

3PL Implementing Corporate Social Responsibility in a Closed-loop Supply Chain: A Conceptual Approach

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Abstract—The responsibility of today's reputable company are not only financial, but also corporate social responsibility (CSR). With regards to the environmental aspect, the public expects green logistics solutions. This paper focuses on how a third party logistics provider (3PL) might provide green logistics services through actions that foster sustainability. This paper aims to address how a third party logistics provider (3PL) can provide green logistics service to the customers and communities through actions that foster sustainability. The methodology used is an in-depth interview approach, which described green logistics through the key drivers using depth interviews. An existing conceptual model is used to support our concepts and ideas. Finally, we summarize the key factors from respondent regarding how to maintain sustainability through action, from a 3PL's perspective. We also discuss the benefits, and challenges to green logistics in future.

Keywords—Corporate social responsibility(CSR); Third party logistics provider (3PL); Green logistics, Sustainability; depth interviews.

1. Introduction

The concept and practical development of CSR have been warmly discussed in recent years, and CSR will become an important guideline for the enterprises in the future. At present, various large international enterprises have the trend of actively emphasizing the CSR. In 2005, The Economist reported that according to their statistics, more than 85% of the global senior managers and 65 important investors thought that CSR would be an important reference for them to select investment in the future.

Corporate social responsibility means that the enterprises' behavior to conform to the existing social regulations, values and expectations. From the past to now, the definition of CSR have been proposed in many researches, while the most widely adopted definition is the architecture proposed by [9], who thought that the corporate social responsibility is the expectation of the society to the organizations within a given period,

including the economic, legal, moral and spontaneous expectations. [15] successively carried out relevant quantitative analyses on CSR; [25], [20], and [17] successively carried out the empirical researches on CSR and corporate financial performance. [22] thought that the implementation of corporate social responsibility by enterprises depends on the company scale, research and development etc., and that the larger enterprises will be more concerned than the small ones. The larger the companies are, the greater their liability ratio will be, under the condition of lack funds, many small enterprises will not be capable of performing the social responsibility, which has been demonstrated by many foreign literatures [22]. With regard to the research on connection between company performance and CSR, [10] pointed that relative payment for the CSR would be helpful to improve the performance of suppliers. [11] selected totally 154 European companies form 2000 to 2008 as the samples, and it was found that there was no sign that undertaking CSR would increase the financial performance.

[4], [5], [8] and [23] molded CSR respectively. [6] proposed an optimal management model of supply CSR of 9-step solution. [2] suggested that the advantageous leaders in the supply chain should undertake more CSR to influence the relatively weak supply chain members. [28] proposed a remanufacturing structure appropriate for OEM in the closed-loop supply chain system; [12] developed a dynamic multi-criteria decision-making architecture to deduce the equilibrium solution of supply chain network and social responsibility. [13] further developed the structure of [12], used the multi-cycle architecture model and researched the influence of CSR on the supply chain network in the long term. In recent years, [26] investigated and analyzed the issue of organization performance and internal and external quality-related CSR in the petroleum industry; [38] proposed 5 CSR aspects to investigate 162 enterprises of logistics services in China.

Closed loop supply chains consist of forward logistics and reverse logistics; positive logistics mainly treat the storage, transportation and distribution of relevant materials, in-process products and finished products in the supply and production; while the forward logistics are a

process through planning, implementation and efficiency control, and the main purpose is to appropriately restore and treat the returned and warehoused secondary products and relevant information. [35] and [34] respectively defined reverse logistics as a logistics activity containing product return, production source reduction, material reuse, waste disposal, reprocessing, repair and remanufacturing etc. and thought that reverse logistics are a systematical commercial model, that is to say, the enterprises use the best logistics management method to complete the circulation of the whole supply chain and make profit from it. [16] thought that the narrow definition of reverse logistics is a process of recovering

the products sold through the distribution network system. However, in a broad sense, the reverse logistics also include the reduction of use of materials in the forward supply chain, so as to reduce the number of raw materials recovered accordingly, so that the products can be reused and reprocessed more conveniently. In addition, Council of Logistics Management, USA has a more detailed explanation to the definition of logistics: “in a broad sense, it means relevant logistics activities conducted through source reduction, recycling, substitution, reuse and disposal and plays the role of material recycling, waste disposal and hazardous goods management.”

