

# Lenovo's Green Supply Chain Management Framework for Green Development of Enterprises

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**Abstract:** With the continuous development of the global economy, environmental problems have become one of the greatest challenges facing mankind. In order to achieve sustainable development, enterprises need to continuously adjust and improve their business models and strategies, combining environmental protection with economic benefits to achieve a win-win situation. Nowadays, the awareness of environmental protection is gradually increasing, and enterprises are no longer limited to internal green management, but gradually shifting to green co-operation practices among supply chains. Faced with pressure from society, government, consumers, and enterprises in the same industry, and in order to actively respond to the national "dual-carbon" goal, i.e., to achieve carbon peak by 2030 and to achieve carbon neutrality by 2060, manufacturing enterprises are also actively establishing green supply chains through a variety of green management tools to increase the sustainability of products or services, improve social benefits, and enhance the sustainability of products and services, as well as improve social benefits. services, improve social benefits, and help enterprises improve their corporate image. Therefore, starting from Lenovo Group's green supply chain management framework, this paper explores its three-tier supply chain consisting of fellow traders, upstream suppliers, and downstream retailers, which stimulates the enthusiasm of the main supply chain enterprises, and at the same time, can reduce the green governance costs for the main supply chain enterprises, and increase the motivation to implement green behaviors.

**Keywords:** Green supply chain, Environmental management accountants, Optimisation Recommendations.

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## 1. Introduction

### 1.1. Background and Significance of the Study

#### 1.1.1. Research Background

At present, the development of green supply chains faces three key issues. Firstly, the research and application of green supply chain in China started late, and most of the supply chain practices are carried out by multinational corporations, while the cost of enterprises undertaking green governance activities alone is high and the return cycle is long, so the implementation of green governance within the enterprise will bring a huge burden to the enterprise; secondly, as the core enterprise of the supply chain, it is difficult to come up with effective green cooperation models to solve the problem in the face of the problem of high cost of green governance. Secondly, as a core enterprise of supply chain, it is difficult to come up with an effective green cooperation mode to solve the problem when facing the problem of high green governance cost, and there is a lack of favourable cooperation mechanism between upstream and downstream of the supply chain and the same industry to achieve the cost sharing and value co-creating; thirdly, there is a significant difference in the perception of green development and management level of the core enterprises in the supply chain, and it is difficult to form the green conscious behaviour of the enterprises, and it is difficult to coordinate the implementation of the supply chain green strategy.

#### 1.1.2. Research Significance

Against the background of deepening global economic integration and green transformation of the global economy, manufacturing enterprises will face more intense global competition, and adjusting structure, controlling costs, and

pursuing higher-quality development in order to gain competitive advantages are common issues that every enterprise needs and faces. At present, domestic and international research on science and technology manufacturing enterprises mainly focuses on industrial structure optimisation, enterprise upgrading and new energy development strategy. Based on the perspective of green supply chain development, this paper proposes a green supply chain idea that responds to the dual-carbon goal from a holistic and comprehensive point of view, taking into account the profitability of the enterprise, and analyses the green supply chain management framework of Lenovo Group, so as to provide reference for related enterprises to build a green supply chain.

### 1.2. Research Methodology

First, the literature collation method, through the collection and collation of relevant reference materials, to summarise and summarise the relevant research literature on green supply chain and environmental management accounting on their own, to understand the relevant theoretical basics and key points, to understand the history of theoretical development, the use of methods, combined with the current policy guidelines, to provide a theoretical basis for the study of Lenovo Group's green supply chain in this paper. Secondly, the case study method, taking Lenovo Group as a representative, combined with the actual situation and operational characteristics of the enterprise, the composition and implementation process of its green supply chain is studied in detail, and according to the theoretical overview and case study, corresponding optimisation suggestions are given.

### 1.3. Current Status of Research at Home and Abroad

#### 1.3.1. Current Status of Foreign Research

The green supply chain concept was first proposed by the School of Manufacturing at Michigan State University in a 1996 study on environmental manufacturing [1]. The goal is to integrate the green manufacturing concept and supply chain management, so that the products in the whole supply chain link from raw material acquisition, processing, packaging, storage, transport, use to recycling process to consider the environmental impact and resource efficiency, to give full play to the competitiveness of the market, and to achieve the unity of the economic, social and environmental benefits. Beamon (1999) believes that the green supply chain model can be expanded appropriately, for example, by adding the factors of Beamon (1999) believes that the green supply chain model can be expanded appropriately by including factors such as manufacturing, recycling and reuse, and adding resource regeneration-related indicators to the environmental indicators [2]. Jeremy (2000) pointed out that enterprises and society should be the starting point of green supply chain operation, and in order to maximise environmental benefits, synergistic effects should be pursued, and every link in the supply chain should be treated as an integral part of the supply chain. In recent years, scholars at home and abroad have added the "Triple Bottom Line Principle" to the study of green supply chain. Elkington was the first to put forward the concept of "triple bottom line" from the microeconomic perspective. He believes that enterprises need to consider the balanced development of economy, environment and society in the process of production and operation.

