 2 of the Kyoto Protocol stated that the Parties included in Annex I shall pursue limitation or reduction of GHG emissions not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), respectively.
- Q29. What are the mitigation measures designed by IMO for maritime industry?
- A29. In COP15 in December 2009, IMO planned to propose a legally-binding regime on controlling maritime emissions of GHG. In the same year, IMO's Maritime Environment Protection Committee (MEPC) put forward a package of technical and operational measures to address GHG emissions from ships, namely, Energy Efficiency Design Index (EEDI), Energy Efficiency Operational Indicator (EEOI), and Ship Energy Efficiency Management Plan (SEEMP).
- Q30. What is Energy Efficiency Design Index (EEDI)?
- A30. EEDI was adopted as a mandatory measure in 2011 under the newly added Chapter 4 "Regulations on energy efficiency for ships" of the International Convention for the Prevention of Pollution from Ships (MARPOL). EEDI addresses improvements in energy efficiency by requiring a minimum energy efficiency level for new ships and stimulating continued technical development of all the components influencing the fuel consumption efficiency of ships. EEDI is the first global GHG reduction regime for the entire maritime industry sector.

#### Q31. Is EEDI applicable to all types of ships?

- A31. EEDI applies to new ships that are built under the regulation of Annex VI of MARPOL and existing ships that undergo major restructuring after 1 January 2013, in condition that the ships are over 400 gross tonnages.
- Q32. Any actions were taken by shipping industries for reducing GHG emissions?
- A32. Ship-owners take voluntary actions, e.g. slow steaming and optimising fleet capacity and routing for reducing GHG emissions. According to European Environment Agency, speed reduction of 10% will result in approximately 19% of energy reduction depending on energy power characteristics.

### Q33. What are the mitigation measures designed by ICAO?

A33. ICAO is responsible for developing a worldwide approach that is technically feasible, commercially acceptable with simple administration. The expert group of ICAO has studied different options and framework among proposed 3 options: Emission trading system, Mandatory offsetting scheme, and Mandatory offsetting scheme with revenue generation mechanism. The high-level group (HLG) of ICAO has considered some measures in the Assembly in 2010, for example, sustainable alternative fuels, action plans by member states, an aircraft CO<sub>2</sub> standard and also future air navigation systems that will allow more direct routes and save fuel and reduce emissions. HLG will also develop a set of policy recommendations to promote the development and deployment of such fuels for further consideration.

# Q34. Are there any regional regulations for aviation industry to reduce GHG emissions?

A34. European Union's emission trading system (ETS) allows airlines to trade emission allowances (quotas) and determine how to reduce emissions, for example, by adopting cleaner production methods. If any airline reduces its emissions, it can keep the spare allowances to cover its future needs or sell them to other airlines that are short of allowances. At the end of each year, each airline has to surrender enough allowances to cover all its emissions, and otherwise it will be fined heavily.

## Q35. How is the European emission trading system applied to the aviation industry?

A35. European airlines are required to monitor, report and verify (MRV) their annual emissions on flights en route Europe, and surrender the required allowances by 30 April 2013 in accordance with the 2012 Monitoring and Reporting Regulations. All flights between European Economic Areas (EEA) states, including their dependent territories, plus flights between EEA countries and Switzerland and Croatia are still covered by the scheme. All airlines, regardless of nationality, conducting such flights will still be required to comply with MRV and surrender the necessary allowances by April 2013.

# Q36. Are there any international guidelines and standards to help corporations reduce GHG emissions?

A36. The GHG Protocol Corporate Accounting and Reporting Standard (also known as GHG Protocol Corporate Standard) defines the international GHG accounting and reporting. The Standard was published in 2001, and developed by the GHG Protocol Initiative launched in 1998. Under the ISO Environmental Management System, ISO 14000, and ISO 14064 are directly related to GHG emissions. ISO 14064 addresses GHG management and related activities. Under ISO 14064, ISO 14064-1 specifies principles and requirements for quantification and reporting of GHG emissions at the organisational level.

## Q37. What are the major similarities between the ISO 14064-1 and the GHG Protocol Corporate Accounting and Reporting Standard?

A37. These two systems are very similar. Both are international standards for organisations to assess and reduce their GHG emissions into atmosphere and establish frameworks for policy makers to tackle against global warming effects. Both provide step-by-step instruction at the organisational level and adopt the bottom-up approach. ISO 14064-1 provides a framework for organisations to quantify, monitor, report, validate and verify the GHG emissions and reduction. It provides a comprehensive solution on assessing emission inventory. These two standards emphasise several techniques, such as adopting activity based approach, creation of fair and true accounting system and introduction to some reduction measures.

- Q38. What are the major differences between the ISO 14064-1 and the GHG Protocol Corporate Accounting and Reporting Standard?
- A38. The major differences are summarised in the following table:
  - Table 1.2Comparisons of ISO 14064-1 and GHG Protocol Corporate<br/>Accounting and Reporting Standard

	ISO 14064-1	GHG Protocol Corporate Standard
Emission Categories	<ul> <li>Direct GHG emissions and removals</li> <li>Energy indirect GHG emissions</li> <li>Other indirect GHG emissions</li> </ul>	<ul><li>Scope 1</li><li>Scope 2</li><li>Scope 3</li></ul>
Focus	• Focus on the technical compliance of the implementation, e.g. quantification	<ul> <li>Detailed guidance on how and why to implement and set target for the GHG accounting</li> </ul>
Inventory Quality Management	<ul> <li>Emphasise on inventory quality management by setting the rules</li> </ul>	<ul> <li>Ask the organisation to consider managing inventory quality</li> </ul>
Verification	<ul> <li>Shall take a 3rd party verification and ask organisations to check the significance of verification statement by including the verification principles in ISO14064-3</li> </ul>	<ul> <li>Recommend organisation to undertake verification</li> </ul>

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### Chapter 2 - Overview of current stages of Low Carbon Logistics

This chapter reviews the current stages of Low Carbon Logistics in Hong Kong and the Pearl River Delta. A questionnaire survey was conducted to identify difficulties or barriers local companies meet when implementing Low Carbon Logistics. The "Low Carbon Logistics" denotes the logistics activities that reduce carbon emissions which can be achieved from low-carbon manufacturing, low carbon packaging, low carbon warehousing and low carbon transportation.

For easy discussion, we do not report the valid response number, which is different from question to question.

#### Q1. What is the distribution of company category?

A1. More than half respondents come from the "non-manufacturing" category. Logistics related companies, including "logistics", "transportation" and "warehouse" shared about one third.

	Category	Percentage (%)
Manufacturing	Electronics and Electricals	15%
	Toys	1%
	Plastics	2%
	Industrial machinery	2%
	Textiles & Clothing	5%
	Metal Products	1%
	Manufacturing-Others	15%
	Manufacturing - Total	41%
Non-manufacturing	Import & Export Trade	8%
	Logistics	24%
	Transportation	7%
	Warehouse	3%
	Non-Manufacturing-Others	17%
	Non-manufacturing Total	59%

Table 2.1 Distribution of Industrial Category of Respondents



### Figure 2.1 Pie chart of distribution of industrial category of respondents



### Q2. What is the company size of respondents?

A2. About half of respondents come from companies with less than 100 employees.

Number of employees	Percentage (%)
1-10	18%
11-30	10%
31-50	7%
51-100	14%
>100	50%

Table 2.2 Distribution of the number of employees

# Q3. How well do they think they understand Low Carbon Logistics and its implementation?

- A3. Many respondents think that they understand Low Carbon Logistics and some respondents have implemented and adopted Low Carbon Logistics. It is interesting to find that 10-20% of respondents which understand Low Carbon Logistics have not implemented it.
  - Table 2.3Distribution of the level of understanding Low Carbon<br/>Logistics

	Agree or Strongly agree
Well understood	60%
Well implemented	49%
Fully adopted	40%

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# Q4. How many respondents think Low Carbon Logistics will generate reasonable return of investment?

A4. Most respondents agree or strongly agree that reasonable return will be brought from investment on Low Carbon Logistics. Only few respondents disagree or strongly disagree.

# Q5. What are the most important prerequisites for implementing Low Carbon Logistics?

A5. Highest proportion of respondents believes that technical support is the most important prerequisite for implementing Low Carbon Logistics, followed by expertise and training. Capital is the least required prerequisite. We believe that since Low Carbon Logistics is related to a wide range of activities in a company, systematic technical support is very important for the successful implementation of Low Carbon Logistics.

Prerequisites	Agree or Strongly agree
Huge capital	46%
Expertise or Training	58%
Technical support	70%

#### Table 2.4 Distribution of prerequisites of Low Carbon Logistics

### Q6. What are the major motivations of Low Carbon Logistics?

A6. "Corporate social responsibility", "brand building", "reduce energy cost", and "reduce energy shortage risk" are the most popular motivations of Low Carbon Logistics. It is obvious that the practice of low carbon leads to reduction of energy cost and risk. However, it is interesting to note that "customers' request", "employees' expectation" and "shareholders' request" are not major motivations, which means Low Carbon Logistics is still at its developing stage.

Table 2.5	Distribution	of motivations	of Low	Carbon	Logistics
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Motivation	Agree or Strongly agree
Brand building	75%
Reduce energy shortage risk	71%
Due to shareholders' request	47%
Due to customers' request	49%
Reduce energy cost	76%
Meet employees' expectation	36%

Industrial leadership	62%
Maintain competitiveness	68%
Corporate social responsibility	79%



Figure 2.2 Bar chart of distribution of motivations of Low Carbon Logistics

### Q7. Is low carbon a criterion of supplier selection?

A7. Low carbon appears not to be a criterion of supplier selection yet. Most respondents select suppliers on the basis of "operation efficiency", "quality" and "reputation".

Table 2.6 Distribution of supplier selection criteria

Selection Criteria	Agree or Strongly agree
Environmental awareness	70%
Low price	76%
High operation efficiency	87%
High quality	85%
Corporate social responsibility	74%
Industrial reputation	88%

### Q8. What are the major barriers against Low Carbon Logistics?

A8. "Lack of relevant experts" and "lack of operational guidance" are the major barriers. "Lack of shareholders' support", "Lack of management commitment" and "Lack of capitals" are not major barriers. The survey disagree the common belief that management and shareholders have driven the company's development.

