

## What is Green Logistic?

To accomplish the sustainable development, the world has faced by huge challenges. Especially, in balancing between the dimension of economic, social and environmental. In this regard, logistics industry plays a major role in sustainable development for countries, which has contribution to economic, social development and its effect on environment (Kumar, 2015)<sup>[1]</sup>. Logistic companies aim to lower the use of resource in order to reduce the cost of the operation and management, as well as increase the demand of the services. However, on the same time, it is actually owing to the carbon emissions caused during the processes of ordering, transporting and holding.

Through globalization, the logistic industry has breakthrough massive scalability. For instance, since 1940, the logistics technology has shifted from manual labour to using mechanized ways of moving goods (Logmore, 2019)<sup>[2]</sup>. From that on, more technology and new efficient logistic system has been created, such as better transportation infrastructure, improved logistics planning, inventory management and optimization of truck routing. The instances have shown the industry focused on the economic and social development, by increase efficiency and cost reduction. Without actually noticing that, the full cycle of logistical operation produces a huge amount of CO<sub>2</sub> emission, from freight transport, warehouse electricity and unloading transport.

With the growth of trends such as e-commerce and globalizations, the required logistical services are increasing. The increase has triggered the negative environmental effects such as more pollution, climate change and congestion (Simm, 2021)<sup>[3]</sup>. Similarly, Teter (2020)<sup>[4]</sup> recorded, in 2020, the emissions from aviation and shipping have been increasing at a faster rate than for any other transport mode. This is due to increasing demand for SUVs and for goods which leads to greater freight transport activity. They also stated that the year have been particularly rapid increase in logistical heavy-duty road freight transport. As the result, transportation is responsible for 24% of direct CO<sub>2</sub> totalled emission in 2020 (Teter, 2020)<sup>[4]</sup>. By 2050, the demand of freight transport will grow 2.6-fold and also potentially 16% increase in transport CO<sub>2</sub> emissions, only if today's commitments to decarbonise transport are fully implemented (International Transport Forum, 2021)<sup>[5]</sup>. Therefore, nowadays there is a term called "Green Logistic", which tends to transform the industry to be more eco-friendly while maintaining the operational cost-efficiency as well.

The "Green Logistic" is defined distinctively from the word "Green" and "Logistic". Logistic is the operation of managing the flow of storing and transporting goods from the point of origin to the point of consumption. With the objectives, to minimize costs, maximize efficiency and profits (Kumar, 2015)<sup>[1]</sup>. By adding green on top of logistic, will make the logistic service to be aligned with the concept of sustainable development. This means there will be better balance between the three dimension, economic, social and environmental. With 8-10% of global CO<sub>2</sub> emission are caused by logistics processes, it is obvious that the environmental effect of green logistic is to reduce the total CO<sub>2</sub> emission through the process (SICK, 2020)<sup>[6]</sup>. For instance, use gas instead of coal for goods freight, replace small trucking transportation with hybrid-energy or clean energy, transform traditional warehouse to sustainable building and green packaging. Moreover, green logistic also offers high efficiency in transporting system solution and route chosen, which lead to less congestion for better social development and less resource, cost for economic development (Simm, 2021)<sup>[3]</sup>.



In general, the green logistic have its specific research area which is called Green Logistic Practices (GLPs). With this, the development of new technologies and feasible logistic system solution for logistic transportation, procurement and warehouse are able to scale, be applied and recognized globally (Jazairy and von Haartman, 2020)<sup>[7]</sup>. Since the logistical services are heavy-relied on transportation and it has huge impact towards environmental, there are lists of GLPs within the literature that target to reduce impact specifically from transportation perspective. According to Simm (2021)<sup>[3]</sup>, many GLPs for transportation appears in different frameworks and many authors use similar terminology. However, he finalized it by capturing the essence of all proposed GLPs in the literatures, into six main focus elements of GLPs. These GLPs are eco-driving; increase fill rates in transport; alternative fuel; modal shift; logistic systems design; vehicle technology.