#### 1.3.2. Status of Domestic Research

At present, the characteristics of China's manufacturing industry of high input, high consumption and high emission lead to the ecological and environmental problems it faces, and there is an urgent need to accelerate the construction of green manufacturing system. Domestic academic research on green supply chain is slightly lagging behind. Wang Nengmin (2007), on the basis of recognising the understanding of the predecessors, made a more detailed elaboration on the significance of the innovative management mode of green supply chain, and considered that this management mode is an innovative achievement in solving the contradiction between ecological environmental protection and the speed of economic development, which provides a new solution to this contradiction. At the same time, they established a brand-new model on the basis of sustainable development and discussed the basic principles of symbiosis, circulation, alternative conversion and system openness [3]. According to Ji Guojun and Yang Guangyong (2011), a green supply chain is a supply chain model based on sustainable development that enhances the economic, social and environmental benefits of enterprises at the same time. Jiao Rui (2020) applies the fuzzy comprehensive hierarchical analysis method to the green index system and proposes a reasonable evaluation index system for suppliers in the green supply chain on the basis of the traditional supply chain [4]. Zhao Lu (2020) improves the existing management process of the green food packaging industry based on the principle of life cycle evaluation from the core links of product marketing, packaging, materials, manufacturing and recycling treatment, and innovates the original technical system.

## 2. Relevant Concepts and Theoretical Foundations

### 2.1. Concepts Related to Green Supply Chains

#### 2.1.1. Definition of a Green Supply Chain

Formed in the 1990s, green supply chain is a modern management approach that takes into account the use of the environment and resources in the supply chain, and it is important for green pollution prevention and green product development practices. Green supply chain management is the potential integration of environmental management thinking into supply chain management practices and is an important concept for organisations to gain profit and market share as well as reduce environmental risks and impacts. Green supply chain management is a product of the times of supply chain management in the green economy development situation, which emphasises the process of systematic planning, regulation, implementation, control and optimisation of the entire supply chain. Through supply chain management, it can optimise the production and operation activities within the enterprise, help integrate the whole chain of enterprise production, and help improve the economic efficiency of the enterprise.

With the development of its theory, the exchange and cooperation with related enterprises have gradually received attention, entrepreneurs have noticed the influence of the external environment of the supply chain, and updated the view of the supply chain, that the supply chain can be viewed as each enterprise in the enterprise supply chain, including the upstream enterprise's production and manufacturing, the intermediary's assembling and distribution, and the downstream retailers, etc., which will transform the raw materials into the product, and finally let the product flow to the end. The process of transforming raw materials into products and finally letting the products flow to the end customers. In the past few years, more and more attention has been paid to the network-chain relationship centred on core enterprises [5].

#### 2.1.2. Five Dimensions of a Green Supply Chain

(1) Green procurement: Green procurement is to ensure the greening of raw materials and to control pollution at the source.

(2) Green production: green production is the core embodiment of green supply chain management, in the production process not only to use the procurement of green raw materials, but also to ensure that to reduce the degree of pollution in the production process on the environment as well as to improve the recycling rate of materials.

(3) green marketing: green marketing refers to the product packaging, storage, transportation, distribution and processing processes follow the scientific design, through the optimal configuration of each node, so that its emissions to achieve the minimum, so as to achieve maximum utility.

(4) Green Consumption: Green Consumption is to advocate that consumers and producers should abstain from consumption, try to avoid or reduce damage to the environment, and resist the use of polluting products.

(5) Green Recycling: Green recycling is mainly for the reuse of products that can be recycled again and again, for products that cannot be put into use again, the enterprise should take a scientific method of disposal.

## **2.2. Concepts Related to Green Supply Chain Management**

### **2.2.1. Definition of Green Supply Chain Management**

Green supply chain management is based on the traditional supply chain management model and adds the concept of environmental and resource conservation to promote the sustainable development of enterprises and communities. Although green supply chain management originates from the traditional supply chain management model, it infiltrates the green eco-approach into the whole supply chain, and makes use of the efficient collaboration between producers and suppliers as well as various departments within the enterprise to maximise the green eco-economic benefits of the enterprise, thus enabling the enterprise to achieve sustainable development. Green supply chain management is an advanced scientific management approach that takes into account the environment, resource efficiency and company interests in the overall supply chain process. Compared with the traditional supply chain management model, it has higher information management complexity and network characteristics. Taking the sustainable development of the society and the company as the starting point, in order to reduce the company's damage to the natural environment, the design concept of eco-environmental protection is integrated into it, and the whole process from the supply of raw materials to the disposal of waste products can improve the environmental performance under the collaboration within the company.