 Table 2.7
 Distribution of barriers against Low Carbon Logistics

Barrier	Agree or Strongly agree
Lack of relevant experts	68%
Lack of shareholders' support	41%
Lack of operational guidance	69%
Lack of IT support	62%
Lack of management commitment	44%
Lack of relevant knowledge	57%
Lack of capitals	47%



Figure 2.3 Bar chart of distribution of barriers against Low Carbon Logistics

# Q9. What are the common mitigation measures in manufacturing process for low carbon?

A9. "Streamline operation" and "Re-design operation" are the most common mitigation measures considered to reduce GHG emissions from manufacturing process. Using environmentally friendly materials is the least common implemented measure but commonly considered in planning. It is consistent with Q7 "supplier selection criteria" that operation efficiency is a key issue.

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	Implemented	Planned	No plan or not needed
Streamline operation	46%	28%	18%
Re-design operation	48%	27%	17%
Use environmentally friendly materials	29%	42%	20%
Re-use surplus materials	39%	29%	20%
Covert by-products to usable materials	33%	26%	29%

#### Table 2.8 Distribution of mitigation measures in manufacturing process

### Q10. What are the common mitigation measures in packaging processes for low carbon?

A10. Mitigation measures in the packing processes are similarly popular.
 38% of respondents avoid over-packaging and reuse used packaging materials in order to reduce GHG emissions.

 Table 2.9
 Distribution of mitigation measures in packaging processes

	Implemented	Planned	No plan or not needed
Avoid over-packaging	38%	30%	18%
Reuse used packaging materials	38%	34%	17%
Use environmentally friendly materials	32%	31%	21%
Return used materials to suppliers	35%	27%	22%

# Q11. What are the common mitigation measures in warehousing for low carbon?

A11. Lighting is on the top of the list of mitigation measures in warehousing for low carbon, as lighting is easily accessible. A warehouse management system is another major mitigation measure. Respondents consider electricity system and air ventilating system at a lower priority.

	Implemented	Planned	No plan or not needed
Use more efficient lighting devices	34%	34%	23%
Use more efficient electricity system	26%	37%	29%
Use more efficient air ventilating system	29%	36%	27%
Improve warehouse	32%	35%	24%

### Table 2.10 Distribution of mitigation measures in warehousing processes

### Q12. What are the common mitigation measures in transport for low carbon?

A12. "Conduct regular vehicle maintenance" and "apply efficient routing" are the most popular measures applied in transport to reduce GHG emissions.
"Avoid traffic peak" is impractical since rush hours are inevitable. "Vehicle retrofit" used to filter particulates is regarded as an ineffective measure to mitigate GHG emissions.

Table 2.11 Distribution of mitigation measures in transport processes				
	Implemented	Planned	No plan or not needed	
Use more efficient transport mode	21%	25%	34%	
Apply eco driving	24%	34%	34%	
Use more energy efficient vehicle	21%	29%	40%	
Avoid traffic peak	14%	31%	41%	
Apply efficient routing	31%	31%	28%	
Conduct regular vehicle maintenance	32%	32%	28%	
Add vehicle retrofit (a filter)	10%	38%	40%	

#### Table 2.11 Distribution of mitigation measures in transport processes

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# Q13. What kind of certificates or schemes are obtained or applied by the respondents?

A13. ISO 9000 and ISO 14000 are related to quality and environment management, respectively and have been popular for years. Many companies have already acquired these two certificates. Relatively speaking, fewer companies join voluntary schemes, e.g. LCMP. It echoes Q6 that meeting customers' expectation on low carbon is not yet a strong motivation yet.

	Certified/ Applying	Planned	No plan or not needed
ISO 9000	53%	15%	25%
ISO 14000	39%	18%	34%
ISO 50000	14%	20%	53%
Carbon Smart	14%	19%	53%
LOOP of WWF	18%	26%	44%
LCMP of WWF	11%	23%	50%
HKAEE	15%	20%	48%
Hang Seng 111	14%	10%	51%

### Table 2.12 Distribution of relevant certificates and schemes

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Developing Low Carbon Logistics in China, Hong Kong and the Pearl River Delta

### Chapter 3 - Developing Low Carbon Logistics in China, Hong Kong and the Pearl River Delta

This chapter discusses the policy and culture development of Low Carbon Logistics in China, Hong Kong and within the Pearl River Delta.

- Q1. In the Chinese Government's 12th Five Years Plan, is there any regional planning to control GHG emissions from transport?
- A1. The Ministry of Transport launched regional pilot city campaigns in order to develop the low carbon transport system. Shenzhen city and Guangzhou city were selected to be one of the regional cities to facilitate green low carbon transport development in 2011 and 2012, respectively. Shenzhen city has compiled the "implementation plan for setting up Shenzhen as a pilot city for low carbon transport system", which provides the planning for setting up low carbon transport system. Comprehensive systems in transport energy consumption, carbon emission statistics and audit based on their unique situations have been developed. The Ministry of Transport has set clear goals in developing low carbon transport system and set up relevant policies and measures for implementation.

# Q2. Are there any specific goals in transport sector needed to be implemented in the pilot cities?

A2. The Ministry of Transport has set clear goals in developing low carbon transport system and set up relevant polices and measures for implementation. Major issues include: (1) building up infrastructures for low carbon port; (2) promoting appliances in low carbon transport to increase the proportion of clean energy and clean fuel vehicles in order to speed up elimination of high energy consumption vehicles; and (3) improving transport modes and operations to develop efficient logistics modes.

# Q3. Are there any low carbon schemes implemented in Guangdong province by the Ministry of Transport?

- A3. The Ministry of Transport plans to implement a thematic pilot on developing green low carbon port and green low carbon highway. Focuses were put on "vehicles, vessels, roads, ports", urban transport and other key energy consumption fields. All these enhance the transformation and upgrading of the transport industries. In particular, the standard of energy efficiency is established to promote the use of low carbon transport modes, and an intelligent transport system is constructed to improve transport management capacity with better access of traffic information.
- Q4. Are there any organisations that have joined the scheme for encouraging the development of green low carbon port and green low carbon highways in the Pearl River Delta?
- A4. The pilot implementation organisations include Shekou Container Terminals Company and Guangdong Guang Jiang Highway Company.
- Q5. Given emission reduction target of land transport in Hong Kong, are there any specific measures proposed by the Hong Kong Government?
- A5. The Hong Kong Government has set 2015 and 2020 emission reduction targets. To achieve the set targets, the government proposes a stringent regulation: phasing out licences renewals for pre-Euro and Euro I diesel vehicles in 2015 and Euro II and Euro III diesel vehicles in 2019. It is expected that 88,000 pre-Euro IV diesel vehicles will be off the roads by 2019.
- Q6. Are there any local regulations or programmes to encourage the use of environment-friendly commercial vehicles in order to achieve emission reduction targets in Hong Kong?
- A6. There is so-called "Incentive Scheme for Replacing Pre-Euro, Euro I and Euro II Diesel Commercial Vehicles by New Commercial Vehicles and Phasing out Old Diesel Commercial Vehicles". Since 2007, an incentive scheme has been introduced by the Hong Kong Government to encourage pre-Euro II vehicles owners to replace their vehicles with those with higher emission standards. Currently an incentive of 18 per cent toward the price of new trucks is offered, although this programme was finished by the end of June 2013. In the Policy Address 2013, a funding of HKD10 billion is proposed to subsidise owners for vehicle replacement. The sooner the vehicle owners give up their old vehicles, the higher the subsidy will be.

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If the vehicle owners choose to buy newer vehicles, the government will raise the offer to as high as 30 per cent of the vehicle price.

# Q7. Are there any tax incentives to owner for buying environment-friendly commercial vehicles?

- A7. The Hong Kong Government encourages the use of environmentfriendly commercial vehicles by reducing First Registration Tax (FRT) for low emission vehicles. The scheme has been started from 1 April 2008. FRT will be offered to buyers of newly registered environment-friendly commercial vehicles. In other words, vehicle owners buying environmentfriendly commercial vehicles can enjoy tax concessions when making an effort to protect the environment.
- Q8. What is "Profit tax deduction for capital expenditure on environmentfriendly vehicles"?
- A8. Since 18 June 2010, the Hong Kong Government has provided incentive for promoting the businesses to purchase environment-friendly vehicles by deducting the capital expenditure incurred under profit tax. The new tax concession is applicable in the year of assessment 2010/11 and thereafter. This tax concession covers the following 3 categories of environment-friendly vehicles:
  - Hybrid vehicles
  - Electric vehicles
  - Approved Environment-friendly Commercial Vehicles and Environment-friendly Petrol Private Cars

# Q9. Are there any local schemes to reduce GHG emissions in marine aspect in Hong Kong?

A9. In September 2012, the Hong Kong Government launched the "Port Facilities and Light Dues Incentive Scheme for ocean going vessels using cleaner fuel" to encourage ocean-going vessels at berth to switch to low-sulphur diesel fuel. If the participating vessels use fuel with sulphur content not more than 0.5% for their main engines (except when used for propulsion), auxiliary engines, generators and boilers while at berth in Hong Kong waters, they will be offered incentive on Port Facilities and Light Dues.

# Q10. Are there any legislative requirements on marine fuel uses in Hong Kong?

A10. The Policy Address 2013 proposes to impose a legislative requirement to switch fuels at berth. At the same time, the Hong Kong Government plans to expand the regulatory boundary to Pearl River Delta (PRD) ports, i.e. requiring ocean-going vessels to switch to low-sulphur diesel while berthing in a PRD port. This relieves the concerns of the shipping industry that the competitiveness of Hong Kong ports will be affected by the green port policy. Besides, the use of cleaner fuels among local vessels will also be encouraged.

# Chapter 4 - Measuring the carbon footprint of logistics operations

This chapter discusses the measurement of greenhouse gas emissions from logistics activities. Various regional and international standards have been developed in recent years for the measurement and reporting of these emissions. An example of step-by-step calculation on carbon accounting is demonstrated in the Appendix 1.

#### Q1. What are carbon accounting and carbon footprint?

- A1. Carbon accounting is an assessment of carbon emissions in order to quantify and monitor the GHG inventory. Carbon footprint is the result of carbon accounting in terms of carbon dioxide equivalent or CO<sub>2</sub>e.
- Q2. Why carbon accounting?
- A2. Carbon accounting is a necessary process for reporting, monitoring and auditing of GHG emissions. It is required by different international conventions, e.g. the Kyoto Protocol (1997), and assoicated Clean Development Mechanism (CDM) and Gold Standard. It is also required by certain national legislation, e.g. Energy Saving Legislation (2008) in China.

#### Q3. What is corporate carbon accounting?

A3. Corporate carbon accounting is a bottom-up approach that calculates emission inventory of a company by summing the emissions from activities of each business unit, facility and division based on the organisational boundary and operational boundary. Carbon accounting assists in recognising significant part of emissions from the energy consumption, material uses and waste disposals.