### **Eco-driving**

Eco-driving is a term for action taken to decrease environmental impact from transportation by driving. It is considered as the operational actions, choice and behavior of the drivers, this includes, choice of routes, choice of vehicles, refuelling & basic maintenance, and driving behaviour (Simm, 2021)<sup>[3]</sup>. The effect of eco-driving is often direct and achieved with low-cost investments, but the process is considerable complex. Operational actions usually are associated with training, continuous feedback to drivers, further improve behaviours and choice of drivers (Huang et al., 2018)<sup>[8]</sup>. Despite that, with the era of technology, there is GPS technologies to help with route optimization, cloud service vehicles that could connect with smartphones in order to optimize the vehicle refuelling & maintenance condition, increase in fuel saving vehicles, and clean energy vehicles.

The fact that these technologies are crucial to the optimization of eco-driving, which exposed benefits such as reduced fuel consumption, increase in resource efficiency, avoid idling or congestion and improve the road safety (Goes et al., 2020)<sup>[9]</sup>

## **Increase fill rates in transports**

Increase fill rates in transports improve vehicle utilization and vehicle efficiency, which in turn improve the environmental performance of vehicles. Thus, aiming to reduce both the number of transports and empty running vehicles. The good logistic model and scheduling process are essential to maximize the feasibility of fill rates transportation (Simm, 2021)<sup>[3]</sup>.

## **Alternative fuels**

Alternative fuels include transitioning to more environmentally friendly fuel alternatives compared to fossil fuel based. Implementing the new alternative fuels either through switching into new energy vehicles, like electric vehicles (EVs) or through the use of alternative fuels for existing vehicles, like hydrocarbon fuels and biofuels.

Different types of alternative fuels offer varying effect of emission reduction. But they are all in the same roadmap to reach less pollution and achieve future carbon neutrality. However, some alternatives have been developed further than others and more attractive, this is due to high innovation, more mature market and high number of available public refuelling infrastructure (Anderhofstadt and Spinler, 2019)<sup>[10]</sup>.

## **Modal shift**

Modal shift refers to the transfer and loading/unloading of goods from transportation with a higher negative environmental impact and more environmentally friendly transport modes. It is also often as a trade-off between environment and services, which comprise the flexibility and lead times, involving both the shippers and provider. For instance, the flexibility to shift between road, water and air freights, characteristic of loading/unloading goods and location of logistics facilities (Rogerson et al., 2020)<sup>[11]</sup>.

## **Logistic system design**

Logistic system design is the system design to optimize the service by finding the best number of links and the length of links which also have the environmental impact. The system is divided into 2, centralized logistic system and decentralized logistic system (Simm, 2021)<sup>[3]</sup>.

Centralized logistic means reducing the number of warehouse or hubs, thus resulting in longer links between provider and customer, but centralized system is possible to hold large product varieties, which lessen more stock supplementary deliveries.

Decentralized logistic, by contrast refers to the use of more warehouse or hubs (stores), creating more but short links in system, which allow more flexible distribution systems, with shorter distance between provider and customers and less transport work.

The use of these system may vary, depends on the geographical and efficiency rates. Nowadays, with better technologies and the popularity of artificial intelligence, the logistic system design could be more autonomous and using algorithm to find the most optimize solution.

## **Vehicle technology**

Vehicle technology is the term for different technologies that can be applied to vehicles, in order to reduce their environmental impact. For example, low-resistance tires, aerodynamic

profiling, and engine technology. Jazairy (2020)<sup>[12]</sup> added autonomous vehicles, IT-integrated vehicles, and intelligent idling control are also type of vehicle technology.

Vehicle technology often targets vehicles like tractors, but actually technology can also target trailers or freights, such as aerodynamic trailers and double-decked trailers (Madhusudhanan et al., 2021)<sup>[13]</sup>. Since, vehicle technology is integrated with GLPs in many ways, it is also associated with other GLP concept, such as utilization of new type of fuels and instruments that help drivers to enhance the concept of eco-driving.

## **What are the logistic companies?**

Thus, by establish these 6 elements on the logistic service, the GLPs can be achieved. Optimizing GLP might also bring balance between the economic, social and environmental value of logistic services, which are crucial. Currently, many logistic companies are racing towards transition of “Green Logistics”, especially with COP26 by UNFCCC which underway in Glasgow, that aims to tackle climate change and achieve 2050 carbon neutrality goal.

