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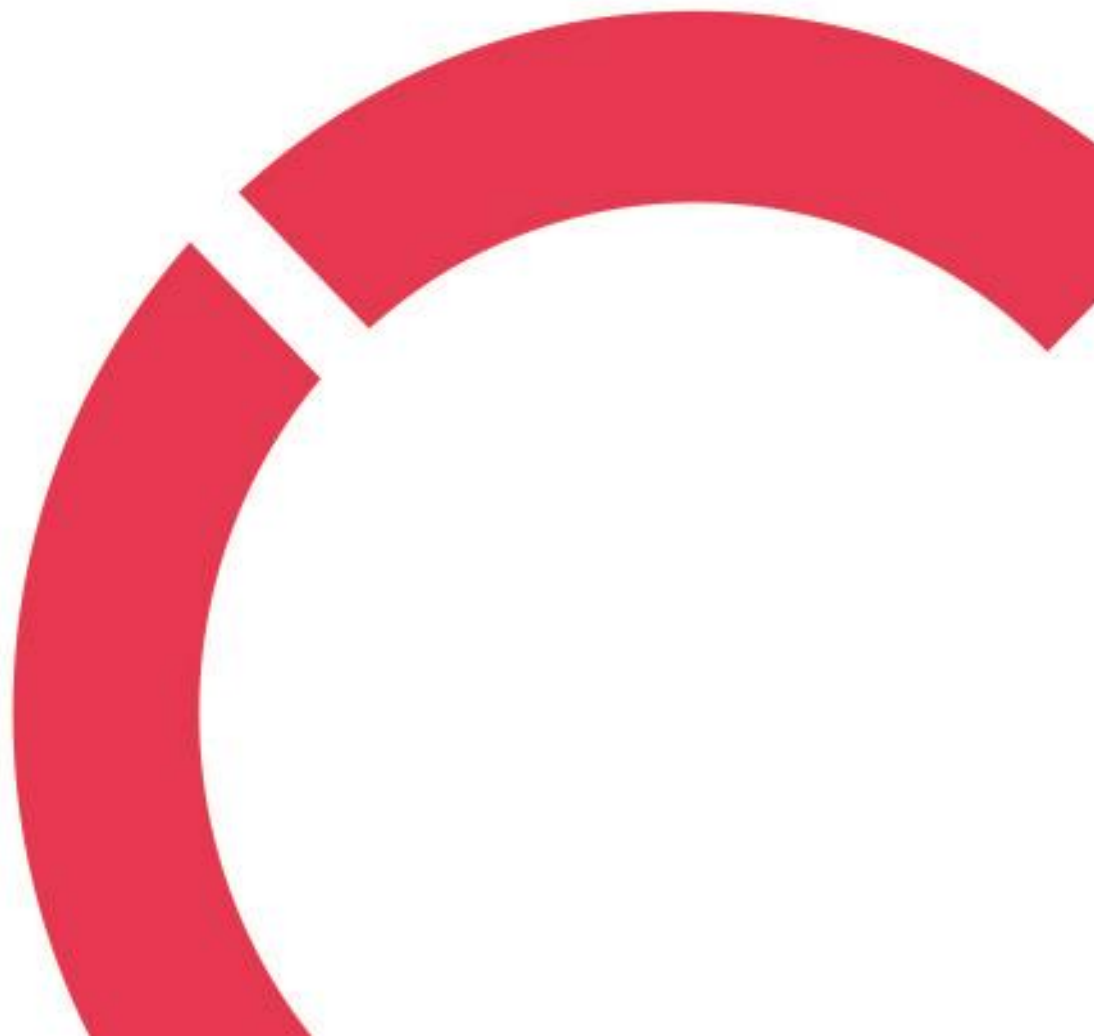
GREEN LOGISTICS: ASSESSING THE ECONOMICAL FEASIBILITY OF SUSTAINABLE LOGISTIC SYSTEM IN EVEREST PHARMACEUTICALS LTD

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ABSTRACT

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Name of thesis GREEN LOGISTICS: ASSESSING THE ECONOMICAL FEASIBILITY OF SUSTAINABLE SUPPLY CHAINS IN EVEREST PHARMACEUTICALS LTD		
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<p>The increased awareness of the detrimental impacts of global climate change has contributed to developing stringent protocols to ensure environmental sustainability across many industries. Adoption of green logistics into core business operations has become mandatory in many parts of the world. Through strategic integration of such practice, industries are able to reduce carbon emissions, enhance resource efficiency, minimize waste production and environmental pollution. This thesis explores the economical feasibility of implementing green logistics practices within the context of Everest Pharmaceuticals Ltd. located in Bangladesh.</p> <p>Everest Pharmaceuticals Ltd. is a leading pharmaceutical company located in Bangladesh. This company will serve as the case company of this study as it provides suitable background for this research. To achieve the research aim, three separate research objectives are selected - the identification of current logistic practices of the case company, the development of a framework for establishing green logistics, and the identification of the associated economical benefits and challenges. This qualitative study will interview associated stakeholders, company executives, and environmental experts to formulate the framework in question and assess the economical feasibility. Inductive approach was opted as this thesis formulated the research outcomes based on the collected data. Semi-structured, open-ended questionnaires will provide the framework for data collection. Purposive sampling will be opted considering the time and budget allocation.</p> <p>The findings of this study are expected to provide crucial insights for the commissioner company to develop and implement green logistics into its core business operation. This thesis will also provide theoretical information about the economical feasibility, associated challenges and benefits so that the management of the company can make an informed decision. All of these are expected to help the case company to overcome relevant challenges by fostering sustainability practices of the company.</p>		
Key words Export supply chain, environmental challenges, green logistics, pharmaceuticals, social challenges, sustainability.		

CONCEPT DEFINITIONS

Carbon Footprint

The sum of greenhouse gases (including carbon dioxide and methane) that are produced by a certain action.

Sustainability

The practice of meeting current needs without damaging the future scopes. It includes protecting the environment, respecting social and economical wellbeing.

Green Logistics

Environmentally friendly practices and strategies used in transportation, storage, and distribution of goods. The goal here is to reduce the carbon footprint associated with logistical process and protecting the environment.

ABSTRACT
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1 INTRODUCTION

The increased awareness of global climate issues has forced many countries to adopt green policies across many sectors. The Paris Agreement signed in 2016, in particular, has pursued many countries to adopt such revolutions (Delbeke et al., 2019, 7-8). Bangladesh as a climate vulnerable country has ratified the agreement. Thus, the government of the country has formed new policies promoting the widespread adoption of green technologies (TBS News, 2024a). Since industries are among the greatest offenders of the environment, the policies are specially geared towards industrial applications. Many industrial processes are constantly polluting the environment through excreting excessive amounts of carbon dioxide and other greenhouse gases. Increased global average temperatures, rising sea levels, desertification, extreme weather events are some of the consequences of unsustainable practices being performed by industries around the world. The logistics department, in particular, has the most profound effects on the environment of any industry. Due to these unsustainable practice experts believe a climate catastrophe is imminent. As a result, it can be said that it is the moral obligation of industries to adopt green solutions wherever possible to save the planet earth from the imminent danger of climate catastrophe. (Stott, 2016, 5.)

The purpose of the study is to provide a scientific guideline and a framework to establish green logistics for the case company as well as other pharmaceutical companies in Bangladesh. The detailed analysis with economical feasibility will allow the company management team to assess the prospects of green logistics and take an informed decision. Moreover, policymakers would also be benefitted through the deep analysis regarding social and environmental responsibilities of the pharma industries in Bangladesh. The content of this thesis will allow them to adjust the environmental policies to align with the global environmental, social, and economical goals. The study has formulated the findings based on recent events, innovations in green logistics, and ongoing corporate practices. As a result, the thesis aspires to present itself as an up-to-date handbook of green logistics for the pharmaceutical industries in Bangladesh.

Logistics are the holistic approach of acquiring, storing, and transporting the goods and materials to their intended place of a company (Pfohl, 2022,6). The primary objective of logistics management is to ensure the required number of resources at the right place at the right time. The traditional form of logistics management involves the use of many unsustainable practices and thus not environmentally sustainable. According to the Paris Agreement, the global temperature rise should be within 2 degrees in comparison to the pre-industrial period (Savaresi, 2016, 2-3). To implement such lofty goals, greeni-

ifying the logistics management systems is a prerequisite. Green logistics can be achieved through implementation of renewable energy sources, adoption of bio-degradable packaging, automation of warehouse management, and increased use of IT infrastructure. Globally many industries have adopted this concept of green logistics and Bangladesh as a developing nation is following the suit. It is believed that by adopting green logistics companies would be one step closer to achieving net zero emissions. Since the logistics department is among the most environmentally impactful departments, transitioning to a green logistics will have a significant positive impact towards sustainability. (Rodrigue et al., 2017a, 10-11, 14.)

Pharmaceuticals are among the primary exported goods in Bangladesh. The market stood at Tk 265.95 billion in 2Q, 2022 and contributes roughly 1% to the national economy (Manik et al., 2023,2-4). The market is experiencing a healthy 9% annual growth. The stability of the overall economy of the country depends on the performance of this industry. The logistical management of many pharma industries of Bangladesh is unsustainable. Identifying the global pressure of greenifying such areas, the government of Bangladesh is encouraging the pharma companies to adopt green logistics. However, there has been a lukewarm response to this notion from the top tier pharma companies of this country. There is a widespread belief held by management of many pharmaceutical companies that the adoption of green logistics adds additional cost burden. This belief stemmed from personal intuitions and lacks any scientific rigor. It is understandable that establishing such infrastructures would require a considerable amount of initial cost, but the long-term benefits of such initiatives may outweigh the financial drawbacks. Renewable energy, for example, incurs massive initiation costs. But in the long run, industries benefit from such arrangements as it reduces overall energy cost. The other components of green logistics have similar prospects and thus the overall economical feasibility of such initiatives should be analysed following proper scientific methods. (Bandara et al., 2025, 3-5.)

The concept of green logistics lacks required exploration through scientific research in Bangladeshi context. Although there are a few researches that have been performed in this regard, they are insufficient and do not cover each of the major industrial sectors of the country. One study conducted by Islam (2018) successfully analyzed the green supply chain practices and explored the methodologies through which the green supply chain can be implemented. The theoretical and industrial backgrounds are deeply explored through this interview based qualitative study. However, this research is concentrated on leather industries only and lacks information about other industries, especially pharmaceutical industries.

Another study conducted by Khan et al. (2024) explored the green supply chain practices in Bangladeshi context. The empirical findings explored the current state of green supply chain practices, identified potential challenges and benefits of green logistics, and evaluated overall environmental impacts. However, the study took a generalist approach, and lacks focus on any particular industry. A case study on a particular industry is needed to fully explore the prospects of such initiatives. Also, economical feasibility is not explored in this study.

Study conducted by Emon (2024) evaluated the importance of green supply chain practices on sustainable development in Bangladesh. This study explored the adoption methodology and impact of green logistics across various industries. The study focused on assessing the environmental impact through interviewing environmental experts. However, the study did not focus on pharmaceutical companies. The pharma industries have significantly different logistical management and thus require different approaches in analyzing the prospects of green logistics.

Based on the discussion above, there is a significant research gap in the topic of analysis of economical feasibility of green logistics of pharmaceutical companies in Bangladeshi context. A qualitative study focusing on the pharmaceutical industry can provide valuable insights into this topic. This study is an attempt to cover up the research gap and acquire the necessary insights into this engaging field of interest.

To fully explore the research topic the following research questions have been set that include what are the current logistics and supply chain practices in Everest Pharmaceuticals Ltd.? Secondly, how can Evergreen Pharmaceuticals Ltd. introduce and implement green logistics into its core business operations is also selected as a research question. Lastly, how economically feasible is the transition to green logistics in Everest Pharmaceuticals Ltd. is selected as the final research question of this thesis.

