



Sustainable supply chain initiatives in reducing greenhouse gas emission within the road freight industry

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Background: Global supply chains have evolved from a traditional simple supply chain to one that is filled with complexities and uncertainties. The increase in road freight transportation has resulted in an escalation in the emission of greenhouse gases (GHG) into the atmosphere, impacting climate change.

Objectives: The purpose of this article was to investigate the implementation of sustainable supply chain initiatives in reducing GHG emissions within the South African road freight transport industry.

Method: This research utilised a case study approach and used primary data, obtained through self-administered questionnaires, to explore the adopting sustainable transport management practices.

Results: The main drivers for implementing sustainable initiatives are pressure from consumer and brand protection, pressure from top management, and cost saving and revenue. Eco-driving, eco-routing and increasing vehicle carrying capacity are the most adopted sustainable supply chain initiatives implemented. The key benefits resulting from implementing sustainable initiatives were operational cost savings, improved competitive advantage and enhanced supplier relationships. Also, the lack of government support, lack of understanding of the cost and insufficient manpower were identified as the foremost challenges associated with the implementation of these sustainable initiatives.

Conclusion: The results reveal that organisations are placed under enormous pressure to implement sustainable practices. This study identifies various sustainable initiatives to reduce GHG emissions and addresses the associated benefits and challenges when implementing these initiatives.

Introduction

Over the past several decades, many organisations have experienced radical changes, particularly those organisations within the supply chain. The rate of change is increasing dramatically and, as a result, global organisations have to be responsive and agile, in a manner that will enable them to transform themselves in order to survive in a global competitive environment. According to Coyle et al. (2013:17), five main forces direct the restructuring of global supply chains, namely globalisation, technological advancements, empowered consumers, organisational consolidation and government regulations. The evolution of the technological landscape has resulted in a global economy that is competitive, multifaceted and increasingly volatile (Glowik 2017; Omatoya 2018). These changes have enabled organisations to interact with each other from great distances, at speed and at a time that is convenient to them. Quesada, Gazo and Sanchez (2012:35) elaborate that technology, such as telecommunication and computer-processing capabilities, allows supply chains to communicate with each other and reduce lead time, paperwork and other unnecessary activities, which result in improved customer and supplier relationships. In addition, the new era has brought about essential changes in individual consumer behaviour. With technology, such as the Internet, consumers have become more knowledgeable and can easily compare the quality and prices of products and services. This has resulted in a growing need and demand for a variety of products, which has influenced the need for changes in processes within the supply chain in order to be able to respond quickly to and satisfy these needs and demands. Prajogo and Sohal (2013:1535) further affirm that the implementation of technologies within the supply chain not only brings about many operational benefits, including cost reductions and improved service offerings, but also generates strategic benefits, such as innovation and product

planning improvements. The outcomes of these changes have led not only to a global business revolution, but also to a global supply chain revolution (Coyle et al. 2013:11).

Confronted with these complexities and the need to gain competitive advantage, organisations have increased production, which has resulted in an increased demand for natural resources, as well as an increase in the utilisation of various modes of transportation to deliver these products in a timeous manner. The increase in road freight transport has brought about acceleration in greenhouse gas (GHG) emissions into the atmosphere, effecting climate change. This upsurge in GHG emissions has led to a rise in global environmental issues, particularly concerns for global warming, which has been addressed in academic literature, government agendas, popular press, and by the general public (Seroka-Stolka 2014:302). The transport sector is acknowledged to be a main offender responsible for increasing carbon dioxide (CO₂) production owing to its considerable energy and fuel consumption (Sánchez-Generoso 2014:10). The road freight transport industry, one of the most perceptible facets of the supply chain, is highly dependent on fossil fuel and emits approximately 14% of CO₂, both at global and European Union (EU) levels and therefore is a chief contributor of GHG emissions (Chapman 2007:355; Dekker, Bloemhof & Mallidis 2012:3). The road freight transport industry affects both humans and the natural environment through the GHG pollutants it emits, which therefore makes it challenging for the industry to be sustainable (Pereseina, Jensen & Hertz 2014:2). The anticipated emissions level from the transport sectors, stressed by Ribeiro et al. (2007:325), is mounting at a higher rate in comparison to other sectors, and will be 80% higher than the present rate by 2030 unless a change occurs. The focus on environmental sustainability, driven by the increasing expectation from stakeholders and consumers, has resulted in the need for the freight transport industry to implement sustainable practices and to validate their environmental and ethical performance (Ashby, Leat & Hudson-Smith 2012:497).

Research problem

Global industrialisation has brought about an increase in activities within the supply chain, which affects natural resource depletion, generation of waste, climatic problems, emission of harmful gases and ecosystem disruption (Muduli et al. 2013:335). Increased awareness of this has led to an escalation in environmental concern. Sheu, Chou and Hu (2005:287) contend that a consensus is growing whereby issues pertaining to environmental degradation together with industrial development need to be addressed simultaneously within supply chain management, thereby resulting in a sustainable supply chain management. The road freight industry is a substantial facet within the supply chain and not only contributes to the economy, but also affects the environment (Havenga et al. 2016; Swarts et al. 2012). An earlier study by Van Essen (2008:10) reveals that emissions from other sectors have stabilised or

decreased; however, emissions from the transport sector continue growing.

