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Green Solutions for the Logistics and Transportation Industry: A Case Study of a Leading Global 3PL Headquartered in Hong Kong

Yiuman WONG[a,1], Shulun MAK[b] and Kinchung HO[c]
[a] *Logistics & Transportation Division, Hong Kong Institution of Engineers, Hongkong, China*
[b] *Department of Construction and Quality Management, Hong Kong Metropolitan University, Hongkong, China*
[c] *Department of Geography, The University of Hong Kong, Hongkong, China*

Abstract. The earth's average temperature has risen by approximately 1.2°C since the 1900s. The COP26 resolution aimed to achieve Carbon neutrality before 2050. It requires either the activities must not release any greenhouse gases or the emitted greenhouse gases must be offset. The logistics and transport industry contributes a lot to global greenhouse gas emissions. The challenges of the logistics industry are discussed in this paper, then the possible solutions such as green procurement, green packaging, green transport, and green warehousing, are discussed. The next is the case study of CN Logistics' contemporary green solutions (circular economy, carbon neutrality & green co-creation) to show how to tackle the problem, and end with a conclusion to appeal the industry to start the green journey now.

Keywords. Green solutions, circular economy, carbon neutrality, green co-creation

1. Introduction

Pursuant to the 2021 United Nations Climate Change Conference (COP26) held in Glasgow in November 2021 and the written pledge from the President of China, Xi Jinping [1] on two directives: (a) Working Guidance for Carbon Dioxide peaking (before 2030) and (b) Carbon Neutrality (before 2060), it leads to the implementation of a new development philosophy in China. The "Action Plan for Carbon Dioxide Peaking Before 2030" [2] specifies implementation plans for key areas such as energy, industry, construction, and transport, and for key industries such as coal, electricity, cement, iron, and steel, which will be rolled out. Coupled with supporting measures in terms of science and technology, it will form a "1+N" policy framework for delivering carbon peak and carbon neutrality, with a clearly defined timetable, road map, and blueprint.

While in the USA, to help inform its work on net-zero pathways towards 2050, the International Energy Agency (IEA) has engaged in extensive consultations with experts in academia and national bodies that have developed pathways to support net-zero

[1] Corresponding Author, Yiuman WONG, Logistics & Transportation Division, Hong Kong Institution of Engineers, Hongkong, China; E-mail: ymwong.skybright@gmail.com.

pledges made by the US and western countries' governments. As can be seen in Figure 1, the challenge to China in improving CO_2 emission reduction (in the orange shade) is the largest of all, and hence requires a lot of extra effort.

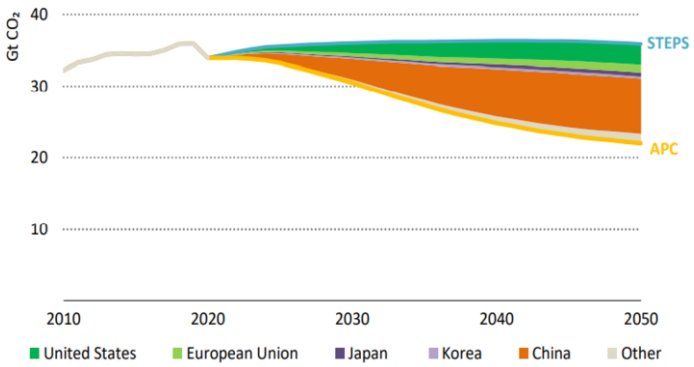

Figure 1. Global energy-related & industrial process CO_2 emissions and reductions by region, 2010-2050.
Source: Net Zero by 2050- A Roadmap for the Global Energy Sector, IEA, Page 43.

According to IEA statistics, in terms of reliance on fossil fuels, the "Transport" sector accounts for 37% of CO_2 emissions from end-use sectors [3]. Even though the COVID-19 pandemic has heavily hurt the industry, carbon emissions are likely to resume rising as demands increase. For the time being, the uptake of alternative fuels remains limited. A broad set of policies, called "Avoid, Shift, Improve" encourage modal shifts to the least carbon-intensive transport options, and operational and energy efficiency measures to reduce the carbon intensity.