### **2.3. Definition of Environmental Management Accounting**

Environmental management accounting (EMA) emerged in the 1960s to effectively manage environmental and economic performance through the development and implementation of environmentally related accounting systems and practices. The United States Environmental Protection Association formally put forward the concept of environmental management accounting in the 1990s, and the relevant theories have been developed in various countries. At present, only the objectives, definition, discipline positioning and other aspects of environmental management accounting have been focused on research and exploration, environmental management accounting integrates economics, management, accounting, statistics and other disciplines, comprehensive and cross-cutting characteristics are obvious, the scope of research is not easy to clearly define, so the construction of related theoretical system is hindered. At present, most enterprises do not pay enough attention to the disclosure of environmental accounting information, and the disclosure of published environmental accounting information is inaccurate and incomplete. Many enterprises still lack the conscientiousness of applying environmental management accounting, and some of them only pay attention to short-term interests, think that the application of environmental management accounting will increase the cost, and lack the effective measurement and control of environmental costs, and lack the infrastructure and application conditions in the specific application.

## **2.4. Relevant Theoretical Foundations**

### **2.4.1. Sustainable Development Theory**

Sustainability is healthy development that meets the needs of today without compromising the ability of the next

generation to do so. The definition of sustainable development contains two main components, "needs" and "limits to needs". In order to develop, we must first meet basic human needs. The constraints on the ability to meet needs are mainly those that will harm the environmental needs of future human beings. Sustainable development requires people to pay attention to economy, harmony with the natural environment and social justice in development, and finally realise the comprehensive development of human beings. Sustainable economic development involves three aspects: the economy, the natural environment and human society. In the macroeconomic sphere, sustainable growth focuses not only on the quantitative indicators of macroeconomic development, but also on the pursuit of the intrinsic qualities of economic development; in the area of ecological construction, sustainable development requires that socio-economic development must be combined with the maintenance and enhancement of the quality of the Earth's ecological environment, so as to achieve the sustainable use of land resources and ecological environment, and so as to realise that the economic development of human beings does not exceed the Earth's natural carrying capacity; in the social area, sustainable growth suggests that the countries of the world can have different levels of development and different specific objects of growth, and that the essence of their growth should be the improvement of the quality of human life, the promotion of human health, and the provision of social conditions that guarantee equity, rights and fairness, rights and the right to avoid violence.

### **2.4.2. Environmental Resource Value Theory**

The theory of the value of environmental resources is a theory of value from the perspectives of ecological compensation and benefit value. In addition to their ecological role, environmental resources also have a certain economic role and are closely related to human production activities. However, due to the traditional economic theory, environmental resources belong to the zero-cost use of public resources, does not have economic utility, so many regions in the early stages of development of ecological resources for large-scale plunder, one-sided only the pursuit of economic development speed, unaware of the huge damage already caused to the environment, until the environmental resources began to reduce significantly, cannot see the road to sustainable development before regretting it. The value attributes of environmental resources are beginning to be realised by people, such as in the exploration, exploitation, research and development of environmental resources in the process of a large number of human and material resources value, which means that the environmental resources are not just pure ecological energy, but valuable, which is the core of the theory of the value of environmental resources. Fully understanding and recognising the value of ecological resources is one of the theoretical conditions for managing environmental costs.

### **2.4.3. Institutional Theory**

Institutional theory is a set of tangible and intangible frameworks and systems of rules with the three distinctive features of public policy, namely, legitimacy, universality and coercion. Institution-based view is to study the strategic development of enterprises based on institutions, it believes that legal norms, the efficiency of law enforcement, the degree of government intervention and other features of the national system will directly determine the effectiveness of the allocation of resources and the level of transaction costs,

thus affecting the results of strategic planning and implementation in the enterprise. Institutions can be conceptually divided into formal and informal institutions, and the comprehensive theoretical framework of formal and informal institutions is also an important theoretical basis for the study of institutional environment variables.

### **3. Analysis of Lenovo's Profile and Motivation for Building Green Supply Chain Management**

#### **3.1. Lenovo Group Overview**

##### **3.1.1. About Lenovo**

Lenovo is a global technology company founded in China with operations in 180 markets. With a focus on globalisation, Lenovo has set an industry-leading example of a diverse corporate culture and operating model, serving more than 1 billion users worldwide. As a trusted global technology leader, Lenovo helps its customers to grasp tomorrow's technology and transform the world today. As a leading global ICT enterprise, Lenovo adheres to the concept of "Intelligence for Every Possibility" and provides users and the whole industry with smart devices that integrate applications, services and the best experience, as well as powerful cloud infrastructure and industry intelligence solutions.