# Q4. What are the major differences between product carbon footprint and corporate carbon footprint?

A4. Product carbon footprint is product based and is the total sum of GHG emissions due to the product from raw materials to the disposal. Corporate carbon footprint is organisation based and is the total sum of GHG emissions, within the predefined organisational boundary, over a period of time. 4

### Q5. What is CO<sub>2</sub>e?

A5. CO<sub>2</sub>e stands for carbon dioxide equivalent and is used to indicate the GHG emissions. CO<sub>2</sub>e is calculated by multiplying global warning potential (GWP) of GHG.

### Q6. What is Global Warming Potential (GWP)?

A6. GWP denotes a conversion factor to translate impacts of different GHG to CO<sub>2</sub>. GWP is assessed by the Intergovernmental Panel on Climate Change (IPCC) and reported in guidelines for national GHG inventories regularly.

### Q7. What is the emission factor?

A7. The emission factor is a conversion ratio used to covert activity data to emission data. The factor is published by various entities, e.g. local, state, or national government agencies.

### Q8. What is carbon credit?

A8. Carbon credit is a right to emit GHG in terms of tonnes of  $CO_2e$ . The carbon credit is tradable through market mechanism.

### Q9. What is carbon market?

A9. Carbon market is a mechanism that develops carbon credit trade among trading partners around the world. Voluntary mechanisms include: Gold Standard and Voluntary Carbon Standard. Mandatory mechanisms include: the emission trade, the Joint Implementation (JI), and the Clean Development Mechanism (CDM) under the Kyoto Protocol.

### Q10. What is carbon neutral?

A10. Carbon neutral refers to net zero emissions of an organisation or a product. Carbon neutrality can be achieved by offsetting GHG emissions.

### Q11. What is carbon offset?

A11. Carbon offset is to reduce GHG emissions and /or compensate for emissions made elsewhere. For example, one can purchase carbon credit through an emission trading scheme or GHG emission quota market.

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## Q12. Are there any guidelines for setting up a carbon accounting for companies?

- A12. Major guidelines include: the GHG Protocol Corporate Accounting and Reporting Standard, and the International Organization for Standardization (ISO 14064). All the guidelines require carbon accounting and reporting with similar procedures.
- Q13. Why carbon footprint is not common in logistics or transport industry?
- A13. Transport activities should be reported under Scope 1 of the Kyoto Protocol. However, the international transport (sea and air) are the industrial sectors excluded from the Kyoto Protocol.
- Q14. What are Scope 1, 2 and 3 of the Kyoto Protocol?
- A14. Scope 1, 2 and 3 are categories of GHG emission sources, which are defined in the GHG Protocol Corporate Accounting and Reporting Standard, also known as GHG Protocol Corporate Standard. Scope 1 denotes direct GHG emissions, Scope 2 denotes energy indirect GHG emissions, and Scope 3 denotes other indirect GHG emissions.
- Q15. What are the major differences between Scope 1 and Scope 3 regarding to logistics operations?
- A15. Scope 1 (direct GHG emissions) denotes stationary and mobile combustion and covers emissions directly from owned vehicles, fleets, aircrafts, etc. Scope 3 (other indirect GHG emissions) covers out-sourced vendors which are not under the corporate operations.
- Q16. Are there step by step procedures for setting up a corporate carbon account?
- A16. The GHG Protocol Corporate Accounting and Reporting Standard and the International Organisation for Standardisation (ISO 14064) provide frameworks for setting up a corporate carbon account. These 2 frameworks can be summarised as 6 steps: Step 1: Set up an internal GHG management team, establish organisational boundary and operational boundary; Step 2: Identify emission sources; Step 3: Collect activity data for each emission sources from relevant departments; Step 4: Select suitable emission factor; Step 5: Quantify GHG emissions from emission sources; and Step 6: Write a GHG report based on the provided guidelines.

- Q17. Why is the management support important for the success of low carbon strategy?
- A17. The management support is important because the success of low carbon strategy relies on a wide range of managerial issues from data reporting, planning, implementing, monitoring and verifying.
- Q18. How are GHG emission sources identified in a SME?
- A18. In order to exhaust all possible areas to reduce GHG emissions, we can review and scan the site from the top to the bottom or vice versa.
- Q19. Is there any checklist to identify GHG emission sources?
- A19. There is no single checklist that can be used for all scenarios. ISO 14064 etc can provide a generic checklist only.
- Q20. Is there any formula to calculate activities data to carbon emissions?
- A20. The formula quantifying GHG emissions from emission sources is: the summation of product of activity data, emission factor and global warming potential.
- Q21. How should the activity data be collected? How does the information of internal activity data be obtained?
- A21. Activity data can be collected from various departments, namely, financial department, logistics department and operation department, or suppliers as a bottom-up approach. An internal GHG management team can be set up to illustrate the supports from top management and various departments. Data can be collected from bills of suppliers, for example, electricity bill and fuel bill. Meters can be installed to measure certain activities.

Activity	Data Sources/ Evidence		
Scope 1			
Stationary sources combustion	Fuel receipts or records		
Mobile sources combustion	Vehicles fuel receipts or records		
Emissions from refrigerants/ air conditioning	Refrigerants procurement, storage and disposal records, refrigerant refill records, fire extinguisher annual check record		
GHG removals from newly planted trees	Number of trees planted		

Table 4.1: Data required for at least one year

Activity	Data Sources/ Evidence
Sco	pe 2
Purchased electricity	Electricity bills
Purchased towngas	Towngas bills
Sco	pe 3
Paper waste disposal	Paper purchasing and recycling records
Use of fresh water	Water supply bills
Sewage discharge	Water supply bills

- Q22. How can the carbon emission factor be obtained for calculating carbon footprint of each activity, for example, LPG, diesel fuel and electricity?
- A22. The carbon emission factor of electricity, water and towngas can be found commonly from official websites of corresponding utilities. The carbon emission factor of fuels can be obtained from fuel suppliers or local authorities.
- Q23. What is carbon calculator?
- A23. Carbon calculator is a template for calculating GHG emissions. The template can be in format of excel spreadsheet or web-based. Once the activity data is input, the emissions will be calculated automatically.
- Q24. Why do the Standard and ISO 14064 require data activity record clearly per each item under each scope?
- A24. It is because such procedure can identify emission sources of energy consumption of data activities easily, and improve auditing and verifying data straightforwardly.
- Q25. Why engagement of all staff members is important?
- A25. Low carbon connects each staff member and each member has significant implications for the low carbon environment. Individual member's commitments on low carbon make the success comprehensive.
- Q26. Are there any principles in the GHG Protocol Corporate Accounting and Reporting Standard (the Standard), and the International Organisation for Standardisation (ISO 14064) for carbon accounting?
- A26. The Standard and ISO 14064 derive 5 principles from the general accepted financial accounting and reporting principles, namely

1) relevance, 2) completeness, 3) consistency, 4) accuracy, and 5) transparency. These 5 principles are used to ensure a true and fair accounting of GHG emission inventory.

- Q27. Is carbon report necessary to start reducing corporate GHG emissions or establishing carbon accounting?
- A27. No, only one year data is good enough to determine the baseline of GHG inventory. It is suggested to have average emissions over several years.

#### Q28. Is verification needed in the guideline or standard?

- A28. For some mandatory requirements, e.g. ISO 14064, verification is expected. For other voluntary systems, verification is not explicitly stated.
- Q29. Should the suppliers be managed regarding GHG emissions, as the GHG emissions from the out-sourced activities may or may not be included in the carbon accounting?
- A29. The carbon accounting will be more demanding in the future. It is better to have environmental protection issues in the suppliers' selection criteria, perform regular audits to ensure suppliers' conformance, and maintain good communication with suppliers, especially in gathering the accurate and intact data.

# Q30. What are the key successful factors to set up a corporate carbon accounting system?

A30. The success of corporate carbon accounting system relies on commitments from the senior, data collection, employee involvement and cooperation across supply chains. "Commitments from the senior" links to the resources support for the implementation. It is closely integrated with the organisational strategies, budget and business practices. "Data collection" involves activity data, consolidates data from several sites, offices, branches, departments & facilities, and unifies auditing and reporting format. "Employee involvement" is essential to launch the carbon accounting system, e.g. streamline working procedures. "Cooperation across the supply chains" denotes cooperation with suppliers and customers. Both upstream (suppliers) and downstream (customers) effort on reducing the GHG emissions from their products and services are critical to the success.

- Q31. Is it necessary to involve huge investment to reduce corporate GHG emissions?
- A31. No, not necessary. Applying 3Rs principles to reduce GHG emissions often does not need capital investment. Cost saving is likely to be resulted by reducing GHG emissions. Some joint venture or profit sharing programmes with vendors do not need new investment.
- Q32. Are there any programmes that encourage local SME for reducing corporate GHG emissions?

A32.	The programmes a	e summarised in	n the following table	e.
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Programme	Organiser	Website
Carbon "Less" Certificates Scheme under Hong Kong Awards for Environmental Excellence	Environment and Conservation Fund (ECF), operated by Hong Kong Productivity Council (HKPC)	http://www.hkaee.org. hk
Carbon Smart Programme	Environment and Conservation Fund (ECF), operated by Hong Kong Productivity Council (HKPC)	http://www. carbonsmart.hk
Low-carbon Office Operation Program (LOOP)	World Wide Fund (WWF)	https://loop.wwf.org. hk
Low Carbon Manufacturing Process (LCMP)	World Wide Fund (WWF)	http://www.wwf.org.hk

Table 4.2: Summary of GHG emissions programmes

### Appendix 1 – An example of carbon accounting

ICMS Logistics Company Ltd. has been established in Hong Kong since 2010. The company mainly consumes electricity in head office and warehouse (Kowloon), LPG for processing cargo by LPG forklift trucks. Moreover, ICMS owns diesel commercial vehicles for picking-up and delivering cargoes between warehouse and dedicated locations requested by customers.

### Step 1: Establish organisational boundary and operational boundary

 Table A1.1: Preparation for collecting activity data based on organisational boundary

 and operational boundary

Activity	Data Sources/ Evidence	
Sco	pe 1	
Stationary sources combustion	Fuel receipts or records	
Mobile sources combustion	Vehicles fuel receipts or records	
GHG removals from newly planted trees	Number of trees planted	
Scope 2		
Purchased electricity	Electricity bills	
Purchased towngas	Towngas bills	

#### **Step 2: Identify emission sources**

Table A1.2: The emission sources of ICMS Logistics Company Ltd.