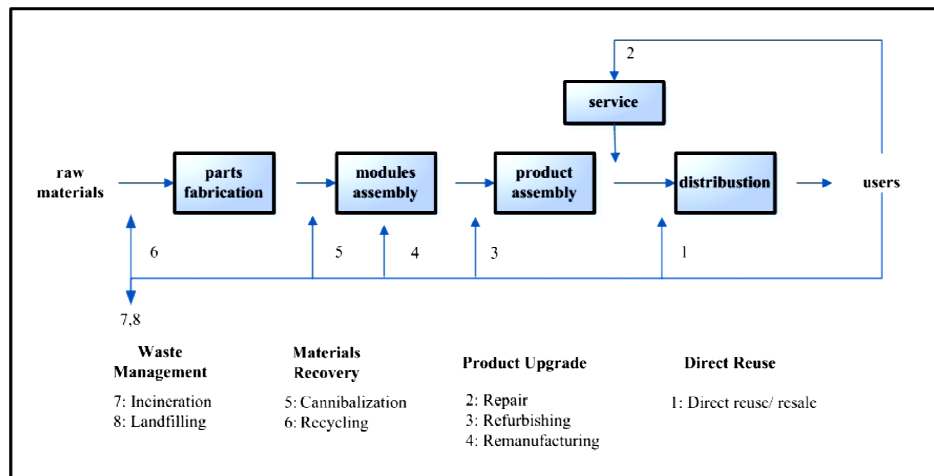


Figure 1. Product regeneration path diagram of closed-loop supply chain [9]

As shown in Figure 1, the products with ended lifecycle recovered from the consumers are disassembled for parts treatment, the products that cannot be used again are disassembled and detected, the appropriate disassembly plan is evaluated, and after disassembly, the parts are treated and selected and applicability of the parts is evaluated (like appearance judgment, instrument detection), and then the parts are classified into the category of reuse, regeneration and recycle, in which energy consumption will also be generated in the process of disassembly and reuse (for example, the processing step during the remanufacturing of products or parts). It can be known from the scene design analysis that there are various behaviors possible to be adopted and energy consumption in the reverse logistics, and some behaviors are beneficial or not beneficial for the environment. The above unbeneficial behaviors or valueless energy consumptions can be deemed as the loss of process.

The main purpose of reverse logistics of CLSC is to provide reuse for the recovery of products and resources, and the used products can be recovered and disassembled into recovered materials. In the reverse logistics system, the products can be manufactured into new products with the new materials, or remanufactured with the recovered materials, and the products manufactured with these two

manufacturing methods have no difference. However, the recovery operation is also accompanied by extreme uncertainty. During the establishment of ordering strategy, in consideration that whether the new materials and recovered materials are supplied sufficiently, it is to find out the optimal production quantity under the random recovery quantity, so as to minimize the production cost. [18] developed a linear planning model about the collection of recovered products; later [18] used CLSC model to simulate the decision analysis on the green supply chain in different cost structures under the demand.

[28] applied the reverse logistics model of hazardous wastes to minimize the cost. In addition, [3] also proposed that the traditional chain supply system should include the reverse logistic management activity, that is to say, during the disposal of the final products, it is required to consider the product recovery, materials/parts and components recovery and reuse, product remanufacturing and final waste treatment etc. Besides, the available components for the product recovery, recycle and remanufacturing will lead to the growth of economic benefit. [37] thought in the research that the production and recovery processes are integrated into a limited plan scope in the process of manufacturing. Therefore, they proposed that an inventory

control model is accompanied with uncertain demand and recovery for the recovery and remanufacturing processes. Under the environment of fierce competition, enterprises should optimize the performance of supply chain, so as to survive in such fierce competition, and to achieve this purpose, it is required to rely on some accurate procedures. Most of the members of supply chain only concern the optimization of their objective, but the devotion to self-service often cause unsatisfactory performance.