The Guangdong-Hong Kong-Macau Greater Bay Area (GBA) in China is the most prosperous region in the world in terms of manufacturing and distribution of goods. The 14th Five Year Plan has provided a lot of guidance in improving the transport infrastructure and efficient use of resources in the logistics processes. These macroscopic plans will help the attainment of the pledged directives. Hong Kong, being one of the member cities of the GBA, ought to follow the lead of the Country to realise more green achievements within the specified time frame. In the following sections, more discussions will be focused on the territorial and district-level considerations.

2. Challenges Facing Green Logistics

Today, the logistics and transportation industry is not recognised as having a high degree of sustainability. Logistics firms face big challenges and obstacles in implementing environmental policies, mainly due to several causes:

(1) Dependence on fossil fuels, especially in transport.

(2) Last-mile deliveries impact urban traffic, especially for the blooming E-commerce.

(3) Insufficient push for regulatory measures from Local governments and authorities.

(4) Low motivation to invest due to low-profit margins discourage investing in process automation, physical infrastructure, or highly efficient handling equipment.

(5) Invisibility of logistics to consumers as logistical costs are usually not itemized

in the invoice or are already absorbed in the unit price.

In particular, the logistics and transportation industry in Hong Kong mainly comprises many small and medium-sized enterprises (SMEs) suffering from adverse conditions of high space leasing costs and short lease periods, thus discouraging the bosses to have long-term investments in sustainability and technology. Only a few small-scale automation or system that have a shorter payback period is seen.

In particular, with the COVID-19 pandemic effect, the profitability of most logistics activities is not good at all. Unless the green culture and ESG reporting requirement gets deep-rooted into everybody's mindset, there is less push and effect to go towards green in a prompt manner.

3. Green Solutions

From the perspective of logistics enterprises, a variety of classical paradigmatic green solutions have been studied and practised. Some are discussed as follows:

a) Green procurement

"Green Procurement" will only buy products and services that cause minimal adverse environmental impacts. This raises concerns for human health and the environment in the search for suitable products and services at competitive prices.

When purchasing goods, one should consider the environment, e.g., avoid single-use disposable items, and purchase products with improved recyclability, high recycled contents, reduced packing, and longer durability. It should have higher energy efficiency and utilise clean technology and clean fuels. The process should consume less water, emit less irritating or toxic substances and generate less harmful or toxic substances.

ISO 20400 (Sustainable Procurement) standard is an important tool at this stage. Also, the mandatory ESG reporting for listed companies is also pushing sustainable procurement to extend into the business world and is gradually affecting SMEs as well.

Local sourcing is preferred due to lower logistics and distribution costs. This will probably discourage globalised procurement practices and incur diseconomies of scale.

Big Data system can also be used to minimise unnecessary procurement, thus reducing waste

b) Green packaging

Packaging should be substantially made of natural plants, can be recurrently used, de-gradable, and not harmful to the environment, human body, and livestock's health.

It is the appropriate packaging that can be reused, recycled, degraded, corrupt, and does not cause pollution to humans and the environment during the product life cycle.

With the principles of 4R1D (reduce, reuse, reclaim, recycle, and degradable), green packaging is not just a package of general application but also helps to protect the environment and itself is a renewable resource.

c) Green transport

There are 3 approaches to reducing GHGs from transport [4]: (i) streamlining transport activity, (ii) applying technology, and (iii) using lower-carbon fuels.

(i) Activity and routing—GHGs from transport can be reduced by shifting some packages from longhaul trucking to more efficient railway or marine ships. By using Big Data, operational research tools and mathematical models, truck drivers can optimise

their delivery routes to shorten routes, increase the quantity of goods transported per trip, minimise the frequencies of empty return trips, and be flexible for managing the fleet.

(ii) Technology—Nowadays, vehicles can have advanced technology, all-electric or hybrid, and uses hydrogen fuel. All are fuel-efficient and emit zero harmful emissions.

