Freight Transport in Urban Areas:
Investigating the Environmental and Societal Impacts of Increased Production Volume on Dominant Stakeholders in Urban Areas. A Mixed Method Approach

Alimatu Alhassan Chibsah
alchibsah@gmail.com

David Thomas Ford
dfordfeb14@me.com

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Supervisor: Amer Jazairy
Assistant supervisor: Ming Zhao
Examiner: Robin Von Haartman
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Abstract
As part of an on-going trend, the greening of logistics actions in business activities has become a critical issue for companies and society. Stakeholders are asking companies to minimize their negative impacts on the environment and society, and create effective business, sustainable environment, stakeholders’ benefits and quality of life. Through a case study approach, this research study aimed to examine the environmental and societal effects of freight logistics on dominant stakeholders in urban areas as a result of a company’s production volume increased. Furthermore, the study also aimed to pinpoint and discuss the suitable research method for a multifaceted research study. A mixed-method research approach of both qualitative (case study) and quantitative (simulation) methods were applied in this study consisting of dominant stakeholders (a Swedish company, a Swedish municipality, the Swedish transport administration, and local urban residents). The research revealed that a company’s production volume increase creates development for the company, local municipalities, and residents within the company’s business environment, however, freight trucks logistics that are used in this process to deliver raw materials to the company’s production site(s) creates negative environmental impacts (carbon emission, road congestion, noise, and pollution) on routes and urban areas. Moreover, as production volume is further increased, these negative impacts also increase. The study also revealed that a mixed-method approach is suitable for multifaceted research studies that comprise of multiple conditions, variables, and data from several sources. As such, the qualitative method can be used in the first phrase to collect formative data, which can then be tested and supported for effectiveness with a quantitative method in the second phrase.

Keywords: Logistics, freight transport, Sustainability, Corporate Social Responsibility, Simulation, Urban Areas, Mixed method.
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1. Introduction:

1.1 Research Background

Freight logistics is considered an integrated and vital part of a company’s production process. It facilitates the transportation of raw materials from the points of origins and finished products to the points of consumptions. Moreover, in some cases, freight logistics is used to transport products that have outlived their lifecycle to the point of recycling, reusing and discarding (Dey et al. 2011). As a result, the demand for freight transport of both private and commercial vehicles has exploded significantly. Inversely, freight transports in production processes are view as ultimate contributors of traffic congestions, pollutions, and generally intensifies impacts on the environment (Jaller et al., 2015).

The term logistics comprises of transportation, storage and handling of products from raw material source, throughout the production line, to sales and/or at the point of consumption as the final destination of the products (Abduaziz et al. 2015). Among the various activities of logistics, transportation is considered the most important economic activity of a company’s logistics systems, and accounts for around one third to two thirds of enterprises’ logistics costs (Tseng et al, 2005). Logistics has a distinct role in companies’ strategy making. Strategically, logistics can serve as a driver for profitability and growth when superior logistics systems are exploited as strategic tools against competitors. Suitably, a well-developed transportation system contributes to a company logistics advantages in achieving better logistics efficiency, operation cost reduction, enhance service quality and increase competitiveness (Sandberg and Rehme, 2010; Tseng et al, 2005). Likewise, an effective freight transport structure plays an important role in the competitiveness of urban areas and the local economy regarding employment and income that it creates (Schliwa et al., 2015). Despite these advantages, the Council of Supply Chain Management Professionals (CSCMP) considered transport logistics responsible for producing up to 75 percent of a company’s carbon footprint. On a global scale, logistics is deemed responsible for 14% of the total greenhouse gas emissions, with three-quarters of these emissions coming from road transport (Dey et al. 201; Piecyk and McKinnon, 2009).

In the awakening of sustainable development (SD) and corporate social responsibility (CSR) in both academia and business research agendas, stakeholders (e.g. Government, Non-Governmental Organizations, Citizens, Employees, etc.) are asking companies to become more watchful of their welfare, to conduct business practices beyond profits and build relationship with society (Dobers, 2010; Pinelli and Maiolini, 2017). Generally, stakeholders expect companies to adopt business strategies and practices “that meet the needs of the enterprise and its stakeholders today, while protecting, sustaining and enhancing the human and natural resources that will be needed in the future” (Labuschagne and Brent, 2005, p.160).

Stakeholders plays strategic roles in companies achieving economic sustainability and societies enjoying the quality of life that they deserve. Accordingly, a stakeholder can possess or have “one, two, or all three of the following attributes to influence a firm abilities to function: (1) the stakeholder's power to influence the firm, (2) the legitimacy of the stakeholder's relationship with the firm, and (3) the urgency of the
stakeholder's claim on the firm” (Mitchell et al., 1997, p.854). Therefore, with the appropriate identification of stakeholder(s) and their attribute(s), managers can predict and create strategies to cater to each class of stakeholder and subsequently, contribute to a company’s sustainable economic growth (Mitchell et al., 1997). Notwithstanding, according to the management theory, achieving an economic sustainability alone is not sufficient for the overall sustainability of a firm, such single-minded focus can only succeed in the short run. Consequently, for companies to enjoy a long-term sustainable economic growth, they are required to satisfied the ‘triple-bottom line’ - the economics, environmental, and social aspects simultaneously (Dyllick and Hockerts, 2002; Behrends et al. 2008).

By adopting Mitchell et al. (1997, p.872), “Qualitative Classes of Stakeholders” model in this study, a Swedish company (Svenska Cellulosa Aktiebolaget, SCA); two Swedish municipalities (Timrå and Sundsvall municipalities); the Swedish transport administration (MITT Traffickverket); and Urban residents of Timrå and Sundsvall municipalities are discovered to possess several attributes, which makes them dominant stakeholders in this research study.

1.2 Research Gap and Motivation

Companies that increase production volume usually increase logistics activities to optimize material flow, production and distribution processes by implementing managerial techniques that promotes efficiency and competitiveness for the company (Tseng et al, 2005). Such undertakings along with stakeholders’ societal concerns for the environment, and companies’ need for long-term economic growth have prompted considerable research attentions in the past years in different dimension of the field of industrial logistics, such as logistics in its pure state (Abduaziz et al. 2015); Third-party logistics (Sandberg & Abrahamsson, 2011); Reverse logistics (Krumwiede & Sheu, 2002); and Sustainable logistics (Teixeira et al., 2018).

In addition, in the case of sustainable environmental development, where societies expects companies to see beyond profit and adopt business strategies and practices “that meet the needs of the enterprise and its stakeholders today, while protecting, sustaining and enhancing the human and natural resources that will be needed in the future” (Labuschagne and Brent, 2005, p.160). In this regard, there have been considerably amount of research conducted to identify new strategies in business sustainability agendas that contribute to the quality of life for stakeholders while maintaining economic advancement (Dyllick and Hockerts, 2002; Pinelli and Riccardo, 2016; Schliwa, 2015).

Moreover, with regards to sustainable urban transport, several research studies have been conducted in recent time (Crainic et al., 2016; Nathaniel et al., 2017; Franceschetti et al., 2017) with regards to how these practices benefits firms and creates quality of life for society (Schliwa et al., 2015). However, despite these bodies of literatures, there are limited research studies that have investigated or researched the freight sector of trucks transporting raw material through urban areas taking into account the impacts of these freight truck on the environment, society and traffic flow in the urban area. (Pinelli and Maiolini, 2017) states that most research regarding companies’
resolution responses to society’s expectations and stakeholders’ interest on sustainable environment issues are often ineffective and lacks strategic thinking. Therefore, this leaves a gap in academic research studies, which this research paper seeks to address. By doing so, this research is intended to create knowledge that will help managers and or practitioners to identify the effects of freight trucks logistics activities on the environment, society and traffic flow through urban areas in the event of production increase, and to point out recommendations to manage these effects.

In addition, due to the multifaceted nature of this study, a mixed research approach is embraced comprising of both qualitative and quantitative methods, which is found to be suitable and facilitates data collection and analysis through a sequential approach as suggested by Venkatesh et al. (2013). Moreover, a mixed method research approach is considered appropriate for multifaceted studies because in its setting, it complement and provide supplementary understanding of the research problem (Johnson et al., 2007; Velzen, 2018). On this note, the qualitative research aspect in this study is to answer the ‘what’, ‘how’ or ‘why’ questions of the phenomenon under study rather than ‘how many’ or ‘how much’, which are to be answered by quantitative methods. Therefore, by embracing the rationality of both methods, efforts are made towards establishing the possibility to effectively relate the outcome found to the aim of this study.

Alexander et al., (2019) claim that it is time to make use of a research methodology in research studies that provides the opportunity to analyze activities or procedures that shapes the visual conversations, which can only be achieved by utilizing the mixed methods research approach. Contrary, the use of a single approach of either a quantitative or a qualitative method poses the possibility for researchers to miss valuable data and observation about the dynamic of the study (Alexander et al., 2019). Therefore, by embracing a qualitative approach to collect formative data which is then tested and supported for its efficiency with a quantitative method, this research study also moves to reveal the significant of mixed methods in research.

1.3 Research Purpose

The purpose of this research is:
1. To investigate the environmental and societal effects of freight trucks logistics activities on dominant stakeholders in urban areas as a result of a company production volume increased. And, to discuss and reveal the significant of a mixed method research approach for multifaceted study.

1.4 The Research Questions

2. What are the likely effects of freight trucks logistics activities on the environment, society, and traffic flow through urban areas as a result of a company production volume increased?
3. How can the identified effects caused by freight trucks logistics activities during a company production increased be manage?
Figure 1: The figure below shows the linkage and role of each research questions in the study. Research question one seeks to point out the potential impacts of freight trucks activities on the environment, society and urban residents during a company production volume increased. And the second research question role is to provide recommendation(s) on how to manage these potential impacts resulting from research question one.

Figure 1: The below figure shows the link between the research questions and the case study.

1.5 The Research Scope

In order to address the research purpose, this study investigates the case of a company’s production volume increase, which involve the company, SCA, and multiple entities: the Timrå municipality, the Swedish transport administration (MITT Trafikverket), and urban residents of Timrå and Sundsvall municipalities. These entities are considered dominant stakeholders as a result of either their power to influence the firm, and/or their legitimacy relationship with the firm, and/or their urgency claim on the firm (Mitchell et al., 1997). How they were determined is presented in section 2.6 and later explained in section 3.4.2.

A case study approach is embraced to investigate in a real-life context the impacts of a freight trucks logistics activities on the environment, society and the traffic flow as a result of a company’s production volume increased. When these freight trucks are used to transport raw materials through urban areas to the company’s production site. Moreover, the study adopts a mixed method research approach of both qualitative and quantitative (simulation) to generate the appropriate data to support the study.

Since the purpose of this research is to investigate the environmental and societal effects of logistics activities involving trucks freight on dominant stakeholders in urban areas as a result of a company production volume increased, this study focus solely on the inbound of freight trucks traffic (road transportation) delivering raw materials through urban areas to SCA manufacturing plant. In addition, in relation to the environmental and societal issues, attention is solely on the CO2 emissions, traffic safety, noise, and pollution the effects the roads condition that is cause by freight trucks driving through urban areas to make deliveries.

Furthermore, the term urban freight is defined as; all movements of goods (as distinct from people) into, out of, through or within the urban area made by light or heavy goods vehicles” (Ballantyne et al., 2013. p. 99). However, while adopting this definition, the term goods with be refer to as raw materials, and only the movement of
trucks freight transports into and through, or within the urban areas made by heavy material vehicles (trucks) is consider.

1.6 The Structure of the Thesis

Figure 2: The figure depicts the various chapters and contents of the research.

| CHAPTER 1 | • INTRODUCTION  
|           | • This chapter presents the research background, gap and motivation, research purpose and questions. All these aspects are included to achieve the purpose of the research. |
| CHAPTER 2 | • LITERATURE REVIEW  
|           | • In this chapter the literature review is conducted to build the needed theory to determine the research methodology. |
| CHAPTER 3 | • METHODS  
|           | • The research approach, design, process, data collection techniques are presented in this chapter, and reviewing the quality of the research. |
| CHAPTER 4 | • RESULTS AND FINDINGS  
|           | • The findings from data collection are presented in this chapter. It consist of the respondents’ perception and reflections regarding the subject matter which is built upon with data from the simulation and documents to created conceptual framework. |
| CHAPTER 5 | • ANALYSIS AND DISCUSSION  
|           | • The results for this research is discussed in this chapter together with the literature review while taking into consideration the purpose and research questions. |
| CHAPTER 6 | • CONCLUSION AND RECOMMENDATION  
|           | • This chapter presents a brief summary and findings of the thesis, and provide the limitations and contribution for the future research studies. |

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2. Literature Review

In this section, the related research conducted on logistics, sustainability and corporate social responsibility are presented and described.