Activity	Energy Types	Scope of Emissions
Head office	Electricity	Scope 2: purchased electricity from electricity supplier
Warehouse	Electricity	Scope 2: purchased electricity from electricity supplier
Processing cargo by LPG forklift	Gasoline	Scope 1: mobile sources combustion
Picking-up and delivering cargoes by owned diesel commercial vehicles	Diesel Oil	Scope 1: mobile sources combustion

#### Step 3: Collect activity data for each emission sources from relevant departments

Activity	Energy Types	Scope of Emissions	Data of Energy Consumption
Head office	Electricity	Scope 2: purchased electricity from electricity supplier	200MWh
Warehouse	Electricity	Scope 2: purchased electricity from electricity supplier	15,000MWh
Processing cargo by LPG forklift	LPG	Scope 1: mobile sources combustion	204,000 Litres
Picking-up and delivering cargoes by owned diesel commercial vehicles	Diesel Oil	Scope 1: mobile sources combustion	398,000 Litres

	Table A1.3: Activity	v data for each emiss	sion sources of ICMS	Logistics Company	/ Ltd.
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#### Step 4: Select suitable emission factor based on emission sources, e.g. electricity emission factor from official website of electricity suppliers, diesel oil emission factor from fuel suppliers or regional announcement.

Enormy Types	Hong Kong Emission Factor				
chergy types	CO <sub>2</sub> (kg)	N <sub>2</sub> O (g)	CH <sub>4</sub> (g)		
Electricity	2.549 kg/ kWh	0.0099 g/ kWh	0.0446 g/ kWh		
LPG	1.679 kg/Litre	0.000 g/ Litre	0.0036 g/ Litre		
Diesel Oil	2.614 kg/Litre	0.072 g/ Litre	0.145 g/ Litre		

Step 5: Calculate GHG emissions from each of the emission sources by multiplying corresponding emission factor and GWP with the equation below. The entity shall be aware of the unit of measurement for each activity.

GHG Emissions = 
$$\sum_{i}^{n} (AD_i \times EF_i \times GWP_i)$$

where

AD = Activity Data EF = Emission Factor GWP = Global Warming Potential i = i<sup>th</sup> GHG emission activity n = the total number of GHG emission activities

Scope	Emission Source	AD	Unit	EF		Unit	GWP	tCO <sub>2</sub> e	Remark
	Transportation - Diesel	398000	L	CO <sub>2</sub>	2.614	kg/L	1	1058.86	Heavy
1				$N_2O$	0.072	g/L	21		Goods Vehicle
				$CH_4$	0.145	g/L	310		
Transportation - LPG	Transportation -	204000	L	CO <sub>2</sub>	1.679	kg/L	1	342.74	Forklift
				$N_2O$	0.000	g/L	21		
			$CH_4$	0.0036	g/L	310		TTUCKS	
Sub-total of Scope 1						cope 1	1401.60		
2	Electricity - Head Office	200	MWh	CO2	0.54	kgCO₂/ kWh	/	108	
2	Electricity - Warehouse	15000	MWh	CO2	0.54	kgCO₂/ kWh	/	8100	
Sub-total of Scope 2 8						8208.00			
Total Emissioon 9609						9609.60	Excluded Scope 3		

Table A1.5: Calculating GHG emissions of ICMS Logistics Company Ltd.

# Chapter 5 - Reviewing of emission reduction measures in logistics

This chapter discusses a number of emission reduction measures that an organisation can take to reduce the carbon emissions of logistics activities. These measures are divided into 7 sub-topics: (1) 3Rs principles: Reduce, Reuse and Recycle, (2) Waste management, (3) Transport and routing, (4) Document management, (5) Warehousing, (6) Reverse logistics, and (7) Energy sources. The chapter reviews the measures for reducing GHG emissions.

- Q1. What are the major sources of GHG emissions from logistics activities?
- A1. GHG emissions are mainly found in the following four logistics activities:
   (1) Packaging, (2) Transport and delivery, (3) Documentation, and (4) Warehousing.
- Q2. What are the major measures to reduce corporate GHG emissions from logistics activities?
- A2. There are many possible measures. We divide these measures into 7 sub-topics: (1) 3Rs principles: Reduce, Reuse and Recycle, (2) Waste management, (3) Transport and routing, (4) Document management, (5) Warehousing, (6) Reverse logistics, and (7) Energy sources.

#### Chapter 5.1 – 3Rs principles: Reduce, Reuse and Recycle

#### Q1. What are 3Rs principles?

A1. 3Rs principles stand for Reduce, Reuse and Recycle. Reduce is to avoid and reduce the waste at source, to prevent waste (before generating waste) in terms of both quality and quantity. Reuse is to prolong the product life through repeated uses, reduce the production of single used products, reduce the new production required for fulfilling indirectly. Reuse reduces the demand for new products but cannot eliminate extraction of resources. Recycle is to produce new products by using waste materials. Typical recyclable materials are alumina, iron, paper, glass, plastics. Recycle can be expensive, because it involves mechanical or chemical disassembly processes and consumes additional resources.

### Q2. How are 3Rs principles implemented in a SME?

A2. 3Rs principles can be the core policy of a SME and applied into every stage and process. It links the operations and decisions related to possible environmental impacts.

### Q3. Are there any typical applications of 3Rs principles?

A3. Some typical applications are listed as follows:

### Table 5.1.1 Typical applications of 3Rs principles

-	
Stages	Examples of measures
Purchasing	<ul> <li>Reduce buying and ordering times</li> <li>Reuse durable products for repeated uses</li> <li>Recycle recyclable products and re-manufacture new products</li> </ul>
Transport and Distribution	<ul> <li>Reduce vehicles' GHG emissions by replacing the obsolete fleet, shortening travel distance, shortening routes</li> <li>Reduce number of vehicles by consolidation, by shortening waiting time and delay with better planning on delivery or pick up orders</li> <li>Extend life of vehicles by regular inspection, maintenance and repairing</li> <li>Recycle tyres</li> </ul>
Warehouse	<ul> <li>Reduce electricity consumption by using energy efficient devices</li> <li>Reduce the usage of electrical air-conditioning system</li> <li>Prolong the life of cargo handling equipment by regular maintenance and repairing</li> <li>Use flexible cargo rack and allow different layout requirement in order to lengthen product life cycle</li> <li>Recycle waste by coordinating with suppliers</li> </ul>
Packaging	<ul> <li>Eliminate unnecessary packages of products but provide sufficient protection cargo during transportation process</li> <li>Collect used packaging materials for reuses</li> <li>Repeat uses of pallets by repairing</li> <li>Recycle package waste by returning packaging materials to suppliers</li> </ul>

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#### Q4. What is green purchasing?

A4. Green purchasing is to consume in a responsible manner. It states sustainable principles in purchasing policy and practices, and creates market power to meet environmental requirements specified by consumers. Green purchasing emphasizes energy-saving, environmentally friendly consumption and environmental impacts should be minimized via purchasing. Green purchasing also reduces the number of deliveries and the amount of packaging.

#### Q5. Can 3Rs principles be applied in green purchasing?

A5. Yes, people can reduce (or avoid) materials purchased or energy consumed, reuse by purchasing durable products for repeated uses, and recycle by purchasing recyclable products.

#### Q6. How important is packaging in reducing GHG emissions?

 Packaging materials include: pallets, boxes, bottles, or any form of items.
 Package is not only part of transport loads but also shares at most 20– 30% of material and transport costs.

#### Q7. How 3Rs principles are applied to packaging?

A7. 3Rs principles can reduce packaging materials and use fewer materials, e.g. single layer corrugated board. Packaging materials can be reused, for example, returnable containers for repetitive shipments. Packaging materials may be recyclable.

#### Q8. How can green supply be identified?

A8. Green supplier can be identified by the following typical purchase practices. During the supplier selection, a SME can ask suppliers to provide relevant information on resources and energy consumption, check the reputation and energy management system of suppliers, trace material sources and energy efficiency of products in its used life, select products with minimum packaging and select products with nearby suppliers in order to minimize transport. Purchases can be made after comparing different products and suppliers.

#### Q9. Is there certificate or label of green supply?

A9. There are eco-label of products and green certificates in the market.

# Q10. As green products are always more expensive, how can green products provide benefit to a SME?

A10. Green products lead to less negative environmental impact, less wastes and less social responsibility. SME can reduce energy cost by using energy efficient devices. Using durable products can save costs from buying disposable products. Recycling green products can enhance relationships with suppliers.

### Chapter 5.2 – Waste Management

### Q1. What is waste hierarchy?

A1. Waste hierarchy is to prioritize waste management practices and minimize environmental impact. Waste hierarchy shows preference from top to bottom (from most preferable to least): Avoid, Reduce, Reuse, Recycle, Recover, Treat, and Dispose. Waste hierarchy is an extended version of 3Rs principles.

### Q2. What is extended producer responsibility?

A2. It is traditionally accepted that producers i.e. manufacturers are responsible for their products before sales. It is proposed that the producer's responsibility is extended to the end of product life and covers all environmental impacts due to products. While there is disposal restriction in some countries, the extended producer responsibility includes recycling or treating before disposal, and accessories: electrical and electronic equipment, vehicle tyres, plastic shopping bags, packaging materials, beverage containers and rechargeable batteries.

The concept of extended producer responsibility is to encourage ecodesign, i.e. apply clean production at production upstream, use less resources to produce, prolong the product life cycle, improve efficiency of material flow and generate less waste at the end of product life.

### Q3. What is eco-design?

A3. The concept of eco-design is to consider product's environmental implications along its product life cycle during the initial design stage. Eco-design reduces negative environmental impacts of the products through three analysis – Inventory, impact and improvement analysis. Inventory analysis is to quantify the energy consumed and materials

associated with material extraction, product manufacture and assembly, distribution, uses, and disposal and the resulting environmental emissions. Impact analysis is to identify and measure environmental impacts of consumed energy for the processes and the hazardous waste emitted due to the manufacturing process. Improvement analysis is to determine how the environmental impact of the product can be reduced by using an alternative production method.

#### Q4. What is shared responsibility?

A4. Shared responsibility covers not only production but also consumption, such as: production, packaging, transportation, distribution, storage, consumption and disposal after the end of product life. Shared responsibility is shared along the supply chains and among manufacturers, distributors, retailers, sellers and end-users.

The concept of shared responsibility is to change buying behaviour of customers. Suppliers will tend to suit for the customers' preference and requirement. Buyers will purchase green products with higher price, durable products for repeated uses.

# Q5. What are the major difficulties to share responsibility among the parties in the supply chains?

A5. Shared responsibility denotes the responsibility shared along supply chains. The major difficulties against shared responsibility are that an individual party along the supply chains may be short-term results orientated, certain process may be at a higher cost, and a party may be unwilling to share the responsibility.