The aim of this research is to evaluate the economical feasibility of green logistics of Everest Pharmaceuticals Ltd. To achieve such an aim and answer all the above-mentioned research questions three distinct and separate research objectives have been formulated. The first objective of this research is to identify the current logistics practices of the case company. The second objective is to evaluate the economical feasibility of green logistics in the context of Bangladeshi pharmaceutical industry. The third and final objective is to identify the economical benefits and challenges associated with implementing green logistics.

The study aims to provide comprehensive answers to the research questions by addressing these objectives.

This qualitative study of this thesis conducted one-to-one interviews with case company executives who work in the business operations department. Following a purposive sampling technique, 5 executives were selected to perform data collection through an interview-based method. Since the case company is in Bangladesh, the location of the participants will be the same. Considering the time and budget constraints, the study will use online conferencing solutions such as Microsoft Teams to conduct interviews. Strict data privacy will be maintained while handling personal information to ensure business research ethics. Gathered data will be processed using manual sorting, filtering and pattern recognition to formulate the results of this study.

The first chapter provides the introduction of the study containing the related background, research gaps, research questions and objectives and the scope of the study. The following chapter contains the related theoretical background and sufficient literature review. This chapter deeply explores the theoretical basis of green logistics and the associated theories of the research objectives. The third chapter entails the research methodology in detail which is followed while conducting the research. Each parameter of the methodology is thoroughly explained, and the justification of each choice is given properly in this chapter. The fourth chapter contains all the empirical findings of this study. The following two chapters contain the discussion of the findings and conclusions.

2 THEORETICAL PERSPECTIVES AND LITERATURE REVIEW

As the assessment of the integration of green logistics, this chapter describes the current practices of pharmaceutical companies in terms of business operation and logistics handling. The entire logistical processes of pharmaceutical industries in Bangladesh are described comprehensively. After that the chapter presents a theoretical analysis of implementing green logistics in pharma industries of Bangladesh. Lastly, the chapter reports the environmental, economical, and social effects of such initiatives in the relevant companies.

2.1 Overview of logistics

Logistics in broader sense means the management of the flow of goods, services, and information (Kukovič et al., 2014,4). Usually this flow of goods, services, and information occurs from the point of production to the point of consumption. Every industry relies on logistical management to ensure the intended efficiency of operation. A typical logistical process involves collection of raw materials, transportation of raw materials to the manufacturing plant, manufacturing warehouse, wholesale warehouse, retailer warehouse, and finally retailer where products are delivered to the end consumer. In essence, logistics function with four types of flow – products/services flow, information flow, cash flow, and demand flow. All these flows work together to manage the right goods or services at the right place which is the primary goal of inventory management. The three domains of logistics activities are presented in a comprehensive diagram in the following figure. (Gudehus & Kotzab, 2012, 21-24.)

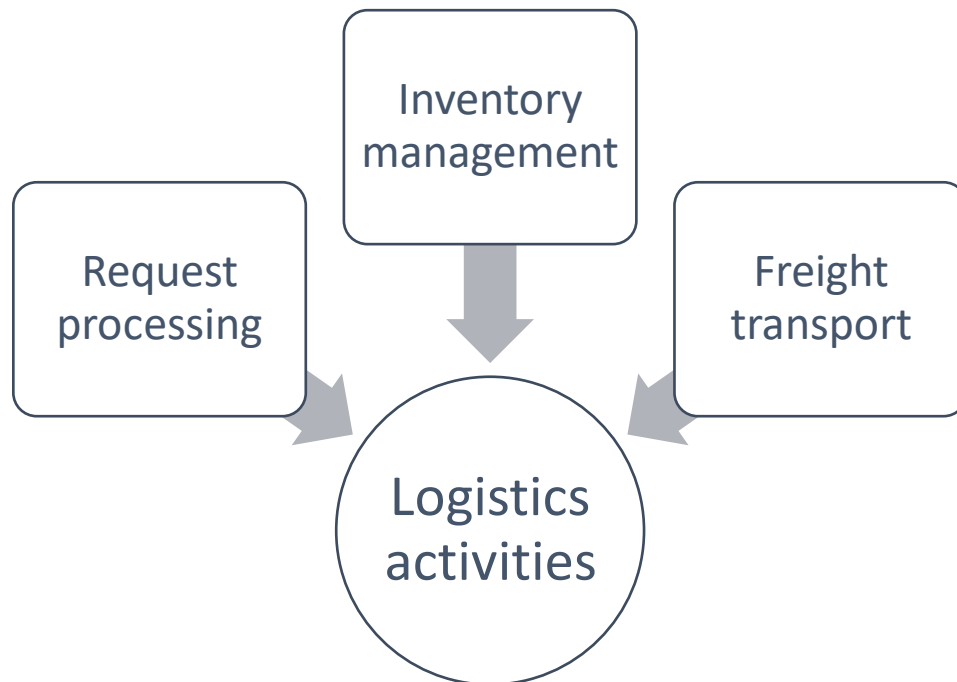


Figure 1. Three domains of activities of logistics management (adapted from Allen 1997)

In figure 1, the activities of logistics are shown in three main domains. The domains are request processing, inventory management, and freight transport (Ghiani et al., 2004,7). These domains define the overall activities of logistical management.

Request processing is the systematic approach to process the demand requests from the end user or any intermediary nodes of the logistics network. Traditionally these activities consumed a considerable amount of time to process due to manual workflow. However, the recent advances in telecommunication and electrical technologies have resulted in much faster and automated processing of request handling. This area of activities drives the demand of goods and services and defines the pace of logistical handling. (Burson, 2011, 5.)

According to figure 1, inventory management is another primary component of logistics activities that include warehousing and stock update management. There are several strategies in warehousing and delivery system formation. For example, it can follow direct shipment where the goods are delivered directly to the end user, or warehousing where the goods are processed in a warehouse, or lastly the newly adopted crossdocking strategy where the goods are stored briefly in a cross dock for consolidation purposes. The main purpose of inventory management is to reduce cost and cope with the randomness of demand and lead times. (Babbar & Prasad, 1998, 4-6.)

Figure 1 also describes the third domain of activities in logistics handling according to figure is the freight transportation where the goods and services are transported from one node to another in a logistics network. There are five primary modes of freight transport. They are ships, trucks, air, pipelines, and rail. The air is the most expensive mode of freight transport followed by trucks, rail, pipeline, and ships. Almost two thirds of the overall costs of logistics take place due to freight transport. Efficiency improvement in freight transport thus results in large gains in the overall cost reduction of logistics.

In business logistics, the transport of goods and services requires several nodes in the logistics network. The outlines of such nodes in the context of a Bangladeshi pharmaceutical industry are illustrated in figure 2.

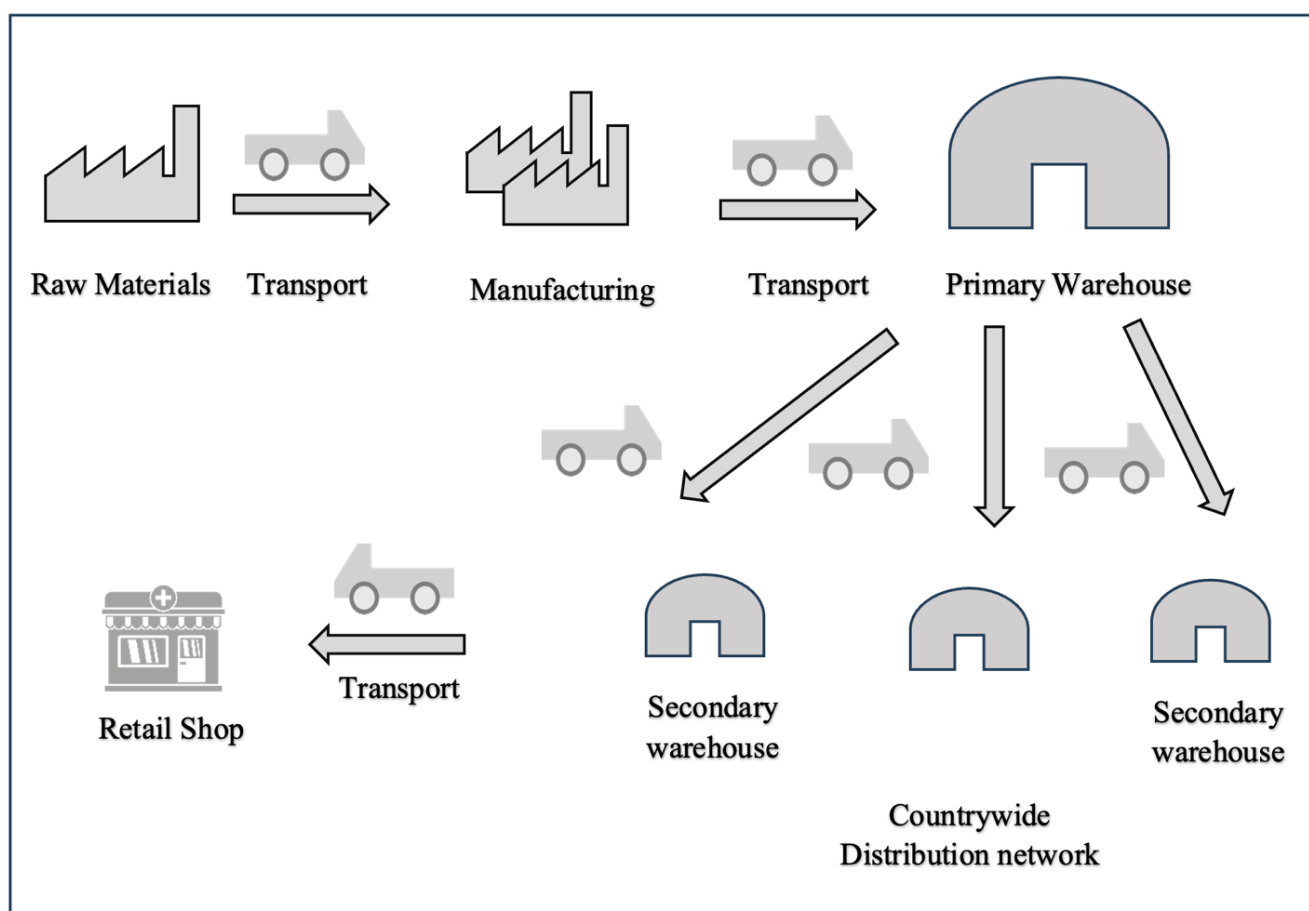


Figure 2. Outline of the nodes of logistics in a typical pharmaceutical industry in Bangladesh

In figure 2, the first node of logistics management is the raw material supplier. This is the point of origin of the products offered by the industry. Then the goods are transported to manufacturing plants

from which goods are transported again to primary warehouse. Some industries have multiple secondary warehouses and finally the goods are transported to the retail shops.

In the case of raw material supplier, there can be multiple raw material suppliers. Industries often try to select raw material suppliers who are in strategically favorable positions to reduce the transport costs and make freight consolidation possible. The second node of logistics networks is the warehouses.

As discussed, earlier freight transportation connects the nodes of the logistics network and thus is among the most important elements of logistics. The mode of transportation is of considerable importance to the overall logistics management (Topolšek et al., 2018, 7). For example, if bulk transportation is required through a fixed route, opting for rail transportation can be more cost effective than using roads. Another important logistics decision related to transportation is route rationalization which optimizes the decision regarding route selection. Freight consolidation is the technique of reducing costs of logistical management. In this case the goods are consolidated into larger packets to reduce the overall costs. Business entities can opt for three different strategies to execute transportation. Firstly, they can have their own private vehicles to satisfy the freight transportation needs. In addition, they can make a contract with a third-party transport service. And lastly entities can make partnerships among themselves to share the transportation costs. (Qin et al., 2014, 8-9.)