As a global leader in smart devices, Lenovo provides hundreds of millions of smart devices, including computers, tablets, smartphones, etc. Lenovo is the world's No. 1 PC seller in 2018. As a top global provider of enterprise digitalisation and intelligent solutions, Lenovo actively promotes the development of "device + cloud" and "infrastructure + cloud" across the industry, as well as the implementation of intelligent solutions. Facing the industrial upgrading opportunity of the new round of intelligent change, Lenovo puts forward the strategy of intelligent change, focusing on the three directions of intelligent Internet of Things, intelligent infrastructure and industry intelligence to become the leader and enabler of intelligent change in the industry. At present, Lenovo is divided into three business groups: Intelligent Devices Group, Infrastructure Solutions Business Group, and Solutions and Services Business Group, with about 82,000 employees globally and operations in more than 180 countries and regions.

#### **3.2. Analysis of Lenovo's Motivation to Adopt Green Supply Chain Analysis**

##### **3.2.1. Empowering with Technology and Innovation, Contributing Value to Society**

As the people's aspirations for a better life continue to grow, fulfilling social responsibility and creating social value have become the basic expectations of the state and society for enterprises, and corporate social value is being closely integrated with stakeholders, socially responsible investment and sustainable development, and has become a new dynamic and new force to promote high-quality and sustainable development of enterprises. Lenovo's social value is to serve the country, the industry, the environment and people's livelihoods in four aspects as a starting point, empowered by scientific and technological innovation, to be the standard bearer of the "double-cycle", to be the main force of high-quality development, to help the common wealth with practical actions, and to take responsibility in promoting the high-quality development of the economy and society.

##### **3.2.2. Implementing the New Development Concept and Promoting High-Quality Development**

Lenovo is entering a new stage of development, focusing on its own development while making more contributions to the country, society and mankind. Lenovo has always been a "country of greatness", and in the process of responding to the national strategy, Lenovo takes the responsibility of promoting the high-quality development of the whole society as its own, the livelihood of the people as the starting point, and environmental governance as the goal of long-term development, and fully fulfils the social responsibility of a high-tech enterprise. 2022, Lenovo will accelerate the integration into the new development pattern of "double-cycle" in the country and the world, overcome the geopolitical situation, shortage of parts, and the impact of inflation on society. In 2022, Lenovo accelerated its integration into the new domestic and international "double-cycle" development pattern, overcame the challenges of geopolitics, shortage of parts, and the return of inflation, and achieved record performance, with all its main businesses historically profitable; from co-creation, sharing to co-advancement, it has contributed to high-quality development with science and technology innovations; it has benefited the people's livelihoods with its science and technology and let more people enjoy the convenience brought by science and technology innovations; it has adhered to the innovation-driven approach, and fully fulfilled its social responsibility as a high-tech enterprise. We adhere to the innovation drive, use the power of science and technology to build a green and low-carbon beautiful home, and continuously create new social value.

##### **3.2.3. Building a Strong Supply Chain System**

The multi-dimensional layout of the supply chain has become an important part of Lenovo's core competitiveness. Domestically, Lenovo has built two manufacturing bases in Hefei and Wuhan, and together with the Tianjin Intelligent Innovation Service Industrial Park and the Southern Intelligent Manufacturing Base, Lenovo has constructed an all-round layout of intelligent manufacturing covering the "East, West, South, North and Central". Globally, Lenovo has more than 30 manufacturing bases, provides products and services for 180 markets, and has established good and solid cooperative relationships with more than 2,000 core suppliers. Businesses cover electronic equipment manufacturing, software and information services, precision electronics, biometrics, etc. Downstream distributors cover software and information technology services, wholesale and retail, and other various fields, enabling Lenovo to achieve global sourcing, global manufacturing, and global logistics. Lenovo fully recognises the importance of local suppliers, which not only reduces logistics costs and greenhouse gas emissions, but also promotes local economic development. In 2022, domestically, about 90% of Lenovo's productive sourcing expenditures are associated with local suppliers. In terms of production model, Lenovo adopts a hybrid manufacturing model combining its own factories, OEM (Original Equipment Manufacturer) and ODM (Original Design Manufacturer), so that Lenovo's production and manufacturing activities, to achieve a dynamic balance between capital investment and controllable effects, and through the system's co-ordination and synergies, to provide a greater degree of elasticity in the corresponding resource deployment, and to reduce the risk of a single source of goods.

