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# GREEN LOGISTICS IN LIFE CYCLE MANAGEMENT: THE THEORETICAL ASPECT

**Abstract**. Green Logistic, Life Cycle Management and corporate social responsibility concepts are playing increasingly significant roles in reaching sustainable outcomes on the economic and social and ecological sides. Since governments and manufacturer globe are not able to curb the economic and ecological alarming consequences for the 21 century as inflation and pollution. There is a need to understand that Green Logistic and Life Cycle Management must be emphasized by all element of supply chain management, starting from supplier of raw materials, passing through various stakeholders and ending with customers, all must share their responsibilities. Through a descriptive analysis for the secondary data and literature review, the papers concluded that sustainability could be achieved just if all element of supply chain management interact efficiently and share balanced responsibilities.

The world today is facing economic, environmental and social challenges, caused by globalization. This has led to increased consumption, and thus increased production and flows of goods and commodities around the world. Industrial and technological revolutions have exacerbated environmental problems such as global warming and greenhouse gases that are beyond the control of governments to curb. The international community, represented by the United Nations Council and other international organizations, is working to take measures to confront these challenges. The academic community is also developing models and mechanisms to improve green logistics operations in the industrial and service sectors through design, planning, implementation, and arbitration models.

The article presents the analysis of the theoretical foundations of life cycle management; the analysis of the latest publications in corporate social responsibility and life cycle management was carried out, the role of green logistics in ensuring the sustainable development of the enterprise was investigated. Based on the research results, a sustainable value chain model is presented by combining elements with green logistics tools.

**Keywords:** green llogistics, supply chain management, life cycle management

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# ЗЕЛЕНА ЛОГІСТИКА В УПРАВЛІННІ ЖИТТЄВИМ ЦИКЛОМ: ТЕОРЕТИЧНИЙ АСПЕКТ

**Анотація.** Концепції зеленої логістики, управління життєвим циклом і корпоративної соціальної відповідальності відіграють усе більш важливу роль у досягненні стійких результатів з економічному, соціальному та екологічному векторах розвитку організації в усіх країнах світу. Це пов'язано з тим, що уряди країн та окремі промислові виробники не в змозі приборкати небезпечні економічні та екологічні наслідки 21 століття, такі як інфляція та забруднення навколишнього середовища. Необхідно розуміти, що зелена логістика та управління життєвим циклом мають бути використані всіма елементами управління ланцюгом поставок, починаючи від постачальника сировини, проходячи через різних стейкхолдерів та закінчуючи клієнтами. Завдяки аналізу вторинних даних і огляду літератури авторами було зроблено висновок про те, що стійкість може бути досягнута лише за умови ефективної взаємодії всіх елементів управління ланцюгом постачання та розподілу відповідальності.

Сучасний світ стикається з економічними, екологічними та соціальними проблемами, спричиненими глобалізацією. Це призвело до зростання споживання, а отже, збільшення виробництва та потоків товарів і товарів у всьому світі. Промислові та технологічні революції загострили екологічні проблеми, такі як глобальне потепління та викиди парникових газів, які уряди не можуть приборкати. Міжнародна спільнота в особі Ради ООН та інших міжнародних організацій працює над вжиттям заходів для протидії цим викликам. Академічне співтовариство також розробляє моделі та механізми для покращення екологічних логістичних операцій у промисловому секторі та секторах послуг через моделі проєктування, та реалізації.

У статті проведено аналіз теоретичних засад управління життєвим циклом; проведено аналіз останніх публікацій з корпоративної соціальної відповідальності та управління життєвим циклом, досліджено роль зеленої логістики в забезпеченні сталого розвитку підприємства. На базі результатів дослідження у статті представлено модель ланцюга створення вартості шляхом об'єднання його елементів інструментами зеленої логістики.