[24] analyzed the current WEEE management status roughly and comprehensively, and reviewed relevant literatures and cases, as well as discussed its future development trend. [27] in recent years, the waste electric and electronic equipment has increased strikingly, and the hazardous substances in them might damage human beings and environment, if not treated properly, they will cause problems. In the developing countries, the electronic garbage is collected and recovered through the informal waste sector (IWS). This makes the electronic garbage and IWS integration must be subject to the official waste reverse logistics, so as to reduce the negative influence mentioned. [21] respectively established a two-echelon closed-loop supply chain inventory system of certain and random demands, and solved the following problems: (1) the cost of closed-loop supply chain must be higher than that of the traditional supply chain; (2) whether the high recovery rate is always converted into low demand change to reduce the expected cost; (3) discuss the relation among cost, demand and recovery. [1] discussed how to improve the consumers' behaviors of returning the goods before end of lifecycle of WEEE, and in consideration of the reliability of product and target, they proposed the consumption goods award strategy in different conditions to improve the return and resource recovery, so as to promote the sustainable development of ecology, and they used the most popular particle swarm optimization (PSO) to solve this complex problem. [30] proposed the selection and evaluation of reverse logistics operation channel with an ideal solution mixing method in the similarity preference sequence under analytical hierarchy process (AHP) and technology fuzzy environment. This method elps the decision makers select the optimal technology conforming to the requirements. Lee (2012) designed the business process of sustainable products and services to develop customers by improving the operation efficiency and increasing the added value of market competition. He designed an effective reverse logistics flow, which helps understand the reverse logistics using information system and technology, so as to improve the customer business process and reserve the process of providing added value for the customers. In order to make the products sold better, the manufacturers will first launch the appointed

promotion strategy to attract the consumers for purchase and give the consumers appropriate pre-order preference.

"Logistics", in its simplest form, can be described as the management of the movement of goods through a supply chain. As such, logistics is an important subset of the full supply chain. Due to the fact that movement of goods contributes heavily to emissions of greenhouse gases, the business has a significant environmental impact. In the last twenty years, CO₂ emissions in the transport sector have risen by more than twenty-five percent. In terms of environmental policy, this figure should act as a warning. Global transport volume has steadily increased in the past decade, as globalization gains traction and protectionism loses ground. Globalized trading, and increased mobility, have resulted in a constant rise in transport services. This development is set to continue. Market growth, while lucrative for the transport sector, is not without problems. Logistics providers need to make every possible effort to ensure that transport growth is not linked to an increase in CO₂ emissions.

Today's businesses want to increase efficiency and reduce costs, while also bearing in mind that "green logistics" is a key theme for the future. Green logistics is both a requirement from clients, and a solution. We can expect that the importance of sustainability will do nothing but increase as time goes on. Reverse logistics is part of the green model that can have a positive impact on the environment, through activities such as recycling, reusing materials, or refurbishing used products.

Green practices in logistics industry can be examined under several dimensions. Firstly, fuel consumption and emissions are related with green logistics. Logistics companies especially transporters are tend to use less fuel consuming vehicles. As a function of green logistics, green transportation can be defined as transportation service that has a lesser or reduced negative impact on human health and the natural environment when compared with competing transportation services that serve the same purpose [7]. There are so many regulations which target to minimize emissions. Efficient use of transport resources which aimed at the selection of vehicle types, consolidation of freight flows and selection of type of fuel can help to minimize negative effects on the environment such as pollution, noise and congestion [36]. Secondly, accurate planning and scheduling can save the resources. Choosing the appropriate vehicle or route has important effects on consumption. Thirdly, designing logistics networks with the perspective of environmentally friendliness, companies will be able to protect nature. Global enterprises have increasingly undertaken measures, including the integration of corresponding suppliers, distributors and reclamation facilities in order to green their supply chains [31]. Moreover, materials used in packaging and warehousing can affect the environment.

Reverse logistics is a new business area which can be considered within the scope of green logistics. Waste management, especially nuclear wastes, may become one of the niche markets for logistics companies according to the increasing figures of nuclear energy usage. [32] Several industrial countries in Europe have enforced environmental legislation charging manufactures with the responsibility for reverse logistics flows including used products and manufacturing-induced wastes. Environmental concerns can affect the value chain of a company. Therefore companies seek for different strategies for managing environmental issues. Not only the increasing importance of environmentally friendly implications, but also state regulations encourage private companies to take incentives about environmental impacts of their production process. Both inbound and outbound logistics activities are affected by policies regarding environmental issues. Despite the fact that consumption of sources like fuel, other kind of activities such as supply chain management, distribution networks or mode and fleet decisions are subject to green logistics concept.