Moreover, there is considerable research pertaining to GHG emission that emanates from the production of goods; however, research related to the emission by the freight transport sector is limited (Cristea et al. 2013:2; EPA n.d.; Eurostat 2018). This finding is supported by Pereseina et al. (2014:3) and Jofred and Öster (2011:1) who reveal that attention focuses more on the environmental impacts by the production of goods and personal transportation rather than road freight transport.

The freight transport industries are the major culprits for increasing the CO₂ emissions within the supply chain, as they are an enormous consumer of fuel, energy and warehouse energy. Kenney et al. (2014:1) support this by explicitly indicating that the transportation sector is one of the biggest contributors to GHG emissions. This is supported by Thambiran and Diab (2011a:2683), who state that globally the transportation sector contributes to about 25% of CO₂ emissions and that the road freight transport sector is responsible for 80% of this emission. Similarly, Wolf and Seuring (2010) indicate that the emissions are likely to increase by 70% by 2020. Velazquez et al. (2015:376) add that by conducting transportation business as per normal and not implementing sustainable practices can result in escalating the adverse climate change situation and that CO₂ emissions may surge by an additional 109% by 2050. This is a serious increase and it is thus imperative that freight transport industries develop strategies to mitigate these emissions and implement sustainable practices that integrate their social, environmental and economic responsibilities. This affirms that there is a gap in terms of research examining the sustainable supply chain initiatives implemented by road freight transport industries, specifically in South Africa. Thus, the primary research objective of this paper is to explore the consequence of implementing sustainable supply chain initiatives in reducing GHG emissions within the South African road freight industry. In order to achieve the primary research objective, specific research questions are stated, namely:

- What are the main drivers that lead to the adoption of sustainable supply chain initiatives in reducing GHG emissions?
- What are the sustainability initiatives that are implemented in order to reduce GHG emissions?
- What are the key benefits gained after implementation of sustainable supply chain initiatives in reducing GHG emissions?
- What are the challenges associated with the implementation of sustainable supply chain initiatives in reducing GHG emissions?

Literature review

Several factors have led to the reformation of the global supply chain. According to Coyle et al. (2013:7), five drivers have forced the supply chain to reform on a drastic scale,

namely globalisation, technological advancements, the empowered consumer, organisational consolidation, and government regulations. Globalisation and technological advancement have made the world a smaller place (Garrido et al. 2014:121; Matecki, Iwan & Kijewska 2014:215; Prajogo & Sohal 2013:1535). Organisations today compete on a global scale to satisfy the need for instant gratification demanded by consumers (Kießling, Harvey & Akdeniz 2014:672). With technological advancements dominating the world, consumers have become much more knowledgeable. Consumers have easy access to extensive databases or sources of information and can easily compare products and services in terms of several attributes (Labrecque et al. 2013:261). Saxton (2006:4) explains that the fundamental shift in consumer behaviour has taken over the economy and has resulted in the need for organisations to quickly adapt.

Stringent government regulations have changed the manner in which organisations operate. In addition, Coyle et al. (2013:11) further point out that deregulation by government of certain industries such as transportation, finance and communication has resulted in a rise in competition and has engendered changes in the manner in which organisations operate. In South Africa, the early permit system constrained the movement of goods by road between 1930 and 1990, and the government-owned rail network was the preferred mode for the movement of goods. However, with the progressive deregulation of freight transport, the prevalence and dominance of road freight transport escalated (Joubert & Axhausen 2011:3; Stander & Pienaar 2002:1).

Hence, these driving forces have resulted in a volatile global environment in which organisations are required to re-engineer their supply chain strategies to achieve and retain competitive advantage. Organisations are producing products at an extreme rate which has resulted in an increase in the usage of raw material and energy as well as an increase in transportation in order to get the products to consumers as and when demanded.

The adverse effect of the increase in production and transportation is an increase in GHG emissions. According to Mohajan (2011:22), GHG consists of six gases, namely: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), hydrofluorocarbon (HFC) and perfluorocarbon (PFC). Of these six, CO₂ is the most dangerous GHG owing to its natural high atmospheric concentration and heat-trapping ability. The emission of GHG is regarded as one of the factors resulting in climate change and its associated negative side effects. Byravan and Rajan (2015:71) mention that global warming will result in the rise of sea levels which will have dire consequences that are not just limited to the land we live on being covered with water, but will also result in wells being flooded with salt water, erosion of coastlines, recurrent floods and extreme storms. This is endorsed by Kumar and Imam (2013:85) who indicate that climate change has altered meteorology with resultant changes such as an escalation in temperature, sea

levels and precipitation on a global scale. There has been a change in ground water levels, soil condition and amplified frequency of intense climatic events. In support of this, El-Fadel et al. (2012:15) state that precipitation, together with a decline in water availability, results in the limitation of dilution effects, which forces communities to use water that is contaminated and can result in a considerable increase in water-borne illnesses, such as diarrhoea. In order to reduce or mitigate these adverse effects, it is imperative for organisations to develop sustainable initiatives to reduce GHG, especially within the transport industry.