One of the biggest business software developer company namely SAP, has developed many solutions towards business processes, operational flow and strategy, includes the supply chain management. In 2020, they managed to make green practices or sustainability a core part of their supply chain strategy and are working to achieve measurable sustainability goals within the global supply chain (Howells, 2020)<sup>[14]</sup>. Under the supply chain management, they owned the transportation management or logistic service, which are also sustainable. Similar to the GLP criteria, SAP sustainable solution for transportation focus on the reduction of cost, resource and time, by choosing right carrier of product, hybrid logistic system which allow businesses to centralize or decentralize planning to the level it is best for them, optimize utilization of space for the freight or trucks, minimize the empty rides and integration with the smart technology or system software their owned for optimization (Rothhardt, 2020)<sup>[15]</sup>.

In China, with the publication of 14<sup>th</sup> Five Year Plan for dual carbon target declared on March 2021 (Chinese Government, 2021)<sup>[16]</sup> and “1+N” dual carbon policy published on 12<sup>th</sup> October (界面新闻, 2021)<sup>[17]</sup>, many China companies has started transitioning towards low carbon, including the logistic sector.

China Communication Xinglu Technology Co., Ltd. (中交兴路) as China’s leading logistic technology and service platform, manage to create a smart logistic environment system. The system will optimize the logistical service based on customers and demands. Beside it can improve customer experience, they succeed in provide GLPs solution, they manage to reduce waiting time from 2-3 days to 6-8 hours, which accounted almost 80% optimization and 70% increase in vehicle utilization (荣程集团, 2020)<sup>[18]</sup>. Less resource, high efficiency concept has been applied, as the result they won "2020-2021 Industry Promotion Award" for its leading technological innovation capabilities in the field of logistics ecology (中交兴路, 2021)<sup>[19]</sup>.





China Communication Xinglu Technology Co., Ltd., the leading road freight data intelligence technology platform

Similarly, JD logistic CEO Yu Rui (余睿) just stated to invest in 1 billion yuan to increase the green and low-carbon integrated supply chain. They also expect the carbon efficiency through this project will be 35% for next 5 years (Sina, 2021)<sup>[20]</sup>. They have established an efficient and collaborative logistics network with warehousing as the core, which optimize the transportation-warehouse solution. Additionally, they also owned smart system which increase efficiency in sorting, transporting, warehousing and distribution.



JD smart supply chain and logistics services to businesses across a wide range of industries.

## **Tool to measure logistic performance?**

Most companies would like to increase the efficiency rate of the services, including time, cost and resources. Since, with stabilization of the business and services, the emission of carbon will decrease correspondingly. With higher efficiency, less freight will be used to transport, which means less fossil fuels carbon being emitted. This also similar with the instances of route chosen, warehouse system, vehicle's empty running or waiting time and others GLPs instances.

To measure and compare the performance logistic of different countries, The World Bank published the Logistic Performance Index (LPI) with latest version in 2016 (Rezaei et al., 2018)<sup>[21]</sup>. The LPI tool is used for benchmarking, as it could compare between 160 countries and help the countries to measure their performance. The recent research by Karaduman et al. (2020)<sup>[22]</sup> by analysing the relationship between logistics performance and carbon emission of Balkan countries through the LPI scores, that they found whether LPI and carbon performance of selected countries have positive and significant relationship. In other words, with their study, they found that high LPI scores country is more likely to have less carbon emissions. As the result, LPI can be useful tool by policymaker to both improve the logistics performance and reduce the carbon emission of the country, which is important to achieve sustainable economic development.

## **Green logistic is the new logistic services?**

In response to the climate change and crisis, the change of a system to be more sustainable and resilient is a must. The GLP is one of the examples which able to sustain and meet our future targets. Beside the GLP gives a strategic advantage over the competition since it is cost saving, it also applied the measure of energy saving and low carbon emission concept. This implies lower environmental risk exposure.

The future of the green logistic will be bright, especially with the expectation of the services to be fully automated in the future. Despite many improvements, the green logistic will be still balance the dimension of economic, social and environmental. Waste reduction, efficiency energy and less cost will be the principle throughout the overall process improvement, which makes the green logistic to be sustainable and comply with the environmental regulations.

Government and official encouragement for green logistic will be crucial as well. Since GLP also part of the low carbon product/service, there should be more incentive given by officials. This to speed up the transition to reach the future carbon neutrality as well.

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