#### Q6. What is the role of SME logistics companies in sharing the responsibility?

A6. Similar to large corporate, SME is often involved in the operations and decisions related to possible environmental impacts at every logistics component. Therefore, SME should control the flow of materials and minimize environmental impacts on transport, distribution, storage, & packaging. SME can cooperate with suppliers and customers for raising their environmental awareness, collect used materials and send back to suppliers for reusing or recycling, encourage the customers repeatedly use materials and sort used and waste materials for recycling, and share the expertise on low carbon along supply chains.

### Q7. How waste management is applied in logistics operations?

- A7. Waste in logistics is generated along the flow of materials, and their movements along the supply chains from extraction and disposal. Waste management is to control material flow so as to minimize errors, delay and waiting, avoid unnecessary material handling, movements and transport, reduce packaging, and increase efficiency and effectiveness.
- Q8. How should corporate waste management be launched?
- A8. The 3Rs principles should be easier to start with, as they do not involve much cost.

### Chapter 5.3 – Transport and routing

### Q1. What are the wastes generated by transport routing?

A1. Transport moves products from one place to another. Transport is inevitable because products are rarely produced and consumed in one single location. Fossil fuel is the major energy source of transport. Fuel consumption increases with increasing transport distance. Routing decision considers transport distance, delivery schedule, waiting time and delay. Routing decision also includes choosing modes of transport against fuel efficiency, fleet utilization, and possible congestion. Human factors may be considered, such as driver behaviour.

# Q2. How can transport planning reduce GHG emissions without compromising delivery schedule?

A2. The reduction of GHG emissions can be achieved by using multimodal transportation, which involves more than one transportation mode. For instance, low emission modes (i.e. water and rail) are used if possible; high emission modes (i.e. truck and air) are minimized. Better transport planning can be worked out with customers by fitting their schedule so as to minimize delay and emissions.

# Q3. Are there any tips for minimizing GHG emissions on routing of land transport?

A3. Cross traffic, which is a reason of transport congestion, can be eliminated by mapping routes to turn right whenever possible. Scheduling of transport and routing are considered jointly. A routing decision can be made in two steps. Step 1: Assign customers to be served by each vehicle and then assign the customers on each vehicle's route. Step 2: Plan route sequence by minimizing the number of vehicles needed by consolidating load plans and applying milk run if possible. For example, products are delivered from a single supplier to multiple retailers or goes from multiple suppliers to a single retailer.

# Q4. Are there advanced routing techniques for minimizing GHG emissions from land transport?

- A4. Distribution network should be updated regularly to ensure appropriate routing and schedule. Total distance travelled by each vehicle should be minimized by route planning. Total travel time or distance of each vehicle should be reduced by avoiding possible congestion. Delivery failures, e.g. re-delivery and transport delay, should be eliminated.
- Q5. Is there any information system to assist in planning transport network and routes?
- A5. Global Positioning System (GPS) is very helpful to communicate with each vehicle in their fleet and record drivers' behaviour and performance. Transport system includes delivery routes and schedule. Transport planning includes transport mode comparison and selection. GPS can provide precise and timely information for routing decision.

#### Q6. What is Global Positioning System (GPS)?

A6. GPS is a radio-navigation system and it provides location, navigation, and time information on continuous spatial and time dimensions.

#### Q7. How is GPS used for transport management?

A7. GPS can be used to monitor drivers, their vehicles and delivery. Collected GPS data can be used to study drivers' behaviour to determine whether a driver is driving safely, off-route, too fast or too slow. GPS can also be used to track every vehicle in the fleet at any given moment and design the optimal routing. Optimal routing can enhance more efficient use of fuel, while optimal speed, tire air pressure, and other factors also affect fuel usage.

### Q8. Which are the most environmentally friendly transport modes?

A8. Water and rail transport modes are considered most environmental friendly. Both water and rail transport modes have highest fuel efficiency over a long distance, relatively low fuel consumption, and results in lowest emissions per distance. The major drawback of water and rail transport is that they usually involve trucks for door-to-door delivery service.

### Q9. How are land and air transport in terms of fuel efficiency?

A9. Land and air transport modes are important especially for courier and timely transport. Land transport can provide door-to-door delivery and is relatively more flexible. However, both land and air transport modes have relatively low fuel efficiency and high fuel consumption.

# Q10. Is it possible to further reduce GHG emissions of water and rail transport?

A10. GHG emissions of water transport can be reduced by speed control, route design (shorten distance, and prevent weather delay). Ship's engines can be turned off when the ship is idle. Ship performance can be improved by reducing the operational costs, e.g. with longer economic life of ships, lower fuel consumption, and higher load factor.

Rail transport is a common alternative to trucking. The loading capacity of a cargo train is about that of 50 heavy duty trucks. Comparing with trucking, rail transport can save 33% or more of fuel if transport distance is over 100 miles. Electrification is one possible way to reduce fuel consumption from rail transport, because electric trains emit 30 % less carbon per mile than diesel trains.

### Q11. Is it possible to further reduce GHG emissions of air transport?

A11. GHG emissions of air transport can be reduced by increasing aircraft occupancy, replacing old aircrafts, choosing more direct flight routes, flying slowly with larger, narrow wings and spending more time at higher altitudes where air resistance is less.

### Q12. Is it possible to further reduce GHG emissions of land transport?

A12. GHG emissions of land transport can be reduced by using new trucks with proper tyre pressure, longer in length, better streamlining, and better diesel engine design. A truck can use hybrid electric-diesel engine, re-use waste heat and slow down, for instance, 65mph down to 55 mph.

Routing can be redesigned so that transport routes are shorter and less congested. Engine should be turned off when idle. Route planning on delivery and pick-up schedule should avoid waiting and possible congestion. Driving behaviour can be improved to have better vehicles performance. Frequencies of movements can be reduced by increasing load factor.

#### Chapter 5.4 – Document Management

- Q1. Document management emphasises data sharing and information accuracy, how does document management related to GHG emission reduction?
- A1. Good document management can reduce mis-communication, the uses of paper and associated GHG emissions.
- Q2. Any tools or system can assist to achieve good document management?
- A2. The Electronic Data Interchange (EDI) is a standard format for exchanging business data. EDI can eliminate errors caused by manual data entry and enhance the timeliness and accuracy. EDI can help to reduce the uses of hardcopy within a company and between companies.

### Chapter 5.5 – Warehouse – Information Technology and Warehouse Management System (WMS)

#### Q1. What is the principle for setting up a low carbon warehouse?

- A1. The concept of low carbon warehouse is extended from that of Green Building. The Leadership in Energy and Environmental Design (LEED) is nationally recognised building certification programme for architects, contractors, owners, and operators. LEED provides a framework for building design, construction, operation, and maintenance, which is applicable to warehouses.
- Q2. What are the major sources of GHG emissions in warehouses?
- A2. Lighting and space heating and cooling are the major sources of GHG emissions in warehouses. It is estimated that lighting and indoor temperature control share approximately 40% of total building energy use. Another major source is cargo handling equipment.

#### Q3. What are typical measures to reduce GHG emissions due to lighting?

A3. Typical measures are increasing the use of natural light through clerestory windows or installing transparent plastic roof in order to allow natural light to come in. Using transparent story glass to allow light into warehouses, switching off unnecessary artificial lighting, and controlling lighting time for each area are also common measures. Lighting time over areas of infrequent uses can be shortened by using motion sensors and daylight sensors. District lighting systems can be used to control the lightings by zoning. If lighting cannot be eliminated, more energy-efficient devices should be used, such as T5 lighting tubes.

# Q4. What are the popular measures to reduce GHG emissions in air ventilation?

A4. The use of natural air ventilation is encouraged, as it brings outside fresh air into the facility. The natural air ventilation can be functioned only when design layout enables well air circulation. Energy-efficient ventilators should be used, maintained, and cleaned with regular maintenance and repairs. Heat gain from wall should be reduced, and for example, heat insulation or white reflective materials can be put on the wall and ceiling. Cooled or heated air leakage to outside or from cargo handling equipment should be avoided.

### Q5. How does the facility layout of warehouse affect GHG emissions?

A5. Facility layout denotes the arrangement of activities, processes, departments, workstations, storage area, aisles, and common areas. Good facility layout of warehouses should reduce movements of materials and cargo handling equipment. Flexible layout can adopt the changing and varying demand conditions and product requirements. Wide aisles can accommodate heavy loads equipment and reduce congestions between cargo handling equipment, e.g. forklifts, carts and AGVs.

# A6. How should cargo handling equipment be selected to reduce GHG emissions?

A6. The major types of energy sources include: diesel, electric, LPG, and hybrid types. Diesel and LPG types are commonly used to handle heavy cargoes. Heat released from equipment by Diesel and LPG types are high, air ventilation is often required. Electric type is widely used as they are cleaner and less noisy, especially for cargoes with higher hygiene standard. Hydrogen fuelled type can further reduce the warehouse's GHG emissions.

#### Q7. What is a lean warehouse?

A7. The concept of lean warehouse is to minimize or eliminate non-valueadded activities, such as delays in receiving, picking and packing, loading and unloading or wasted motion, poor picking paths, congestion and poor equipment condition.

#### Q8. How does a lean warehouse reduce GHG emissions?

A8. A lean warehouse increases warehousing efficiency, increase utilisation of cargo handling equipment and storage space and reduce energy consumption in unnecessary cargo movements. Therefore a lean warehouse increases energy efficiency and reduce GHG emissions.

#### Q9. How can lean warehousing be achieved?

A9. Warehouse operations include inbound and outbound flows should be streamlined. Warehouse processes can be simplified. Roadblocks should be dismantled to allow free flow of materials through the warehouse.

# Q10. Are there any technologies or systems to enhance warehouse operations and reduce GHG emissions?

A10. Warehouse management system (WMS) is the software for efficient warehouse management. It provides a platform to manage cargoes. WMS often provides an initial planning of storage and optimizes processes: control the movements and store of cargoes, including receiving, stocking, picking and scheduling. WMS can also improve accuracy of inventory, e.g. accurate receipt, shipment and location of items in warehouse, minimise overall warehouse operation time and reduce wastes or errors. A recent popular technology used in warehouse management is RFID (Radio Frequency Identification).

#### Q11. What is Radio Frequency Identification (RFID)?

A11. RFID is a technology to transfer data by using radio wave. The key components of an RFID system include: RFID tags (the passive tag is used for a license late on a pallet, a bin location, a container load, or item level tags), RFID reader, RFID printer (print a label with readable data and have an RFID tag on them), RFID Antennas and Cabling, RFID Middleware, and Wi-Fi connectivity points.