With the exception of the foundational drivers such as global warming, change in climate, scarcity of raw material as well as natural energy resources, there are other drivers that have added pressure on organisations to implement sustainable initiatives. Some of these drivers include pressure from stakeholders, top management and employees, consumers and communities, and government; realisation of reduction in cost; increase in revenue; as well as technological innovations (Carter & Easton 2011; Diabat & Govindan 2011).

These internal and external drivers have forced organisations to implement sustainable initiatives. Sustainable initiatives enable organisations to measure their GHG emission levels and to examine possible ways to reduce them. According to Cullinane (2014:32), organisations can measure three scopes of emissions. This scope categorisation method was developed jointly by the International Greenhouse Gas Protocol Initiative (2001), the World Business Council for Sustainable Development, and the World Resources Institute, as follows (Cullinane 2014):

- **Scope 1 emissions** – those GHG emissions that are emitted directly from the sources that are controlled or owned by the organisation. Hence, the emissions from burning fossil fuels in vehicles as well as on site are examples of Scope 1 emissions.
- **Scope 2 emissions** – those GHG emissions that are emitted indirectly as a result of the generation of electricity, as well as activities associated with heating or cooling. These emissions can emanate from steam that is generated off site but purchased by the organisation. The emissions from chilled water or steam are examples of Scope 2 emissions.
- **Scope 3 emissions** – those GHG emissions that are indirectly produced from sources that are not directly controlled or owned by the organisation but associated with the organisation's activities. Employees travelling and commuting as well as solid waste disposal are examples of Scope 3 emissions.

In most cases, the GHG emission from transport companies is as a result of the amount and type of fuel being utilised (Scope 1). According to Thambiran and Diab (2011b:6658), although fossil fuel-based energy has been a key driver of economic and social development throughout the world, it is at the same time the root cause of current environmental problems. Thambiran and Diab (2011b:6658) further explain

that even with the availability of non-fossil energy, demand remains for fossil fuels as the primary energy source. Reducing the emissions produced by freight transport industries can be done by cautious administration such as the supervising of load factors, decreasing the distance that transporters travel, and employing advance routing and scheduling systems (Rogers & Weber 2011:752). Other strategies that organisations have implemented include eco-driving (Barkenbus 2010; Cullinane 2014; Mudgal, Hallmark, Carriquiry & Gkritza 2014:20); eco-routing (Boriboonsomsin et al. 2012; Scora, Boriboonsomsin & Barth 2015; Zeng, Miwa & Morikawa 2016); modal selection (Brogan et al. 2013; Protopapas, Kruse & Olson 2013; Van Essen et al. 2009); alternative fuel usage (Cullinane 2014; Solomon 2010); improving freight logistics efficiency (Greene, Baker & Plotkin 2011); and alternative technical opportunities, such as low rolling resistance tyres, engine development, air resistance reduction, improving carrying capacity, lightweight vehicle construction and hybrid propulsion for distribution trucks (Van Essen 2008). Mudgal et al. (2014:20) found that aggressive driving can contribute to 40% higher fuel consumption compared to normal driving, and hence increase the GHG emission. Although fossil fuel remains a primary energy source, organisations are beginning to focus on biofuel as a renewable energy source. Bio fuel includes an extensive range of fuels, which are derived from biomass (Awudu & Zhang 2012:1360).

Taking cognisance of the above, this study firstly aims to determine the drivers that lead to supply chain organisations adopting sustainable practices; secondly, to identify the various sustainability initiatives that have been implemented in order to reduce GHG emissions; thirdly, to identify the perceived benefits obtained from implementing these sustainable supply chain practices; and finally, to identify the associated challenges of implementing these sustainable initiatives.

Research methodology

To explore the justification and consequences of implementing sustainable supply chain initiatives in reducing GHG emissions, a case study approach was adopted. A leading South African logistics and supply chain management service provider with several operating companies, with an approximate fleet size of 6000 vehicles under their management, was selected. The survey questionnaire was distributed to around 150 employees involved in sustainability management in 13 logistics operating companies and 108 responded.