**Ключові слова:** зелена логістика, управління ланцюгом поставок, управління життєвим циклом.

**Formulation of the problem.** The term “logistics” was traditionally associated with reducing costs and increasing profits through more efficient storage, delivery, and operations [1]; and today, the term is mostly associated with green logistics. Supply chain management is defined by scholars as practices and strategies that reduce the energy and carbon footprint of freight distribution. In addition to handling material, managing waste, packaging, and traveling, these strategies focus on handling and transporting products [2]. According to Lee & Klassen, logistics is a supply chain management activity that takes environmental concerns into account and integrates them into supply chain management to improve suppliers' and customers' environmental performance [3]. The concept of sustainable development and green logistics can be defined as "the production and distribution of goods in an environmentally and socially sustainable manner" [4]. Green logistics is broadly defined in accordance with the World Commission on Environment and Development definition of sustainable development and corporate responsibility [5]. Thus, it is more important to study mechanisms of distributing economic and environmental responsibilities in a balanced manner to all these elements, from the source of raw materials to the manufacturer to the carrier to the consumer to the supplier and seller.

**Analysis of recent research and publications.** It is the goal of the Green Lifecycle Management (GLM) to enhance the environment and operational performance by managing the logistical life cycle of the product. Using environmental performance and operational performance metrics, Kee Hung Lai and Christina Wong examined GLM in the Chinese industrial sector [6]. They measured the rate of reduced emissions, waste and pollution caused by logistics activities. In addition, they measured the improvements in features, designs, options, and delivery. According to their results, the economic benefits of GLM could not be realized in the short term. In most cases, the high disposable cost and implications of environmental procedures are considered as a burden for the manufacturer to adopt GLM. However, GLM program can benefit manufacturers by recovering reusable products and participating in a customer product return program. Other scholars investigated the outcomes of GLM concluded that governments must play its role in supervising and controlling green logistic since manufacturer couldn’t handle the high disposable costs alone [7, 8]. Effective GLM must be enhanced with governmental supervision, tax-reductions and green logistic disciplines [9]. In previous studies, the focus was on the role of manufacturers and the state in taking responsibility for GLM and environmental issues. However, it appears that all basic supply chain elements do not share the responsibilities equally. Several recent challenges, including the COVID-19 pandemic, have demonstrated the importance of supply chain elements in the global economy [10]. As a result of transportation disruptions and logistical crises during the pandemic, and as a result of manufacturers and the state's commitment to environmental controls, which increased costs and prices, the United States and the European Union are experiencing very high inflation rates [11].

Organizations embed holistic environmental sustainability logic through life cycle management (LCM) [12] which is dedicated to minimizing the environmental and socioeconomic impacts of products throughout their lifecycles and value chains. By improving product systems and assimilation of integrated product policies, LCM facilitates the implementation of life cycle thinking and product sustainability for businesses [13]. Accordingly, green logistics is a logistical activity that depends on reducing environmental pollution and greenhouse emissions, especially processes related to transportation and manufacturing, and identifies environmentally friendly primary resources, to go beyond sales mechanisms and consumer choice. Thereafter, this concept is the adoption of mechanisms and means linking green supply and green demand in the process of economic management, also known as environmental logistics [14].

**Research goal:** This study aims to explore modern and comprehensive model for efficient and sustainable logistic flows in the green life cycle management.


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**Outline of the main research material**

*1 History of CSR and sustainable development.*

The first person to define CSR was Howard Bowen in 1953, who described it as a company's obligation to pursue policies, make decisions, and take actions in a way that encourages society to achieve its goals (figure 1). Due to the massive power and actions of large corporations, Bowen believed decision makers should incorporate consideration of their impact into their decision-making [15]. Milton Friedman in a 1970 claimed that "there is one and only one social responsibility of business - to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud" [16]. During the 1980s, Archie Carroll tried to combine the mentioned opposite ideas and developed his four parts of corporate social responsibility into a hierarchical pyramid known as the "Pyramid of Corporate Social Responsibility". Carroll's CSR Pyramid design aims to facilitate the concept of CSR by balancing commitment with various stakeholders [17]. A major focus of Edward Freeman's work on business ethics was the concept of corporate social responsibility and stakeholder theory published originally in 1983 and reviewed in 2017. Taking into consideration Freeman's theory about CSR and stakeholder relationships, companies should be purpose-driven and generate value for all stakeholders. CSR doesn't create tension between the creation of value for other stakeholders and the creation of value for communities [18]. According to John Elkington, the Triple Bottom Line theory (TBL) must achieve sustainable results. Using the TBL CSR framework, businesses assess their expenditures and operations, forecast business climate factors, assess market benchmarks, and minimize their risk exposure [19]. Sustainability can only be achieved through a thorough understanding of all these components. According to the history of corporate social responsibility theories, corporate social responsibility evolves alongside environmental needs and structural elements of sustainability [20]. It is becoming increasingly evident that social responsibility is integrating all facets of the supply chain. The reason for this is that sustainability cannot be achieved without including all the interdependent and disruptive elements of the economy cycle as well as global corporations [21].