### Q12. What are the major types of RFID for warehouse applications?

A12. There are four major types of RFID according to its frequency range: (1) 125 to 134 kHz is classified as Low Frequency for scanning items close at hand, (2) 13.56 MHz is classified as High Frequency, generally used as smart tags for loyalty cards, (3) 860 to 960 MHz is classified as Ultra High Frequency and is used in the supply chain for all the tasks, (4) 2.45 GHz and 5.8 GHz are also classified as Ultra High Frequency, and 2.4 GHz is mainly used for the toll road i-Pass.

### Q13. How does RFID complement the warehouse management system?

A13. RFID can be used as an extension of WMS. RFID can make the process of warehouse management paperless, provide complete and continuous global visibility of pallets, cases and products. RFID can be used for inventory control and updating inventory information when receiving and storage. RFID contains more information than barcode, in particular, date of shipment and storage, shipping schedule, labour performance level, cargo status, temperature within shipping period and amount of time spent outside the acceptable range. For perishable cargoes, RFID may record humidity, vibration for certain product defects, light received by the cargo, e.g. film that should be kept in a dark environment. Overall, RFID improves WMS with timely information.

# Q14. How does RFID enhance the automation for tracking and measuring performance?

A14. RFID tags can be placed inside the concrete of certain areas of the warehouse. When a forklift travels over the designated check-points and unloads the pallets in the location with an RFID tag on the floor, such activity is recorded. The forklift's onboard computer shows what products are being stored or loaded at which location. The WMS can automatically assign item, quantity, and location to all pieces in a warehouse, which cuts down on loss and allows for date-stamping for goods that are perishable. WMS with RFID leads to the creation of a true concise and precise environment.

#### Chapter 5.6 – Reverse Logistics

#### Q1. What is reverse logistics?

A1. Reverse logistics denotes goods movements in the reverse order, from finished products back to raw materials. Reverse logistics consists of reprocessing, remanufacturing, repairing, reusing, recycling, disassembling, and deposing.

#### Q2. Why reverse logistics?

A2. In general, reverse logistics occurs upon returns of unused or unsold products, commercial returns, returns of products under warranty, wastes, logistics accessories (e.g. packaging). The application of reverse logistics is newly extended to GHG emission reduction.

Description	Considerations	Examples
Return of unused products	Economics, marketing	Electronic equipment recovered, recycled carpets, shoes, tire
	Legislation	White and brown goods decree (the Netherlands)
	Recovery of value	Ink cartridge collection, recovery of computer components
Commercial returns	Marketing	Retailer part surplus, clothing, cosmetics, returns of mail order catalogue
Product warranty returns	Marketing, legislation	Defective appliances, spare parts
Derivative products and production waste	Economics, legislation	Pharmaceutical industry, steel component
Packaging	Economics	Pallets, crates, bottles
	Legislation	"Green dot system" (Germany)

Table 5.6.1: Summary of reverse logistics activities

## Q3. How and why is the corporate application of reverse logistics classified in different phases?

A3. Reverse logistics is commonly classified in the following 3 phases: In Phase 1, companies respond mainly to legislative, customer and other

requirements. In Phase 2, companies become more sophisticated and develop environmental programmes, such as internal recycling and reuse of materials. In Phase 2, companies attempt collaboration with government in design of improved environmental guidelines and regulations and may develop coalitions of private companies and public agencies for reuse and recycling. In Phase 3, companies adopt valueseeking approach and commit top management to recognition that the development of core competences in environmental management is a source of potential competitive advantages.

# Q4. What are the common methodologies adopted in Phase 2 and 3 of reverse logistics?

A4. In Phase 2 and 3 of reverse logistics, a 4-level approach is commonly identified. Level 1: reuse, recycle and reduce their residual waste materials. Level 2: retrieve products and packaging from customers for reusing and recycling. Level 3: sell any remaining residual recycled and waste materials to other manufacturers for use as raw material inputs. Level 4: purchase recycled and residual waste materials from other manufacturers for use as raw material inputs.

### Q5. How is reverse logistics applied to GHG emission reduction?

A5. Reverse logistics reduces waste by using and reusing by-products. It maximises the utilisation of materials, reduces wastes and maximizes the value. A more important implication of reverse logistics is the zero-landfill or clean disposal due to reverse product flows, i.e. from the consumption point back to the point of origin. Therefore, reverse logistics leads to a significant reduction of GHG emissions.

### Q6. What is zero landfill?

A6. Zero landfill is a philosophy that sends nothing to landfill. Implementing zero landfill will eliminate discharges to landfill.

### Q7. What are key stages in reverse logistics?

 A7. Reverse logistics can be divided into 4 operation stages. Stage 1 Collection: Initial inspection is required for some products during collection process. Screen of returned goods is done to identify products for reusing, revalorizing or recycling. This stage involves a large volume of used goods. Stage 2 Assortment or Pre-processing: each product is diagnosed and certain decisions are needed. Stage 3 Location and distribution: This stage involves more logistics activities such as warehousing and cargo handling. Stage 4 Treatment: This stage involves a range of processes, including repackaging, repairing, disassembling, reconfiguring, remanufacturing, recycling and selling to secondary markets.

- Q8. Are there tips for SME logistics companies on providing reverse logistics service?
- A8. A strategic alliance between logistics organisations is critical, because SME can share hard facilities, e.g. for specific remanufacturing activities and soft skills, e.g. logistical coordination. Strategic alliance will enhance the planning of reverse logistics, as it is very difficult to forecast the demand.
- Q9. How does a SME logistics company provide service for Stage 1 Collection of reverse logistics?
- A9. Reverse logistics is closely related to logistics network in every stage. In Stage 1 Collection, a SME can enhance its competitive advantage by establishing distributed collection points widely with well-developed transport networks for transporting of return and used products from the location of end-users.

#### Q10. How does a SME logistics company provide service for Stage 2 Assortment and Pre-processing of reverse logistics?

A10. In Stage 2 Assortment and Pre-processing, a SME can enjoy competitive advantage by enhancing its knowledge and expertise on requirements on cargo handling, storage, shipping as well as pre-processing. Then, the SME can provide solutions to its potential buyers.

## Q11. How does a SME logistics company provide service for Stage 3 Location and Distribution of reverse logistics?

A11. In Stage 3 Location and Distribution, a SME should establish its transport network and have ability to deal with different transport channels. The SME should have expertise in routing design, storage methods and transport mode selection.

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# Q12. How does a SME logistics company provide service for Stage 4 Treatment of reverse logistics?

- A12. In Stage 4 Treatment, a SME should coordinate with customers (or buyers) and provide tailor-made solutions. For example, packaging solutions should be offered for different reusable goods.
- Q13. How should a logistics company compete on providing reverse logistics service?
- A13. A logistics company may earn competitive advantages by reducing operating costs, increasing operation efficiency, upgrading information system and enhancing human resources. Operation cost can be reduced by using specialized third and fourth party logistics companies. Operation efficiency can be increased with efficient reverse logistics processes so as to add value back into used goods. Information System can be upgraded with advanced logistics management systems in order to fully satisfy individual client's needs. Human resources can be enhanced by providing personnel with necessary expertise.
- Q14. What kind of knowledge is needed for providing reverse logistics service?
- A14. Knowledge for providing reverse logistics service include: market trend, relevant international and national legislations, and characteristics of products for providing value-added services.

### Q15. Which type of products is suitable for reverse logistics service?

A15. Products for reverse logistics should be homogenous and simple for logistics. Homogenous products are those products that do not require technique for screening, sorting or separation. Homogenous products include, for example, newspapers, packaging and beverage containers. Products simple for logistics should be distributed through simple network or supply chains. Otherwise, the cost of reverse logistics will be very high.

# Q16. How should the transport network be designed to enhance reverse logistics service?

A16. The transport network for reverse logistics should be efficient that products can be exchanged in both upstream and downstream directions along supply chains. Used products can be collected and delivered effectively and efficiently.

### **Chapter 5.7 – Energy Sources**

### Q1. What are the sources of bio-fuel?

A1. Bio-fuels are mainly made from biological materials e.g. plants. For instances, petrol substitute is made from sugar, biodiesel from wheat or recycle cooking oil. Bio-fuel can be made out of agricultural materials such as straw stubble or manure, or from wood chips, sewage or landfill gas. Today, bio-fuels have been extended to a wider variety of chemical structures and, for example, ethanol, other alcohols, nut oils derived from organism such as algae.

### Q2. What are the major motivations to use bio-fuels for transport?

A2. Transport is a major source of GHG emissions. Using bio-fuels will neutralise carbon emissions. Recent technological advancements have made liquid transport fuels possible from a much wider array of biomass feed-stocks.

### Q3. In which countries are bio-fuel used in transport?

A3. Biofuels are commonly used in transport in Europe Union, Brazil and the USA. The Europe Union required at least 5.75% of all transport fuel to be made from bio-fuel before 2010, rising to 10 % in 2020. Bio-fuels used in EU almost all come from food. In Brazil, bio-fuel may cheaper than petrol, and bio-fuel there is made from sugar-cane ethanol. The USA produces bio-fuel by using algae that absorbs sunlight and converts CO2 from the air into oil inside each cell. In USA, the supply of bio-fuel is large enough to meet all of US's transport needs for bio-diesel.



以「Blue Cotton」造成的牛仔褲 Jeans made of Blue Cotton



由廢膠造成的塑料顆粒原料 Plastic pellets as materials made of waste plastics

![](_page_51_Picture_4.jpeg)

重用裁床布碎作原料 Re-using cut waste as raw material

![](_page_51_Picture_6.jpeg)

已包裝的將會運到中國大陸 Packed plastic pellets to be transported to Mainland China

![](_page_51_Picture_8.jpeg)

污水處理廠 Wastewater treatment plant

![](_page_51_Picture_10.jpeg)

重用裁床布碎作原料 Re-using cut waste as raw material(2)

### **Chapter 6 – Case studies**

This chapter reports some good practices of Low Carbon Logistics and illustrates the current development of logistics due to low carbon. Due to limited pages, a total of 11 cases are reported herein only. The collection of cases is to highlight different issues and good practices of Low Carbon Logistics.

# Case

**Crystal Group - International OEM/ODM garment manufacturer** 

#### Q1. How does Crystal Group implement Low Carbon Logistics?

A1. Crystal Group combined Low Carbon Logistics with their supply chain design in order to set their factory as a model of Low Carbon Logistics. It is shown in several aspects, e.g. transportation mode selection, Radio-frequency Identification (RFID) technology, loading capacity maximisation, supply chain coordination and product innovation.