(iii) Fuels—Many lower-carbon fuels are available in the market these days, and even more are in development. Examples include biological renewable energy (e.g. biodiesel made from microalgae), compressed natural gas (CNG), electricity, biofuels, and hydrogen. Hybrid options are available to add convenience in case a fuel type is insufficient to complete a trip. For instance, the most contaminating aviation industry is actively pursuing the use of sustainable aviation fuel (SAF) that can reduce up to 80% of carbon emissions during its full lifecycle [5].

d) Green warehousing

Green warehousing aims to lessen its environmental impact through an Omni-direction deployment of best practices such as automation, lean warehousing, green building, etc. The achievement can be obtained via:

(1) Extensively apply digitisation, AI, IoT, virtual reality, to enhance automation and become less human dependent. For example, robotic process automation (RPA) can eliminate repetitive work e.g., extracting vital information to form an order, updating checkpoint status, generating customised reports and proof of deliveries, etc.

(2) Constantly update available logistics technology and deploy machines with lower energy fuel consumption and pollution (in terms of exhaust gas, noise, heat, vibration, etc.), replacing forklifts with those running on electricity is a good example, and using more AS/RS equipment to make better use of vertical space and fewer materials flows.

(3) Upgrade warehouse lighting with high-efficiency options with LED Lighting for applications like high bay lighting. This can reduce electricity consumption by 30% to 70%.

(4) Deploy Rooftop Solar Panels for warehouses to generate natural electricity.

(5) Install high-volume, low-speed industrial ceiling fans (HVLS) to redirect current.

(6) Initiate a Recycling Program for cardboard, packing materials, wooden pallets, clinging plastic films, etc. It gives workers a sense of empowerment and contribution.

(7) Go for LEED (Leadership in Energy and Environmental Design) certification for the warehouse building. It sets standards for sustainable building design and framework.

Having explained the above classical green solutions, there is a more contemporary approach recently that observes the various initiatives from another angle that amalgamates both macro and micro-level considerations of green solutions for the logistics and transportation industry. Such green solutions can be grouped under three main categories, namely (i) Circular economy, (ii) Carbon neutrality, and (iii) Green co-creation. It will be readily understood and exemplified with a detailed case study.

4. Case Study of CN Logistics' Contemporary Green Solutions

CN Logistics (CNL) is a publicly listed company on the Hong Kong Stock Exchange (Stock Code: 2130.HK). It is a well-established international logistics solutions provider (sometimes also referred to as 3PL) with 18 offices worldwide and over 600 direct employees in Hong Kong. CNL has a global vision of being a leading integrated logistics solutions provider to the high-fashion industry and other emerging opportunities.

It has tailor-designed its own green solutions to protect the Earth by reducing the environmental impacts of business practices and operations. They offer customised solutions for their clients and partners to streamline sustainable implementations at different stages of the supply chain.

The main initiatives leading to their green solutions [6] include (a) One-stop green logistics solutions; (b) Sustainable supply chain and waste reduction at source; (c) Invest in green transportation; (d) Partnerships to Reduce, Reuse, Recycle and Recreate recycled materials; (e) Carbon consultation, statistical assessment, and carbon offset; and (f) Contribute to renewable energy projects.

In implementing the above, they would first collect the concerned items cost-effectively, predominantly paperless and also with simplified operations.

Then the items would be sorted by well-trained staff to maximise the yield of recyclable materials. CNL sorts clothing into 5 categories, namely, (i) Wearable Clothing; (ii) Wearable Accessories; (iii) Unwearable Clothing and Non-Donate-able Clothing; (iv) Wearable Non-Donate-able Clothing; (v) Landfill materials. Different treatments and processes will apply to the different categories above.

Then the processing to get recycled is undertaken by well-equipped recycling partners. Subsequently, the materials would be consolidated cost-effectively aiming at having zero landfills if possible. Finally, all the above processes would be summarised, cost analyzed, and project reviewed to make it a sustainable action. ISO 14064-3 is used as a guideline for meeting the Corporate Value Chain (Scope 3) Accounting and Reporting Standard of the GHG Protocol.