Sustainable development has been defined as a development progress which meets the needs of the present without jeopardizing the needs of future generations at the World Commission on Environment and Development of the United Nations [14]. Long term existence and sustainable development are the main objectives of companies. The environment they exist and interact with should not be considered apart from business life. Furthermore, protection and development of habitat in which the workers, managers, and their families live should be taken into account. Companies have to secure flow of sources not only today but also in the future. They should build up long term relations that based on trust with their suppliers. This will increase the quality if supply process and better procurement with better input will support the development. Hence, having an effective role in creating the future, will contribute to secure long term existence and development.

This paper will use a in-depth interviewing method to illustrate the role of 3PL in taking action to provide green logistics services to the customers and communities. It covers various ways of achieving sustainable transportation and warehousing from 3PL's point of view. We also address green logistics solutions from a 3PL and the resulting benefits for the customers. Finally we will also develop a conceptual model to support the concepts and ideas. In conclusion, we will discuss the drivers, benefits, and challenges to green logistics and how to maintain sustainability through action, all from a 3PL's perspective. The rest of this paper is organized as follows: Section 2 introduces an in-depth interviewing methodology regarding how understanding implementing CSR through 3PL in a closed-loop supply chain. Section 3 presents a interview with a senior managing director of

world famous corporation, who has substantial experience in the related field. Section 4 presents to the key challenges of sustainability through 3PL that conducted by the proposed model. Finally, Section 5 we have a discussion for the above interviews and comprises the conclusion.

2. Research Approach

Depth Interviews are a method of qualitative research in which the researcher asks open-ended questions orally and records the respondent's answers. Interviewing is typically done face-to-face, but can also be done via telephone. Depth interviews are one of the most powerful methods for digging into the factors that motivate consumers' behavior [19]. In a qualitative interview, the interviewer has a general plan of inquiry, however he or she has no specific set of questions that must be asked with particular words and in a particular order. The interviewer must, however, be fully familiar with the subject, potential questions, and plan so that things proceed smoothly and naturally.

The methodology of the depth interview is integral to its success; interviewers must not lead their respondents, or informants, but instead must find ways to encourage the informants to speak candidly. A typical depth interview produces a lengthy transcript that must be analyzed for key data points that are coded into categories that either use labels that arise from the data itself or are adopted from similar studies.

This paper will use a in-depth interviewing method to illustrate the role of 3PL in taking action to provide green logistics services to the customers and communities. In next section, we will discuss out the various ways of achieving sustainable transportation and warehousing, and address green logistics solutions from 3PL's point of view and the resulting benefits for the customers. We will also develop a conceptual model to support the concepts and ideas.

2.1 Stages of the interviewing process

Identifies seven states in the complete interviewing process[19]:

- (1) Thematising: Clarifying the purpose of the interviews and the concepts to be explored.
- (2) Designing: Laying out the process through which you'll accomplish your purpose. This should also include ethical considerations.
- (3) Interviewing: Doing the actual interviews.
- (4) Transcribing: Creating a written text of the interviews.
- (5) Analyzing: Determining the meaning of the information gathered in the interviews in relation to the purpose of the study.

- (6) Verifying: Examining the reliability and validity of the information gathered.
- (7) Reporting: Telling others what you have learned or discovered.

2.2 Description of the respondent

Mr. Schnell Jeng is a Doctoral candidate at Chung Yuan Christian University and serves in DB Schenker Taiwan, where was established way back in 1967 and has since then developed into a fully fledged integrated logistics service provider. Mr. Schnell Jeng ever successfully integrated the traditional areas of freight forwarding by air and ocean into supply chain management. Now he is the Managing Director of DB Schenker Taiwan.

For DB Schenker Taiwan, 2007 is a milestone in the development towards a key player in the logistics industry. On 1 January 2007, BAX Global Ltd (Taiwan office) successfully merged operations with Schenker Taiwan. Testimony to the industry-leading position of the organization in Taiwan, Schenker is one of the first logistics service providers to be awarded and accredited with ISO9001:2000 certifications in Taiwan.