In response to the new requirements for intelligent and

digital upgrading of the supply chain in the new era, Lenovo has established a digital platform with suppliers to promote collaboration with digital intelligence and ensure the global nature and flexibility of the supply chain; it promotes the coverage of the entire supply chain scenario, provides scenario-based solutions, and serves as the intelligent brain and command centre of the global supply chain through the supply chain intelligent control tower, which is responsible for monitoring and guiding end-to-end supply chain activities; it has increased the use of graphical neural network, digital control tower, and digital control tower in the supply chain. We will increase the transformation of technological achievements in key areas such as graph neural network, reinforcement learning and multi-intelligence learning, and endeavour to create a collaborative, consistent, agile and demand-driven supply chain ecosystem, so as to continuously widen the powerful moat of resilient supply chain.

#### **3.2.4. Creating a Responsible Procurement Supply Chain Process**

(1) Supplier Management System. Lenovo is committed to ESG management in the end-to-end supply chain process, and helps ensure that suppliers meet or exceed applicable labour, environmental, health and safety, and ethical standards by developing ESG-specific systems and supporting contractual provisions.

(2) Supplier Access. Lenovo reviews all new suppliers in accordance with relevant regulations such as sustainability policy, code of conduct, ISO certification, ESG standards, environmental impact, prevention of forced labour and public reporting.

(3) Supplier Audit. Lenovo requires suppliers to obtain RBA (Responsible Business Alliance) VAP audits and Factory of Choice (FOC) certification. Regardless of the supplier's self-assessed level of risk, Lenovo requires that 95% of its suppliers (in terms of purchase value) undergo RBA VAP audits every two years or equivalent independent third-party audits conducted by RBA-approved auditing organisations. In addition to implementing Lenovo's formal RBA programme, the Global Supply Chain team works with Lenovo's Personal Computer and Smart Device (PCSD) Quality team to conduct on-site audits of supplier facilities.

(4) Supplier assessment and evaluation. Lenovo utilises the Supplier ESG Scorecard to manage supplier ESG performance in more than 30 dimensions, including RBA project performance, environmental project performance, responsible raw material sourcing, and the EcoVadis project, and scores suppliers on a quarterly basis.

(5) Supplier training and internal training. Lenovo has set up training files for suppliers to help them learn the company's ESG requirements and practical knowledge in ESG-related areas.

## **4. Lenovo Green Supply Chain Case Study**

### **4.1. Overview of Lenovo's Green Supply Chain Management Framework**

Lenovo continues to focus on the sustainable development of its supply chain, taking compliance as the basis, eco-design as the fulcrum, and full life cycle management as the methodology, exploring and piloting "cradle-to-cradle" practices, gradually establishing a comprehensive green

supply chain management framework, and building a "five-dimensional and one-platform", namely, "green production", "supplier management", "green logistics", and "green recycling". "Green Production", "Supplier Management", "Green Logistics", "Green Recycling" and "Green Packaging". "Green packaging" five dimensions and a "green information disclosure (display) platform", to guide and drive the upstream and downstream industrial chain to achieve low-carbon development and reduce carbon footprint. The supply chain is formulated from the dimensions of green energy use by suppliers, greenhouse gas emissions in the transport chain, and product end-of-life management.

#### **4.1.1. Green Production**

Lenovo's R&D team works closely with suppliers on lightweight and integrated design, and introduces compliant recycled/modified materials such as industrially-renewable component plastics (PIC), post-consumer recycled plastics (PCC) and closed-loop recycled plastics (CL PCR), ocean-converting plastics (OBP) and recycled metals into its products. The use of these materials not only saves natural resources and energy needed to manufacture new materials, but also reduces the disposal of waste materials to landfills. While achieving environmental benefits, we are able to produce products that meet Lenovo's high-performance standards.

#### **4.1.2. Chain Management**

In 2019, Lenovo initiated the ICT High Quality and Green Development Alliance, joining hands with head suppliers such as BOE and Lixun Precision to set standards, share practical experience in low carbon, and provide customised coaching to willing small and medium-sized suppliers and organise regular trainings, so as to enhance their ability to reduce carbon emissions. In 2021, Lenovo sent out questionnaires on scientific emission reduction to suppliers on a regular basis, to understand and analyse the In 2021, Lenovo will send out questionnaires on scientific emissions reduction to suppliers on a regular basis to understand and analyse the challenges and difficulties faced by suppliers in setting scientific emissions reduction targets. Currently, suppliers accounting for 28 per cent of Lenovo's purchasing volume have committed to joining the Global Science-based Carbon Target Initiative or setting science-based carbon targets. In the future, Lenovo plans to promote the participation of suppliers accounting for 95% of its procurement value in scientific carbon reduction activities, covering about 100 major suppliers.