Regarding the three contemporary green solution concepts, namely Circular Economy (CE), Carbon Neutrality, and Green Co-creation, CNL also has aggressive and enforceable actions to realise these in the logistics and transportation arena. They will be discussed in turn below.

4.1. Circular Economy as a Green Solution

Circular economy is an economic model that promotes circularity and on the application of the various Rs in the various stages of the value chain—can consider the five Rs: Refuse, Reform, Reduce, Reuse and Recycle.

At CNL, the implementation of circular economy model results in waste reduction via reducing, reusing, and recycling paper, plastics, electronics, garments, and other materials. Since the inception of such an initiative in 2018, there has been a phenomenal increase in materials recycled. Table 1 shows the development over these years.

Table 1. Volume of recycled materials & parts (unit: tons).

	2018	**2019**	**2020**	**2021**
Participating clients	5	13	15	25
Plastic hangers	3.71	5.87	35.62	25.60
Plastics polybags	1.26	14.8	24.06	30.05
Cardboard/paper	32.55	253.44	350.75	423.32
Electrical, clothing & others	-	0.90	1.84	39.58
Total	37.52	275.01	412.27	518.55

Inspecting the full 4-year period, the total recycled volume in 2022 is 13.82 folds of that in 2018. If we just consider the most recent three years, the CAGR is 37.35%,

indicating that the growth rate is significant. For the first four months of 2022, the momentum is still strong, at a 30 to 35% increase rate. Also, the no. of clients participating in this circular economy programme also increased significantly from 5 in the first year to 25 in 2021. This indicates that more clients buy this concept, and more or less follow the green procurement concept to cooperate with "green companies".

CNL pays for the transportation costs of collecting, transferring (to recycling partners), and disposing of the above goods and materials at no charge to the clients. This requires improved route planning as well as higher load utilisation of the vehicles [10-13].

4.2. Carbon Neutrality as a Green Solution

The carbon footprint is expressed as carbon dioxide equivalent (CO_2e) and is defined as the total greenhouse gas (GHG) emissions caused by an individual, event, organization, service, place, or product. Greenhouse gases, including carbon-containing carbon dioxide and methane gases, are emitted through the burning of fossil fuels, manufacturing processes, consumption of manufactured goods, raw materials, transportation, and other services. The carbon footprint (CO_2e) is calculated with the amount of greenhouse gas (GHG) emission and the global warming potential (GWP).

At CNL, free statistical consultation is provided to the clients in terms of carbon neutrality. Carbon footprint measurement is verified by ISO 14064-3 on the emissions methodologies, account, and reporting standards for logistics and in-house carbon. While on the efficient use of resources and minimising damage to the environment, it is verified by ISO 14001 .

During the fiscal year 2020/21, the measured carbon footprint for CNL itself as well as 4 other clients was 8,603,635 kg CO_2e. CNL holds certificates issued by the United Nations Framework Convention on Climate Change in accordance with the procedure for voluntary cancellation in the Clean Development Mechanism (CDM) Registry and commits to contribute to climate action and offset carbon dioxide emissions through trustworthy climate friend projects. During the same period, four such certificates have been bought (see Table 2). Since the incurred carbon footprint is 8,604 Tons against an offset of 6,403 Ton, leaving a balance of 2,201 Tons to be further canceled in the near future. While the carbon footprint can be offset via monetary payout, the main emphasis is still on decarbonisation. In other words, generate less, and pay less [14. 15].

Table 2. Four rounds of carbon offset certificate issued.

Order number	Certificate reference no.	Issued date	No. of units canceled (tonnes of CO_2)
15284	VC15284/2020	24-Jun-20	1,000
16457	VC16457/2020	10-Nov-20	1,462
16891	VC16891/2020	15-Dec-20	1,242
18892	VC18892/2021	30-Apr-21	2,699
		Total	6,403

In addition to the first batch of the electrical van being launched into use in 2018 that was mainly dedicated to domestic courier services within Hong Kong, CNL has also started to have three more electrical trucks (5.5-ton capacity) since May 2022 for a wider deployment of green vehicles for all the other transportation needs. This will significantly reduce the carbon footprint and make the environment cleaner due to no pollution [16].