Industries need warehouses and other storage facilities to safely store raw materials, work in progress goods, and finished goods (Camacho, 2011). Logistics management ensures proper and safe handling of these materials. Inventory and warehouse management are closely related to each other. Automation of processes can augment the warehouse handling techniques to speed up the storing process. Depending on the business entity, it can be a primary warehouse serving the whole service region or there can be one primary warehouse and several secondary warehouses. As seen in the figure 2 in some instances, large industries also use secondary transit points of cross-docking to consolidate freight to further reduce logistics cost. The last node of logistics supply is the retail shops where the goods or services are delivered to the end user. (Kain & Verma, 2018, 5.)

There are a few strategies to make logistics processes more efficient. First, maintaining proper inventory updates is the key to improving the overall efficiency of logistical management. Accurate and efficient monitoring of stock level is required to maintain by expert personnel. Inventory management is crucial to take informed decision about procurement, delivery status, and overall effectiveness of logistics management (Williams & Tokar, 2008). Utilizing better information technology can greatly enhance the operational effectiveness of inventory. Additionally, proper packaging ensures the safety of

the goods and materials during transport. Commercial packaging is also important to attract customers' attention and build brand identity. Over reliance on polythene, plastic, and other unsustainable solutions for packaging needs is the greatest concerns in recent years. Lastly, Information technology is a crucial part of logistics that coordinates every other element of the logistics management (Gunasekaran et al., 2017). Real time monitoring, enhanced communication system, data gathering and processing etc. can make handling logistical operations strategic and informed. Aside from the abovementioned activities, logistical management also includes forecasting, procurement, operation management, human resource management which is also related with logistics. (Dima & Grabara, 2013, 2-4.)

The activities that are managed by business logistics can be summed up by a popular method of seven Rs (Flex Logistics, 2021). The seven Rs are presented in figure 3.

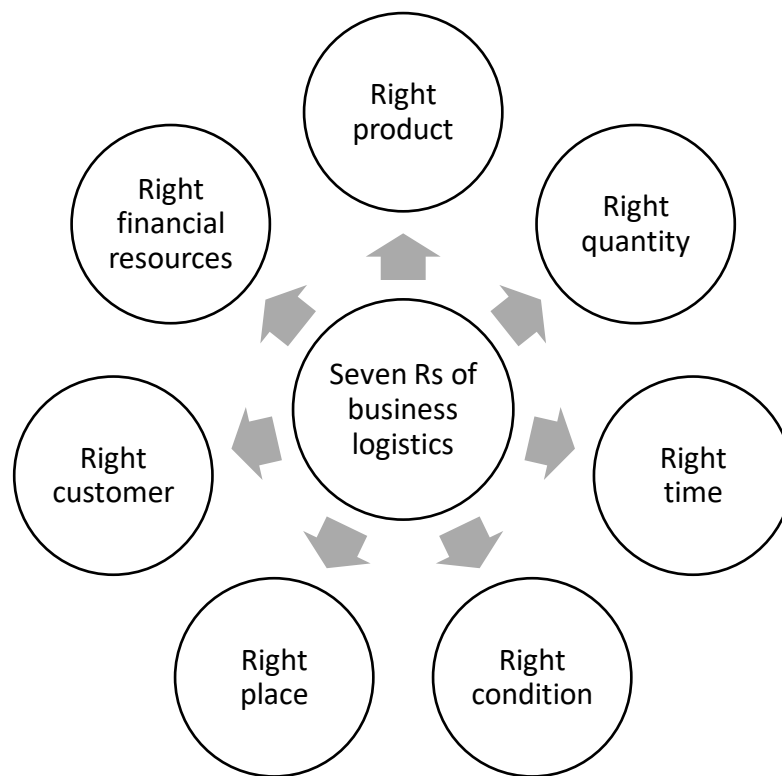


Figure 3. The seven Rs of activities covered by business logistics (adapted from Flex Logistics, 2021)

In figure 3, the overall logistical processes are illustrated. Logistical process ensures the right product at the right time in the right condition in the right quantity. It signifies the level of sophistication that is

required to maintain optimum logistical operation. It also includes delivering the right financial resources to the right place to the right customer. In essence logistical processes involve a holistic approach to managing everything to ensure smooth operation of a business.

The services of logistics management are vast and of different variations. The services covered by logistics thus can be divided among many fields. For instance, procurement logistics refers to the logistical activities that are associated with market research, planning and buying decisions. Global logistics is another field that is concerned with sourcing goods from different parts of the world. Another important field of logistics is reverse logistics that deals with reusing and recycling of products and goods in operations. It includes processing of surpluses, returned goods, faulty items and so on. Lastly, green logistics is an attempt to make logistics ecologically sustainable so that industries maintain respect to the environment and nature. (Phillips & Phillips, 1998, 11-15.)

2.2 Introduction to green logistics and its significance

The increased environmental awareness and the push for sustainability has surged the concern surrounding green practices and sustainability of industries around the world. Minimizing carbon footprints, reduction of pollution, respecting nature and environments, respect to the community, and achieving economical growth with sustainable practices are the core principles of green logistics. Companies can achieve such sustainable goals by incorporating green logistics and establishing links to circular economy. While green logistics promotes reduction of environmental impacts regarding transportation, warehouse management, maintaining distribution, and delivering the products to the end user, circular economy promotes the efficient use of available resources to increase sustainability even further. Integrating these two concepts into core operations of any industry can achieve both economical prosperity and sustainability simultaneously. (Garbie, 2015, 7.)

Environmentalists around the world predict severe climate catastrophe due to the increase in global average temperature. Extreme weather events are observed around the globe more frequently as a result of climate change. Effects such as meltdown of polar glaciers, desertification, intense cyclones, erratic weather pattern, rising of sea levels, salination and many more are observed due to the negative consequences of climate effects. Extreme greenhouse gas emissions are the primary reason behind such

types of climate catastrophe. The effects have been accelerating over the years. Since the start of this century, every corner of the globe faces intense heat and erratic weather patterns. Recent wildfire in Australia and California is also an indirect consequence of climate changes. Recognizing the severity of the negative impacts of climate changes, the UN has set SDG goal 13 to be the climate actions which states the protection of the environment to undo the changes in climate. If not corrected urgently, the negative consequences of climate change will continue to increase and that will result in severe consequences for both humans and wildlife. (Patz et al., 2000, 8-15.)

To reduce the observed effects and lessen the impacts, we collectively need to reduce carbon emission through every way possible. Green logistics is a step forward in that direction. Through proper adoption of green logistics, it is estimated that a total of 6.5% reduction in global carbon emission is possible. Since the global manufacturing processes are dependent on logistical operation, a small greenification can result in large gains in terms of reduction in carbon emission. That way green logistics can help to reach the goals set by Paris Agreement, keep the global temperature rise in check, and protect the environment and ecology as a result. Adoption of green logistics will have a sequential effect by motivating other areas of an industry to adopt green measures as well. Other potential carbon intense activities such as regular commute or energy generation will also have guidelines to follow to turn into green. To sum it up, green logistics will have a pleiotropic effects on the environment through acting as a primary driver as well as a source of inspiration to reduce carbon emissions. (Patz et al., 2000, 10-15.)

However, achieving a proper and functioning green logistics set up includes many important steps. First, in order to achieve green logistics, industries must focus on transportation efficiency. The use of electric vehicles and route rationalization can reduce the dependency of logistics processes on fossil fuel run vehicles. As discussed earlier, transportation is the most impactful segment of logistics operation in achieving sustainability. Greenifying this segment would have the largest impact on reducing the carbon footprint as well as saving the nature. (Larina et al., 2021a, 14-17.)

Warehousing and store management of goods is another key area to focus on to transition from traditional systems to green ones. Efficient management, using software-based approach, maintaining stock updates with proper location information, automation of processes will significantly reduce the rearrangement required to satisfy the needs. That way the required number of rearrangement, manpower, and energy needs will be decreased. Also, that will improve the efficiency and speed of these operations. (Abideen & Mohamad, 2020, 12-14.)

Using renewable energy as opposed to the traditional form of energy to satisfy energy needs in logistics processes can have a profound impact on the overall outcome of sustainability in logistics operation. Industries can shift to solar powered energy to have a self-sustaining energy generation facility that is clean and green. That way the carbon footprint of logistical operations can be greatly reduced. Other ways to implement green logistics include training the manpower to become more environmentally aware and form a culture of respecting the nature and environment, using modern information technology systems to fine tune algorithms of logistics handling, and maintain records so that the overall trend of sustainability can easily be monitored. (Khan et al., 2022, 20-25.)

2.3 Evaluation of green logistics: benefits, challenges, and link to circular economy

The benefits of green logistics are manyfold. However, integration of such initiatives presents with considerable challenges as well. The primary benefit of greenifying logistics is the improved sustainability and conservation of nature. While the industry may not achieve direct benefits with such initiative, a collective approach is needed to bring about required changes in the emission of greenhouse gases.

The negative impacts of emitting excessive greenhouse gases and successive climate change can have global catastrophic consequences. That is why every industry is morally bound to adopt green measures in every segment of the operation. Since logistics processes account for the lion's share of greenhouse gas emission, greenifying logistics can have the most profound effects on the environment. The reduction of greenhouse gases would be immediate positive effects of green logistics. That would result in reduced carbon emission which will in turn help to reduce the rise of global average temperature. It will also help us to meet the 2015 Paris Climate Agreement which was set by the COP conference. The logistical processes will also produce less waste materials as a result. All of these would function in tandem to protect the ecology and the environment. The summary of the three paradigms of the implications of green logistics is given in figure 4. (Karia & Asaari, 2016, 12-25.)