2.1 Overview and Improvement of Logistics

Logistics encompasses the planning, implementing, controlling of raw materials and the distribution of finished products to the designated place, at a required time, and in favorable qualities (Abduaziz et al. 2015). Logistical process can extend from the raw material source through production and distribution to the point of consumption and the associated reverse logistics (Dey et al. 2011).

Traditionally, logistics management has been a secondary role in firms’ strategy making, wherein essentially, logistics has been considered as operational, held between the requirements set by the company’s marketing and production functions, to carry a speculation stock to support a market expansion attitude with short lead times, and as a buffer stock to support a production push attitude (Sandberg & Abrahamsson, 2011). However, in today's industrial economy, the term logistics has a clear role in the strategy making of a firm and serves as a driver for firms’ profitability and growth with superior logistics systems that are utilized as strategic tools against competitors (Sandberg & Abrahamsson, 2011). In short, logistics management is the integrated management of all the activities required to move products through the supply chain to its final destination at a logistics cost (Dey et al. 2011). This can make major contributions toward a firm achieving superior performance and sustained competitive advantage, and in consistently meeting customer expectations (Perego et al. 2011).

Typical logistics systems are made up of elements such as customer service, demand forecasting, distribution communications, inventory control, material handling, order processing, parts and service support, plant and warehouse site selection, purchasing, packaging, return handling, salvage and scrap disposal, traffic and transportation, and warehousing and storage (Dey et al. 2011). Moreover, in this computer age and with the inception of the internet, computer technology has become an integral part of our society and industries, and acts as the main facilitator for work in firms (Orlikowski & Scott, 2008). The importance of technology has recently been widely acknowledged of the significant roles it plays in the field of logistics, supply chains, and its crucial importance in bringing products to the market (von Haartman, 2012).

The function of technology such as the “Internet of things” (IoT) - the act of manufacturing or embedding products or physical things with complex systems consisting of hardware, sensors, data storage, microprocessors, software, and connectivity elements in numerous of ways in order to be connected to each other through the internet to exchange information often with minimal or no human intervention (Borgia, 2014; Porter & Heppelmann, 2014; Rose et al., 2015). This concept has become common in logistics operations, use as a means of tracking individual product and providing advanced tracking-based services, like tracing and product condition monitoring (Holmström et al., 2010).
The tracking of shipments, materials, and products is recognized in operations management as a potential essential tool for improving inventory management and operations performance. Moreover, tracking in logistics is used as a key tool for linking tasks across functions and organizations based on information generated in efforts to improve the performance of product as well as providing services for the supply chains (Holmström et al., 2010). Rao, (2009) point out that Internet web-based information technology applications has led to the fundamental changes in the way that sale and distribution of goods are carried out from manufacturers to customers.

Improving logistics operations depends on both internal and external stakeholders and having the balance between profit making and providing benefits for various stakeholders (Kringelum and Gjerding, 2018; Su et al., 2011). Improvement of any kind in industries does not only involve the creation of new idea or ways, but also extends to various practical executions that involves in meeting the needs of clients and other stakeholders as well as making profit (Sidorenko et al.,2015). Therefore, in the area of Logistics improvement, it pertains to taking new direction(s) in existing logistical activities of a company or when creating new activities (goods or services) (Sidorenko et al., 2015). According to Sidorenko et al., (2015), there are six main areas of improvement process or activities base on directions and goals:

1. **The logistics area**: under this section, improvement activities can be applied to warehousing, purchasing activities, inventory, sales activities and so on.
2. **Group of distribution**: improvement in this manner can take place under the functional logistics chain - focusing on the logistics subsystems, the micro-logistic chain - focusing on distribution activities within enterprises and organizations and finally the macro logistic chain - focuses on innovating the activities involved with production of goods and services.
3. **Logistic improvement is determined by the scale of application**: innovation can be applied by connecting different supply chain with the same goal and task to release the finished products to the customers.
4. **The level at which improvement will be applied to logistics**: improvement can be applied at both the operational, functional, and procedural levels in an organization depending on the goal of the project or the firm.
5. **The business process type**: under the business process, improvement can be applied to the technological, organizational and managerial areas of the firm:
   - The managerial level - focus will be laid on the control actions of both organizational.
   - Technological levels - innovative activities can be applied to principles and methods of the technological process.
   - The organizational level - improvement activities can be applied to transport, warehousing and cargo handling under the technological area of the business processes.

### 2.2 Freight Transportation in Logistics and its Impacts in Urban Cities

The role of transportation in logistics is essential in supply chain management, accordingly, transportation serve as the connector between several stages that involves the transformation of raw resources to valuable goods for consumer and products that have out lived their life-cycle to the point of disposal (Dey et al. 2011; Tseng et al, 2005).
Transportation take place when planning the require stages and sub-stages in a logistics system of product distribution to minimalize cost and maximize service for customers, which constitutes the concept of business logistics (Tseng et al, 2005). Usually, the stages of logistics activities of production, storage, transportation, wholesaling, and retail sale involve multiple companies (TPL) to get a product(s) to the point of consumption (Sandberg & Abrahamsson, 2011; Halldorsson & Skjott-Larsen, 2004). Ultimately, manufacturing plants, warehousing services, and merchandising establishments are all concern with transportation. In this realm, manufacturing is responsible for assembling materials, components, and supplies, whereas, warehousing provides storage services between plants and marketing outlets which involves separate transport system. And, merchandising establishments conclude the chain with delivery of product to the buyer by means of transportation (Tseng et al, 2005).

Freight Transportation derived as the result of the need to deliver fundamental consumers merchandises to urban and suburban areas, and for the opposite flow of used goods in terms of clean waste (Behrends et al. 2008). This is done so that citizens can have access to commodities that are produced by companies worldwide wherever and whenever they are require. Accordingly, urban freight transport plays a vital role in meeting the needs of citizens, but likewise contributes drastically to the non-sustainable effects on the environment, economy and society (Behrends et al. 2008). The structure of freight transport growth in Europe has over the years changed in several ways as a result of the change from train to truck transport and due to the growth in logistical range (Nielsen et al. 2004). The primary reason for such development is due to the demand that logistics have provoked for transportation, especially with the increase of flexible production and distribution structures, and the recent improvement of infrastructure (Nielsen et al. 2004).

There is a speedy development and growth in urban areas around the world due to the increased economic activities of need for more consumer goods and services, all of which need to be transported from production sites and to the place needed (Jaller and Wang, 2015). As the outcome of this, the demand for both private and commercial vehicle has increased significantly, from nearly “130 million registrations worldwide in the 1960s to more than a billion vehicles in operation in 2010” (Jaller and Wang, p. 51, 2015). In the United State alone it was estimated that during 2010, there were delays of 4.8 billion hours experienced by travelers, using an extra 1.9 billion gallons of fuel, resulting in a total “congestion cost” of roughly $101 billion, from which the costs for freight truck congestion alone accounted for about $23 billion (Jaller and Wang, 2015).

And, despite freight traffic only make up of 10% of local traffic, it is considered to be an significant contributor to air pollution problems in urban areas in the United Kingdom and Europe from Heavy Goods Vehicles, HGV; in the peak of morning hours, 13.8%, 43.7%, 9.2% for CO₂, oxides of nitrogen (NOx) and after midday distinctly, whereas Light Goods Vehicles, (LGV) contribute less, with 5.5%, 3.8%, 6% for CO₂, NOx emissions and after midday distinctly, nevertheless are more accountable for local congestion because of their numbers (Aditjandra et al., 2016). In addition, automotive emissions (road, airplanes, trains and ships) are known to be the source of
more air pollution than any other single human activity. Globally, transportation accounts for 26% of anthropogenic CO₂ emissions of which 81% comes from road transport due to the burning of fossil fuels - the combustion of petroleum-based products like gasoline and/or diesel in the internal combustion engines of motor vehicles (McBain et al, 2018). On the local scale, in urban areas, urban transport accounts for 40% of automotive CO₂ emissions and up to 70% of other environmental pollutants and road congestion (Pan et al., 2013). Road congestion increase the length of time it takes for private and commercial vehicles to make their journeys (Schliwa et al., 2015). Moreover, according to the union of concerned scientists (2018), Motor vehicles cars, trucks and buses also emit air pollutants, predominantly carbon dioxide, that contribute to global climate change. These air pollutions are odorless, colorless, and poisonous gas when inhaled, the CO₂ can block oxygen from the brain, heart, and other vital organs of a living creature.

2.3 Sustainability in the Context of the Environment

The issue of environmental sustainability is an important business issue that is increasing, where industrials are being held responsible for sustainability issues in logistics operations, product production and supply (Cosimato & Troisi, 2015). The World Commission on Environment and development (WCED, 1987), defined sustainable development (SD) as a development that does not compromise the benefits of future generations whiles meeting the needs of the current generation. Accordingly, the biggest and challenging priority for a company is reducing emissions of greenhouse gases and any other air pollutants (Schneider et al., n.d.). Sustainability and sustainable development in the context of environment is almost impossible without including transport as a result of the number of pollutants that the logistic industry releases into the atmosphere. (Measuring sustainability of transport in the city development of an indicator-set, 2011).

According to the Council of Supply Chain Management Professionals, logistics can produce up to 75 percent of a company’s carbon footprint (Dey et al. (2011). Greene and Wegner (1997) state that the negative environmental impacts of transportation include climate change, air pollution and so on (Measuring sustainability of transport in the city development of an indicator-set, 2011). The impacts of transportation on the environment is caused by both input and output of both the environment and the transportation processes. Below is a framework developed by the authors of the SUMMA project proposing an input-output framework for classifying the various environmental interest outcome (Rand et al. 2004; Measuring sustainability of transport in the city - development of an indicators, 2011).

Figure 3: Input–output framework of the environmental outcomes of interest

The framework below shows the different input from the environment, such as land, energy, etc. that are consumed by the transport and mobility system, and in return, what the transport system outputs back into the environment, such as noise, air emissions, etc. And, the framework also shows who and what it can affect, such as humans’ well-being,
ecosystem, etc. Also, the transportation system consumes enormous amount of natural resources, such as building of roads and rails, and manufacturing and transporting requires chemical. Both of these productions impact the environment mostly in a negative way as argued by Rand et al. (2004). Rand et al. (2004) point out that how we use resource is an important issue for sustainability in terms of developing the society to benefit today and tomorrow generations in a long-term run.

2.4 Greening of Logistics and its Importance in today's Business environment

There are growing concerns pertaining to issues of global warming, greenhouse gases and consumer health have increased the immediate co-operation of firms to incorporate sustainability into their strategies (Dey et al., 2011; Lee, 2010). Therefore, it has become significant for firms to adopt an innovation supply chain management (SCM) ‘greenness approach’ in the management of supply chain activities (Cosimato & Troisi, 2015). Such approach should be based on the reduction of a company’s core activities’ ecological impacts, such as cost saving, quality, reliability, performance and energy efficiency with respect for environmental regulations to achieve a reduction in ecological damage and increase the overall economic profit of firms (Cosimato & Troisi, 2015).

Green supply chain management reduces the negative impacts that supply chain operations has on the environment and also maximize profitability (Teixeira et al., 2018). One important aspect of such approach is the use of appropriate packaging methods in logistics operations for raw materials and products, which contributes to saving resources and reducing the environmental burden for efficiency and value creation in the supply chain (Olsmats and Dominic, 2003). Additionally, sustainability in companies’ business and logistics operations mandates that companies should adopt systems that are directed towards the reduction of emissions of pollution and toxic waste (Teixeira et al., 2018). In this regard, several companies are learning to use sustainable approaches in business practices to differentiate themselves from other firms, and to improve services and reduce cost (Dey et al., 2011; Gold & Seuring, 2011; Pedersen, 2009). Moreover, companies have developed and implementing creative ways to reduce
their environmental footprints, such as using automatic engine shut down systems; reducing their dependence on fossil fuels, which is one of leading cause of high CO2 emissions. In addition, some companies are initiating strategies to reduce manufacturing lead-time, improving supply reliability as a mean of keeping inventory levels to a minimum (Ballou, 2004; Dey et al., 2011).