4.3. Green Co-creation as a Green Solution

It is a process of exchanging environmental ideas among customers and suppliers to achieve sustainable value. Being a continuous process of value co-creation, it forms virtuous circles for both the supplier and the buyer. Sustainable value is linked to the closed-looped cycles and generates offers to customers without losses [17].

For green co-creation at CNL, there are 3 main work directions, described as follows.

(1) Co-create sustainable business practices with globally renowned brands to build customised solutions;

(2) Connection with Green enablers specialised in processing the recycling, recreating, and donating of different types of material such as Redress, Alba IWS, etc.;

(3) Sponsor and participation as a member of the Business Environment Council (BEC) that advocates sustainability in enterprises and connect with the Hong Kong SAR Government to exchange green insights, propose policy implementation, funding support, and share the needs and challenges of businesses in driving green and sustainability [18, 19].

From this case study, CNL has pioneered reaching out to various clients and partners to execute policies and plans that can lead to a more sustainable business operation. This contributes to the entire logistics and transportation industry of Hong Kong. Since at this stage not many legislations or rules are enacted by the Government to follow the national or global commitment, the company directors and management started all these voluntarily. This needs unwavering determination, courage, and some initial investments.

On top of the comfort of truly contributing to preserving the Earth, there are also some benefits such as a positive corporate image, more brand loyalty from the clients, increased employee pride, motivation, and satisfaction, and ultimately money will be saved as resources are saved and more effectively used.

This is also a good lesson for other logistics and transportation industry players to benchmark and develop their own green solutions. It can be anticipated that many other new approaches and means of achieving sustainability will be seen in the near future.

5. Conclusions

This paper has covered the current situation and challenges towards a greener environment and path towards net-zero carbon emission. There is a strong quest for green solutions for sustainability. It is particularly challenging for the logistics and transportation industry where many SMEs are struggling for survival. And it is even more challenging for the case of Hong Kong due to the lack of land for logistics use or central "logistics hub", the adverse conditions of high space leasing costs, and short lease periods, thus discouraging long-term investments in sustainability and technology.

Various classical paradigmatic green solutions have been discussed, mainly along with four perspectives, namely, green procurement, green packaging, green transport, and green warehousing. A no. of methods and tools being used and practised are discussed.

Three newer thoughts of green solutions are: (a) circular economy; (b) carbon neutrality; (c) green co-creation.

Circular economy applies the various Rs in the value chain, namely, Refuse, Reform, Reduce, Reuse and Recycle. These can gain advantages in materials acquisition, product design, production, transport and distribution, consumption, use- reuse-repair, collection,

recycling, and end-of-life treatment.

Carbon neutrality focuses on measurement and reduction of carbon footprint to a net-zero as a target. Enterprises need to operate in a way to reduce their carbon footprint. Or else, as compensation, invest in some green projects to offset their damages to the Earth.

Green value co-creation is an exchange of environmental ideas among customers and suppliers to achieve value via virtuous circle types of discussions, thus letting them learn from each other. Many SME firms would like to cooperate with their supply chain partners to gain savings more cost-effectively rather than fighting on their own

In the case study, the researched 3PL is dedicated to deploying and practising their green solutions that fit the logistics and transportation industry. They extend the concept from what to do to how to do it, thus reaching out the first few steps. Though the Government has not yet announced any harsh directives and laws, the logistics and transportation industry, being one of the "main polluters", should take initiative to start themselves. It is noted that the new Chief Executive of the Hong Kong SAR Government is planning to change the administrative organisation to set up a separate Logistics and Transport Bureau. This can better lead the industry and business sector, and some major changes in the policy, initiatives and actions are expected to come soon.

CNL is spending money pursuing all these green solutions and seeking clients and partners to join the league. They are confident that the ultimate benefits gained can make such investment worthwhile and ultimately make more profits. CNL also wishes their green movements can invoke other industry practitioners also take action to start the journey of meeting carbon dioxide topping in 2030 and subsequently net-zero by 2050.

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