The research instrument consisted of five separate segments. The first section included questions regarding general information about the respondents; the second section included questions to obtain perspectives on the driving forces for the adoption of sustainable practices and the main activities that emit GHG; the third section requested information about the various sustainable initiatives implemented and project investments made; the fourth section requested the respondents to indicate the benefits

achieved due to the implementation of sustainable initiatives, including project returns and cost savings realised, and the last section requested information regarding the perceived challenges associated with the implementation of sustainable initiatives. The survey data were analysed using SPSS for Windows version 23. The reliability of the survey instrument was assessed to ascertain the internal consistency. The Cronbach's alpha coefficient values for Sections 2–5 ranged between $\alpha = 0.77$ and $\alpha = 0.91$, which indicate that the internal consistency is acceptable (Field 2013).

Research results

Demographic profile

The results indicate a respondent gender split of 68.5% male and 31.5% female, which represents the gender configuration within the case study organisation. The majority of the respondents involved in sustainability initiatives were middle management (57.4%) and top management (22.2%), with an average work experience of more than 16 years and more than 60% of the respondents had completed tertiary qualifications. When queried on their understanding of the concept of sustainability, nearly half of the respondents (45.4%) indicated that sustainability is a balance between finance, people and environmental dimensions.

Activities contributing to greenhouse gas emission

Various activities within the organisation contribute to the level of GHG emitted into the atmosphere. To determine this, respondents were asked to indicate, based on a five-point Likert-type scale, the extent to which specific activities contribute to GHG emission within their organisations. The mean scores on each of the activities are depicted in Figure 1. Outbound (4.08) and inbound (3.79) transportation were ranked as the activities that contribute most to GHG emissions. This is probably owing to the fact that the company has a large fleet of vehicles. Other Scope 1 contributors to GHG emission are the consumption of paper (3.50) followed by business travel by car (3.13). In fifth position is a Scope 2 contributor, namely purchased electricity (3.13). Being aware of these detrimental environmental impacts, the company adopted various sustainable initiatives to reduce GHG emissions.

Drivers of sustainable initiatives in reducing greenhouse gas emission

Respondents were asked to indicate the major drivers and activities that result in GHG emissions within their organisation. Based on literature, eight potential drivers were identified and a five-point Likert-type scale, ranging from *to no extent* (1) to *a great extent* (5), was used to score the respondents' level of agreement with the different drivers of sustainable initiatives (Figure 2). The top four drivers are pressure from consumers and brand protection (3.56), pressure from top management (3.53), cost saving and revenue (3.47) and pressure from government (3.43).

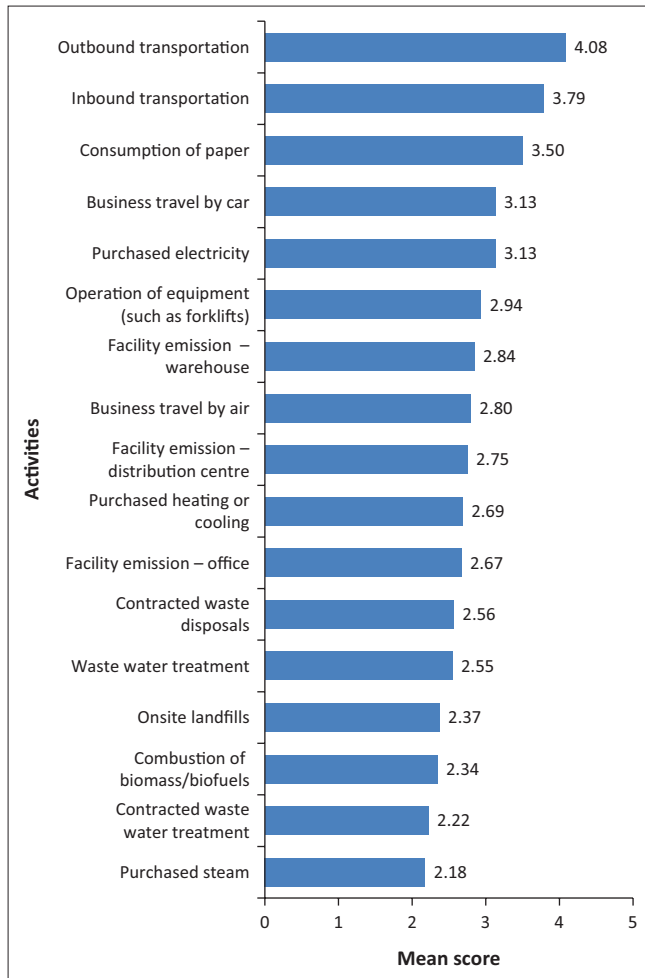


FIGURE 1: Activities contributing to greenhouse gas emission (mean scores).