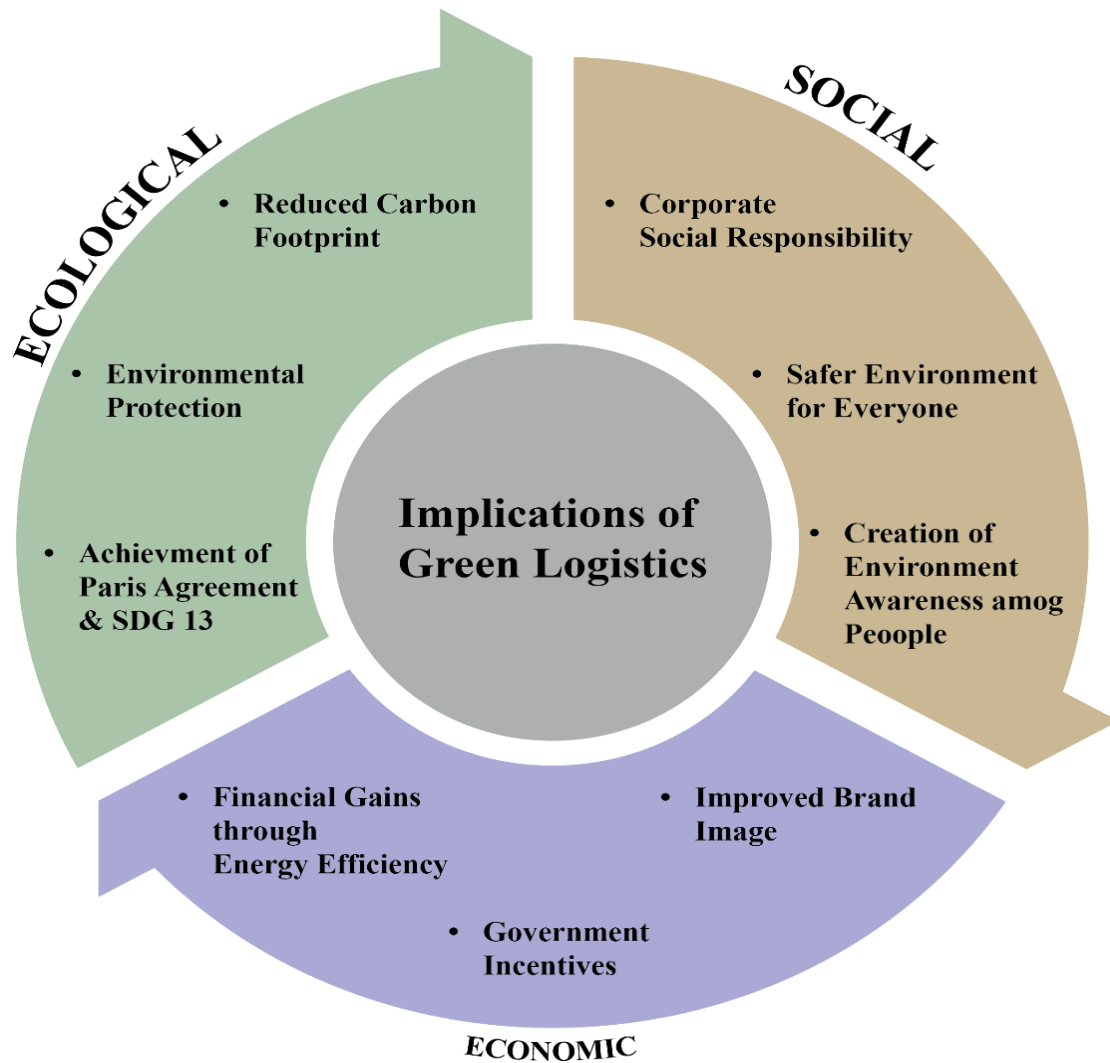


Figure 4. Overall implications of green logistics divided into three main domains

In figure 4, the combined implications of green logistics are divided into three separate paradigms upon summarizing. The three paradigms are ecological, social, and economical implications. Each of the paradigms and their implications are described in detail in the following paragraphs.

Green logistics has a substantial impact on the environment since it would help to reduce all kinds of pollution involved. By saving fossil fuel we will need less oil production. Oil production is an activity that has severe negative consequences on the planet. Green logistics will also produce less plastic and polythene. That way soil and rivers would face less plastic pollution. Through route rationalization, both ocean and air logistics would be needed less frequently reducing air and water pollution. The environmental awareness that would be created among the mass people would further add up to save the environment as an indirect result of green logistics. Moreover, green logistics would function as a source of inspiration for many other processes and areas to reduce carbon impact. These activities would follow green logistics as a guideline and a holistic positive impact would be observed as a result. (Kim et al., 2024, 5-6.)

Figure 4 also describes the economical implications of green logistics in addition to the environmental benefits (Kumar, 2015). Integrating renewable energy, more efficient vehicles, automation of processes, route rationalization and so on can have long term cost efficiency. Through the reduction of energy cost, maintenance cost, and cost associated with human resources, industries can reduce associated costs in the long-term basis. Green logistics in one statistic can reduce the energy expenditure up to 60% for many industries. That would result in significant cost reduction overall. Also, governments provide various types of economical incentives such as special green loans, tax incentives, and non-financial benefits to lure industries in adopting green measures which further increases the financial gains of green logistics of an industry. This types of government incentives can prove to be a considerable economical gain for industries that would adopt green logistics. (Barut et al., 2023, 2-7.)

The brand reputation is another considerable benefit of the adoption of green logistics. People are getting environmentally cautious over time. The integration of green logistics can increase the brand reputation to these environmentally cautious population and thus can contribute to improving the brand image across the target audience. An industry that adopts green logistics can also acquire unique proposition in the market and thus be able to devise distinctive marketing strategy. All of these can have positive impacts on the overall performance of the industry. The overall implications of green logistics is illustrated in figure 4 for easier understanding. (Zhang et al., 2020, 1-4.)

Lastly, figure 4 summarizes social implications of green logistics. Primarily it aligns with the goals of corporate social responsibility that instruct companies to take responsibility for activities that would enhance public health and wellbeing. Since climate directly hampers the regular life of not only humans, but also overall wildlife, adopting green logistics enables companies to serve greater responsibilities

According to some environmentalists, green logistics is the most influential and impactful corporate social responsibilities in the twenty first century for corporations. On top of that, green logistics ensure a safer environment for everyone involved. The employees working in such industry would experience improved safety due to energy efficient and safer processes that are dictated by green logistics. Lastly, the enhanced environmental awareness due to the promotion of such industries would have a pleotropic effect and would result in mass awareness for the protection of environment. (Setyadi et al., 2023, 6.)

Despite the benefits the major drawback of adoption of green logistics is the considerable upfront cost (Beškovnik & Jakomin, 2010a, 10-15). The establishment of green logistics requires establishment of massive infrastructure configuration and radical shifts in logistics operation. That may include buying new technologies, new types of vehicles, establishment of new facilities, establishment of renewable energy plants, and industrial software. Training the existing workforce to adapt to the newly green logistical elements can also incur additional challenges. However, the adoption of green logistics usually has net positive effects on a company in the long term and the challenges can be overcome easily through strategic decisions. (Beškovnik & Jakomin, 2010b, 4-8.)

The concepts of green logistics are intertwined with the concepts of circular economy. Circular economy is the promotion of reuse and recycle of resources to cut down wastes and ultimately save the nature (Geissdoerfer et al., 2017, 9-10). The circular economy models inspire the mindful use of resources to reduce the environmental impacts. For example, circular economy models state that industries should use more efficient vehicles that run on alternative fuels such as electricity, hydrogen fuel, or biodiesel. These principles align with the principles of green logistics. Circular economy also provides emphasis on the use of eco-friendly biodegradable packaging which promotes the goals set by green logistics initiatives. Smart warehousing and inventory management through smart usage of resources, manpower, and energy is another important domain set by the models of circular economy. For example, more efficient and informed forecasts can be implemented to reduce waste and unnecessary expenditure to the company. Collaboration across different departments of a company to achieve the goals set by both circular economy and green logistics principles is the key to achieving the intended environmental, economical, and social output. In short, together the concepts of green logistics and circular economy can play pivotal roles to obtain the intended results in terms of sustainability. (Korhonen et al., 2018, 12-17.)

2.4 Review of the current logistics practices of pharmaceutical companies in Bangladesh

While the concepts of green logistics are similar in most situations, pharmaceutical industries are required to consider few more additional points due to the need for rigid quality control of the products. Since pharmaceutical products have different storage and transportation requisites and the urgency to deliver products is different than other consumer goods, this industry opted for a vastly different logistics management system. Below is a comprehensive description of the overall current logistics in Bangladeshi pharma industry. First, the raw material of pharma industries is often the API (Active Pharmaceutical Ingredient) which is in most cases imported from abroad. Popular destination for API importing is usually USA or China (Clarke et al., 1998, 2-10). Almost 90% of the API is imported from these countries, some being European origin as well (The Daily Star, 2024b). The API is transported through international shipments and subject to additional cost, time, and environmental impact. Considering the importance of local API sourcing, Bangladesh government has also taken initiatives to establish local API production with the proposed API park at Gazaria Munshiganj. (The Daily Star, 2024a.)



Picture 1. The traditional form of logistics adopted currently in the pharmaceutical industries uses fossil fuel run vehicles which has serious consequences on the environment (Islam, 2021, 6)

Secondly, the imported raw materials are then stored in storage facilities for manufacturing purposes. Majority of the pharma companies have more than one manufacturing facility. One of the key pharma companies in the country Eskayef Pharmaceuticals Ltd. is for example, has manufacturing facilities located in Tongi, Gazipur, Rupganj, and Mirpur. Each manufacturing facility has its own raw materials storage facility. The facility features temperature-controlled storage system since pharma products demands tight control over the temperature and humidity. (Eskayef, n.d.)

Thirdly, after production is completed, the products are packaged in several types of packaging methods based on product type and marketing strategies. Bottles, blister packaging, vials, and sachets are some of the most common types of pharmaceutical packaging modes. Products often have a secondary packaging for secured transport. The secondary packaging also includes description of the product and sometimes attractive designs as per the marketing strategies. The packaged products are then bundled in cartons for warehouse delivery. (Amarji et al., 2018, 3-8.)

Fourthly, the packaged products are then delivered to primary warehouse for storage. Since the pharma products are temperature and humidity sensitive, the warehouse often features weather control facilities. The inventory is also maintained based on the input and output status of the products in the primary warehouse. Personnel associated with the delivery system decide based on product demand for where and when to send products. Often large companies have multiple warehouses at strategic locations to store the large amounts of products. (Abideen & Mohamad, 2020, 2-5.)

There are 26,000 government listed pharmaceutical retailers in Bangladesh, although number of privately owned retailers exceed 300,000. To reach such widespread retailers, companies must rely on a robust and extensive delivery network. There are a few third-party delivery networks that provide this service to many clients. While major pharmaceutical companies have their own in-house delivery networks, smaller pharmaceuticals often resort to these third-party solutions. One such delivery network is the Transcom Distribution which has nationwide distribution networks and 33 storage facilities with cold room storage. Route rationalization is a newer concept that is being applied by such distribution networks through which the cost, time, environmental impacts can be significantly reduced. (Moniruzaman, 2016, 2-4.)

Lastly, the end point of the products is the retail shops where the pharma products are bought by the consumers. These retail shops provide pharmaceutical products according to the customer needs, functioning as a retailer point of logistical node. The logistics network ends with the retail shop as a result.

To rapidly response to retail orders, majority pharmaceutical companies resort to local warehouse facilities. Company appointed sales personnel ensure stocks are aligned with the demand. However, over reliance on the human resources is a potential drawback and a modern approach in this regard is needed. (Knop, 2019, 3-4.)

2.5 Theoretical analysis of implementation of green logistics in pharmaceutical industries in Bangladesh

Green logistics is the environmentally friendly approach in the logistics sector to reduce the environmental impacts associated with the processes involved. The current practices of logistics management of many pharmaceutical industries, as mentioned above, relies on unsustainable practices. However, with strategic initiatives and proper implementation, greenifying the logistics management is possible to a satisfactory degree. Description of the core strategies to implement green logistics in Bangladeshi pharma industry is given in figure 5. (Rodrigue et al., 2017b, 6.)