2.3 The services outsourcing to logistics integrators in a supply chain system

The key thrust, for any 3PL provider of green logistics, would be on the vital factors- transportation and warehousing. Most developments in achieving the goal of greener logistics have been based around reducing the impact of transportation and warehousing activities on the environment.

According to [33], the partnership between a collaborative supply chain system only has two reasons, namely to create a low-cost and high-efficiency supply chain, but how to create a low-cost and efficient management method in a collaborative supply system? The important consideration is that various relevant supply activities in each supply chain can be connected

***Note:** With annual sales of over 19 billion euros, nearly 91,000 employees across about 2,000 locations in about 130 countries, DB Schenker is one of the world's leading providers of integrated logistics services, offering land transport, air and ocean freight as well as comprehensive logistics solutions and global supply chain management from a single source. of the world's leading providers of integrated logistics services, offering land transport, air and ocean freight as well as comprehensive logistics solutions and global supply chain management from a single source. Schenker Taiwan is part of DB Mobility Logistics AG, the logistics division of Deutsche Bahn AG.

closely; as for how to connect, [33] proposed two concepts:

- (1) Optimization: the optimal junction between cost and added value of various activities to achieve the overall optimization.
- (2) Coordination: no error of coordination between various activities.

Therefore, under the current operation environment of suppliers, it is not wise for the members in the supply chain to increase their profit alone. But 3PL can make the whole supply chain system more efficient and valuable. 3PL will be the role as a strategy alliance for implementing CSR, required to improve the competition status and reduce cost and risk through the cooperation of upstream and downstream manufactures, so that the whole chain management system will be more efficient.

Most enterprises now would like to focus on their core activities, and outsource logistics services to 3PL. Of all types of services provided, transportation and warehousing are the most outsourced. Please refer to Table 1.

Table 1. Types of services outsourced to logistics integrators

Types of Services Outsourced to Logistics Integrators	
Outsourced Logistics Service	Percent of Respondents Outsourcing
Domestics transportation	85
International transportation	81
Warehousing	72
Customs clearance and brokerage	65
Forwarding	52
Shipment consolidation	46
Reverse logistics (defective, repair return)	38
Cross-docking	38
Transportation management (shipment planning and execution with one or more carriers)	37
Product labeling, packaging, assembly and kitting	36
Freight bill auditing and payment	30
Supply chain consulting provided by 3PL	17
Order entry, processing, and fulfillment	15
Fleet management	13
Lead logistics provider/logistics integrator services	13
Customer service	12

Transportation and warehousing activities are of paramount importance in logistics, and therefore the greening of logistics involves the greening of these activities.

2.4 The benefits of green logistics

Green logistics offers numerous benefits to the environment, society, and organizations .

- (1) The most obvious is reduced impact on the ECO system and reduced environmental degradation leading to enhanced quality of life.
- (2) Green logistics frequently results in lower costs due to fewer trucks, better delivery planning, and better truck utilization.
- (3) Green logistics helps increased customer loyalty and brand goodwill because of pro-active approach.
- (4) Green logistics helps organizations mitigate risks of legal action and financial impacts of avoidable environmental incidents.
- (5) Involvement of customers and suppliers in devising sustainable solutions and waste take-back program helps strengthen customer and supplier relationship.

Emissions from vehicles, ships, trains, and aircraft contribute significantly to the problem of air quality. In many parts of the world, local governments put strict laws and regulations in place to control the carbon emissions. The Key Drivers of Green Logistics are:

- (1) Emissions from vehicles, ships, trains, and aircraft contribute significantly to the problem of air quality.

In many parts of the world, local governments put strict laws and regulations in place to control the carbon emissions.

- (2) Ever-increasing awareness of the long term effects of environmental degradation.
- (3) Transportation is perceived as being the main contributor of greenhouse gases.
- (4) Government incentives aimed at lowering emissions and improving energy efficiency.
- (5) The development of alternatives to fossil fuels is having a big impact on the transportation industry.
- (6) There is ever-increasing pressure from voluntary and mandatory programs to execute reverse logistics and to design products and packaging to facilitate efficient, safe and cost effective product recovery.