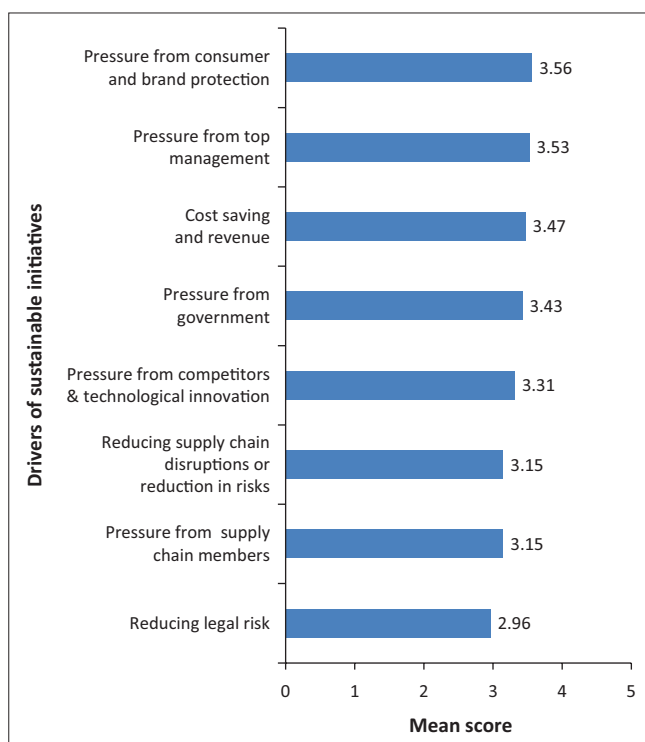


FIGURE 2: Drivers of sustainable initiatives in reducing greenhouse gas emission (mean scores).

Literature reveals that consumers are one of the main driving forces that resulted in the evolution of supply chain management (Coyle et al. 2013; World Economic Forum 2015). Furthermore, consumers are becoming more knowledgeable and are demanding services and products that are environmentally friendly (Labrecque et al. 2013). Further to this, protecting the brand image is essential. A poor brand image can lead to reduction in consumers and hence a reduction in sales and revenue (Ataman & Ülengin 2003; Dertwinkel-Kalt & Köster 2017). To prevent the organisation from losing their customers together with preventing the brand image from being tarnished, top management are now adding pressure to implement sustainable practices (Marshall & McCarthy 2013). This is supported by Kashmanian and Moore (2014:13) who state that management now recognises the fact that their operational performance can impact their reputation and that consumer demands add extreme pressure on organisations to implement sustainable supply chain initiatives.

For every organisation, reducing cost and increasing revenue is one of the core strategic goals and therefore having cost saving and revenue as the third most important driver is appropriate. Pressure from government was ranked as the fourth most important initiative. Government legislation and policies are forcing organisations to implement sustainability initiatives to comply with this legislation. To avoid legal costs, organisations are adopting sustainable practices. The fifth important driver of sustainability initiatives was pressure from competitors and technological innovation (3.31). Being seen to be environmentally conscious by existing and potential customers can give an organisation a competitive advantage.

Sustainable transport initiatives

The resultant effects of the various drivers necessitate organisations to implement various initiatives to reduce GHG emissions. Respondents were asked to indicate the sustainable transport initiatives already implemented (or planning to implement over the next 12 months) within their logistics operating firms (see Figure 3). The top three most implemented initiatives were eco-driving (62%), eco-routing (routing and scheduling) (60.2%), increasing vehicle carrying capacity (58.3%) and improving freight logistics (58.3%). Driving in a manner that is environmentally friendly has gained importance as part of an overall strategy to reduce GHG emissions (Barkenbus 2010; Cullinane 2014; Ericsson, Larsson & Brundell-Freij 2006; Mudgal et al. 2014). A study conducted by Luke and Heyns (2014) indicated that speeding, harsh braking and aggressive accelerating, which increase fuel consumption, are some of the main causes of risky driver behaviour in South Africa. Such driving cannot be considered to be eco-driving. With a large vehicles fleet eco-driving becomes a critical sustainable transport initiative.

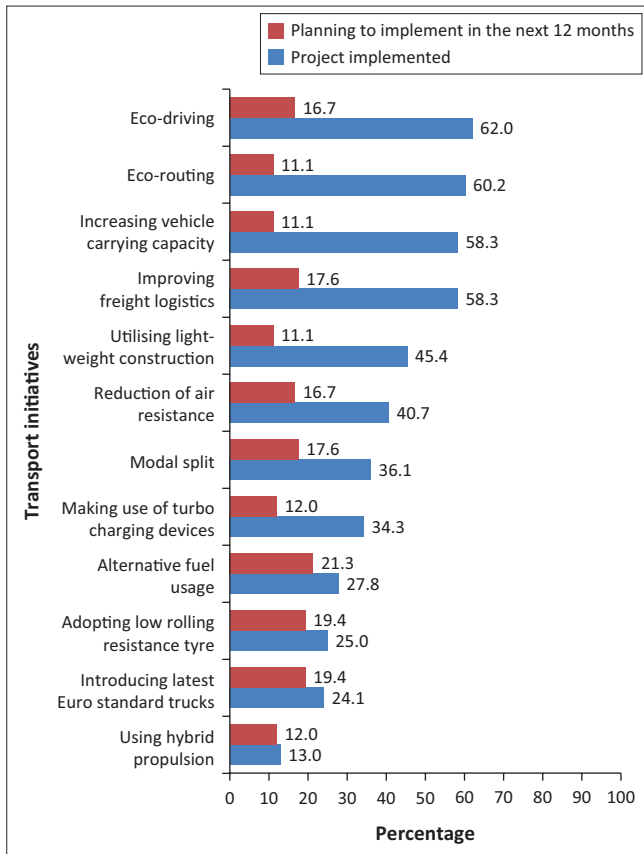


FIGURE 3: Sustainable transport initiatives.