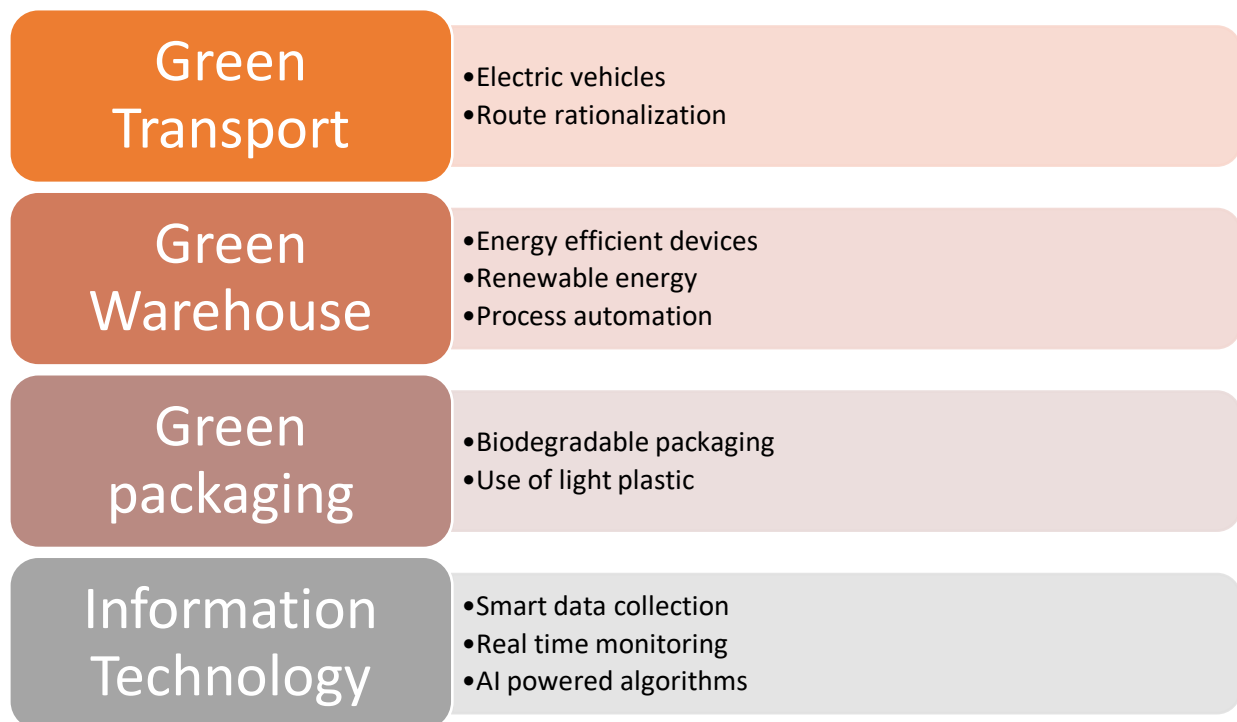


Figure 5. Core strategies to implement green logistics in Bangladeshi pharma industry

In figure 5, the strategies that can be adopted by Bangladeshi pharmaceutical industries are presented in a concise manner. Green transport, green warehouse, green packaging, and information technology utilization are four broad categories of strategies that can be adopted by a stakeholder. Details of each category are discussed in the following paragraphs.

Firstly, as seen in the previous diagram shown in figure 2, the transport system is a key element in logistics. Unfortunately, the logistics in pharmaceutical industries in Bangladesh relies on vehicles run on fossil fuel. On top of that, many of the vehicles lack proper fitness and offend the environment even further. Transition to an electric or hybrid vehicle can significantly reduce the carbon footprint of logistics (Ubeda et al., 2011). However, transitioning to electric vehicles is a cost-intensive process. Electric vehicles are significantly costly in Bangladesh over the traditional fuel-based vehicles. Also, there is a shortage of charging facilities, service facilities, maintenance facilities and so on in Bangladesh. That is why, transition to electric vehicles is expected to take more time and necessary policies from the government might be required to coerce the industries to adopt electric vehicle. (Mohiuddin, 2023, 1-3.)

According to figure 5, another way to greenify logistics in the transport sector is route rationalization. Currently, the transports of goods is done without thorough planning in pharmaceutical industries. This increases back and forth movement of goods and the overall transport systems are not optimized as a result. Using the latest algorithms and software solutions can significantly optimize the overall transport of goods and services. That way, industries would be able to reduce carbon emissions due to the transport of goods and services. (Zhang et al., 2012, 2-5.)

To implement such strategies, pharma industries need to use sophisticated data input and analysis solutions with real time monitoring so that algorithms can suggest optimized routes of transmission. Use of rail or waterways is another great way of introducing route rationalization into the transport systems. Rails and waterways are highly efficient and cost-effective methods of transport. It can reduce carbon emissions along with reduced fuel cost. Together these strategies can significantly change the sustainability of transport facilities currently used by pharma companies in Bangladesh avoiding any large up-front costs. (Puri & Ranjan, 2012, 2-6, 8.)

In this figure, warehouse management is shown to be a critical element of logistics in pharma industries. Warehouses consume a considerable amount of energy through weather control facilities, lighting systems, surveillance systems, and use of lifters to move large objects around the facility. Use of

renewable energy such as simple solar panels on the rooftops can provide the warehouses clean and green energy it needs. (Yimenu et al., 2021, 10.)

Switching to energy efficient LED light bulbs and flood lights instead of old tungsten or sodium lights can reduce the energy consumption in lighting systems (Lim et al., 2013). Also, newer inverter technologies can reduce the energy consumption in the temperature control system (Kian Jon et al., 2021, pp 80-83). All of these technologies can incur large upfront costs; however, it also reduces energy consumption and hence the cost of energy. As a result, companies can be financially benefit through the use of such technologies. By taking advantage of smart algorithms, goods can be stored in an optimized way to reduce the need of moving goods around the facility. It can help to reduce the carbon footprint by reducing the need for using lifters that run by fossil fuel. Using electric lifter machines or automated overhead conveyor facilities can further reduce the dependence on fossil fuel run vehicles. But they require considerable upfront costs and maintenance which many pharmaceutical companies would find difficult to finance rendering such initiatives economically unfeasible in the Bangladeshi context. (Ding et al., 2021, 12-14.)

Another aspect of logistics that has a profound effect on the environment is the choice of packaging (G. Zhang & Zhao, 2012). Figure 5 describes the core choices in packaging to implement green logistics in Bangladeshi pharma industry. The conventional method of pharmaceutical packaging is to use blister packs, sachets, bottles, and vials. as the primary packaging. There is often a secondary package to protect the sensitive products. All this packaging is mostly made of plastic which has an immense impact on the environment and nature. Opting for biodegradable packaging where possible can make a large difference environmentally. However, not every packaging type can opt for biodegradable packaging in the case of pharma industry. Use of light packaging with less plastics can be an option for those scenarios. On top of that, reusing plastics for packaging and incorporating the concepts of circular economy in the packaging sector can help pharmaceutical companies to implement green logistics with great efficacy. (Zadbuke et al., 2013, 6-9.)

Lastly, according to figure 5 the cutting-edge information technologies can be integrated into the traditional form of logistics management to further enhance the effectiveness of green logistics. Smart data collection, analysis, and management can make the logistics operation more eco-friendly through optimization in every step involved. Real time monitoring system, for example, is one key technology that can revolutionize the entire logistics processes. Through real time monitoring logistics can be handled with greater automation and optimization. Necessary data input, collection, analysis, and interpretation methods are required for successful implementation of real time monitoring. GPS can be beneficial to

monitor the real time location of various transport vehicles, specialized sensors and tag systems can be implemented to track the movement of goods and parcels, inventory management software can be used to monitor the stock levels in real time. (Larina et al., 2021b, 7-10.)

Additionally, figure 5 emphasizes the fact that the recent revolution in AI can further augment the usefulness of information technology in green logistics. AI can be used to track and identify objects, adjust route rationalization algorithms based on traffic conditions, perform complicated data analysis, and automated threat detection. ANI or Artificial Narrow Intelligence can be implemented in additional smaller areas to automate smaller tasks so that human intervention can be avoided to reduce carbon footprint even further. Through sophisticated implementation of these technologies, greenifying logistics in pharmaceutical companies can be achieved with greater success. (Boute & Udenio, 2023, 10-12.)

2.6 Assessment of the environmental, economical, and social impacts of green logistics in pharma industries according to TBL theory

Transition to green logistics is a cost intensive process for pharma industries of Bangladesh. However, there are profound long term positive impacts of such a transition. The overall impacts fall into three distinct domains – environmental, economical, and social. These three domains cover the most crucial impacts of green logistics and through careful analysis of these domains the overall impacts of the green logistics can be understood. (Khan, 2019, 8.)

The environmental impacts of green logistics are most profound and easier to follow. The primary outcome of green logistics is the reduced carbon footprint (Seroka-Stolka, 2014). The traditional method of logistics management involves over reliance on fossil fuels. Especially the transport vehicles emit large amounts of greenhouse gases into the atmosphere. These activities have a long-term negative consequence on the climate and environment. Through route rationalization, shifting to electric vehicles, and smart usage of rail and waterways can reduce carbon emissions. TDCL, one of the largest distribution networks aimed at handling the logistics of pharma companies relies on completely fossil fuel run vehicles to operate in Bangladesh. Similar distribution networks in Bangladesh are also reliant on fossil fuel since Bangladesh as a country yet to transition to electric vehicle era. Greenifying the

transport systems can help by reducing the carbon footprint of the logistics processes. It also helps to reduce environmental pollution by reducing pollution that is caused by the upstream processes such as manufacturing such vehicles and maintenance. (*Transcom Distribution*)

Another crucial way through which the environmental pollution is reduced by green logistics is the reduction of waste production (Li et al., 2021, 8). Using biodegradable materials or light plastic for the packaging of pharmaceutical products can have an immediate effect on the level of environmental pollution. Currently the use of heavy plastic and polythene outer packaging significantly affects the environment through plastic pollution. Often these plastics are not reused and simply discarded into the open fields by the end consumer further polluting the soil and water bodies such as ponds, canals, and rivers. This not only harms humans but also has devastating effects on wildlife and marine animals.

Recently a plastic monster statue was built in Cox's Bazar to draw the public attention of plastic pollution and its harmful effects on the marine life (TBS News, 2024b). The concepts of circular economy can further augment the positive effects of green logistics. Reusing and recycling can be a powerful method to reduce pollution and make the overall environment cleaner. Plastic packaging especially can be reused so that the detrimental effects of plastic pollution can be minimized. Decreased use of energy is an additional benefit of green logistics. The use of more efficient electric vehicles, use of renewable energy, recycling and reusing, all these elements of green logistics are helpful at decreasing the energy needs. The use of modern temperature control systems in warehouses can have significant implications in terms of decreasing energy demands of the logistics management of pharmaceutical companies in Bangladesh. (Nesbitt, 2007, 8-9.)

Green logistics incurs a large upfront cost as implementing it requires massive infrastructure development. Maintenance of such infrastructure and educating the workforce to tackle the job adds to the costs of green logistics. As a result, green logistics is economically unfavorable at initial stages. (Klumpp, 2016, 12-14.)

However, green logistics can have positive economical impacts in the long run through various ways (Seroka-Stolka & Ociepa-Kubicka, 2019). Firstly, green logistics reduces the operational costs if compared with the traditional form of logistics. The electric fleet of vehicles, proposed by the green logistics strategies, are much more energy efficient and requires less maintenance costs (Hawkins et al., 2012, 10-12). Route rationalization can also help companies at decreasing the fuel cost associated with transportation. Smart handling and real time monitoring can be beneficial at ensuring the right amount of goods at the right place at the right time.

That way, companies will be able to ensure proper supply of goods across the country which will positively affect the sales of products. Pharmaceutical companies will be able to ensure faster and more accurate delivery to destination warehouses and retailers. Lastly, improved brand image can increase the sales figure through positive public perception. People are becoming environmentally conscious day by day and if a company adopts green logistics, it may have improved brand image than the competitors. This in turn can help to increase the sales performance of such pharmaceutical company. (M'hand et al., 2019, 7-9.)

Lastly, green logistics have complex social impacts that can have positive impacts on all the stakeholders involved. Firstly, lower emissions and reduced environment pollution are helpful at improving public health. The reduced carbon emission has a positive global effect and is crucial to achieve the Paris Agreement set by the COP conferences. The effects of climate change can only be undone through reduction of carbon emissions. By reducing land, air and water pollution, green logistics can have additional beneficial effects on public health. Moreover, the sustainable practices that can be achieved through green logistics are essential for ensuring safe and sustainable work environments for the employees of an organization. The need for skilled workforce that is more capable of utilizing modern technology to implement green logistics functions as the driving force of new job creations and boosting the overall economy.