2.5 Corporate Social Responsibility to Societal Stakeholders
Stakeholders can be best describe as either: “as owners and non-owners of the firm; as owners of capital or owners of less tangible assets; as actors or those acted upon; as those existing in a voluntary or an involuntary relationship with the firm; as rights-holders, contractors, or moral claimants; as resource providers to or dependents of the firm; as risk-takers or influencers; and as legal principals to whom agent-managers bear a fiduciary duty” (Mitchell et a., 1997, P. 854).

A stakeholder can be perceived as anyone that affects or is affected by a company. The internal stakeholders being members that are formally connected to the project or to the company, i.e. employees and shareholders (Aaltonen and Sivonen, 2009). And, the external shareholders would then be members without a formal connection such as, local residents, environmentalists, regulatory agencies, local governments, customers, communities, public relations, non-governmental organizations (NGOs), and national governments (Aaltonen and Sivonen, 2009; Jensen, 2001). How competing stakeholder interests are managed is something that has received increasing popularity within the field of management literature (Harrison and Freeman, 2009). Freeman, Wicks, and Parmar (2004) claim that a company must create value for their stakeholders in order to create value for the shareholders. This is done by creating products and services that customers purchase, offering jobs that employees are willing to occupy, building relationships with suppliers, and by being good citizens in the community (Wicks, and Parmar, 2004).

According to Carrol (1979) the term social responsibility is defined as “the social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that stakeholders or society has of organizations at a given point in time.” This definition is based on Carrol’s (1979) conceptualized model called “The Social Performance Model” in which there are four key classes of social responsibility identified. These together forms what Carrol (1979) describes as “Total Social Responsibility.” The four classes of Carrol, (1979) “Social Performance Model” are in their essence of four types of categories in which different motives or actions taken by companies can be categorized in (Carrol, 1979). These are:

Economic responsibilities: What business naturally can contribute in terms of social responsibility are economics. Business institutions are the basic economic units in our society. Therefore, business as such has a responsibility to produce goods and services that society wants and to sell them at a profit in order to generate a positive impact on the economy (Carrol, 1979).

Legal responsibilities: As society acknowledges its need for business economically, society has also laid down the ground rules in terms of laws and regulations
under which businesses is expected to operate. Meaning that society is expecting business to fulfill their economic role within a framework of legal requirements (Carrol, 1979).

**Ethical responsibilities:** There are activities that are not necessarily enforced by law but still are expected by society to be dealt with by business. Ethical responsibilities are hard to define and therefore are among the most difficult for business to deal with. However, society seems to deem ethical responsibilities as highly important as debate continues as to what is and not ethical. This has implications for business in the sense that they are not only expected to contribute economically and adhere to legal requirements, but they must also follow ethical responsibilities as well (Carrol, 1979).

**Discretionary responsibilities:** There are activities that are looser than the ethical responsibilities and cater to social roles that are expected to be fulfilled beyond what could be classified by the responsibilities above, one such example would be a daycare center within the Multi National Enterprises, MNE (Carrol, 1979).

Given Carrols (1979) definition of social responsibility one can assume that society can, in fact, inflict pressure on a company based on the four key social responsibilities as the responsibilities are “expectations that society has of organizations at a given point in time.” This point of view is shared by Oliver (1991) who states that companies who seek to gain social legitimacy and worthiness might do so by conforming to external criteria. In this case, criteria demanded by society in accordance with the social responsibility theory. As a way to handle the pressures given by social responsibilities, four different types of strategies have been identified by Oliver (1991), these are: acquiesce, compromise, avoid, defy, and manipulate.

According to Oliver (1991), acquiescence can take alternative forms, including habit, imitation, and compliance. Compromise strategy is when a company is trying to balance, pacify, and/or bargain with external constituents. Avoidance is defined as “the organizational attempt to preclude the necessity of conformity,” which means that organizations could conceal their unwillingness to conform, trying to escape expectations that might exist. Oliver (1991) defines defiance as an active form of resistance, for example challenge or attack. Finally, the active manipulation strategy implies that a company purposefully and opportunistically attempts to co-opt, influence, or control pressures (Oliver, 1991). Further, Oliver (1991) argues that when a company anticipates that conformity to external criteria will result in the company achieving or enhancing its social fitness it is likely that acquiescence to the criteria’s will be the companies’ response.

### 2.6 Determining a firm’s Dominant Stakeholders

By clearly identifying relevant stakeholders, firms can successfully predict, create strategies and increase their chances of adequately addressing them. This is done in consideration of who (or what) are the stakeholders of the firm? And to whom (or what) do managers pay attention as either primary or secondary stakeholders (Mitchell et al, 1997). More specially, “Managers must know about entities in their environment that hold power and have the intent to impose their will upon the firm. Power and urgency
must be attended to if managers are to serve the legal and moral interests of legitimate stakeholders. (Mitchell et al., 1997, p. 882). Therefore, various classes of stakeholders might be identified based upon the possession, or the attributed possession of one, two, or all three of the attributes: power, legitimacy, and urgency (Mitchell et al, 1997). From this perspective, according to Mitchell et al, (1997) through the use of the “Qualitative Classes of Stakeholders” model, stakeholder classes can be identified from the various combinations of the three attributes: power, legitimacy, and urgency, as showed in figure 4.

Figure 4: Qualitative Classes of Stakeholders

![Figure 4: Qualitative Classes of Stakeholders](image)

Figure 4 Adopted form Mitchell et al, (1997)

The analysis of stakeholder through this model acknowledges and validates the identification of entities that should be considered stakeholders of a firm. Moreover, it establishes the set of entities from which managers select those stakeholders they perceive as relevant. And, then entities with no power, legitimacy, or urgency in relation to the firm are considered not be stakeholders to the firm and are perceived as having no salience by the firm's managers (Mitchell et al, 1997). Therefore, in order to capture the dominant stakeholders of a firm - stakeholder types that can emerge from the combinations of the various attributes of power, legitimacy, and urgency. When considered from a logical and conceptual perspective as shown in figure 4, in which case seven types of stakeholder are examined – it is shown that three possess only one attribute, three possess two attributes, and one possess all three attributes (Mitchell et al, 1997).

2.7 The Conceptual Framework

The conceptual framework in figure 5 is developed after identifying and linking the key elements in the literature review in chapter 2. The framework illustrates the relationship between a company’s production volume increased freight transport activities, stakeholders influence, and the environment and society outcomes. These relationship goes from the top to bottom on a vertical axis and a horizontal axis at the bottom. Both axes are labelled as the environmental and societal stakeholders, and output(s).

The vertical axis has three sections, the origin, impactors and outcomes. These sections are independence of each other, which together determine the environmental and societal outcomes of a firm logistics activities in production increase.
The origin section indicates the starting point of the environmental and societal impacts, from when a firm begins to increase production volume to meet customers' demand for products and stay in business.

The impactors section reveals the stakeholders’ attributes that are capable of influencing logistics outcomes of production increase, and the logistics activities (freight transports) that are needed for raw materials transport which subsequently determines and contributes to firms' environmental and societal outcomes of production increase.

Finally, the outcomes section, pertains to the environmental and societal impacts that are experienced or produced due to the freight transport activities in production increase. These outcomes can either have a positive(s) and or negative(s) impact(s) on the environment and society.

Figure 5: The Research Conceptual Framework
3. Methodology

Since the research method implemented in this study is a key component of the study, this section provides in-depth explanations of the type of research method used. It points out the advantages and disadvantages of the methods. In addition, the research data collection process, data analysis, the unit of analysis, and the quality assessment aspect of the study are also discussed.

3.1 The Research Strategy and Process

This research is based on an abductive approach. Dorst, (2011) indicate that there are three different settings or reasoning patterns that can be applied by researchers to achieve the intended research purpose. These strategies include firstly, a deductive approach where the research follows a pattern of predicting the results of the research based on information or answers collected to questions such as “what is needed and how it will be done” are available to the researcher. Secondly, the inductive approach which is the opposite of the deductive approach. It focuses on proposing theories that can explain some results. And, lastly, the abductive approach, which comes in two forms. The first form focuses on value creation for problem solving whiles the second form which is more complex, begins with the results or value, and the with the later, research are based on how and what this value created can be used for.

Based on these definitions, the approach for this research can be classified as both deductive and inductive approach. It is deductive based on the fact that the research is to identify the possible effects that a company’s production increased freight activities has on the environment, society and other stakeholders based on previous research studies. It is inductive based on the information and data collected from the different actors (dominant stakeholders) e.g. traffic engineers from MITT Travikverket and Timrå municipality, etc.

The term research process is referred to as the general process or model of carrying out a research and it differentiates one research from another with few researches following a project plan (Croom, 2009). According to Peters et al. (2012), a typical research process should consist of planning, identification of the study area, selecting the research topic, deciding the approach, formulating the action plan, collecting data and information required to answer the research question, interpreting, analyzing of the data collected and finally, presenting the findings and result. From this perspective, this study followed the process described research process according to Peters et al. (2012) and based its method on the combination of both semi-structured interviews and simulation.

**Figure 6: The research strategy and process**

The research underwent a systematical strategy and process which is shown in figure 6.
3.2 Choice of Scientific Method

A very important aspect of reaching the goal of the research is to identify and choose the suitable research approach for the study. According to Remenyi et al., (1998) a research method can be classified as either positivism or phenomenological. A positivism research refers to studies that are connected to statistical analysis whiles phenomenological approach refers to studies that have holistic approach of researching deeper into a phenomenon. The important struggle of choosing the suitable research approach to provide inward information about the process focusing on where the problem is been created and how truthful it can be classified as subjective or objective (Croom, 2009).

From these perspectives, a mixed research method was adopted in this study consisting of both a phenomenological approach based on the qualitative method, and a positivism approach based on quantitative method. For the phenomenological aspect, several methods were used to develop different understandings of the phenomena under the study which included interviews, observations and reviewing document (Biggam 2015; as argued by Acumen, 2009). And, with regard to the positivism approach aspect, two simulation models were built with concentration on facts and causality (Mangan et al., 2004). This was done by enabling and integrating data for analyses through a computer software (Bazeley, 2006).

Therefore, since this research is considered to be complex, a mixed method research was deemed the best option for the research which requires a qualitative approach at the first stage for gathering data (Creswell, 2007; Kong et al., 2018). A mixed research approach is useful when researching multifaceted situation because they complement each other and it provides more understanding of the situation or the research problem (Johnson, Onwuegbuzie, & Turner, 2007; van Velzen, 2018).

Additionally, Alexander et al., (2019) state that it is time for researchers to use research a method that can provide the opportunity to analyze activities or procedures that can shape the visual conversations, which they claimed can only be achieved by utilizing the mixed methods research approach. Moreover, Alexander et al., (2019) add that a single or mono-approach such as the use of only qualitative or quantitative data can make the researchers to sometimes loose valuable data and observation about the dynamic of the study, as well as miss potential relationships that can be statistically analyzed in an absolute quantitative study (Alexander et al., 2019). Therefore, the most suitable research procedure is mixed method where qualitative method is used to collect formative data, which is then tested for its effectiveness with the quantitative method (Kong et al., 2018).

3.2.1 The Research Mixed Method

Figure 7: The figure depicts the structure of research mixed method that was adopted in the study, it also shows the data collection process of each of the research method of the mixed method.
3.2.1.1 The Research Qualitative Method

Qualitative research is a research concerned with events involving quality, descriptive, non-numerical, applying reasoning, aiming at getting a meaning, and describing the situation (Crowe et al., 2011). For this study a case study qualitative research design was adopted to collect raw data for analysis. The importance of using a case study design is that it highlights why certain decisions were taken, how they were implemented and the results (Scharamn, 1971; Yin, 2018). A case study can be classified as an empirical method that seeks to investigate the depth of a phenomenon when the barriers between the context and phenomenon is not clearly visible (Yin, 2018). Moreover, a case study copes with situations with many variables, uses theories to design, collect and analyze data and also uses multiple evidence sources (Yin, 2018). As such, a case study method can be characterized in three main categories: intrinsic, instrumental and collective (Crowe et al., 2011).