Benefits of implementing sustainable supply chain initiatives

In addition to the financial benefits, organisations realised other benefits, including enhanced brand image and customer loyalty (Bansal & Hunter 2003; Bonini & Swartz 2014; Malecki et al. 2014; Naidoo 2014; Srisorn 2013). Based on the literature, a list of potential benefits of sustainable supply chain initiatives was identified and the respondents were asked to indicate the level of achievement for these benefits. A five-point Likert-type scale, anchored in *strongly disagree* (1) and *strongly agree* (5), was used to assess the level of achievement of the different benefits of sustainable initiatives. The mean scores in Figure 4 indicate that the top three benefits, as indicated by the respondents, were operational cost savings (3.99), increased competitive advantage (3.97), and improved supplier relationships (3.96). The majority of sample organisations aim to achieve cost savings, gain competitive advantage and improve relationships among suppliers and customers. This ultimately enhances the brand image as well as improves processes. However, even though there are various benefits that the organisation realises after implementation of sustainable initiatives in reducing GHG emissions, there are also various challenges.

Challenges in implementing sustainable supply chain practices

Respondents were asked to rate, on a five-point Likert-type scale, the perceived magnitude of the specific challenges that were experienced when implementing the sustainable

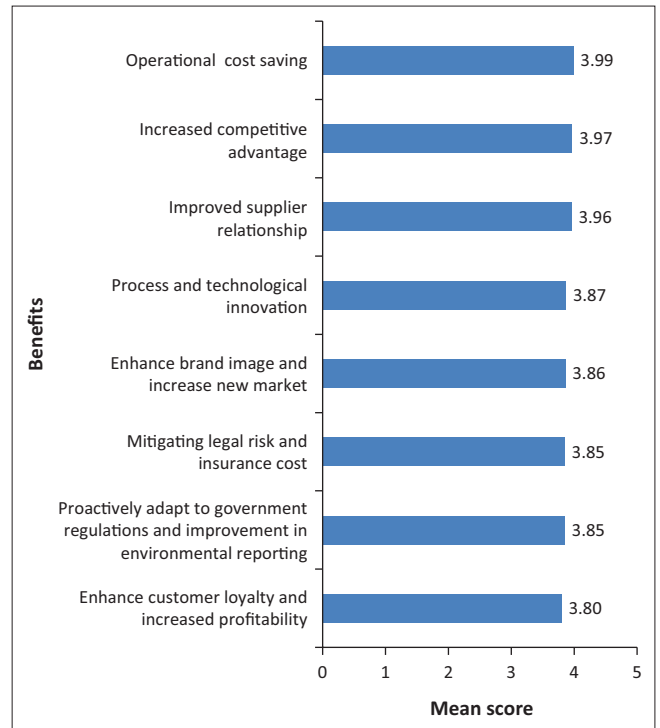


FIGURE 4: Benefits of implementing sustainable supply chain initiatives.

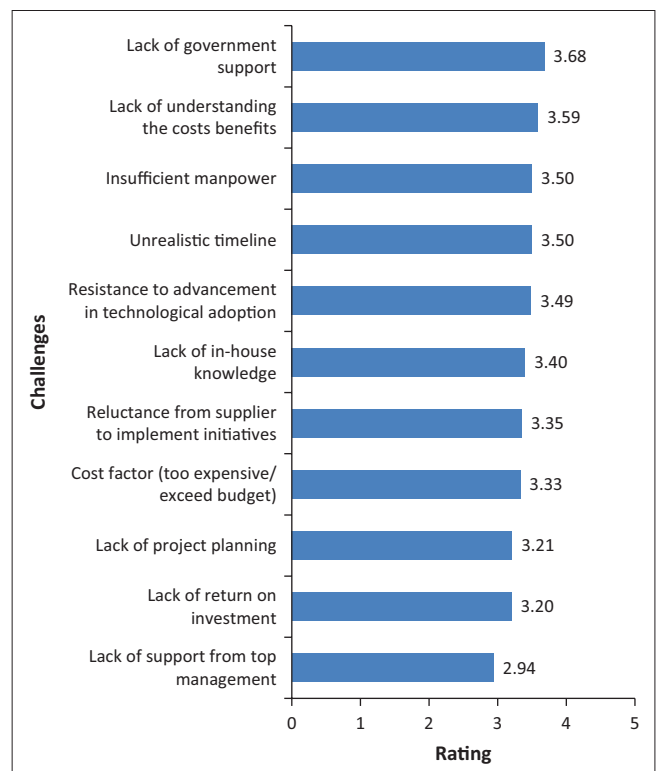


FIGURE 5: Challenges in implementing sustainable supply chain practices.