Finally, through strategic marketing the customers can be made more environmentally conscious, which can have pleotropic effects on the society and environment. Together all these factors affect the society in unison to bring about a positive social change. (Zhao & Gu, 2014, 5-7.)

The impacts of green logistics may not be immediately apparent to the environment or the organization adopting such initiative. The effects manifest and the cumulative benefits are seen in the long term. That is why it is essential to assess the effectiveness of green logistics over a long period of time. Pharmaceutical companies in Bangladesh need to set their strategies accordingly to mitigate the short-term disadvantages and utilizes the long-term benefits of green logistics in their company operation.

3 RESEARCH METHODOLOGY

This chapter focuses on describing various aspects of research methodologies such as research philosophy, research approach and strategy, research design and sampling techniques, data collection and analysis, and lastly validity, reliability and ethical consideration. Each of these aspects are described from a theoretical standpoint and then the justifications of choosing one method over others are also given. Lastly, the importance of choosing an appropriate research methodology is also explained in each section.

3.1 Research philosophy, approach, and strategy

This study uses interpretivism as the guiding research philosophy. The implementation of green logistics in Everest Pharmaceutical Ltd located in Bangladesh is explored based on the analysis of respondents' experience and knowledge. That is why this study focuses on the human understanding to find the realities. The entire theme of the study is guided by this choice of research philosophy. There are three main types of research philosophy. The first one being positivism that states that reality is objective and independent from human perception. The second type of research philosophy is interpretivism which focuses on social perception and emphasizes human understanding through knowledge and wisdom. The last type of research philosophy is pragmatism which incorporates elements from both other two philosophies. Since interpretivism is best suited to achieve the research objectives and goal of this study, this research opts for interpretivism as the choice of research philosophy. (Mbanaso et al., 2023,81-113.)

As for the research approach, an inductive research approach is chosen as the preferred approach for this study. Research can be performed following two distinct pathways – inductive and deductive. The inductive approach to conducting research is the method of research approach where a new theory or result is developed and formulated based on the study outcomes (Soiferman, 2010). Deductive approaches, however, utilize research data and results to validate a proposed hypothesis. Quantitative data aligns with the research methodology of deductive approaches and thus deductive approach often involves statistical analysis.

This study aims to assess an economical feasibility of the green logistics in Bangladeshi pharmaceutical companies taking Everest Pharmaceutical Ltd as the case study. That is why the study formulated its result based on the findings of the study. An inductive approach, thus, is suitable to serve the need of this study. (Haque, 2022, 98-105.)

Additionally, the study also aims to obtain deeper understanding about the green logistics in pharma industries in Bangladesh based on the understanding and experiences of the stakeholders involved. By conducting interviews of the participants, the study objectives of this study can be met. That is why qualitative strategy is opted for this study to obtain the findings. In conjunction with the inductive approach, qualitative research strategy is the most suited for achieving the research objective of this study. Qualitative strategy helped to develop deeper understandings about the study topics allowing the researcher to tackle the subject matter from different angles.

3.2 Research design, sampling methods, data analysis, and ethical considerations

Research design is the method of data collection to obtain complete, comprehensive, and meaningful data that is in line with the study topic. There are quite a few popular styles of research design, such as experiments, surveys, interviews, case studies, cross-sectional, and longitudinal designs. This study focuses on the Everest Pharma in Bangladesh to assess the economical feasibility of green logistics in pharma industry. Since this study will focus on collecting data by interviewing key stakeholders of green logistics in pharma industries in Bangladesh, this study opts for an interview research design. Interviews carried out in this study generated primary type of data which is further analyzed manually to prepare study outcomes. That way achieving the research objectives was possible through the strategic choice of research design. Interview allows a qualitative research to obtain in-depth data from the personal point of view of the participants and is compatible with the interpretivism research philosophy. (Crowther & Lancaster, 2008, 82-88.)

The thesis uses an interview-based approach to perform data collection. Microsoft Teams was used as a video conferencing tool to carry out the interviews. Mainly the case company's business operation personnel are the primary candidates for the interview. The thesis aims to interview three company executives to obtain insights about the green logistic initiatives and prospect in the case company and the ways to implement it to other pharmaceutical industries in Bangladesh. Written consent was taken

through emails from each of the participants about participating in this thesis interview. After that a time schedule was selected at the convenient time of the participants. The interviewees were selected following a purposive sampling technique.

Sampling is a crucial step in conducting business research methodology. Sampling techniques are important because the validity and reliability of a study largely depends on proper implementation of sampling techniques. (Henry, 1990, pp. 45-48). This study of assessing economical feasibility of green logistics in Bangladeshi pharma industry incorporated interviewing selected stakeholders associated with the research topic.

Conducting a large-scale interview of randomly selected members is beyond the scope of this study. That is why purposive sampling technique was selected to attain optimum research output within the time and resources allotted for this study. Between the two major types of sampling strategies, non-probabilistic sampling is used to minimize the time and resources required to carry out research. In this type of sampling, some of the members of a population can have zero chances of being selected. The groups of members are to be omitted is determined by several types of techniques which ultimately define the type of non-probabilistic sampling type. For example, in purposive sampling method in this case allowed the researchers to apply their knowledge, experience, and wisdom to select the group of members who are to be omitted from being selected. Conducting a large-scale interview of randomly selected members is beyond the scope of this study. That is why purposive sampling technique is selected to attain optimum research output within the time and resource allotted for this study. (Nyimbili & Nyimbili, 2024, 2-6.)

Since this study is a qualitative case study, it opted for an interview-based method of data collection. Among many types of interviews, thematic interview was chosen for carrying out this study. That way, capturing detailed feedback from the stakeholders was possible. In telephone calls, any miscommunication during the audio call can lead to potential biasness. That is why this study opted for the latest video conferencing technologies. Microsoft Teams is among the most sophisticated video conferencing solutions that are available currently in the market. This study used Microsoft Teams as the preferred platform to carry out the interviews of this study. Although face to face interviews is the gold standard in taking interviews, they are beyond the scopes of this study considering the time and budget allocation. Video conferencing can greatly reduce costs and budget while generating bias free data through real life like interviews. The detailed and insightful responses from the participants about the economical feasibility of the green logistics of Bangladeshi pharma industry was collected through this online video conferencing methods.

The participants were asked to semi-structured questionnaire to acquire authentic and elaborate responses. Structured questionnaires often limit the flexibility of the responses from the participants. Since this study aimed to collect the genuine responses from the participants based on their knowledge, experience, and wisdom – semi structured questionnaire is the preferred method of conducting the interviews. (Hussein, 2022, 207-219, 15-25.)

Quantitative studies generate numerical data which can easily be analyzed through statistical means. That way precise study outcomes can be generated following mathematical operations. However, qualitative studies generate long string of texts which require manual analysis (Wilson, 2014). Filtering, sorting, pattern recognition, summarizing, drawing of conclusion are some of the steps involved in annual data analysis of qualitative studies. At first the interviews taken with online video conferencing tools were transcribed. After that the responses were converted into written texts and stored safely, maintaining data safety and privacy. Lastly, pattern recognition, sorting, and filtration were performed to generate a summary of the responses. The summarized responses were then aligned with the research objectives to produce the final research output. (Mey, 2023, 453-478.)

Considering the necessity of maintaining research ethics, integral concepts of research ethics were maintained throughout the research in each step of research methodology. Firstly, the participants were counselled about the study nature and their roles were explained to them. After that an informed consent was collected from each of the participants.

Secondly, the privacy of the participants was strictly maintained. Any type of personal information was discarded to ensure privacy. It was ensured that the participants or any other individual were not harmed while conducting this study. While performing literature review intellectual rights to the study publications were respected. Other steps of this study also performed without violating intellectual property rights. Data collection and data analysis were performed with the utmost sincerity so that biasness and errors could be avoided. Multiple rechecks were performed to achieve validity and reliability of the results. To avoid subjectivity, transparency was maintained in every step. To summarize, strict measures were followed so that business research ethics is maintained throughout this study.

4 RESULTS

This chapter provides a concise presentation of the findings of the study. At first, the data collection and result formation parts are briefly discussed. After that the overall findings of the study are broken down into three sub-chapters aligning with the objectives of the research. All these sub-chapters contain precise information about the findings of the study.

4.1 Data collection and preparation of the results

To formulate the intended results, open ended semi structured questionnaire was prepared as part of data collection. The respondents were stakeholders of green logistics initiatives in the case company of Everest Pharmaceuticals Ltd. One of the participants was in managerial position in the business operation department of the company and thus in charge of logistical supports. Others were executives of the same department who supervise specific tasks for smooth logistics operation. In essence, all of the participants have direct association with green logistics.

The questionnaire had a thematic approach to analyses and understand the economical feasibility, opportunities, and challenges involved in the overall implementation of green logistics in the case company. To generate an authentic response, the questions were mostly semi-structured or unstructured in some cases. The open-ended questionnaire also allowed the participants to provide detailed informative responses to formulate the result which further enhanced the validity and reliability of the study findings. Questionnaire sets were repeatedly analyzed so that any type of ambiguity and bias are avoided. The questions along with three sets of responses are listed as appendices at the end of this thesis report.

The questionnaire was prepared with thematic integrity so that the economical feasibility of green logistics in the case company can be analyzed and understood deeply. The experience, wisdom, and knowledge of each of the participants were helpful at forming the basis of the results of this thesis. As a qualitative study, the detailed responses from the participants needed manual data analysis to recognize the underlying pattern. The responses were summarized and curated to form the ultimate results as a basis. Thus, the responses are the primary source of information and the basis of the results of this thesis.

The responses from the stakeholders are marked as H1, H2, H3 and so on. Irrelevant and personal information were discarded safely after the data analysis. Attention was given so that crucial information about the study topic from the participants are not omitted during the manual data analysis while forming the result.

4.2 Understanding green logistics and its significance in the context of the Bangladeshi pharma industry

An initiative such as green logistics can have different meanings depending on the context of discussion. Also, the geographical area of interest can have further influence on the meaning and significance of it. That is why it is crucial to know what it means by green logistics in the Bangladeshi pharma industry context. Bangladesh being a developing country has different legislation regarding environmental and labor practices. Also, the economical incentives are different than in a developed country. That is why applying standard green logistics principles in Bangladesh will have significant drawbacks. On the other hand, pharmaceutical companies have different requirements for logistical operations.

The products of pharmaceutical industry are extremely sensitive to weather conditions and some products need to be transported and stored in a strict temperature range. Also, quality control is extremely sensitive for this industry. That is why it is crucial to identify the meaning and significance of green logistics in the context of Bangladeshi pharma industries.

To illustrate this, the participants were requested to provide opinions about the meaning of green logistics in the context of their own company. They shared their personal opinions based on their knowledge, experience, and wisdom. The summarized responses contain crucial information about the principles of green logistics according to the Bangladeshi pharma industry segment.

Green logistics means the eco-friendly practices in the logistics segment of the company. There are three main pillars of green logistics – green transport, green warehousing, and green packaging. The end goal of green logistics in pharma company is to reduce carbon emissions, respect nature, and ensure a safer future for everyone. (H1)

Despite the differences, green logistics is widely considered an additional burden to the company by many company managements. It is imperative to explore the key drivers of green logistics in this regard. The participants mentioned regulatory compliance, long-term cost effectiveness, consumer preference, and corporate social responsibilities. Together, these factors play a vital role in driving the adoption of green logistics in many companies around the world, especially in the logistics department.

To dive deeper into the regulatory compliance issue, the participants shared their experiences regarding the current regulatory laws of Bangladesh. The summarized response of the participants is given below.