An intrinsic case study is assuming to learn about a special phenomenon; whilst the instrumental case study is performed on a specific case to gain an extensive appreciation of a phenomenon; and the collective case study focuses on studying several cases at the same time or continuously in an attempt to produce a still wider appreciation of a particular issue (Crowe et al., 2011). However, some key disadvantage of a case study is that the results obtained can be difficult to generalize and can be difficult to reproduce. In addition, researchers can lack full availability to case study sites, and “case study research has often been considered to be lacking in rigor “(Yin, 1994, p. 9). Overall, it is difficult to generalize the results of a qualitative research method (Ritchie & Lewis, 2003). From this perspective, this study is based on an instrumental case study approach to investigate the company’s SCA increased production volume impacts on the research dominant stakeholders.

The important of conducting a case study in this research is that it allows the researchers to investigate their subject of interest in a unique and real-life context, and it provides the possibilities to the researchers to gain firsthand access to vital data for the study.

3.2.1.2 The Research Quantitative Approach

Quantitative research approach is an approach that uses statistics, mathematics and computerized techniques (Walter, 2013). This research method tries to answer questions starting with how many, how much and to what extent (Rasinger, 2013; Rahman, 2016). Quantitative data has numerical records from measurement or mathematical figures, which can be classified as either metric or non-metric (Singh, 2007). Non-metric data refers to data collected from binary, nominal or ordinal scales whiles metric data refers to data with scales and with defined distance between them (Singh, 2007). Metric data according to Singh, (2007) can further be classified into two, namely: discrete and continuous data. Continuous data is a data with measurable variables like the heights of people whiles discrete data is a data that has countable variables like the number or people in a city (Singh, 2007). Based on these definitions, the data collected for this study can be classified as a discrete metric data because the data collected under the quantitative
approach is from simulation which involves the number of traffics on the road. This traffic data includes trucks, public and private cars.

An advantage of using quantitative approach is that one can generalize the findings for the study (Carr, 1994; Rahman, 2016). A disadvantage of using this method is that it leaves off the social phenomenon and it fails to search deep into the problem to understand the meanings of those figures collected (Denzin & Lincoln, 1998; Rahman, 2016).

3.3 The Research Data Collection Methods

3.3.1 The Qualitative Approach

There are six different sources of collecting data during a case study research. These sources can include interviews, documentation, archival records, direct observations, participant observations and physical artefacts (Yin, 2018). From this perspective, the primary sources of data collection for the qualitative approach aspect of this study were through interviews and documentations - semi-structured interviews were conducted with five relevant respondents, and SCA project documents pertaining to its production volume increased were reviewed.

The advantages of using an interview approach in research study is to provide researchers with the opportunity to collect in-depth explanation from the participants, and to focus directly on the case topic. However, if an interview approach is not practiced well, it could lead to the interviewer getting bias information because one cannot control the responses from the participant (Yin, 2018). From this perspective, the interviews conducted in this study were based on semi-structured interview questions, which were designed to guide the conversation with participants rather than having structured questions solely because interviews are said to be fluid and not rigid (Rubin and Rubin, 2011; Yin, 2018). According to Yin, (2018) semi-structure interviews allows the interviewers to use “whys and hows” which gives the participants the opportunity to reflect on the question(s) to answer in order to give detain explanations, and to give researchers the opportunity to gather in-depth data from the participant(s).

In regard to the documentation aspect, according to Yin, (2018), the most important use of documentation in a case study is to expand upon the data collected from other sources. Its advantage is that it is a stable source of data, which can be reviewed repeatedly and still provides the same outcome/data. In addition, to further support the study, secondary data were collected from the websites of relevant stakeholders, such as: SCA, Sweden traffic administration (MITT traffikverket) and Timrå municipality.

Table 1: The relevant respondents, role and interview durations

The table 1 shows a detail overview of all interviewees, their position and role in their various organizations/entities, and the durations of interviews with them. Due to ethical consideration, anonymous name is used for the respondents, such as: Respondent SCA; Respondent Traffikverket; Respondent Timrå; Respondent society 1, and Respondent society 2.
<table>
<thead>
<tr>
<th>Interview Respondents</th>
<th>Representation</th>
<th>Role or Position</th>
<th>Durations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic engineer</td>
<td>Timrå Municipality</td>
<td>The project manager (PM) for SCA increased production project.</td>
<td>35 minutes</td>
</tr>
<tr>
<td>Traffic Planner Engineer</td>
<td>Swedish road authority</td>
<td>Work alongside the PM on SCA increased production project.</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Chief Logistics Manager</td>
<td>SCA</td>
<td>Responsible for the overall logistical activities for SCA</td>
<td>1 hour</td>
</tr>
<tr>
<td>Society 1</td>
<td>Timrå Municipality Residence</td>
<td>Have insights on SCA’s project logistics activities</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Society 2</td>
<td>Timrå Municipality Residence</td>
<td>Have insights on SCA’s project logistics activities</td>
<td>45 minutes</td>
</tr>
</tbody>
</table>

### 3.3.2 The Quantitative Approach

The quantitative data collection approach for this study were done through the building of two simulation models. These models were built to capture the effects that production increased would have on the traffic flow due to the increased level of freight (trucks) logistics activities involved. To build such visualization, it is required that qualitative data be collected first from relevant respondents to generate insights and then be combined with statistical data about the subject or area of interest, which could then be inputted into the simulation software to build the model.

The term simulation in its broadest sense is a tool used to evaluate the performance of a system, existing or proposed, under different configurations of interest and over long periods of real time (Marie, 1997). Simulation is used before an existing system is altered or a new system is built to reduce the chances of failure; to meet specifications; to eliminate unforeseen bottlenecks; to prevent under or over-utilization of resources; and to optimize system performance (Marie, 1997).

A model can be best described as a designed to display significant features and characteristics of the system which one wishes to study, predict, modify or control (Kellner et al., 1999). One key purpose of a model is to enable the analyst or managers to predict the effect of changes occurring in a system. A model should be a close approximation to the real system, and it should incorporate most of its salient features (Marie, 1997). Furthermore, a model should not be complex that it is difficult or impossible to understand. Another important aspect to consider is what to simulate and why it should be simulated. According to Kellner et. al. (1999), a model should consist of the following, some of which are usually treated as constant over the course of the simulation.
1. A model scope - the scope behind the study should be stated clearly, fully addressed and the questions posed. The reason behind the creation of the simulation model should be described and stated under this phrase;
2. Results variable - the information needed to create the model by answering key questions identified under the model purpose;
3. The process abstraction - to design the model, it is important to identify the key elements and their inter-relationship and behavior. This includes activity dependencies, flow of objects and among others;
4. The input parameter - this focuses on the key factors;
5. Drivers - depend on the desire results variables.

3.3 Data and Literature Collection and Review

To collect data from previous studies and build the theory to support the research purpose, scientific literatures were collected in order to collect the background data; plan how to group the subjects; focus on the topic related to the study and analyze the data required; comprehending the source; build the foundation for the research; and finally, use the data as secondary data for the study (Croom, 2019; Hart 1998).

Therefore, for literature about the impacts of production increase on the environment and society, several literatures were collected and reviewed for analysis. Beforehand, to have a focus point according to the research subject, a search guideline was drawn to scan and compel the necessary articles based on trustworthiness. Databases such as the Google Scholars, Scopus and EBSCOhost via the Google-search engine and the Gävle University online Library using the following keywords; Logistics, Supply Chain, sustainability, stakeholder, freight transport, etc. to fulfil the purpose of this study. Afterwards, the found articles were closely reviewed and cross-examine to determine if they correspond with the topic under study, and relevant to achieving the research purpose. Then the most relevant articles were selected, however, since Google-search was used and its contents are diverse - comes from several reliable and unreliable sources that are constantly updated, they were cross-examined and compared with articles found on databases from the Gävle University Library website since academia databases are considered to be reliable.

3.4 Building the Research Models

Two simulation model systems (prototype models) were built regarding the freight transport traffic flow for SCA production increased initiative. The models were created using the Aimsun computer software by means of the following five key steps: 1. the problem and objective setting, 2. Data/information collection, 3. Model building, 4. Verification, and 5. Validation as shown in figure 8.
3.4.1 Problem and Objective Setting, and Models Building

The first step in constructing the simulation model for this research was to describe the problem(s) and objective(s) of the model in order to use the simulation to answer questions generated from the problem description (“Handbook of simulation,” n.d.). In this realm, the aim for building the simulation models was to visualize the potential impacts of SCA’s production increased freight trucks logistics activities on the traffic infrastructure - on routes that are used to deliver raw materials to its SCA’s Östrand pulp production site (see section figure 11 A &B).

For the second step, two models were built for each of the research areas or routes of interest to capture the road conditions regarding the impacts of SCA’s current production freight logistics activities in terms of capacity, emission, and road safety issues on these areas or routes, and to also capture these impacts when SCA’s productions and freight trucks activities are further increase on these areas or routes. These two models focus solely on the both inbound routes that freight trucks use to deliver raw materials to SCA’s Östrand pulp production site in the Timrå municipality. The simulation was created using data from the Swedish traffic authority pertaining to the number of cars that travel per day (24 hours) on the various routes under study.

In order to capture relevant data from the models, various parameters where set according to the aim of the study. Therefore, the number of cars traveling per day (24 hours) were entered into the model as the number of vehicles traveling per hour as mandated by the Aimsun software. The first model was created based on the peak time of the day, using hypothesis and practicality measures, taking into consideration the time that freight trucks begins to travels on Timmervägen and the time that the Birsta city shopping center opens to when its closes – Birsta city is located opposite Timmervägen,
the route that freight truck travel on to make deliveries. Based on this, the time estimated was between 6 AM and 10 PM.

Founded on the above mentioned, the first model was built for the Timmervägen route leading to the motorway towards Jarnväsgatan (see figure 11B). To measure the number of carbon emission released on these routes into the environment, Panel et. al. (2006) model for calculating emission was used. The model takes into account the type of vehicle, the speed and acceleration of the vehicles. Precisely, it captures the second-by-second speed and acceleration of the vehicle while travelling in the road network through urban areas (Panis et al., 2006). According to this model, the carbon emissions calculated are measured in grams (g). As for the road capacity and safety issues affecting other road users, the software parameters density and delay time per travel were set to aid examine the results. As such, delay time per travel was calculated in sec/km travelled on the route, whereas density was calculated showing the number of cars travelling at a time.

3.4.2 Verification and Validation of the Simulation Models

The last two steps of building the simulation were verification and validation. Verification refers to the process of verifying the consistencies and correctness of the data, whereas validation refers to how appropriate the model is in regard to the real-world context (“IEEE Trial-Use Recommended Practice for Distributed Interactive Simulation - Verification, Validation, and Accreditation,” 1998).

The to meet the aim of building the models - to visualize the potential impacts of SCA’s production increased freight trucks logistics activities on the traffic infrastructure, data that were collected from both interviews and the Swedish traffic authority, were imputed into the model. To verification and determine the accuracy of the simulated models, they were run for an hour to cross-exam and compare the outputs. However, since the models were built on data collected and assumption - data collected were used for current road conditions whiles data for SCA’s potential production and freight activities increases were assumed. Therefore, it is impossible to concluded that the models are 100% accurate because of their assumption elements (Robinson, 2004, p.210). According to SCA, production volume will be expanded to its full capacity to consume up to 4,5 million cubic meter of forest trees. Due to the complexity and lack of data for such future expansions/expectations, assumption was made to nearly certainty in the model building process. Additionally, depending on the types of freight trucks to be used to make deliveries, assumptions were also made about the various traffic turns/directions the trucks will use, and how these traffics will connect to each other. Accordance, the Aimsun software made it possible for all turns to match with future expectations, which helped in the model building process, to include and increased the number of potential vehicles that are expected to travel on the traffic of interest. Afterward, the developed models were run for several times from different scenarios context to compare and find out if they produce the same result(s) irrespective of the number of times using the same data setting. Although the simulation output cannot be considered 100% accurate,
therefore, to validation the result, the process used in building the model is estimated to be suitable enough to assume that the result is close to reality.