initiatives. As depicted in Figure 5, respondents indicated that lack of government support (3.68), lack of understanding of the costs (challenges) or the benefits (3.59), insufficient manpower (3.50), and unrealistic timelines (3.50) are the highest ranked challenges. Scrutiny of the results brings out the fact that lack of government support was perceived as the highest ranked challenge. However, it was disclosed

earlier (see Figure 2) that pressure from government was the fourth highest perceived driver. The explanation for the apparent paradox could be that although government enforces various legislation and policies, thereby adding pressure on organisations to implement sustainable initiatives, there is a lack of government support in terms of incentives and rewards.

The second highest challenge is the lack of understanding of costs and benefits, which may result in the companies in the case study company being sceptical of implementing sustainable initiatives. Lack of top management support was found to be the least experienced challenge as pressure from top management is one of the drivers that enforces organisations to implement sustainable practices. Pressure from top management (see Figure 2) was ranked as the second highest driver for the implementation of sustainable initiatives and, in terms of challenges, was ranked last, suggesting that it was not a major challenge. Top management is increasingly becoming aware of sustainable practices and as a result is adding pressure on the organisation to implement these practices.

Difficulty in implementing sustainable initiatives

To further analyse the challenges of implementing sustainable initiatives, respondents were asked to indicate the level of difficulty in implementing these initiatives. The most difficult initiatives to implement were also the top five least implemented initiatives, namely hybrid propulsion, using

alternative fuel, adopting rolling resistance tyres, introducing Euro standard trucks, and making use of turbo charging devices.

Sustainable initiatives decision-making

Finally, respondents were requested to indicate the importance of sustainable decision-making in terms of vendor selection, material to be procured, energy and water consumption, and waste reduction. On a five-point Likert-type scale, more of the respondents indicated these five factors were very important when making decisions while some respondents indicated that it was important. Very few respondents stated that it was not important at all. This is depicted in Figure 6.

Conclusion

A fundamental change in the global economy has resulted in the necessity for supply chains to evolve from traditional simple supply chains to dealing with complexities and uncertainties. Five forces, namely globalisation, technological advancements, empowered consumers, organisational consolidation and government regulations have driven this reformation within the supply chain. As a result, organisations within the supply chain have been forced to re-engineer their processes and strategies in order to remain competitive and operative. This change has created an over-production of products and hence an imbalance between demand and supply. With the increased production, there has also been an upsurge in the movement of goods by different modes of