Lenovo actively drives upstream and downstream suppliers in the supply chain to reduce carbon in science, becoming the first IT brand to disclose suppliers on the IPE Green Supply Chain Map. Strengthening supplier environmental management and publishing the list of important suppliers on its official website to accept public supervision. We have set environmental management targets in multiple dimensions, such as suppliers' green energy use, greenhouse gas emissions from transportation, and product end-of-life management, and launched the Key Supplier ESG Scorecard, which includes more than 30 indicators for management, such as the code of conduct, CDP performance assessment, water resource reduction targets, conflict minerals management, greenhouse gas emissions reduction, and sustainability reports. Lenovo's management of suppliers' environmental performance Lenovo has implemented RBA (Responsible Business Alliance) audits in its management of suppliers'

environmental performance, supporting suppliers to prioritise the use of environmentally friendly materials where applicable.

#### 4.1.3. Green Logistics

Lenovo Logistics, as a key component of the global supply chain, is committed to reducing the Scope 3 GHG emissions intensity from upstream transport and distribution by 25% by 2030 (compared to 2018 and 19). Logistics' emissions accounting and reduction efforts are aligned with the Global Logistics Emissions Council (GLEC) framework and drive reductions through multimodal transport, modal optimisation, consolidation and utilisation, network optimisation, technology and automation, rewards, and recognition of partners' relevant achievements. Lenovo promotes emission reductions through multimodal transport, optimisation of transport modes, integration and utilisation, optimisation of networks, technology and automation, and rewarding and recognising partners for relevant achievements. At present, Lenovo mainly adopts the following measures to promote carbon emission reduction in logistics:

(1) Low-carbon transport: Lenovo is committed to using land transport and sea transport to replace air transport. Domestic transport is dominated by land transport, for example, 97% of the freight volume of Infrastructure Solutions Business Group (ISG) is transported by road.

(2) Clean energy: Explore the use of low-carbon fuels in air and marine transport; increase the proportion of new energy vehicles used in logistics and distribution. 23% of electric forklifts in China's regional distribution centres and warehouses in 2022, a 3% increase from the previous year, and 21% of electric trucks in last-mile distribution in 2021, a 3% increase from the previous year.

(3) Improved efficiency: For international shipments exported via Shanghai, UnionPower Technology has improved the truck loading rate, resulting in 747 fewer trucks being transported in 2022 than before. In the park, the introduction of 5G new energy trucks and self-driving logistics lines in the park could increase the park's transport efficiency by 20%.

#### 4.1.4. Green Recycling

Lenovo is committed to controlling the environmental impact of the product life cycle to the maximum extent possible, increasing the recycling of reusable products and accessories, and carrying out the Product End-of-Life Management (PELM) project to reuse, dismantle, recycle, decompose, treat and dispose of wastes of products and components that have been taken out of use, have reached the end of their life cycle or have been scrapped, so as to achieve

the regeneration of resources, and to promote energy-saving, emission reduction and the development of a green circular economy. Lenovo provides consumers and customers with a variety of e-waste recycling channels globally, including Asset Recovery Services (ARS), and further harmless treatment. Maximise the recovery and recycling of materials. Maximise the value of surplus, returned or obsolete products and parts by taking measures such as reuse, refurbishment, remanufacturing, dismantling, recovery, disassembly, recycling, waste treatment and disposal.

#### 4.1.5. Green Packaging

(1) Tailor-made, green and low-carbon, Lenovo intelligent packaging "careful calculation".

Lenovo's innovative intelligent packaging solution not only focuses on packaging consumables, but also strives for excellence in space utilisation. Artificial intelligence tailor-made packaging for products according to specific dimensions, through artificial intelligence algorithms to optimise packaging and loading in all dimensions, from packaging to transport to achieve the optimal combination of space and materials. Application scenarios cover the entire field from packaging cartons, pallets or pallets to containers or containers, which not only saves packaging materials, but also significantly optimises the loading space, thus improving transport efficiency, lower carbon and more efficient, and is a model of lean manufacturing in the field of packaging. Lenovo's green packaging has covered various industries, not only for the carbon emissions "subtraction", but also shoulder to do intelligent transformation "addition", for the transformation of enterprises to inject green power.

#### (2) Lenovo Sustainable Packaging Programme

Lianbao Technology actively carries out green design and successfully creates the Remember sustainable packaging programme through the innovative dual-cycle model of raw material sources and production processes. The programme adopts the waste corners of FSC certified paperboard as raw materials, and uses environmentally friendly wet-pressing technology to make pulp-moulded packaging boxes, achieving excellent product cushioning and protection, while significantly reducing the use of brand-new paper-based materials, waste turnover and recycling energy consumption, and realizing the recycling and processing of the "inner cycle". Users can transform into practical and beautiful photo frames for secondary use through simple assembly, while the environmentally friendly material of the packaging can be biodegraded and composted under natural conditions, thus realising the "external cycle" of the external environment.