#### Q2. How does transport mode selection reduce carbon emissions?

A2. To increase the flexibility, Crystal Group tended to use land transport for transporting textile from Zhongshan to Hong Kong by truck. By concerning high GHG emission rate of trucking, Crystal Group changes the transport mode from land transport (trucking) to water transport (barging). Crystal Group switches to use barging service for transporting finished products from Zhongshan to Yantian to Hong Kong. As a result, about 67% of carbon emissions per piece of cloth has been reduced.

#### Q3. How does technology enhance daily operation efficiency?

A3. Crystal Group applies RFID technology at Production Workshops, RFID tags are stuck onto cloth batch, data of each slot of cloths are inserted, and the receivers are installed in every major station. The application of RFID system significantly reduces the paper record without trading off the operation efficiency and resource utilisation. Moreover, RFID technology enables Crystal Group to implement "one piece flow" and

remove operation bottleneck. In short, the RFID system facilitates both the processing of information and the handling of goods, thereby enhancing productivity and reducing errors and waste.

# Q4. How is the Low Carbon Logistics concept promoted to suppliers and customers?

A4. Crystal Group extends this concept to their suppliers and customers. In the past, the supplier normally sent the raw materials to the plant of Crystal Group per order. Crystal Group realised that the carbon emissions involved was high, therefore, Crystal Group communicated with customers and suppliers in order to standardise the components of products. As a result, a larger quantity of parts can be used for large order and the number of times for transportation is significantly reduced. Crystal Group provides the warehouse capacity to suppliers for storing raw materials (one month inventory) to further reduce the local delivery. This delivery model maximises truck load efficiency, minimises pollution with less fuel used and reduces GHG emissions.

# Q5. Are there any communication methods that enable Crystal Group to have better internal and external communication?

A5. To strengthen the communication along the supply chains, Crystal Group uses electronic data interchange (EDI) to communicate with suppliers and customers; the e-order enables Crystal Group to enjoy a paperless and accurate communication. The implementation of Enterprise Resource Planning (ERP) system further decreases paper used in departmental communication, and hence reduces the GHG emissions from the Group.

### Q6. How does Crystal Group extend the concept of Low Carbon Logistics?

A6. Other than supply chain management, the concept of Low Carbon Logistics also motivates Crystal Group to develop "Low Carbon Product". Crystal Group is trying to use waste materials for re-manufacturing as recycle cotton, called Blue Cotton. With high quality, the eco-products manufactured by Crystal Group successfully draw the attention from customers who are concern about environmental protection.

### Case 2

DCH Logistics Company Limited (DCH Logistics) – Leading logistics service provider

# Q1. How does DCH Logistics apply Low Carbon Logistics in warehouse operations?

A1. DCH Logistics provides packing and re-packing services to customers. Customers transport the cargo as compact and bulk shipments from origins to destinations. DCH Logistics re-packs the cargoes in warehouse at the destinations before delivery to retails. The repackaging service not only enables efficient logistics operations in the supply chain management but also reduces the carbon emissions of transportation.

#### Q2. How successful are the measures?

A2. By reducing the spacing consists of packing of finished products, cargoes transport as compact and bulk shipment reduces the number of shipments by about 30%. The value-added service offered by DCH Logistics facilitates customers to lower carbon emissions of their shipments and end-products.

# Q3. Are there any basic principles that enable DCH Logistics to implement Low Carbon Logistics in daily operations?

A3. DCH Logistics advocates 4Rs principles (Reduce, Reuse, Recycle and Replace) in their daily operations. The layout design of warehouse allows efficient operation flow, thus reduces the energy consumption. Air conditioning system is only used for temperature-sensitive cargoes. The warehouse storing dry cargoes are designed with good air circulation in order to avoid the use of unnecessary electricity. Natural light coming through the transparent plastic roof during daytime reduces electricity usage for lighting in the warehouse area. Electrical forklift trucks are widely used in the warehouse where only few are powered by LPG or Diesel for heavy cargoes. It reduces carbon emissions generated by forklift trucks during warehouse operations. The used pallets are reused, and the damaged pallets will be repaired by the repair and maintenance workshop in the warehouse. If the used carton boxes and pallets can no longer be reused, they will be recycled.

![](_page_55_Picture_0.jpeg)

DHL Global Forwarding (Hong Kong) Limited (DHL) - Global freight forwarding leader

- Q1. How does awareness of Low Carbon Logistics impact on the customer requirements on logistics service?
- A1. Due to increasing awareness on Low Carbon Logistics, a considerable number of customers have requested tailor-made service to comply with their internal Green Policy. For some customers, the attainment of ISO14001 (Environmental Management Standard) has become one of the crucial criteria in vendor selection.
- Q2. How does DHL make the threat as an opportunity?
- A2. As a forerunner of Low Carbon Logistics, DHL is advantaged in this niche market. DHL proactively encourages customers to compare and tradeoff between shipment transit time and carbon emissions. Customers are provided with the annual summary report on carbon accounting, so that they can take carbon emissions of their shipments into consideration by comparing alternatives in transport mode and routing. All these help customers quantify their carbon emissions for their shipments. Moreover, DHL provides assistance to customers by offering carbon neutral and offset actions. In short, the implementation of Low Carbon Logistics helps widen the customer base for DHL and maintain its leading status within the industry.

# Case

Esquel Group - Global textile and apparel manufacturer

### Q1. Is there any policy for Esquel Group to ensure a Low Carbon Logistics?

A1. Staying green has long been an integral part of Esquel Group's daily operations. Its supply chain is vertically integrated in order to ensure the quality from raw materials to the final products, as well as the visibility of manufacturing processes and associated environmental impacts.

# Q2. What are the key mitigation measures in production implemented by Esquel Group?

- A2. Environmental protection is woven into the very fabric of Esquel Group's business. This commitment is backed by significant investments in research and technology as well as the adoption of more resource-efficient manufacturing processes. A key example is in Mercerisation, a process that gives fabric luster and dye affinity yet consumes a lot of water and steam. Via process engineering, Esquel Group has reduced 8,300 tons of steam in this manufacturing process.
- Q3. What are the key significant achievements of implementing Low Carbon Concept?
- A3. Esquel Group has made substantial progress in improving the way it uses power and water, and better managing carbon emissions through innovative technology and energy efficient measures.

With the set up of a thermal power plant and a wastewater treatment centre, Esquel Group successfully reduces annual energy consumption by 45% and the use of water by 59%. In addition, Esquel Group has reached a breakthrough in water conservation by launching an advanced wastewater treatment and recycling system, treating 5,000 tons of wastewater daily. Half of the treated effluent can be reused in the dyeing and finishing process which effectively reduces the use of fresh water, while the rest is discharged in compliance with the industry standard.

- Q4. How does Esquel Group extend the concept of Low Carbon Logistics?
- A4. Esquel Group extends low carbon concept to its finished products, e.g. organic cotton shirts the use of pesticides and fertilisers are reduced in cotton production; wrinkle free shirts which provide extra softness and greater resistance to wrinkles, thereby reducing the need for ironing; and stain release finished shirts which reduce water, heat and detergent consumption.

### Case 5

Fuji Xerox (Hong Kong) Limited (Fuji Xerox) - Information and communications technology (ICT) provider

- Q1. Why and how does Fuji Xerox promote low carbon concept to their customers?
- A1. Fuji Xerox values "Good Company" concept in corporate culture's development. In 2004, Fuji Xerox targeted "Zero-landfill" as part of the company's used product recycling policy. They further extended their internal "Ecological Workplace Program" into "Eco-solution" scheme and started to promote green products to their customers by offering consultancy services. These significantly help customers to start Low Carbon Logistics by integrating reverse logistics to supply chains. It also reduces carbon emissions in product life cycle.

### Q2. How does Fuji Xerox implement Low Carbon Logistics?

- A2. Fuji Xerox applies the concept of reverse logistics. It collects used office equipment and consumables, including copiers, printers, and toner cartridges, from customers for recycling purpose. The used devices and parts are initially disassembled and categorised in Hong Kong and further classified into more than 88 different categories after shipping to Fuji Xerox's eco-manufacturing centre in Thailand.
- Q3. Has Fuji Xerox implemented any energy management system? How did it start?
- A3. In 2009, Fuji Xerox (Hong Kong) joined the energy auditing programme held by property owner (i.e. Swire) which indirectly provided opportunities to build up the preliminary energy management system. Today, both Environmental Management System (EMS) (ISO14001:2004) and Energy Management system (EnMS) (ISO50001:2011) have been certified.

### Case 6

### Leo Paper Group (Hong Kong) Limited and Heshan Astros Printing Limited (Leo Paper) – Worldwide printing company

### Q1. Why did Leo Paper start to implement Low Carbon Logistics?

A1. Low Carbon Logistics strategy in Leo Paper was initially motivated by cost efficiency. Leo Paper identified the sources of inefficiency and restructured the operation flow in order to reduce transportation cost within the factory. After data collection and analysis, they found that the average travel distance of an operation flow transforming raw material to finished goods was about 30km within their factory. Upon re-engineering, the travel distance is gradually reduced to 6km and ultimately 3km. The success not only increases cost efficiency but also lets Leo Paper taste the very first fruitful achievement of Low Carbon Logistics. As a result, Leo Paper implemented Low Carbon Logistics in full gear.

# Q2. What is the key philosophy adopted by Leo Paper in order to implement Low Carbon in full gear?

A2. Since 2009, Leo Paper has been promoting the philosophy of a "Zero Waste Factory" consisting of a series of targets, namely zero waste, zero emissions, and zero energy by encouraging participation of all staff, customers, suppliers and the community.

### Q3. How is the low carbon philosophy applied in practice?

A3. To support the organisational philosophy, a wide range of Low Carbon Logistics strategies was covered, including information management, production process management, material traceability, green purchasing, office administration, and enhancement of the Environmental Management Systems assessment of environmental factors which includes the input of raw materials, the manufacturing processes, and the disposal of waste and emissions.