3.5 The Research Data Analysis

For data analysis, data collected from both the qualitative and quantitative methods were cross-examined with the related literature to generate scientific insights to discover patterns of certain facts that supports the purpose of this research. More precisely, the interview conducted were recorded, later transcribed and afterward coded using a thematic analysis approach (Braun et al, 2006). This approach was found suitable for the dataset since it helps to aid and guide the data analysis process while as the same time focusing on isolating, examining, and finding patterns and themes in the data sets.

Moreover, the thematic analysis approach emphasis organization and profound representation of the data set and attempt to identify the implicit and explicit viewpoints within the data (Guest et al, 2012). This approach ultimately led and facilitated the data analysis process in determining themes that made important perspectives into understanding what was going on within the dataset in regard to the purpose of the research. The thematic analysis coding process for this thesis was theoretically driven, denoting the various parts of the conceptual framework of origin, impactor, and outcome. Accordingly, after the coding process, each author read the final reports individually and then compared, discussed and interpreted them to observed common themes that corresponded with various parts of the framework.

3.6 The Research Unit of Analysis

The figure below shows the unite of analysis for this study. The unite of analysis is considered the sole focus of the study. It comprises of the different components of the study to examined to support the study. It consists of the following: A case - Impacts of increase production volume, and four dominant stakeholders - SCA, Timrå Municipality, Sweden Traffic Authority, and the Society.

Figure 9: Overview of the Research case and stakeholders

![Diagram showing the research case and stakeholders]

Figure 13: (Created by Authors)
3.6. Determining the Research Dominant Stakeholders

The dominant stakeholders of this research case study were determined according to Mitchell et al, (1997) “Qualitative Classes of Stakeholders” model (see section 2.6).

**Figure 10: The Qualitative Classes of Stakeholders Model**

The figure shows Mitchell et. al (1997) Qualitative Classes of Stakeholders Model used to determine the dominant stakeholders of the research: SCA, the Timrå municipality, the Swedish transport administration (MITT traffickverket), and urban residents of Timrå and Sundsvall municipalities. These stakeholders have the attribute possession of all three attributes Qualitative Classes of Stakeholders Model in relation to the case study: (1) the power to influence the case, (2) the legitimacy relationship with the case, and (3) the urgency claim on the case.

![Qualitative Classes of Stakeholders Model](image)

From this perspective, SCA, the Timrå municipality, the Swedish transport administration (MITT traffickverket), and urban residents from the Timrå municipality are all located in #7 of the “Qualitative Classes of Stakeholders” model. They are considered to have all 3 possession attributes (power, legitimacy, and urgency) to influence the case. SCA is the firm that have increase production volume which is under review in this study; the Timrå municipality creates regulations that governs such business and logistics practices for SCA to ensure the quality of life for inhabitants while sustaining access to goods and services for the promotion of sustainable city development; the Swedish transport administration (MITT Trafficverket) provides and regulates the traffic infrastructures that are under study in this research use by SCA freight trucks to transport raw material for production; whereas urban residence are the entity that can either be or have positive and/or negative influences on the logistical issues in the case.
Table 2: Dominant Stakeholders

Table 2 shows and explains brief overview descriptions of the dominant stockholders along with their importance to the study.

<table>
<thead>
<tr>
<th>The Dominant Stockholders</th>
</tr>
</thead>
</table>
| **Svenska Cellulosa Aktiebolaget (SCA)**
(BCA) is a Swedish company located in Sundsvall, Sweden. SCA currently operates three major plants in the Sundsvall area: Östrand pulp mill in the Timrå municipality, Sawmill in Tunadal and Ortviken's paper mill. SCA consists of five business units: Forest, Wood, Pulp, Paper, Renewable Energy, and have a supporting unit for Sourcing & Logistics. SCA also conducts strategic research and development with close co-operation with Mid Sweden University. SCA is key in this study because of its production increase which impacts is connected to stakeholders. |

| **The Timrå Municipality**
The Timrå municipality is the Västernorrland (west-north) county of Sweden. The town of Timrå is the municipal seat. SCA pulp mill is located and operates in Timrå city. This makes them an important stakeholder of this study because any impacts from this doubled production can directly or indirectly affect the city of Timrå and its inhabitants. |

| **The Sweden Traffic Authority (MITT)**
The Swedish traffic authority in general is responsible for all traffic systems and its long-term planning (Trafikverket, n.d.). The traffic authority is also in charge of designing laws and regulations for traffic users to ensure road safety measures and to ensure that road users abide by these laws (Trafikverket, n.d.). |

| **The Society**
Society plays important roles in the development of industries. The importance of societies to industries is based on their response to the company. If a society responds positively to a company, said company is motivated to provide more offerings and vice versa. According to Giddings et.al., (2002 p,191) "Society embraces the multitude of human actions and interactions that make up human life"; this emphasizes the importance of including society in the research, especially when the problem can have effects on them. Based on this study society is referred to Timrå inhabitants (human beings) who have in one or the other have contact with the case problem. This includes road users, residence around the company and its surroundings. |

3.7 The Research Quality Assessment
Quality assessment of any research is an important element of research studies. In this regard, it is vital for research studies to be design in a way that have logical set of statements that are used to judge the quality of how the study was designed and conducted (Yin, 2018). Based on this argument, four criterial have been designed and commonly used to test the quality of most empirical research and can also be applied to case studies since it falls under the empirical research (Yin 2018). These four critical can also be used as a framework for assessing case studies that involve larger groups (Gibbert et al., 2008). These four tests criteria include construct validity, internal validity, external validity and reliability (Yin, 2018).
Construct validity refers to pinpointing and establishing the correct operational measures for the research being conducted (Yin 2018). With regards to case studies, this test is considered challenging and has received critics, which indicates that researchers who use case studies fail to come up with set of measures that are sufficient due to their subjective
judgement (Yin 2018 p,43). Moreover, it is difficult for a reader to genuinely differentiate between the results collected; whether it really reflects the situation of the problem or event or it is based on the researchers’ assumption (Yin, 2018). In order to improve the construct validity, Yin, (2018) suggests three strategies that can be applied to case studies; firstly, by using multiple source of evidence, secondly by establishing a chain of evidence, and lastly by having the drafted case study report reviewed by key informants.

The first and second tactics are very useful during data collection and it encourages the line of inquiry in the research (Yin 2018). Therefore, in order to have a strong construct validity for this study, interview questions were designed in relation to the purpose of the study, for multiple dominant stakeholders that have relevant insights/knowledge pertaining to the case studied. By doing so, the researchers aim at eliminating the bias associated with the case study to avoid having results that are based on the researcher’s assumption(s).

Internal validity focuses on two major points with regards to case study. Firstly, it is only concerned with explanatory studies where the researcher tries to find out the connection between two conditions; if one condition lead to the outcome of another (Yin 2018). In order to have a strong internal validity, the researcher must cover all important actors in finding the connection. Failing to identify all events connected or leading to an event, the research is considered a failure in terms of its internal validity (ibid). Secondly, internal validity includes making inferences when the event cannot be observed directly. This means that results and conclusion can be made from case studies and interviews because both are designed to deal with the problem by making inferences therefore covering the internal validity (Yin 2018). In this regard, Yin (2018) suggests four tactics that can be used to improve the internal validity when conducting a case study such as; 1. pattern matching which involves comparing data sample with other sources if the sample support the empirical data; 2. explanation building, involves the analysis of data which is done by building up on the explanation around the case; 3. logic models, is a pattern matched by matching the empirical data with related theories; and 4. rival explanation which provides matching the patterns for non-dependent variables (Yin, 2018). For this study, the authors included these element/tactics by covering several relevant dominant stakeholders to obtain their viewpoint regarding the case under study. By doing so, these data sample compared with theories built from previous studies in order to have a strong validity. Moreover, established literatures were used to discuss the possible impacts of increased production on the environment and society. Precisely, this case study can be seen as a logic model based on Yin (2018) description, because it tries to match the empirical data collected with the related studies. Therefore, with such consideration the study is considered to be internally valid.

External validity is used to determine whether and how a case study finding can be generalized beyond the current study (Yin, 2018, p,42). One of the major issues related to case studies is that its inability to be generalized (Yin, 2018). A single case can be generalized by using "analytic generalization" by matching the study results with relevant theories but in the case of multiple case study, one can enhance generalization of the study by using replication logic when sampling for data collection (Yin, 2003).
However, conducting interviews based on the appropriate and sufficient literatures can increase the generalization of a research case study (Rowley, 2002). For this study, literature reviews were intensively conducted based on different academic journals, which helped to establish a solid foundation for the interviews to be built on, and to collects data and achieve results that can be connected to the literature. Based on these descriptions, this study can be generalized to some extent, however, due to the amount of data sample collected from interview, the result from this study cannot be totally generalized.

Reliability of a research deals with the possibility of achieving the same results and conclusion when the operations (such as data collections) of the study is repeated irrespective of whoever repeats it, but in reality, this rarely occurs (Yin, 2018). The main goal of reliability is to reduce the possibility of errors and biases in the study, however, the means of improving the reliability of a study and making it possible for other researchers to repeat is by proper documentation (Yin, 2018). To ensure that this study fits with this criterial, all details relating to how the study was conducted has been indicated in the methodology section. Furthermore, details of the interviews and research respondents were documented and saved. And, the interviews were recorded and transcribed which can also be referred to when needed. Based on these undertakings, it can be said that this study is considered reliable. Moreover, there is a likelihood that similar results can be reproduce if the study is repeated within the same environment and with the same problem description.
4. Results

This section provides the results for the thesis. The conceptual framework, which comprises of three levels refer to as the origin, impactor and outcomes is use as lens to guide the research respondents’ perceptive views of the research subject. These perceptive views are built upon with data from the simulation models, and data gathered from SCA production increase project, which are then incorporated within the conceptual framework.

Reintroducing figure 5, the conceptual framework:

![Conceptual Framework Diagram]

4.1 Origin

From the interview conducted, all participants acknowledged and agreed that the company SCA has increased production volume at its Östrand pulp mill plant in Timrå. The respondent from SCA revealed that SCA has invested eight billion Swedish Kronor in its Östrand pulp mill to double up the pulp production. This expansion will increase the demand for raw materials from 450,000 tonnes to 900,000 tonnes of raw wood. Accordingly, prior to the investment, SCA used 2,2 million cubic meter of forest trees for production of pulp products. However, after the investment, SCA is expected to expand production volume to 4,5 million cubic meter of forest trees to product pulp products.

The respondent from SCA also disclose that the expansion means that the amount of wood raw materials to be refined will be doubled, and that freight truck transport is use in conjunction with rail and boats transportation to deliver raw wood materials to the Östrand pulp mill production plant in the city of Timrå. Respondent traffikverket and Respondent Timrå both pointed out that the freight truck transport goes
through several residential areas to and from the Östrand production plant. Respondent SCA noted that the main problematic areas of these freight transport activities are the inbound route that the freight truck use to make deliveries to the Östrand pulp mill plant. This traffic goes through a street that have heavy traffic capacity that is adjacent a major shopping centre area in Sundsvall called Birsta city.

The interviews and project documents revealed routes that SCA freight logistics activities span from the following Swedish counties: Västernorrland county, then towards Jämtland and Västerbotten. There counties are where large portion of the raw material comes from to enter into the Timrå municipality. Therefore, the routes to be investigated are marked with black lines in figure 11A & 11B. The freight traffic flow goes through roads and intersections that are also used by nearby residents, which are marked with circles in the map in figure 11A. In the figures 11A & 11B, the streets are marked with square boxes; such as the kungsvägen, which comes from residential areas and intersects with the slipway route use by freight trucks leaving the southern inbound from the E4 highway to get to SCA Östrand pulp mill production plant; another street referred to as prästgatan is a street that leads to and from a crowded residential area, which also intersects with kungsvägen and Järnvägsgatan. These are routes that are used by freight trucks from both the southern and northern inbound from the E4 motor highway towards the SCA Östrand pulp mill production plant.