## 4.2. Lenovo Green Supply Chain Key Performance

### 4.2.1. Economic Performance Dimensions

**Table 1.** Economic Performance of Lenovo's Green Supply Chain Implementation

Indicator/year	2018	2019	2020	2021	2022
Revenue (RMB bn)	2,878.91	3,239.99	3,219.55	3,856.02	4,546.45
Year-on-year growth in total revenue (%)	-	-	1	20	18
Gross profit (RMB bn)	398.16	467.93	530.52	620.09	764.89
Gross profit growth rate (%)	-	-	13	17	23
Taxes (RMB bn)	17.77	12.66	13.53	29.28	39.51
R&D expenses (RMB bn)	80.86	80.39	84.80	92.30	131.63

## 4.2.2. Environmental Performance Dimensions

**Table 2.** Environmental Performance of Lenovo's Green Supply Chain Implementation

Indicator/year	2018	2019	2020	2021	2022
GHG emissions (metric tonnes CO2 equivalent)					
Scope 1	6,371	6,031	7,766	7,269	6,069
Scope 1 (By site)	193,760	201,321	162,597	177,678	191,778
Scope 2 (market)	176,800	26,029	23,852	21,519	21,160
Scope 3 (total)	14,660,700	16,010,994	17,531,179	19,976,020	12,324,408
Emission intensity: GHG (by location) (metric tonnes/million RMB revenue)	0.69	0.64	0.53	0.48	0.43
Energy intensity of operational consumption Scope 1 and Scope 2 (by location) (MWh/million RMB revenue)					
Fuel consumption	0.12	0.10	0.11	0.09	0.05
Purchased energy (electricity, steam, cooling)	1.03	0.98	0.91	0.81	0.75
Operational energy consumption - Scope 1 and Scope 2 (by location) (MWh)					
Fuel consumption	34,733.55	30,904.82	35,152.32	33,156.59	24,546
Purchased energy (electricity, steam, cooling)	298,019.77	316,482.68	292,645.18	313,526.43	342,340
Energy consumption by major energy source (Gigajoules)					
Fuel	125,041	111,257	126,548	119,364	88,364
Electricity	955,624	979,486	979,740	1,053,903	1,165,186
Steam	108,649	144,240	66,051	70,092	62,213
Cooling	8,599	9,016	7,731	4,701	5,023
Total	1,197,913	1,243,999	1,180,071	1,248,059	1,320,787

**Table 3.** Environmental Performance of Lenovo's Green Supply Chain Implementation

Indicator/year	2018	2019	2020	2021	2022
Direct energy consumption by source (fuel detail) (Gigajoules)					
Petrol/Diesel (fixed combustion)	5,461	10,321	6,442	9,712	5,058
Natural gas (fixed combustion)	113,470	94,476	115,375	106,317	77,757
(LPG) (stationary combustion)	3,087	2,550	1,628	1,454	1,401
Road Diesel (Mobile Combustion)	948	955	801	626	1,593
Gasoline (Mobile Combustion)	1,835	1,703	1,112	996	1,492
(LPG) (Mobile Combustion)	240	188	260	236	112
(CNG) (Mobile combustion)	-	-	-	-	-
Aviation Kerosene (mobile combustion)	-	1,064	930	21	952
Total	125,041	111,257	126,548	119,364	88,364

#### 4.2.3. Social Performance Dimensions

**Table 4.** Social Performance of Lenovo's Green Supply Chain Implementation

Indicator/year	2018	2019	2020	2021	2022
Number of employees	45,754	57,000	63,000	71,500	75,000
Percentage of employees by gender					
Male	65%	64%	64%	64%	63%
Female	35%	36%	36%	36%	37%
Percentage of employee composition by age group					
Below 30 years old	-	-	-	15%	15%
30-50 years	-	-	-	73%	73%
Over 50 years old	-	-	-	12%	12%
Percentage of employees by geography					
Americas (North America, Latin America)	16%	16%	189%	14%	14%
Asia Pacific (excluding China)	9%	11%	12%	10%	11%
China	66%	65%	62%	69%	67%
Europe, Middle East, Africa (EMEA)	8%	8%	8%	7%	8%
Percentage of Employee Turnover by Gender					
Male	-	-	-	8%	11%
Female	-	-	-	8%	11%
Percentage of employee turnover by age group					
Under 30 years old	-	-	-	16%	21%
30-50 years old	-	-	-	7%	10%
Over 50 years old	-	-	-	3%	5%
Average training hours per employee - middle management					
Female	-	-	-	4	9
Male	-	-	-	5	10
Average training hours per employee - top management/decision makers					
Female	-	-	-	3	6
Male	-	-	-	3	6
Percentage of employees trained - middle management					
Female	-	-	-	4%	4%
Male	-	-	-	13%	13%