3. Greening DB Schenker

Green logistics has become a market trend, and will continue to gain importance in the next decade. An existing conceptual model is used to support the concepts and ideas.

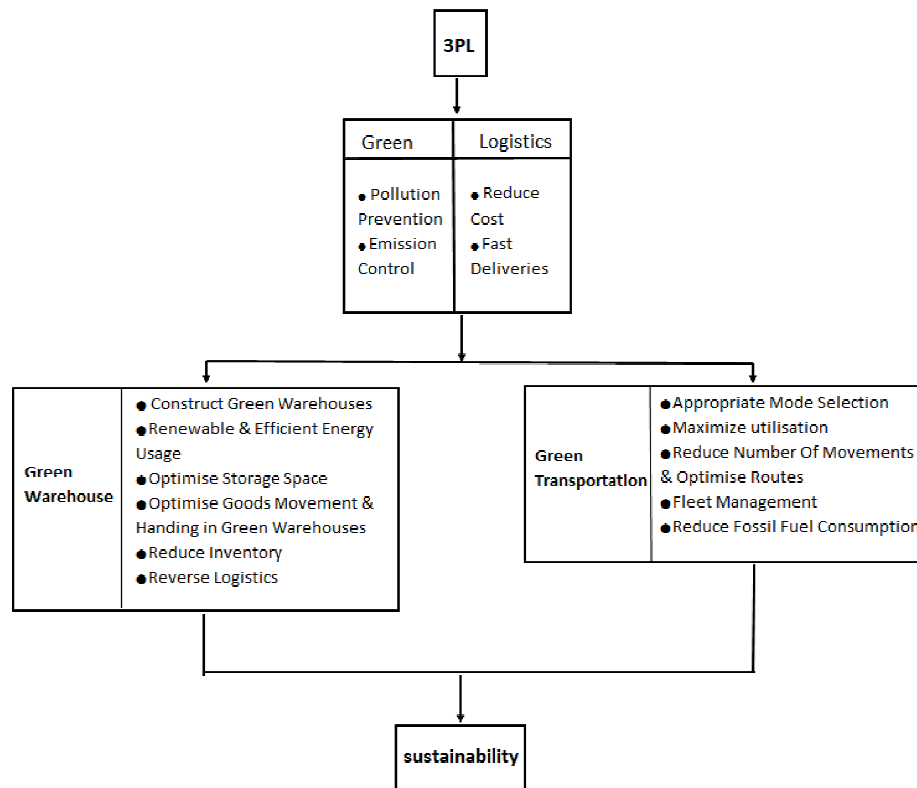


Figure 2. Conceptual Model–Green Logistics from 3PL's perspective

In this respect, DB Schenker will focus its activities on combining their services portfolio as noted below:

3.1 Rail Freight

Rail is the mode of transport with the lowest pollution. In the recent years, DB Schenker has continuously increased the proportion of electricity (generated from renewable sources) used in its rail network. They recently offered a 100% carbon-free transport by using electricity from renewable sources. They help a well-known high performance car maker in Germany reduce its carbon footprint. Some 150,000 new vehicles were transported on the train in 2011. Their efforts led to a reduction in carbon emissions of about 5,250 tonnes annually, or over 35 kilograms per vehicle.

3.2 Land transport

DB Schenker uses a combination of many different measures to help reduce the environmental impact of land transport. The cornerstones of an environmentally friendly transport include bundling of transport and the optimum use of trucks where shipments are consolidated through hub systems for particular transport connections (see Figure 3). Flexible routing and smart city logistics are made possible by intelligent route planning and control systems.

Some of the measures are currently being taken:

- All truck drivers, including subcontractors are trained in energy efficient driving.
- Continued fleet renewal, to meet European emission standards.

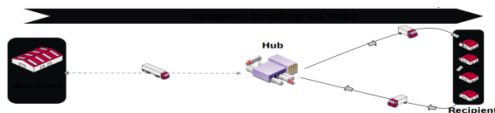


Figure 3. Hub system

3.3 Air Freight

In order to reduce the paperwork involved in air freight, DB Schenker has shift to e-freight. In this procedure, air waybills are done electronically. This saves tremendous amount of paper consumption, and increases production efficiency. Many DB Schenker branches have implemented e-freight procedures.