**Figure 11A:**

![Map of the SCA Östrand pulp mill production plant, Timrå, Sweden (Adopted: Google Map)](image-url)
4.2 Impactor

With regard to the environmental and societal outputs, respondent SCA and respondent Timrå pointed out that the number of transports activities from the forest to the Östand pulp mill factory has increase significantly. Delivery and returning of freight trucks take place every weekday, from Monday to Friday between 06:00 AM to 01:00 AM the next morning, and on every weekend (Saturday to Sunday) from 06:00 to 18:00.

These freight logistics activities flow spans from the Västernorrland county towards Jämtland and Västerbotten county where a large part of the forest raw material comes from. More precisely, the respondent from SCA added that the inbound of freight trucks transporting raw (wood) materials goes through 4 different routes to get to SCA Östrand pulp mill production plant in Timrå: 10% comes from the E4 north bound route, 5% from the E4 south bound route, an estimated between 50% to 60% comes from the west E14 route towards Östrand using the Timmervägen route nearby the Birsta shopping city centre in Sundsvall. According to respondent SCA, this route usually has heavy traffic flow that is cause by mostly shoppers during the evening hours of weekdays (Mondays to Fridays), and weekends (Saturdays to Sunday) from 10:00 to 18:00. In addition, 25% goes through the E4 via Järnvägsgatan route in Timrå.

Respondent SCA further added that SCA has 2 terminals located in the Swedish towns of Töva and Torsboda which are located about 15 and 5 kilometers away from the Östrand production plant in Timrå. These terminals are used to store some raw wood materials that are taken from long distances for easy access and quick transport to the Östrand plant in Timrå.
In addition, Respondent SCA added that SCA hires the logistics services of a TPL company for its yearly logistics operations. The TPL company provides SCA with 450 trucks for all of its transport logistics operations. For this production increase project, freight trucks make 80 trips daily transporting raw materials mostly from SCA terminals in Töva and Torsboda to the Östrand production plant in Timrå. A total of 26,600 trips are made yearly to deliver 1,2 million cubic meters of forest trees, equivalent to 64 tonnes or raw wood materials, which is allowed by Sweden law. However, the Swedish traffic authority is currently discussing a regulation to allow trucks to transport up to 74 tons yearly of raw materials per truck excluding the weight of the truck.

Document on SCA expansion project revealed that with such an increase, the municipality of Timrå and neighbouring municipalities (Sundsvall, etc.), and the Swedish transport administration (MITT Trafikverket) required that measures to be put in place on the road infrastructure to make it suitable for the society (inhabitants and road users). In this regard, respondent Timrå pointed out that the government help fund roads and important infrastructure at small communities, so that the company (SCA) can use better suited trucks that bring more cargo, and in that way, it will produce less pollution per ton transported. In addition, respondent Trafikverket stated that the Swedish traffic administration works with companies or cases like SCA to find vehicles mobility solutions that are suitable for the road infrastructure in areas that are use or affected by these cases. As such, respondent Trafikverket further revealed that the Swedish traffic administration sometimes invests in new roads project, or situations to make the whole traffic system suitable for all users and communities. Notwithstanding, adding new roads can be last result that the Swedish traffic administration implemented because it does not like to encroach on the environment expect when it is highly needed.

Another way to find a solution to such activities is according to respondent SCA is that the Timrå Municipality imposed regulations on decibel which require companies to have permits to drive through certain road.

From another viewpoint, respondent SCA revealed that by using multiple means to transport raw wood materials, such as rails ways, boats and roads transports concurrently, can help to create flexibility in the process and reduce a company’s CO2 emission problems. Respondent Trafikverket shared similar view and indicated that this could be a better choice to reducing road congestion problems and CO2 emission problems on the road and environment.

Respondent residents 1&2 from the society described that economically, doubling of the production is a great step and that this kind of expansion definitely triggers a lot of boost in several sectors of society. Several jobs will be created and the lives of many will improve. This expansion in production could also transform the residential landscape of the area with more settlements springing up according to the respondent.

### 4.3 Outcome

From the perspective of the outcome resulting from SCA freight logistics activities due to its increase production volume, the document on SCA expansion project shows that the SCA acknowledge that the increase production volume is expected to cause transportation increases from SCA inbound activities from high volume of freight of
trucks transporting raw materials to the Östrand plant in the Timrå Municipality. Furthermore, it is revealed that the Timrå Municipality and the Swedish transport administration (MITT trafikkverket) are concern that these increased freight traffic activities will have significant impacts on traffic safety and create noise through several urban areas, as well as have effects on the roads condition.

Respondent Timrå also noted that since the increased, residents usually complaint of polluted smell coming from the factory, which happens whenever SCA is undertaking cleaning of its production tanks. And, since production has increased this means that the polluted smell will increase if measure is not implemented to resolve it. In addition, respondent Timrå added that there are increase in noise from the increased of freight trucks, and more wear and tear down on the roads. However, this also has a positive side for the community that SCA has invested and increased its production in tend of jobs creation and direct economic enhancement for the city of Timrå.

In relation to this, respondent from SCA noted that the Timrå Municipality prefer that SCA increase production to create more jobs for the unemployed and create economic benefits for residents and the Municipality. However, there are traffic safety issues because of the large trucks that travel the roads. But, the overall impact on the roads, the environment and society are not very high since the delivery have now been split between the rail, boat and roads transports, moreover, the increase of differences in raw materials transported by road from the previous volume capacity has not changed significantly. It has been increased from 1,1 to 1,2 million cubic meter of forest trees. Respondent from SCA added that there are several concerns regarding congestion, road safety, cost, and emission.

Respondent trafikkverket also revealed that when companies increased production volume, one of the major problems is an increase in the traffic capacity wherein there become several vehicles on the roads leading to and from the companies’ production site(s). And, that there can also be the cases of pollution in the environment. In regard to SCA production increased, residents who use the same roads as SCA freight truck has complained of issues such as road safety and congestion. Respondent trafikkverket noted that such complains usually goes through the Municipality authority then to the Swedish transport administration for solution(s) to be provided. Respondent trafikkverket indicated that, providing the needed solution(s) to problems that derived from these undertakings of increase productions can take a long period of time due to the long durations that are required to acquire the necessary investments for them. Furthermore, the solutions do not come into effect immediate, it can take up to several years, sometimes 5 to 6 years periods.

Respondent society 1 from the society's concern is the emissions from this plant as production doubles regardless of the clean technology in place and that it also has repercussions on the environment. With the increase in production, comes more vehicles traffic to and from the area; involving the transportation of raw materials to the plant and produced products from the plant to the point of consumption. Also, increase in staff comes with more road/rail users to and from the area. There the respondent thinks this might affect other road users compared to before doubling of production. Both
respondent society 1 and 2 stated that doubling of production means doubling of toxic waste emissions into the environment. This is economically beneficial in the short run since the increase in production comes with economic growth in the short run for the community. However, in the long run, handling the effects of the emissions on the environment and people has a tendency to affect the economy negatively. They expect the management of the plant and authorities in the area to strictly adhere to sustainable ways of production and ensure the environment is well taken care of. Respondent society 1&2 both complained that the air quality in the area is sometimes poor. The area has this strong smell that is very difficult to breathe when one is around. Respondent society 1 thinks the road is sometimes too narrow to share with big trucks so the increase in these trucks due to the doubled production might be a bit uncomfortable and unsafe for some other road users. Respondent 2 is concerned with the traffic congestion that is likely to occur around the streets of Timmervägen, which has a shopping mall around the area. So, the freight trucks that are using the area should have specific times, ideally late night for truck drivers to ensure the safety of other road users in the areas.

### 4.3.1 The Outputs from the Simulation models

This section presents the results generated from the two simulation models that were built using Aimsun software pertaining to issues of road density/congestion/road safety, and CO2 emission produced by freight trucks activities.

Simulation model 1 pertains to the inbound of freight trucks passing through the street of Timmervägen nearby the Birsta city shopping centre in Sundsvall (figure 11B). In addition, simulation model 2 span from the entrance points of freight trucks from the southern and northern inbounds through the E4 highway toward the street of Järnvägsgatan leading to Östrand pulp mill production plant (Figure 11A). Both models were developed according to the settings in section 3.4.1.

**Figure 12:** 3D Simulation Model 1 of Timmervägen – Model 1 generated by Aimsun simulation software.
Graph 1A shows the outcomes of the road density/congestions. The blue bar represents the delay time/travel time it take for a vehicle to travel on certain road, whereas the red bar represents the road density per second/kilometer on said road. In addition, Graph 1B shows the outcomes from the CO2 emission. The x-axis represents the route (road), and the y-axis represents the volume of the output(s).

Graph 1A & 1B - Based on parameters set to the current road activities involving freight transport on the Timmervägen road.

Graph 1A below shows the current delay time/travel time and road density on the Timmervägen road. The graph shows that the highest delay time per travel is approximately 83 sec/km on road with road ID 1184, and the lowest delay time is 3sec/km per travel on road 893. The highest density on this route is experienced on road 1184 with approximately 42 cars travelling at one time, whereas the lowest density is on road 893 with about 5 cars travelling at one time.

Graph 1A – Road delay time/travel time and road density

Graph 1B - CO2 emission released:
Graph 1B shows the amount of CO2 that is released into the atmosphere during the travel. It shows the highest emission released currently been as 25,000gms on the road with ID 1433 and the lowest emission released are on eight roads between 100 to 500gms.
**Graph 1C & 1D** – When parameters concerning freight transport activities are further increase on the Timmervägen road.

**Graph 1C – Road delay time/travel time and road density:**
Graph 1C shows the expected road density and delay time per travel time on the Timmervägen road. From the graph, it is shown that the highest delay time per travel is approximately 93 sec/km on road with the ID 1184 and the lowest delay time of 5sec/km on the road 893. The highest density on this route is experienced on road 920 with approximately 72 cars travelling and the lowest on road 893 with about 5 cars travelling at one go. This indicate that there has been more increase in density than in the delay time per travel.

**Graph 1D - CO2 emission released:**
Graph 1D shows the CO2 released into the atmosphere during the travel. It shows clearly that the highest emission released currently is about 42,000gms on the road with ID 1433 and the lowest on about 8 roads releasing between 1000 to 8000gs. The CO2 expected to be released is more than double in some areas and almost as double in certain areas.

**Conclusion 1:** The outcomes for both Graph 1A & 1B points out that there are issues of delay time/travel time and CO2 emission due to traffic activities in model 1. Moreover, it also shows that when the number of vehicles parameters are further increase on traffic/routes as presented in Graph 1C & 1D, it shows that the outcome further increases.
Model 2: Graph 2 A & 2 B shows the outcome for model 2 in according with settings in section 3.4.1.

Figure 13: 2D Simulation model 2 of Jarnvägatan – Model generated by Aimsun simulation software.

Graph 2A & 2B - Based on parameters set to current road activities.

Graph 2A - Road delay time/travel time and road density:
Graph 2A shows the current delay time and density per travel on the roads connecting through järnvägsgatan road to the SCA company. From the graph, it shows that the highest delay time per travel is approximately 45sec/km on järnvägsgatan and the lowest delay time is between 4sec/km to 10 sec/km on several roads. The highest density on this route is experienced on road 3017 with approximately 10 cars travelling and the lowest on several roads with between 1to 5 cars travelling at one go.
Graph 2B - CO2 emission released:
Graph 2B shows the CO2 released into the atmosphere during the travel. It shows the highest emission released which is currently 5,000gs on järnvägsgatan and the lowest CO2 released on 8 roads releasing between 100 to 1000gs.

![Graph 2B - CO2 emission released](image)

Graph 2C & 2D - Based on parameters when road activities are increased.

Graph 2C - Road delay time/travel time and road density:
Graph 2C shows the expected delay time per travel and road density on road connecting through järnvägsgatan to the SCA company. From the chart, it shows that the highest delay time per travel is approximately 48sec/km on järnvägsgatan and the lowest delay time between 0 to 10 sec/km on several roads. The highest density on this route is experienced on road 3017 with approximately 50 cars travelling, and the lowest on several roads between 1 to 10 cars travelling at one go.