The government has enacted laws on emissions, packaging standards, waste management pipeline, and carbon footprint along with energy emission standards. The government forces companies to meet these standards and provides various incentives to those companies who do well in this regard. (H2)

4.3 Assessment of the economical feasibility of green logistics in the context of Bangladeshi pharma industries

Companies assess economical feasibility before taking a major initiative. Green logistics is an initiative that requires holistic changes across many industries' operational processes. Such an impactful initiative thus requires in-depth economical feasibility analysis to assess the cost and benefits. Different industries can have different propositions for economical feasibility. In order to assess the economical feasibility of green logistics in the context of Bangladeshi pharmaceutical industry, participants were requested to provide insights about the process of examining the prospect.

The cost implications are calculated and then are compared with the economical benefits of green logistics. Although green logistics have considerable upfront cost, it can have net economical benefits in the long-term basis. (H3)

In order to examine economical feasibility, calculating the cost implications is necessary for companies. Transitioning from traditional form of logistics into a green one can incur massive cost to the company. That is why it is helpful to know details about the potential cost elements beforehand.

The main cost implication in such endeavors is the transition to electric vehicles from fossil fuel runs. However, commissioning electric vehicles in Bangladesh is not feasible considering the lack of adequate charging facilities. As a result, the primary cost elements for Bangladesh are renewable energy, transition to eco-friendly packaging infrastructure, instalment of corporate software solutions, and training the human resources. Warehouses also are required to upgrade in some cases. (H2)

Participants shared the importance of following specified protocols to assess the economical implications. Because if specific and standard methods are not followed, it can generate biased data sets. That can influence the overall outcome of feasibility tests. Participants also stressed assessing the cost implications beforehand to accurately gauge the overall picture beforehand. Complete idea on cost implications can help an industry to properly assess economical feasibility and examine whether initiatives like green logistics is beneficial for the company in the future or not.

4.4 Exploration of opportunities, challenges, and future prospects of green logistics

It is evident from the findings of the study that implementing such massive initiatives such as green logistics requires holistic efforts, significant cost drawbacks, and additional work from the company personnel. Despite the initial hurdle, green logistics offers unique opportunities as well to entice company management to implement it. The participants were asked to shed light on the ways green logistics enhance operational efficiency and reduce company costs as a result. They responded in the following manner.

Reducing fuel consumption, increasing energy efficiency, minimizing waste production, and streamlining transport facilities are the major advantages of green logistics which significantly reduces overall company costings in the long-term. With proper implementation green logistics can be economically profitable for companies in the long term. The various incentives offered by the government such as tax waiver, loan benefits, and

non-financial benefits further enhance the economical feasibility of green logistics.

(H1)

Companies also benefitted through the improved customer perception that is created through the green logistics initiatives. That in return enhances the competitiveness of a company. This aspect of green logistics presents unique opportunities to the companies involved. Participants from the case company in Bangladesh shared their perceptions regarding this in the following manner.

The recent global environmental awareness among mass people has resulted in increased preference of products from the companies who adopt green operations by a significant portion of the customers. This helps companies to establish a unique competitive position which in turn helps to build the brand image. Eventually companies experience positive brand image, improved sales volume, and recognition from the government. (H3)

However, green logistics also presents some formidable challenges, especially at the initial stages. The participants shared their views on the challenges and strategies to overcome those challenges in the context of Bangladeshi pharma industry.

High upfront investment is the major challenge of implementing green logistics. Lack of green technologies in Bangladesh, shortage of infrastructures, mental inertia are the additional challenges that green logistics in pharma industries are facing in Bangladesh. To combat such challenges, companies are utilizing several strategies. Gradual transition to green logistics helps to break down the costs into smaller chunks. Also, companies are making partnerships with sustainable suppliers, leveraging digital tools, utilizing green financing options, and increasing awareness among the stakeholders.

(H1)

Lastly, green logistics is going to be a deciding factor for pharmaceutical industries in Bangladesh in the coming future. To make the best outcome, companies should have strategic future plans to expand the scope of green logistics. Executives of the case company were asked to share their plans of future expansion of green logistics. They provided the following response.

Transition to renewable energy, commissioning more electric vehicles, enhancing waste management, expansion of recycling programs, more and more government collaboration, and utilizing AI to develop efficient algorithms are the primary areas pharma industries in Bangladesh can focus to expand the green logistics initiatives in the future.

(H1)

5 DISCUSSION

Green logistics is an important step forward towards achieving sustainability. To combat the negative consequences of climate change and keep the global average temperature rise within 1.5°C than the pre-industrial level, implementing green logistics is a must. Green logistics can have different meanings in different contexts. That is why analysis of green logistics in different contexts is important. This study assessed the economical feasibility of green logistic system in Everest Pharmaceutical Ltd – a pioneering pharma industry in Bangladesh.

The study revealed the concepts of green logistics in the pharma industry setting, economical feasibility of green logistics, its opportunities and challenges, and the future prospects. In essence, this study presents itself as a comprehensive guide for pharma industries located in Bangladesh about the economical feasibility of green logistics through the eyes of the key stakeholders.

Strategically selected optimum research methodology choices enhanced the credibility of the study. The apt decision of adopting qualitative research strategy allowed the research to develop in depth understanding about the research topic. The interpretivism research philosophy allowed the research to focus on the personal experiences of the participants rather than the objective reality. On top of that, the choice of conducting remote interviews with tools such as Microsoft Teams allowed the research to remain within the time and budget allocation while maintaining proper scientific integrity. Thematic interview with semi-structured questionnaires allowed the study to adapt to changes while collecting research data.

The ethical aspects of performing business research that were considered enhanced the reliability of the findings of this study. By strictly following appropriate business research methodology, the study was able to meet the research objective with scientific rigor and integrity.

The study found that green logistics can have different meanings based on the context. That is why it was necessary to understand the definition, significance, and scopes of green logistics in the context of Bangladeshi pharma industry. At first, the study revealed the significance of three pillars of green logistics which are green transport, green warehousing, and green packaging. As part of green transport, industries focus on vehicles that are run by clean energy sources and not by fossil fuels. Electric vehicles are best suited to greenify the transport systems of an industry. However, the study outlined that Bangladesh lacks proper infrastructure to charge electric vehicles. That is why implementing such an

electric vehicle fleet is not feasible for the country. The large upfront cost associated with deploying such a fleet is another hurdle to implement such an initiative. However, Bangladeshi pharma industries can benefit from route rationalization. The findings revealed that the environmental impact of transporting facilities can be greatly reduced through proper route rationalization. To do this, new and improved algorithms through sophisticated software can be beneficial.

Especially, the use of AI can revolutionize this aspect of green logistics. Through careful implementation of route rationalization, companies would have to perform less transport through either reduced trip, consolidation of packages, or real time monitoring of packages.

Green warehousing, on the other hand, means sustainable practices in maintaining the operations of warehouse activity. For example, storing goods, relocation of goods, maintaining stock levels, and delivery of goods based on requirement. Warehouses typically use a significant amount of energy. The energy consumption is even greater in the case of pharmaceutical companies as they often need to maintain optimum temperature for many pharmaceutical products. As a result, a great deal of carbon footprint can be reduced through the use of renewable energy such as solar panels.

The findings stated the use of solar panels on rooftops which can generate the needed electric energy and thus helps to turn the facilities into fully self-sufficient in terms of energy use. Lastly, through the use of environmentally friendly packaging and not using polythene or plastic based packaging, pharma industry can contribute to saving the environment through green logistics.

Besides defining the scopes of green logistics, this study aimed to assess the economical feasibility of green logistics initiative in the context of Bangladeshi pharmaceutical industry. Participants shared their experiences on how to accurately measure the economical feasibility of green logistics. The responses reflected the personal work experiences of the participants and shed light on the possible ways to calculate economical feasibility accurately. At first, it is necessary to calculate the cost elements of green logistics. To do this, industries need to consider the requirements of the transition. In case of Bangladeshi pharmaceutical companies, the need for deploying electric vehicles is not feasible considering the lack of adequate charging facilities. That is why it can be omitted in this case from cost calculation.

Companies need to primarily invest in infrastructure building for renewable energy sources, eco-friendly packaging machinery, updated software packages, and training human resources. They also need to invest in new forms of marketing to make both the employees and customers become more environmentally aware so that they understand the necessity of green logistics. The costs associated with

infrastructure building can be relatively easy to gauge. However, the costs associated with training of human resources can be difficult to measure and may require to perform over a long period of time. After calculating the cost elements, companies then be able to have a picture on the overall economical feasibility.

The study revealed that after calculating the cost elements, economical feasibility can be calculated by comparing the long-term returns through green logistics. Participants shared the possibilities of long-term returns through the increase in energy efficiency, renewable energy sources, increased transport efficiency, faster operation, improved brand image, and government incentives. All of these acts as a financial return of the investment made by companies willing to implement green logistics. As a result, green logistics has the potential to become a profitable investment for pharmaceutical companies in Bangladesh according to the findings of the study.

In addition to outlining the opportunities of green logistics, this study also explored the challenges of green logistics and ways to navigate through the challenges in detail. The participants shared their experiences on facing formidable challenges to implement green logistics. The biggest challenge that is faced according to the participants is the large upfront cost of infrastructure build up. As mentioned earlier, green logistics requires massive infrastructure development in the form of a new vehicle fleet in transport facilities, instalment of renewable energy sources in warehouse facilities, instalment of more energy efficient lighting and other electric devices and so on. Besides, the training of human resources incurs an additional cost burden to the company. Investing such a huge amount in such a short time can be challenging for many industries.

Another pitfall of implementing green logistics that is unique to Bangladesh is the lack of adequate green technologies. For instance, the lack of charging facilities for EV is the major obstacle for the widespread use of electric cars which are often dubbed as green cars. Without electric cars, it is difficult to achieve groundbreaking results in carbon emissions through something like green logistics. Mental inertia of key stakeholders is also a possible challenge for green logistics as found by this study. People in Bangladesh are less aware of the environmental problems than developed worlds. Also, management in key industry lack the willingness or knowledge to show respect to nature through their business activities. Sustainability practices are considered an additional burden that generates no tangible revenue to the company by many company owners or management committees. All these contribute to significant mental inertia for stakeholders that impede the implementation of green logistics.

The study also explored the possible ways to overcome the challenges associated with green logistics. It was revealed that a gradual approach to implement green logistics can reduce the upfront cost needed. Participants shared that companies benefit through greenifying one component of green logistics at a time and gradually transition to green logistics. For example, industries can first install green energy through installing solar panels on the rooftops of the warehouses. Then companies could focus on components that incur less expenditure such as route rationalization and process optimization. Gradually industries can greenify other nodes of green logistics to turn the logistics process entirely green. That way the challenge of large upfront cost to implement green logistics can be mitigated.

Lastly, the future of green logistics was also examined following the objectives of the research. The study found that the case company which is Everest Pharmaceutical Ltd. has an extensive plan to implement green logistics with more and more sophistication. In the future when EV charging facilities will be available, the company aims to introduce EVs to their transport fleet. That revealed the opportunity of revolutionizing green logistics in the future for pharmaceutical companies in Bangladesh. As internet gets faster and more widespread, more and more opportunities to improve sustainability would be opened up through digitalization for pharmaceutical companies in Bangladesh.

The ongoing AI revolution is expected to dramatically change the landscapes of logistical processes. AI could be used to perform real time route rationalization while considering key parameters to save fuel and energy. It can also be used to perform tasks such as demand forecasting and smart inventory management so that logistical processes become more reliable, efficient, and smart. That way AI is expected to emerge as a powerful tool for green logistics in the future for pharma companies in Bangladesh.