3.4 Ocean freight

DB Schenker helps preferred carriers (shipping lines) achieve their emission reduction targets by monitoring emissions values annually and coordinating the calculation methods. One of his preferred German carrier began utilizing “slow steaming” enables fuel consumption savings of up to 50% on longer routes for general cargoes, which has a direct corresponding emission of CO₂.

3.5 Contract logistics

The aim is to ensure sustainable initiatives are implemented and monitored – particularly in new and refurbished warehouse buildings. There are numerous instruments for reducing carbon emissions such as the use of photovoltaic, wind, and solar energy systems, and the more intensive use of rain water. They encourage customers to use shared warehouse space instead dedicated. This will not only save costs, but also provide optimal space utilization for customers.

3.6 Providing solutions

DB Schenker offers a strong portfolio of eco solutions to its customers. They have developed their own tool to help customers for analyzing global carbon emissions along entire supply chain from door to door. Reverse logistics can have a positive impact on the environment through activities such as recycling, reusing materials, or refurbishing used products. DB Schenker has many show cases examples on how successfully they manage customer’s reverse logistics.

4. Key challenges of Sustainability through 3PL

In achieving greener logistics processes, we are facing the following key challenges:

- (1) Cost and environmental consideration:
Cost reduction, and faster and more flexible deliveries are the primary objectives of logistics. These objectives conflict with environmental considerations.
- (2) Transport modes:
Trucks and aircraft are the most popular choices of transportation mode, because they reduce transit times and increase flexibility. However, shipping goods by road and air generates more pollution and is less energy efficient than shipping by sea or rail.
- (3) Response time and reduced inventories:
Supply chain and logistics strategies focus on reducing inventory with frequent, short, speedy shipments. These strategies remove the need to stock, and reduce warehouse use. If inventories are not being stored in warehouses, they may be somewhere in transit, which contributes additional burden on the environment.
- (4) Excess product movement due to customization:
Additional movements are frequently introduced to supply chain to facilitate products customization, tax optimization and process specialization. While these steps add value to the supply chain, they increase the carbon footprint of the logistics chain.
- (5) E-Commerce:
Purchase of goods online, instead of at a physical store, drastically increases the amount of product

packaging required. More online purchases also mean more frequent delivery to households.

- (6) Road congestion:
Road congestion wastes both money and carbon. It can mean late arrivals, delayed delivery, lost sales, and loss of customers, all leading to higher costs and poor productivity.

5. Conclusions

In an effort to protect the climate in a globalized world of logistics, 3PL is actively working to provide green, sustainable services. Today's successes are the basis for tomorrow's solutions. In the long term, 3PL must be able to break the link between carbon emissions and the growth in transportation, which means that emissions must be reduced to a much greater degree. Considering the massive amount of freight that it moves, 3PL must take its responsibility seriously. 3PL will focus its activities on two basic principles—continuing to develop environmentally friendly solutions for its customers, and redoubling its efforts to achieve its planned carbon reduction targets. Sustainability is becoming an increasingly important criterion for logistics customers.

We find that 3PLs have to be adaptable, able to offer green logistics solutions at an early stage, and maintain a competitive advantage over competitors. Those 3PL companies which recognize the market for green logistics early may be able to build on their expertise and provide eco-consultancy services to customers. Sustainable, green, and environmentally friendly supply chain solutions demand highly specialized expert knowledge. Eco-consultants from 3PL could give advice on how to design supply chains and how to reduce greenhouse gases within the customer's supply chain by providing the required competencies.

In this paper, an attempt has been made to develop a conceptual model to achieve environmental sustainability through action from 3PL's perspective. We present two initiatives—warehousing layout and intermodal transportation. These two, in combination, led to a 20% reduction in transportation CO₂ emissions, while achieving comparable cost savings across the transportation network. The drivers, benefits, and challenges to green logistics and how to maintain sustainability through action are discussed out, all from a 3PL's perspective. For future research, quantitative approach can be undertaken to prove the applicability of the model.

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