## 5. Lenovo Green Supply Chain Implementation Optimisation Recommendations

### 5.1. Emphasis on Developing Employees' Awareness of Green Management

Enterprises should strengthen the cultivation of green management concepts for their employees, so that they can establish the value concept of green management, focusing on strengthening the awareness of cooperation, win-win situation and environmental protection, hiring external experts with experience in green management, and compiling learning and training materials on the concepts of green supply chain management and the code of conduct, so as to internalise the characteristics, advantages and ideas of green supply chain. Meanwhile, a set of system is formulated to regulate and guide based on the principle of green supply chain management requirements. In the process of shipping production and operation, procurement and transportation, we should uphold the concepts of saving resources, reducing energy consumption and optimising pollutant management, not only strengthening green production within the enterprise, but also focusing on green management when cooperating with suppliers, customers, and partners, jointly achieving green goals, agreeing on environmental risks and responsibilities, sharing skills, knowledge, and resources, and

enhancing the industry's green awareness.

### 5.2. Improve the Information System of Green Supply Chain

In order to further create better services for consumers, the information system of suppliers can be studied and optimised. Provide information system interface for each supplier, so that all suppliers can directly access the green supply chain information system, thus improving the evaluation and classification level of suppliers, making suppliers more aware of their strategic position and competitiveness in the supply chain, so that they can actively meet the company's strategic development goals, and enhance the enthusiasm and initiative of the supplier's operation. Using the most advanced computer technology to improve the powerful green enterprise information management platform, green supply chain management should also actively introduce artificial intelligence technologies such as machine learning, pattern recognition and data mining to discover potential valuable knowledge in the massive supply chain data, so as to improve the level of supply chain management. Therefore, by using AI algorithms to parse problems in the supply chain, one is able to locate and identify the categories, locations, and suppliers of these problems in order to correctly determine the causes of the problems and thus optimise the execution process of the green supply chain. In addition, we are able to proactively identify the greenness implementation level of each supplier,

and use this to improve the greenness management level of suppliers, thus realising the efficient operation of the green supply chain.

### 5.3. Establish Green Management Culture System

The competition between enterprises is the surface of the product competition, pursued to a deeper level is actually the competition of corporate culture. To enhance the competitiveness of enterprises, improve corporate performance, we must build a healthy green culture, create a harmonious corporate cultural atmosphere, and promote the implementation of green management. All employees of the enterprise's mental outlook, behaviour, values, mental health and living habits, etc. subconsciously affected by the enterprise's business activities in the formation of the influence of corporate culture. The construction of green culture system of shipping enterprises is the premise of the implementation of green management, the green values of managers will directly affect the company's "green" business strategy and "green" business model; the key to the construction of corporate culture lies in the implementation of the enterprise culture, so the use of The key to the construction of corporate culture lies in its implementation, so it is necessary to use publicity media, put forward publicity slogans, set up publicity boards, and set up corporate culture slogans on the uniforms of the employees, so that the employees can firstly internalise them in their hearts and minds, and most importantly, pay attention to the use of environmentally friendly materials and equipment, the use of clean energy, and the recycling of wastes in an environmentally friendly way, so as to make the idea of green supply chain management into a kind of behavioural habit, and to form the initiative and habitual habit, and to safeguard the performance of the company and the enhancement of the competitive ability. The green supply chain management idea becomes a behavioural habit, forming initiative and habit to guarantee the improvement of enterprise performance and competitive ability.

## 6. Conclusion

The representative action of Lenovo Group in practicing social responsibility is to actively respond to the "dual-carbon" goal, strive to achieve green, low-carbon and sustainable development, and has been committed to driving upstream and downstream partners to jointly promote the whole chain of carbon reduction. Any outstanding enterprise, in the development of the road is never only product sales or lead the industry's scenery, should also actively fulfil social responsibility, show the times bear. Enterprises are the important main body of economic activities, the popularity of green supply chain and the promotion of related policies to reshape the value of enterprises, the use of market forces to promote the sustainable development of enterprises. Enterprises are the important main body to practice the "dual-carbon" strategy, and the green supply chain is an important tool for enterprises to help achieve the "dual-carbon" goal. Through the case of Lenovo, this paper finds that the implementation of green supply chain has a positive effect on the economic value and market value of enterprises, and affects the value of enterprises to a certain extent.

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