![Graph 2C - Road delay time/travel time and road density](image)
Graph 2D - CO2 emission released:

Graph 2D shows the CO2 expected to be released into the atmosphere during the travel. It shows clearly that the highest CO2 emission released is approximately 25,000gms on the road with the name järnvägsgatan (1704) and the lowest on about 8 roads releasing between 200 to 1000gms.

Conclusion 2: The outcomes of both Graph 2A & 2B show that there are issues of road delay time/time travel and road density and CO2 emission on roads under study in model 2, as a result of influx traffic activities. Moreover, when freight activities parameters are further increase (Graph 2C & 2D), these results further increase.
5. Analysis and Discussion

This chapter discusses the previous research studies in section 2, together with the finding in section 4 to answer research questions 1 and 2. The purpose of this research is to investigate the environmental and societal effects that an increased production volume can have on dominant stakeholders in urban areas. By connecting data collected through interviews, and the simulation models with previous research studies in chapter 2, this study moves to answer the research questions to create new knowledge in the field of logistics.

5.1 Discussing and Answering Research Question 1

This section discusses the research question “what are the likely effects of freight trucks logistics activities on the environment, society, and traffic flow through urban areas as a result of a company production volume increased?” to create understandings of the possible consequences that an increased production volume can have on the environment, society, and traffic flow through an urban area.

5.1.1 Environmental Impacts

From the perspective of when companies’ increase production volume, it causes increase in its logistics activities to deliver raw materials to production plant (Dey et al. 2011). Accordingly, the sole purpose of companies increasing productions volume is to serve market demands to retain customers and or to extend market domain and to stay in business. From this perspective, all respondents revealed that companies increased production volume, results to increase in its logistics activities of freight transport on routes that are used to delivery raw materials to production site(s), especially when these roads are located adjacent density areas such as major shopping centers in urban areas.

Furthermore, these activities according to the respondents can produce outcomes that have either negative or positive impacts on the environment. As such, logistics activities involving freight trucks can cause major issues of increase environmental CO₂ emissions of carbon footprint, traffic congestion, increase in the level of noise produced, road safety problems (Aditjandra et al., 2016; Jaller and Wang, 2015). Results from the simulation models and respondents point out that as the result of production increases in an urban area, logistics activities connected to this undertaking increase drastically in efforts to get raw materials to meet production demand. This action produces steady increase in CO₂ emissions, and other pollution releases, such as noise and smell in the environment. Moreover, CO₂ emission are primarily emitted from cars, trucks, and buses due to the burning of fossil fuels - the combustion of petroleum-based products like gasoline and/or diesel in their internal combustion engines. Carbon dioxide (CO₂) emissions from fossil fuels and industry operations encompass of 90% of all CO₂ emissions from human activities. An increased total of CO₂ emission could lead to a rapid increase in greenhouse gas emissions, which leads to global warming - attributes to climate change. However, our research does not reveal that SCA current freight trucks activities in its production volume increased project are detriment to urban residents.
5.1.2 Societal Impacts

A company must create value for stakeholders in order to create value for the shareholders (Freeman, et al. 2004). A stakeholder is alleged as anyone that affects or is affected by a company. Consequently, a company have two set of stakeholders; the internal stakeholders are those entities that are formally connected to the project or to the company, i.e. employees and shareholders (Aaltonen, and Sivonen, 2009). And, the external shareholders are those without any formal connection to the company such as, local residents, environmentalists, regulatory agencies, local governments, customers, communities, NGOs, and national governments (Aaltonen, and Sivonen, 2009; Jensen, 2001). To better serve or act according to these set of stakeholders, managers must possess the necessary knowledge about stakeholders in their environment, as to those that hold power and have the intent to impose their will upon the firm. Moreover, manager must attend to those stakeholders that have the power and urgency to influence, if they are to serve the legal and moral interests of legitimate stakeholders. (Mitchell et al., 1997). Thus, stakeholders might be identified based upon the possession or the attributed possession, of one, two, or all three of the attributes: power, legitimacy, and urgency (Mitchell et al, 1997).

As firms increase production to create value for stakeholders, the sole purpose is for citizens to have access to commodities that are produced by the companies wherever and whenever they are required. Nevertheless, society growing concerns for environmental issues such as global warming, greenhouse gases and consumer health require firms’ immediate co-operation to incorporate sustainability into their strategies (Dey et al., 2011; Lee, 2010). In this regard, urban freight transport plays dynamic role in meeting the needs of citizens, to get raw materials to products sites, finish products to the point of consumption, and to the point where used products are discarded. However, urban freight transport also contributes drastically to the non-sustainable effects on the environment, economy and society (Behrends et al. 2008, Dey et al. 2011).

On the opposite side, the result from the interview respondents revealed that increase in production and subsequently increase in freight truck activities does not only increase financial benefits for a firm but also enhance economic benefits for residents. As such, this can boost numerous of sectors in the society, by creating jobs for residents thereby helping to improve the livelihood of residents and subsequently improving the quality of life for urban community.

In addition, as firm increase production, it can also transform the residential landscape of an urban area by attracting more people to settle in such community. With these advantages comes some disadvantages as well. This was witnessed in the context of safety for residents and other road users. To tackle such disadvantages, it becomes the duty of the internal stakeholders or business owners to ensure the safety of external stakeholders when conducting business activities. In this regard, in terms of social responsibilities, it is expected of businesses to cover essential categories, which includes ethical and discretionary responsibilities (Carrol, 1979). Environment issues that are not necessarily enforced by law, but society still expect companies to deal with them adequately, wherein businesses are no longer expected to only contribute economically
and adhere to mandatory legal requirements, and societal roles that are expected of them to be fulfilled. Firms are now expected to go beyond what could be classified by the responsibilities, to be more ethically responsible in taking on initiatives for the betterment of society (Carrol, 1979).

5.1.3 Traffic Flow
Transportation is the most important economic activity of a company’s logistics systems, which accounts for around one third to two thirds of enterprises’ logistics costs. An effective transportation system helps companies gain logistics advantages for a better logistics efficiency, lower operation cost, enhance service quality and increase competitiveness (Tseng et al., 2005). The impacts of transportation on the environment is caused by both the input and output the transportation process (Rand et al. 2004). The study revealed that by forming a transportation alliance with specialized TPL firm services provider for the deliveries of raw materials, it can help firms maximize the material inputs. In addition, this can help firm to enjoy effective freight transport structure in urban areas and creates local economy growth regarding employment and income (Schliwa et al., 2015). Notwithstanding, the research respondents revealed that when companies increased production volume there can be several impacts that can affect the flow of traffic. These impacts can take the form of increase in the traffic capacity due to the increased volume of vehicles on the roads leading to and from the companies’ production site(s), which can cause congestion that leads to delay in travel time for urban residence; and cause significant impacts on traffic safety, and creates more wear and tear down on the roads infrastructure.

5.2 Discussing and Answering Research Question 2
In this section discusses and answer the second research question, “How can the identified effects caused by freight trucks logistics activities during a company production increased be manage?”. By discussing and answering the second research question, the study moves to reveal how the possible effects of increased production volume on the environment, society, and traffic flow through an urban area can be manage.

In line to the environmental impacts with regard to the results from the research question 1, the study indicates that by concurrently using multiple logistical means to transport raw materials, such as by ways of railway, boats and roads transports, firms can create flexibility in its logistics process and reduce CO2 emission problems. This is in line with Sidorenko et al., (2015), which points out that improvement in logistical can occur by connecting different supply chain with the same goal and task to release the finished products or materials to the point of consumption.

Adopting a managerial approach that reduces the negative impacts that supply chain operations has on the environment in order to maximize profitability (Teixeira et al., 2018), it is appropriate to us methods in logistics operations for raw materials and or products that contributes to saving resources and reducing the environmental burden for efficiency and value creation in the context of supply chain
(Olsmats and Dominic, 2003). Moreover, for companies to be environmentally friendly in their business and logistics operations, it is mandated that they adopt systems that are directed towards the reduction of emissions of pollution and toxic waste into the environment (Teixeira et al., 2018).

Therefore, with regard to traffic congestions and delays, according to the study, the best solutions to reducing such problems is that government sometimes impose regulations measures that restricting moving of freight truck from driving through certain urban streets, to help reduce roads congestion problems. Furthermore, traffic administration sometimes invests in new roads infrastructure projects, or institutes traffic situations to construct overall traffic systems that are suitable for all users and communities. In addition, in some cases government help to fund roads projects and important infrastructure at communities’ levels to provide companies the opportunity to use trucks that are suitable to transport more cargo to produce the level of pollution per ton transported.

5.3 Discussing the Research Mixed Method Approach

This section moves to discuss the significant of a mixed research approach in research studies. The discussion is based on the details of both the applied qualitative and quantitative research methods in the research.

The second aim of this study is to discuss and reveal the significant of a mixed method research approach - for multifaceted research studies which was adopted in this study. The most suitable research method for conducting multifaceted research studies to develop a result, should include both a qualitative collection and quantitative research (Nastasi et al., 2007). In so doing, qualitative methods should be used to collect formative data, which can then be tested for its effectiveness and or supported with data from the quantitative method (Kong et al., 2018). Moreover, a mixed research approach is deemed useful when researching multifaceted situation because the research methods complement each other and it provides more understanding of the situation or the research problem (Johnson, Onwuegbuzie, & Turner, 2007; van Velzen, 2018).

This research involved multiple entities that collectively influenced the research process, which were found to increase the level of complexities and dimension to managed in order to reach comprehensive results. The complexities nature of this study could be seen in different aspects of the research. Firstly, the unavailability of adequate data to investigate both SCA’s current and further potential freight logistics impacts on the environment, the traffic flow and urban residents to reach complete conclusions contributed to the level of complexity. Accordingly, some data were easily accessible or available while some were not. From this perspective, through the use of both qualitative and quantitative approaches, the researcher(s) were able to collect data through interviews from relevant dominant stakeholders’ respondents, literatures, projects documents, and observations. And, a quantitative method was used to collect data through the help of computer a simulation software to support the study. Two simulation models were constructed to observe, analyzed and forecast their outputs of potential occurrences in order to investigate the possible consequences of increased production volume on the
environment, society, and traffic flow through an urban area that could originate due to SCA increasing its production volume and freight logistics activities to full capacities.

Access to the relevant data could not have been possible through the application of a single research method of either a qualitative or a quantitative research method. Therefore, the most appropriate research method for overcoming these complexities was through the use of a mixed method technique, which facilitated data collection for the entire scope of the research to reach comprehensive conclusions. According to Alexander et al., (2019), it is time that researchers use a research methodology that provides the opportunity to analyze events or procedures that revamp our understanding of the occurrences in research studies by applying mixed methods research approach into research studies. They further add that by adopting a single research method of either a qualitative or a quantitative method, can sometime make it possible for the researchers to miss valuable data and observation regarding the dynamic of the study. Likewise, the researcher can miss possible connections between data. Moreover, by embracing the rational of both these methodologies, effort can be made to establish the possibility of effectively relating the elements discovered to the subject of interest (McCusker & Gunaydin, 2015).

From this perspective, a mixed research method of both a qualitative approach (case study) and quantitative approach (simulation) in a single study can be done in a systematic manner, in two phases. The qualitative approach in the first phase and the quantitative approach in the second phase. By adopting a mixed research method, the underlying factors (theory) about the research aim can be establish first in the qualitative phase, and in the quantitative phase, further empirical support for the research aim can be obtained to support the theory and subsequently the entire study.

In this regard, a qualitative research is about understanding aspects of societal component, and its method of reaching a conclusion involves generating words, rather than numbers as data for analysis. As such, qualitative research study aims to answer questions about the ‘what’, ‘how’ or ‘why’ of a phenomenon (McCusker & Gunaydin, 2015). Specifically, this study was center around a qualitative case study approach to highlight why certain decisions were made, how they were implemented and the results. Accordingly, a qualitative research case study design is considered as an empirical method that seeks to investigate the depth of a phenomenon where barriers between the context and phenomenon is not clearly visible. From this perspective, due to the complex nature of this study, an instrumental case study approach was adopted to perform a study on a specific case to gain extensive appreciation of the phenomenon (Yin, 2018). Therefore, this was done to investigate the potential impacts that SCA freight logistics could have on the environment, traffic flow and urban residents due to its production increased, which contributed to the researcher(s) gaining extensive understandings of the phenomenon under study, and to developed a theory that highlights the factors of freight logistics impacts on the environment, traffic flow and urban residents as a result of companies increasing production volume.