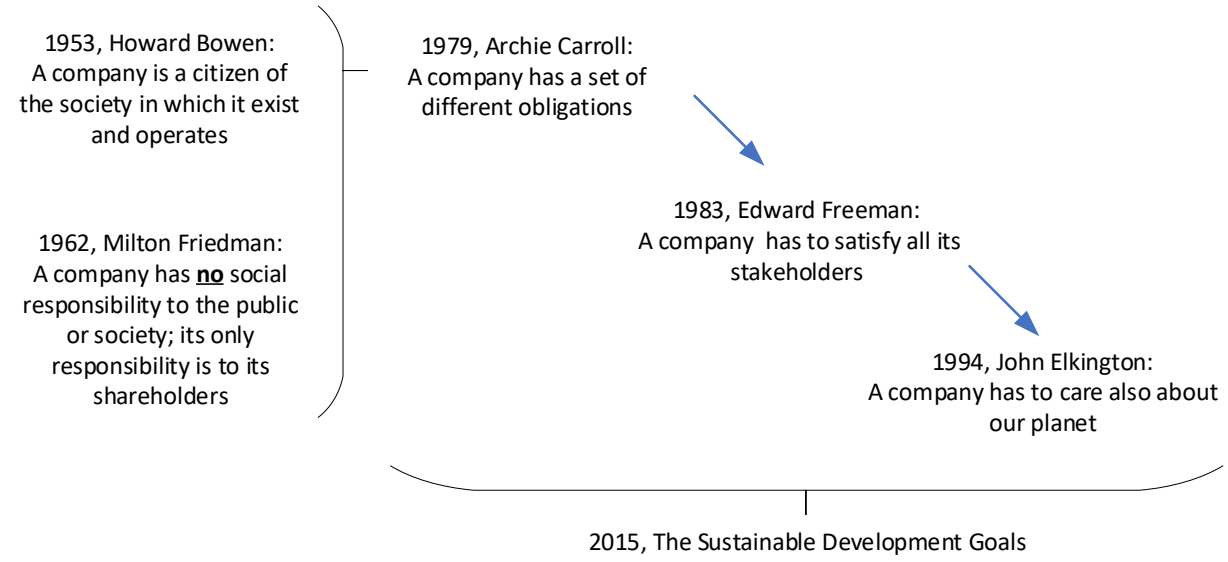


**Fig. 1. Historical development for CSR theories and its dimensions with sustainability.**
*Source: created by the authors*

*2 The role of green logistics in life cycle management*

It used to be that the management of green logistics was limited to the factory and producer. in other words, green logistics was limited to operating or converting raw materials into goods and services that were environmentally friendly. As a result of environmental laws

and ISO standards, producers and decision-makers were challenged to obtain eco-friendly raw materials that were environmentally friendly due to hyper-demand for such sustainable raw materials [22]. The adoption of green logistics management methodologies has thus become more widespread among distributors, suppliers, and companies responsible for storing and transporting goods. Aside from that, corporate social responsibility, with its concepts and dimensions, also plays a major role in involving all parts of the supply chain: suppliers, distributors, warehouses, manufacturers, carriers, sellers, and even consumers in adopting green logistics management techniques [23]. So, it is completely impossible to implement CSR concept just in one company, therefore the green logistics plays the bigger role in modern society; Green Logistics in Life Cycle Management evolved from one element in the supply chain producer in stage one to incorporate all elements - suppliers, producers, sellers and consumers (figure 2).