# Q4. Are there any technologies enable Leo Paper to implement Low Carbon Logistics efficiently?

- A4. "Environmentally Friendly Packaging and Logistics" and "RFID Technology for Transportation and Logistics" are the two initiatives of Low Carbon Logistics implemented in Leo Paper. Leo Paper identifies packaging as a significant energy consumption process. Leo paper developed a singlelayered corrugated box, which meets all the requirements of a traditional double-layered corrugated box. This innovation reduces not only the raw materials used, but also the weight of shipments. Leo Paper applies RFID Technology in production workshops, intelligent finished products warehouse, and container loading. The operation efficiency and resource utilisation are significantly improved. RFID devices are installed at the entrances and exits of every key stage. When pallets with RFID labels are transported across, the product information on the pallets is transferred to Leo Paper's system immediately. The RFID system facilitates both the processing of information and the handling of goods, thereby enhancing productivity and reducing waste.
- Q5. How does Leo Paper measure the achievement?
- A5. Since 2007, Leo Paper have started carbon accounting at the corporate level based on ISO14064, which enabled Leo Paper to establish systematic carbon reduction objectives and implement corresponding reduction initiatives each year. Compared figures with base year of 2007, the total carbon emissions decreased by 17% in 2011 while it constitutes a 26% reduction per unit output.

### Case 7

Modern Terminals Limited (MTL) and Da Chan Bay Terminal One (DCB) - Terminal operator

# Q1. How does management support of MTL enhance the implementation of low carbon concept?

- A1. MTL implements the "Green Terminal" concept in the design, development and equipment of both new and existing terminals. Backed by strong commitments from the senior management and governed by clearly defined environmental policy, MTL has been very ambitious towards continuous improvement of energy efficiency.
- Q2. What are the measures of Low Carbon Logistics that have been found in MTL?
- A2. Rubber-tyred gantry crane (RTGs) is one of the equipment with major energy consumption in terminal. It significantly affects the operation efficiency and energy efficiency. In 2009, 44 diesel-powered RTGs were converted into a hybrid system by utilising new model engines in compliance with emission standards. The hybrid system uses highly efficient super capacitors to store energy generated by RTG's main hoist motor during lowering motions. The energy is afterwards reused during the hoisting cycle. Carbon emissions are lowered by modifying energy source and reducing energy consumption by more efficient operations. In 2011, MTL invested HKD170 million to convert 94 RTGs into electric-RTGs (E-RTGs) for contributing to cleaner air and a quieter environment. E-RTGs emit zero CO<sub>2</sub> during their operations in the terminals and their indirect CO<sub>2</sub> emissions are 60% lower than those of diesel-powered RTGs.

#### Q3. Has MTL attempt any small scale measures?

A3. Apart from this large scale RTGs conversion project, MTL completely replaced industrial diesel oil (IDO) with marked Ultra Low Sulphur Diesel (ULSD) for all container handling equipment, yard vehicles and contractor tractors in early 2008. With the successful implementation of ULSD and the E-RTGs conversion project, there was noticeable reduction in SOx emission. It is expected to significantly contribute to improving the air quality.

### Q4. How does MTL promote Low Carbon Logistics?

A4. MTL jointly developed the Da Chan Bay Terminal One (DCB) together with the Shenzhen Municipal Government. The "Green Terminal" concept of MTL is also infused to the DCB. DCB was the first container terminal in the world to deploy 100% E-RTGs, its strategical location close to cargo catchment areas, which benefits the environment by reducing CO<sub>2</sub> emissions and fuel consumption.

# CaseMurata Company Limited (Murata) - Electronic components and<br/>solutions supplier

- Q1. What are the key logistics operations in Murata?
- A1. A 45,000 sq-ft distribution centre had been set up in Tsuen Wan. Murata distributes its products to all districts in Hong Kong by using 2 trucking service providers.
- Q2. What is the key motivation of Murata to implement Low Carbon Logistics?
- A2. The idea of Low Carbon Logistics makes the operations and supply chain management more efficient with lower cost. It contributes to the competitiveness of Murata in the industry.
- Q3. What kind of difficulty was faced by Murata when it tried to extend Low Carbon Logistics to its vendors?
- A3. Murata encourages its vendors to replace the existing EURO 4 vehicles with the more environmentally friendly EURO 5 vehicles. However, the vendors worries that the heavier weight of EURO 5 vehicles with lower loading capacity may increase the number of delivery or distribution.
- Q4. How does Murata continue to extend the implementation of Low Carbon Logistics to its vendors when they refuse to use more environmentally friendly vehicles?
- A4. The company re-allocates the distribution points and requests the vendors to re-plan their delivery routing to concentrate the delivery locations. As a result, the delivery distance of trucks will be shortened and hence the carbon emissions in the transportation flow will be reduced.

# Q5. What is the problem regarding Low Carbon Logistics identified by Murata?

- A5. Third party logistics companies deliver products from Murata overseas (e.g. Japan) to the distribution centre in Tsuen Wan. Since the loading and unloading equipment of Murata is limited, the loaded trucks have to wait for available loading and unloading equipment and man-power in Murata. As the drivers normally wait without turning off the engines, longer waiting time accelerates air pollution.
- Q6. How does Murata resolve the problem mentioned in Q5?
- Q6. Concerning this problem, Murata tries to minimise the waiting and operation time of trucks. By analysing the delivery schedule of different third party logistics companies, Murata plans and redesigns the import (delivery) and export (pickup) in cooperation with them. With better planning on the schedule, the trucks will only arrive when operations equipment and man-power are available. In that way, the waiting time of vehicles can be minimised and the air pollution caused by engine emissions on waiting can be reduced. Furthermore, Murata uses electric forklift trucks with double-decks which enable suppliers to shorten handling time on cargo loading and unloading by half. In short, carbon emissions are lowered by speedy cargo handling in the supply chains.

#### **Case 9** Orient Overseas Container Line Limited (OOCL) - Ship owner/ ship operator

- Q1. What are the motivations for OOCL to implement Low Carbon Logistics?
- A1. OOCL recognises that businesses must take responsibility for their industry's effects on the environment. The company is dedicated to meeting the needs of the present without compromising those of the future; and takes the innovative environmental care measures to help minimise the carbon footprint and improve air quality.
- Q2. When and how does OOCL implement Low Carbon Logistics into its core business?
- A2. Since 2000, all OOCL owned vessels have been installed with advanced slide fuel injection valves in order to reduce NOx emissions by 30%. In 2001, OOCL voluntarily launched a fuel saving programme, which is the

most effective way to reduce GHG (especially CO<sup>2</sup>). It includes using the weather routing systems to take the shortest route possible, slow steaming, planning to achieve the optimum trim and minimising the use of ballast, thereby burning less fuel to reduce emissions.

# Q3. Has OOCL joined any local or overseas voluntary programme in order to promote Low Carbon Logistics?

- A3. OOCL has been actively involved in the Vessel Speed Reduction Programme launched by overseas ports since 2005. In 2010, they went further by bringing other liners together to take part in the Fair Winds Charter, a voluntary programme encouraging vessels to use fuel of 0.5% sulphur content or less when they berth at the Hong Kong port.
- Q4. How does OOCL cope with new industrial requirements? Are there any mitigation measures that OOCL applies in advance for suiting the growing regulatory restrictions?
- A4. OOCL has upgraded the design of ships and containers. OOCL newly built vessels have exceeded today's internationally recognised standard by achieving a much improved Energy Efficiency Design Index (EEDI) level from the International Maritime Organization baseline required in the year 2025; OOCL uses CFC-free refrigerants for all of the refrigerated (reefer) containers. OOCL's newest reefer containers have the lowest power consumption in the industry and it also introduced the use of eco-friendly bamboo floors instead of the traditional hardwood ones and applied tinfree paint for the containers.

# CasePanalpina China Limited (Panalpina) - Global freight forwarding10company

### Q1. What is "PanGreen" Programme? What are the set targets?

A1. The Panalpina started "PanGreen" Programme to embrace social responsibility on environmental protection. Eco-transportation and ecoconsumption are the main target areas of "PanGreen", which enclose different measures. The Panalpina Group set clear targets for regional offices, e.g. annual electricity saving of at least 2%. The targets will be reviewed every year to ensure continual improvement.

### Q2. What has been done by Panalpina to meet the pre-set target?

- A2. Every single employee of Panalpina is committed to paper reduction, recycling, waste management and the limitation of business flights, electricity use and water consumption.
  - Reduce toner cartridges and paper usage as well as energy consumption by replacing obsolete printers and photocopiers;
  - Reuse the packing materials of import cargoes when exporting cargoes, e.g. plastic packing materials and wooden pallets;
  - Recycle paper boxes and plastics packing materials that cannot be reused by participating the recycle campaign of suppliers and recycling companies.
- Q3. What are the principles behind the actions?
- A3. Low Carbon Logistics can be achieved by implementing 3Rs principles (reduce, reuse, recycle), instead of having huge investment. Employee awareness will be a crucial factor in achieving targets. Panalpina's employees contribute to the reduction of carbon emissions in the corporate by paying efforts on 3Rs principles.

### Case Shing Kee Logistics (Shenzhen Yantian) Limited (Shing Kee) -11 Warehousing

# Q1. What are the measures of Low Carbon Logistics that have been found in the warehouse of Shing Kee?

A1. Efficiency in operation and cost of warehouse facilities are crucial to Shing Kee's sustainable development. The design layout of warehouse enables Shing Kee to minimise operation efficiency and minimise GHG emissions. By balancing the benefits from capacity utilisation and cargo handling efficiency (i.e. cargo shift), Shing Kee determines that 4-7-pallet-depth per row is optimal for cargo stacking. At the same time, the no barrier design layout enables good air circulation, fans are seldom needed. The transparent plastic skylight of warehouse allows natural sunlight to enter the warehouse. Proper use of reflective materials on wall together with no barrier design of the warehouse mean the number of fluorescent tubes can be reduced. The electricity consumption for lighting and air ventilation system can be minimised.

### Q2. How is Low Carbon Logistics implemented in operations?

- A2. Cargo handling equipment is essential to warehouse operation. Shing Kee realised the electrical forklift trucks are not efficient for handling heavy cargo but better for reducing GHG emissions. Therefore, Shing Kee uses LPG forklift trucks for handling heavy and bulk cargo, and uses electrical forklift trucks for handling light goods and goods that require better hygiene standard. In Shing Kee, each pallet can be repeatedly used for at most 10 years. Shing Kee set up a maintenance and repairing workshop to repair its damaged pallets in the warehouse. Those seriously damaged pallets will be recycled or reused as spare parts of other damaged pallets.
- Q3. What are the impacts of customers' raising awareness of Low Carbon Logistics?
- A3. Environmental friendly operation flow has become one of suppliers' key selection criteria. To satisfy customers' requirement on fully utilising capacity of container and reducing carbon emissions, sophisticate load plan system is adopted. More international companies build up their environmental management systems which are extended to cover their vendors. Therefore, Shing Kee is regularly evaluated and audited by their customers. Customers visit Shing Kee's warehouse and check its daily operations flow, packing materials and equipment used in order to ensure that Shing Kee's performance is complied with their requirements.