Subsequently, the quantitative method approach was applied in the second phase of the study. Quantitative method aims to measure certain aspect (percentage) of something, particularly it uses statistics, mathematics and computerized techniques (Walter, 2013). This form of research method tries to answer research questions such as
how many, how much and to what extent (Rasinger, 2013; Rahman, 2016). Moreover, according to Singh, (2007) quantitative data has numerical records from measurement or mathematical figures, which can be classified as either metric or non-metric. A discrete metric nature can be applied in a mixture method research because the data collected under the quantitative approach comes from a simulation model, which was appropriate in this study, to account for the number of traffics on the road. This traffic data included trucks, public and private vehicles. According to Venkatesh et al., (2013) such technique contributes to the development process of a research theory.

One key advantage of using a quantitative approach is that its findings can be generalized (Carr, 1994; Rahman, 2016). However, the disadvantage of using this approach is that it neglects the social phenomenon aspects of the ‘what’, ‘how’ or ‘why’, and it fails to search deep into the problem to understand the meanings of those figures collected (Denzin & Lincoln, 1998; Rahman, 2016).

In conclusion, accordingly, a mixed research method was adopted (or can be adopted) to highlight why certain decisions were taken, how they were implemented and the results. Likewise, a mixed method can help the researchers to manages a research study that contains many different situations, variables, and multiple data sources. In this sense, it is appropriate for complex research studies. A mixed research method of both qualitative and quantitative research methods can facility the possibility for the researcher(s) to achieve the intended research purpose and answer the research question(s). In adopting a mixed method, the qualitative method be can use in the first phrase to collect formative data, which can then be tested and or supported for its effectiveness with a quantitative method in the second phrase.
6. Conclusion

The aim of this research was to investigate the environmental and societal effects that an increased production volume can have on dominant stakeholders in urban areas. A mixed research method was adopted to investigate and compare the current and expected outcomes of this production increased.

The results revealed that increasing of production volume wherein freight trucks are used to transport raw materials through urban areas can result into both negative and positive outcomes on the environment and society, and the traffic flow in such urban areas. These negative impacts can be in the form of increase in air pollutions from CO₂ emission, primarily emitted by vehicles due to the burning of fossil fuels of petroleum-based products like gasoline and/or diesel that are burn in a vehicle(s) internal combustion engine(s) in traffic, which can intensify during traffic congestion. An increased total CO₂ emission could lead to a rapid increase in greenhouse gas emissions, which can lead to global warming - attributes to climate change. However, this research does not reveal that the CO₂ emitted from SCA current freight trucks logistics activities has detrimental impacts on urban residents. Nevertheless, such CO₂ impacts in urban areas can be reduced by companies employing appropriate logistics transport strategies that are flexible, based on the simultaneous use of either two or all of the transport methods, involving rails, boats and/or roads transport to move raw material – and to reduce the level of road transport activities involving freight trucks. The rationale behind this is that firms can reduce the risks of global warming (or carbon risks) while increasing new business opportunities and long-term investment, and eventually achieve higher financial, environmental performance and competitive advantage.

Furthermore, freight transport can also create issues of road safety and increase noise pollutions for other road users and residents due to the increase in number of trucks on the subjected route. To resolve such impacts, the appropriate traffic and municipality authorities can form and enforce regulation that restricts freight trucks transport activities on certain route in urban areas, and/or constructing new road solutions or infrastructures to resolve some of these negative impacts.

However, on the positive side, there are societal benefits from production volume increased. From this perspective, such undertaking contributes meaningfully to the community, by creating jobs for residents within the municipality where the company is located, thereby improving the quality of life of urban residents. Moreover, the expansion of production volume can transform the residential landscape of the society, by attracting more people to migrate to such communities.

6.1 Theoretical Contributions

This study contribution to the field of academic in several ways. Firstly, in response of Pinelli and Maiolini, (2017) view that most research about companies’ resolution responses to society’s expectations and stakeholders’ interest on sustainable environment issues are often ineffective and lacks strategic thinking. From this perspective, the study contributes to the field of logistics by revealing a strategic approach that pinpoints the
explicit relationship between a company’s production volume increase, its related freight logistics, its influential dominant stakeholders and the outcomes of these relationships. Mainly, this study has provided new knowledge in tend of identifying the effects of a freight trucks logistics activities on the environment, society and the traffic flow through urban areas, due to production volume increased, and how these impacts can be managed. Second, from a research perspective, this study shed light on the use of mixed research method in a complex research study. It contributes by reinforcing Kong et al., (2018); and van Velzen, (2018) views of adopting mixed method research approach to multifaceted studies, where in this study move to add that a mixed research method is appropriate for complex research study, in which case, a mixed research method consisting of both qualitative and quantitative methods is appropriate. The qualitative method should be use in the first phrase to collect formative data, which can then be tested and or supported for its effectiveness with a quantitative method in the second phrase. Likewise, with mixed research method, researcher(s) can manage a study that contains multiple conditions, variables and data originating from different sources.

Finally, this research contributes by providing a conceptual framework that can be used as a lens to guide data analysis to reach research comprehensive results. The conceptual framework illustrates the relationship between three key segments “origin, impactor and outcome”. These relationship goes from the top to bottom on a vertical axis and a horizontal axis at the bottom. Both axes are labelled as the environmental and societal stakeholders, and output(s). It captures the beginning of the deriving problem(s) (origin), the contributors/influencers (impactor), and the results (outcome) from their relationship and connection to each other.

6.2. Recommendation and limitation

This research moves to recommend that firms that increase production volume should take into consideration the welfare of urban residence and other road users. Since such undertaking also produce negative impacts on the environment, society, and the traffic flow, it is essential for the dominant stakeholders (the traffic authority, the local municipality and the company) to jointly create strategize and put in place protective road safety, and environmental measures for all parties involved. Primarily, since the simulation model revealed issues of increased traffic density and road safety problems in certain areas (e.g. timmervägen and Järnvägsgatan), the Swedish traffic authority, the Timrå and Sundsvall municipalities and SCA should jointly workout modalities to ensure the safety and well-being of the urban residents.

In addition, it is recommended that this study be use as foundation for further research studies in the areas of firm increase production and logistics activities of freight transports in urban areas to create new knowledge in the field of logistics. From this perspective, the study provides relevant insights pertaining to sustainability, logistics, freight truck transport, corporate social responsibility, and simulation. Moreover, it clearly revealed the main scope of the research area that was addressed, which can help research to explore and build further on these subjects.

However, this study is limited to some degrees. While it focuses on dominant stakeholders, only one stakeholder per area of interest was represented in the
study, e.g. only on company, one governmental entity, one traffic management entity, and fewer residents were interviewed, which limits the overall data collection and perspectives from respondents, thereby limited the researchers to capture broader views on the subject matter. In addition, pertaining to the case of increase production volume, only one company (SCA) production volume increase project was researched, which limits the researchers from exploring and comparing multiple cases of production volume increase to generate in-depth knowledge about the subject matter.
Reference:


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https://doi.org/10.1109/IEEESTD.1998.87819


Website:

Appendix:

Interview Questions – Timrå Municipality
1- What is your position at the Timrå Kommun, and what is the specification of job?
2- Are you aware of SCA increase product activities? Do you know that several trucks are used to deliver raw materials to the production site in the Timrå kummun?
3. What is your opinion on SCA’s doubled production volume in general?
4. Do you have idea about the number of tracks currently using the same route used for the transportation of raw material to SCA?
5. What are your expectations for this SCA project (doubling production volume)?
6. Why do you think so?
7. Have there been similar situations where a company or companies in the kummun have carried out similar operations of increase production?
8. Are there people living close to these company’s production site? Particular in this current case of SCA?
9. Have the kummun even received complaints from other worker or residence living close to those companies/SCA production plants? What are the complaints if yes?
10. Where you informed forehand about this doubling of production? If so where the inhabitants and other road users informed as well? What was their reaction to this?
11. Can you provide us with the statistics of the number of tracks, public buses and private cars that use the same route as SCA when transporting their raw materials? How many traffic lights on the route? Around what time is the busiest?
12. Is there a difference on this traffic flow route during the various seasons of the year?
13. If you should make a recommendation that will benefits the Timrå Kummun, residence, road users and SCA in this operation of production increase, what will it be?

Interview Questions for Trafikverket
1. What is your position at the at trafikverket, and what is the specification of job?
2. Can you provide us with the statistics of the number of tracks, public buses and private cars that use the same route as SCA, when transporting raw materials?
3. How many traffic lights on the route? Around what time is the busiest?
4. In your opinion what can doubling of production volume cause on the traffic flow? And the Environment?
5. How there been similar cases in the past of increase production that traficverket had to deal with? If so, how was it dealt with to resolve increase of traffic congestion, reduce emission, and create safety measures of pedestals and other road users?
6. Have trafikverket received complaints from residence and other road users in the vicinity of SCA production site in Timrå? If so, what are some of the complaints? Is noise and safety part of the complaints?
7. What is your concern with this doubling of production volume?
8. Have there been similar situations where a company or companies in the kommun have carried out similar operations of increase production?
9. In your opinion is the transport by truck the best option? If yes why and if no what is your recommendation?
10. If you should make a recommendation that will benefits the Timrå Kummun, residence, road users and SCA in this operation of production increase, what will it be?
11. Do you have any thing you will like to add to this interview? Maybe there is something we have left out and you will like to add.

**Interview Questions for SCA**
1. Can you briefly tell us the logistics/transportation operations of SCA in terms of material and products transports?
2. Regarding this particular project to increase production at SCA Timrå plant, what is the most common routes by SCA to get raw materials?
3. By what means are you transporting raw materials (trucks, or trains)? and since we are particularly focusing on road transport in this thesis, what are the total number of trucks delivering materials to SCA Timrå plant on a daily basis?
4. Does SCA has plans to increase the total number of trucks making daily deliveries? If so, when and to what volume? During what time is loading and unloading taking place?
5. Around which time are the truck deliveries been made? Is it precisely around certain hours or random?
6. Which route do the trucks use for deliveries? Is delivery done on daily or weekly basis? Which time during the days is delivery done?
7. How many trucks expected for daily basis? Do you have consistence time for these deliveries?
8. Have SCA received complaints from residence or the Municipality about the truck activities along the route to the production plants?
9. After making the deliveries do the truck drive immediately back using the same route back.
10. At what time during of the day do loading and unloading of material occur? And, how long do it take to off-load
11. Do you have any idea about the traffic situation during the transportation of the raw materials?
12. Have you been approached by any stakeholders (municipality, inhabitants, traffic users) regarding your transportation of the raw materials?
13. What is your opinion about the doubling of the production volume? Any expected impacts on the environment, traffic flow and inhabitants?
14. Compared to other means of transport, which is more efficient and why is that?
15. What is your take on the environmental issues connected with doubling trucks on the road?
16. Since the issues of Corporate social responsibility and sustainability has become relevant to business operations and society?
17. In your opinion, do you think other road users (highway and nearby) will be affected with this doubling of production volume.
18. Have you received any complaints from the community or other road users about the logistics activities of these trucks?
19. Does the company own the delivery trucks, or you outsource to third party logistics?
20 Is there any other route you can use to reduce the number of traffic flow through the urban area?

**Interview Questions for residents**

1. What is your opinion on SCA’s doubled production volume in general?
2. In what way do you use the road? Driver or pedestrian?
3. Do you have any idea about the traffic situation during the transportation of the raw materials?
4. Have you come across trucks with raw materials on the road? What is your feelingly experience with it?
5. What is your opinion on doubling production for SCA pulp mill? And what is your opinion on releasing of toxins from the production plant into the environment?
6. What are your expectations for this SCA doubling of production?
7. What are the impacts in your opinion will this production have on surrounding cities?
8. What are some of the impacts you think can arise from this doubled production for human beings?
9. Have you heard of any complaints regarding transportation of raw material from other road users?
10. In your opinion what can be done to ensure safety on the roads for both trucks with raw materials and other road users?