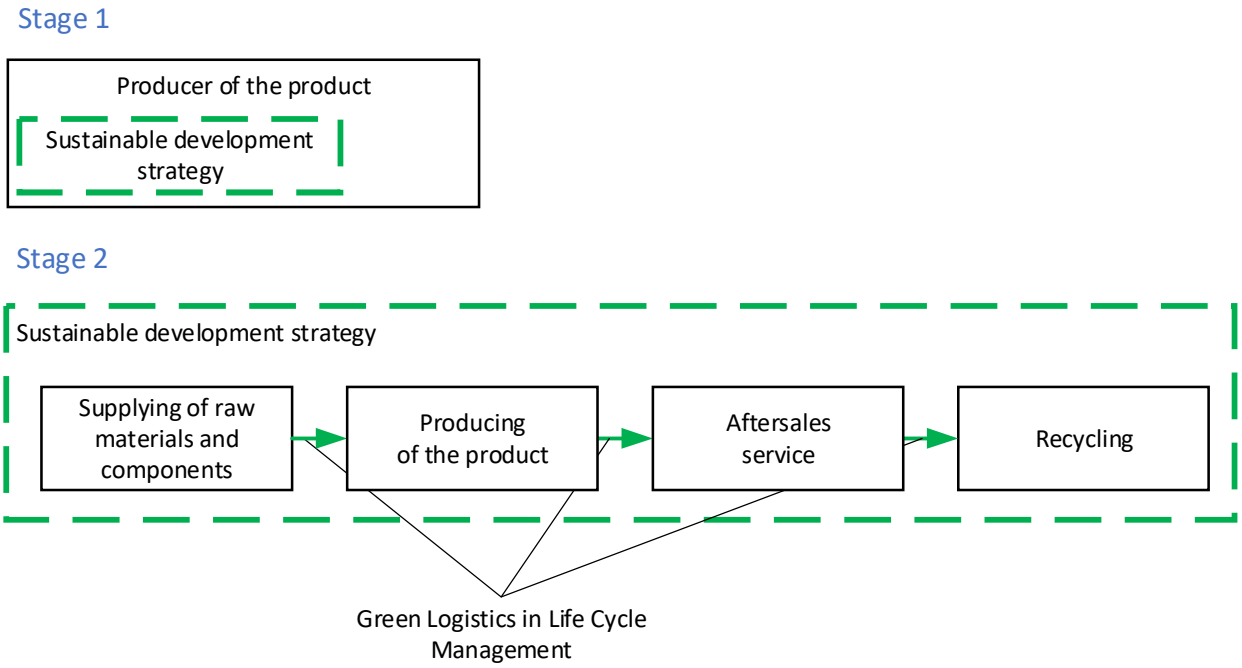


**Fig. 2. The place of Green Logistics in Life Cycle Management**
*Source: created by the authors*

The concept of corporate social responsibility involves creating a balance between the needs of all stakeholders [24]. In the advanced and contemporary second stage of green logistics management, each party and contributor to the production process has environmental, societal, ethical, and legal responsibilities. It is possible to use green logistics methodologies by developing recyclable packaging, packaging goods with recyclable materials, or using bio-analysis, and relying on algorithms and modern technology to deliver as much volume as possible from the source to the consumer as cheaply and quickly as possible. Furthermore, eco-friendly methodologies employ technologies such as solar panels and pneumatic actuators in production plants that consume little energy. All the elements of the supply chain have environmental responsibilities, and governments' role is limited to enforcing laws and regulations and monitoring the implementation of green logistics. With consumers becoming more aware of environmentally friendly products and materials, green logistics is becoming more critical to meet consumer demand. By increasing the demand for green goods, it enhances the economic benefit and profitability of the supply chain as a whole. The process of change does not happen overnight. Rather, it needs a gradual development in sustainable mindsets, incorporating sustainability into academic curriculums and researches, and in media and advertising materials.


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**Conclusions from the study.** Throughout its entire life cycle, green logistics covers the design, distribution, and recycling of a product. In particular, it focuses attention on the environmental impact associated with the transportation of goods from one point to another. Generally speaking, green logistics refers to a practice in which an ecological approach to logistics is incorporated into a supply chain so that it is able to play a more responsible role in protecting the environment. Therefore, in order to reduce waste and improve efficiency, the entire supply chain must be examined, from suppliers to customers. However, in order to be more interactive, it needs to be paired with corporate social responsibility, all of which aim to attain sustainability through joint efforts between all elements and departments. In light of this, it is recommended that green logistics should strive to reduce fuel consumption, waste creation; distances traveled, as well as use renewable resources when feasible.

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