6 SUMMARY AND CONCLUSION

Green logistics is a novel concept which can revolutionize the global fight against climate change. Considering the ever-increasing negative consequences of many environmentally hazardous industry operations, the importance of green logistics is increasing every day.

However, green logistics can have different meanings in different contexts and key aspects have different attributes in different countries. Although the feasibility of such initiatives is thoroughly assessed in many western countries, the economical feasibility of green logistics in countries such as Bangladesh requires additional investigation to fully explore the notion. That is why this study aimed to examine the economical feasibility of green logistics in a Bangladeshi pharmaceutical company named Everest Pharmaceutical Ltd.

To achieve the research objectives, the study interviewed key stakeholders to gather qualitative data from the participants. The thematic semi-structured interviews allowed the study to develop an in-depth understanding about the research topic based on the personal knowledge and experience of the participants. Upon manual data analysis through coding, filter, and pattern recognition the findings were obtained. The study followed recommended business research methodology and ensured strict research ethics.

The research findings revealed that green logistics in the context of Bangladeshi pharma industries is not only economically feasible but also profitable if long-term financial gain is considered. There are three main domains of green logistics which are green transport, green warehousing, and green packaging.

The participants shared their knowledge and experience of green logistics and informed that green logistics can have different meaning in Bangladeshi pharma industry context as the logistical requirements are different for this industry than other industries. For example, deploying electric vehicle as part of green logistics is impractical in the context of Bangladesh. Rather green transportation can be achieved through using fit vehicles with minimal emissions and route rationalization. As for green warehousing, renewable energy sources, automation in goods handling, robust software can considerably reduce carbon emissions.

The use of bio-degradable and environment friendly packaging and minimal packaging can reduce the plastic waste production and augment the initiative of environment conservation.

However, it is important to analyze the economical feasibility of green logistics to inspire industries to adopt green logistics. The study findings revealed that although it has considerable upfront costs, green logistics is profitable in the long term. The financial gain through energy consumption reduction, improved brand image, government incentives are the contributory factors of such profitability.

However, the large upfront cost remains the primary challenge of green logistics. In addition to that, lack of awareness among management committees, inadequate government support, and lack of supporting infrastructure are among the challenges of green logistics. By adopting gradual transition and utilizing green climate funds the necessity of large investment at once can be lessened or divided into smaller portions. The revolutions in information technology and the upcoming AI revolution are expected to change the dynamics of green logistics even further through a more digitally integrated approach according to the findings of the study.

The study is limited by the lack of in person investigation and the sample size choices. The contextual findings of this study are based on the knowledge and experiences of the participants. By conducting in person investigation of the status of green logistics in the case company the validity of the study findings could be further augmented.

The sample size of this study is also small compared with similar study. Although the purposive sampling technique of this study allowed the research to meet its objectives within the budget and time allocation, it is another limitation of this study. A simple random sampling could potentially enhance the reliability of the study findings.

The scope of this study is narrow and precise. That is why it leaves scope to conduct future studies to extend the topic of this research. A study on the analysis of green logistics can be performed through investigation and physical examination of the companies in cases.

The study analyzed economical feasibility of green logistics in the context of Bangladeshi pharma industry. Economical feasibility of green logistics in other related industries can be analyzed through future studies. Lastly, analysis of other aspects of green logistics such as methods of implementation or the role of digitalization on green logistics can be further examined by future studies following the findings of this study.

Despite having limitations, the study successfully achieved its research objectives by following standard research methodology while ensuring strict research ethics. The importance of green logistics will

increase many folds in the coming future. The in-depth economical feasibility analysis of green logistics can serve as a reference for pharmaceutical companies in Bangladesh that wish to implement green logistics.

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APPENDIX 1

Transcript of the interviews.

1. What does green logistics mean in the context of Everest Pharmaceuticals Ltd.?

Participant 1: Green logistics in the context of our industry means the integration of environmentally sustainable practices in supply chain management. It includes eco-friendly transportation, efficient energy use, waste reduction, and carbon footprint minimization. As a pharma company, we try to optimize routes, use energy-efficient warehouses, and adopt recyclable packaging materials as part of this initiative.

Participant 2: Green logistics refers to the implementation of environmentally sustainable practices in transportation, warehousing, and supply chain management. At Everest Pharmaceuticals Ltd., this involves optimizing delivery routes, using fuel-efficient vehicles, reducing carbon emissions solutions to minimize environmental impact. Recently we also started to introduced bio-degradable and eco-friendly packaging to reduce plastic waste and adopt green logistics in our operations.

Participant 3: Green logistics refers to environmentally responsible supply chain management, ensuring that logistics operations minimize pollution and resource wastage while maintaining efficiency. Everest Pharmaceuticals Ltd. is implementing initiatives such as eco-friendly transportation and carbon footprint reduction. There are many strategies we are currently adopting to combat the uphill battle of saving the environment.

2. What are the key drivers for implementing green logistics at Everest Pharmaceuticals Ltd.?

Participant 1: The key drivers include regulatory compliance, cost savings from energy efficiency, corporate social responsibility (CSR) commitments, consumer demand for sustainable products, and long-term operational efficiency improvements. We also value ethical practices of doing business and respecting the nature is in our company policies.

Participant 2: The primary drivers include cost reduction through fuel and energy savings, increasing regulatory pressures, the company's commitment to sustainability, and enhancing brand reputation in

the global pharmaceutical industry. Company policies also guide us to adopt environment friendly practices.

Participant 3: Key drivers include environmental sustainability goals, global demand for eco-friendly pharmaceutical supply chains, corporate sustainability commitments, and long-term cost savings from energy-efficient logistics practices.

3. How does Everest Pharmaceuticals Ltd. assess the economical feasibility of green logistics initiatives?

Participant 1: We evaluate economical feasibility through a cost-benefit analysis. First, we compare investment costs in green technologies with long-term savings in fuel, energy, and waste management. We do recognize that green logistics may incur considerable costs upfront but there are opportunities to make the initiative economical viable in the long run. We also consider ROI calculations, government incentives, and the impact on brand reputation and customer loyalty. The concepts of green logistics are relatively new in Bangladesh. We are carefully approaching to become one of the first industries to adopt such modern principles.

Participant 2: The company evaluates economical feasibility through lifecycle cost analysis which measures reductions in fuel expenses, logistics efficiency improvements, and compare costs of sustainable alternatives with traditional logistics operations.

Participant 3: The company evaluates feasibility using cost-benefit analysis, environmental impact assessments, and key performance indicators such as fuel consumption reduction and warehouse energy efficiency improvements.

4. What are the main cost implications of transitioning to green logistics?

Participant 1: The main costs include upgrading vehicle fleets to electric or fuel-efficient models. This is really difficult in the context of Bangladesh as we don't have any electric vehicle charging infrastructure so far. We are mostly focusing on route rationalization as a result. We are also investing in renewable energy sources, implementing advanced logistics software for route optimization, and developing eco-friendly packaging solutions. However, these costs are often offset by long-term savings.

Participant 2: The transition requires capital investments in sustainable transportation, renewable energy sources, and upgraded warehousing facilities. We need to adjust many parameters to better suit the conditions of Bangladesh.

Participant 3: Main costs are associated with infrastructure development. Since Bangladesh is so much different than developed nations, most of the green logistics models do not work properly in the context of our country. We need to constantly adjust things to calculate the cost implications of such a grand initiative.

5. How does green logistics impact the supply chain efficiency and operational costs of the company?

Participant 1: Green logistics enhances supply chain efficiency by reducing fuel consumption, minimizing waste, and streamlining transportation. It may initially increase operational costs due to infrastructure investment, but over time, it leads to cost reductions through optimized resource utilization and fewer regulatory penalties. Also, the government of Bangladesh heavily incentivizes any initiatives that is in line with the Paris Agreement. So, we also enjoy government subsidies, loans, and other non-financial benefits that come with it. It really pushes the company brand image to a new height. Also, workers feel motivated due to the prestige that comes with such initiative.

Participant 2: Green logistics improves supply chain efficiency by reducing transit times through optimized routing, lowering fuel costs, and ensuring compliance with sustainability regulations, which helps avoid financial penalties.

Participant 3: While green logistics requires an initial financial investment, it streamlines supply chain operations through better route planning, reduces dependency on fossil fuels, and minimizes wastage, ultimately lowering long-term operational costs.

6. What are the challenges in implementing green logistics in Everest Pharmaceuticals Ltd.?

Participant 1: Challenges include high initial investment costs, resistance to change from stakeholders, lack of government incentives, limited availability of green technology in Bangladesh. However, the biggest hurdle to implement such revolutionary concepts is the lack of trained personnel and right

mindset among the stakeholders. People are not willing to change so easily here in Bangladesh. Making a new mode of operations to work is considerably difficult as a result.

Participant 2: The key challenges include limited infrastructure for green technology in Bangladesh, high upfront investment costs, lack of financial incentives, and supply chain partners' reluctance to adopt sustainable practices.

Participant 3: Some challenges include insufficient green infrastructure in Bangladesh, slow adoption of sustainable technology by supply chain partners, and potential disruptions in transitioning to new logistics models.

7. What strategies has the company adopted to overcome these challenges?

Participant 1: Strategies include securing financial support through grants or green financing options, raising awareness among employees and stakeholders, gradually phasing in green technologies, partnering with sustainable suppliers, and leveraging digital tools for data-driven decision-making.

Participant 2: Everest Pharmaceuticals Ltd. focuses on securing government subsidies, forming strategic partnerships with eco-friendly suppliers, integrating energy-efficient logistics software, and gradually implementing sustainable logistics changes to manage costs effectively.

Participant 3: Everest Pharmaceuticals Ltd. is focusing on employee training programs, collaborations with logistics partners for sustainable solutions, seeking government incentives for eco-friendly initiatives, and gradually integrating green technologies.

8. What are the regulatory and policy factors affecting green logistics adoption in the pharmaceutical industry in Bangladesh?

Participant 1: Regulatory factors include environmental laws on emissions, packaging waste management, and energy efficiency standards. Everest Pharmaceuticals must comply with both national and international environmental regulations, which influence our logistics strategy.

Participant 2: Regulatory frameworks include environmental impact assessment laws, waste disposal regulations, and carbon footprint reporting mandates. Compliance with international environmental standards is also crucial for export-oriented operations.

Participant 3: Compliance with environmental laws, emission control regulations, and packaging waste management policies impact logistics decisions. Aligning with global sustainability standards is also necessary for international trade.

9. How do green logistics initiatives impact customer perception and market competitiveness?

Participant 1: Customers increasingly prefer eco-friendly brands, and adopting green logistics improves our corporate image, attracting environmentally conscious consumers. It also strengthens our competitive edge by aligning with global sustainability trends and improving relationships with international partners.

Participant 2: Green logistics enhances customer trust and loyalty by demonstrating a commitment to sustainability. It also improves market access by meeting international sustainability requirements, particularly in European and North American markets.

Participant 3: Adopting green logistics differentiates Everest Pharmaceuticals Ltd. from competitors, making it more appealing to sustainability-conscious customers and international buyers who prioritize environmentally responsible sourcing.

10. What future plans does Everest Pharmaceuticals Ltd. have for expanding its green logistics initiatives?

Participant 1: Future plans include investing in electric delivery vehicles, expanding renewable energy use in warehousing, improving waste recycling programs, integrating AI-driven logistics solutions, and collaborating with government agencies for policy advocacy and incentives.

Participant 2: The company aims to integrate renewable energy sources in warehouses, introduce electric vehicles in its distribution network, and explore AI-driven logistics optimization to reduce overall environmental impact.

Participant 3: Future plans include expanding green transportation networks, investing in AI and IoT for supply chain optimization, and implementing carbon offset programs to achieve net-zero emissions in logistics operations.