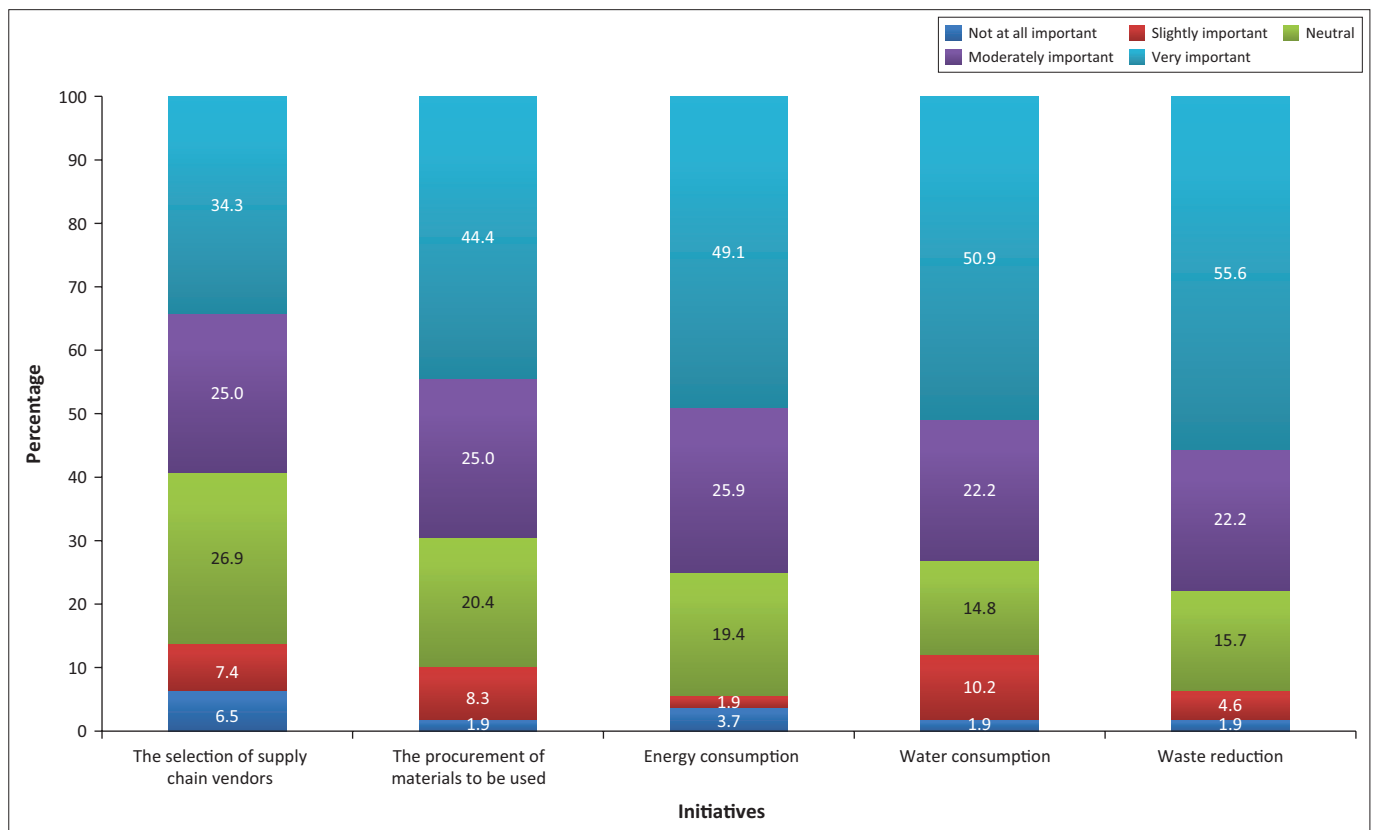


FIGURE 6: Sustainable initiatives decision-making.

transportation, particularly within the road freight industry. The increase in road freight transportation has resulted in an escalation in the emission of GHG into the atmosphere, resulting in climate change. The adverse effects of these gases have intensified concerns of various stakeholders, consumers and society and consequently organisations have been pressurised to implement sustainable supply chain initiatives to reduce GHG emissions.

The aim of this paper was to investigate the implementation of sustainable supply chain practices to reduce GHG emissions within a prominent South African road freight company. In order to achieve the research objective, the following research questions were answered: What are the main drivers that lead to the adoption of sustainable supply chain initiatives in reducing GHG emissions? What are the different sustainability initiatives that are implemented by freight transport organisations? What are the key benefits and challenges experienced by South African road freight organisations when implementing sustainable supply chain initiatives to reduce GHG emissions?

Firstly, the results indicate that the top three drivers to implement sustainable initiatives are pressure from consumer and brand protection; pressure from top management; and cost saving and revenue. This is strongly aligned with the literature that indicates that consumer demands present considerable pressure to implement sustainable supply chain initiatives (Kashmanian & Moore 2014). Cost plays a fundamental role in the success or failure of any organisation. The results confirm that there is considerable pressure on the road freight organisations to implement sustainable initiatives, especially as the industry is notorious for emitting high levels of GHG.

The results indicate that the most implemented sustainable initiatives in reducing GHG emissions are: eco-driving, eco-routing (routing and scheduling), increasing vehicle carrying capacity, improving freight logistics and utilising lightweight vehicle construction. Inefficient and unsafe driving habits not only affect GHG emissions but also increase vehicle operating costs (e.g. higher fuel consumption and maintenance costs), insurance costs (i.e. increased risk profile) and damage corporate image. These results are strongly aligned with the literature, which indicate that eco-driving is an important strategy to reduce operating costs and associated risks.

It seems that the main benefits derived from implementing these sustainable supply chain initiatives were operational cost savings, increased competitive advantage, and improved supplier relationships. Additionally, the results demonstrate that the operating companies do not merely act to gain financial rewards but also embrace their responsibility in sustaining the business and the environment. The implementation of sustainable initiatives reduces the companies' vulnerability to escalating energy costs and ultimately enables them to reach their set CO₂ emission targets.

Finally, the research identifies the various challenges organisations experienced when implementing sustainable supply chain practices to reduce GHG emissions. The main challenges are: lack of government support; lack of understanding of the cost and benefits; and insufficient manpower. Although respondents disclosed that pressure from government was an important driver in implementing sustainable initiatives, most of them are of the opinion that government does not provide sufficient support to organisations in terms of incentives. The lack of understanding of the costs and the benefits of sustainable supply chain initiatives was a dominant challenge. This can result in organisations not implementing sustainable practices. Thus, organisations need to conduct more studies pertaining to the feasibility of sustainable initiatives to be implemented. This should include cost factors, time constraints, and capital required. Road freight transport organisations should familiarise themselves with the concept of the sustainable supply chain management and implement more training programmes within their organisations to inform all employees of the importance of sustainable supply chain practices and introduce guidelines and frameworks to successfully implement sustainable initiatives.

It is recommended that future research studies on the implementation of sustainable supply chain initiatives in other logistics and supply chain service providers, which also include other transport modes such as air, sea and rail services, in South Africa should be conducted.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

H.M. and G.J.H. both contributed to the writing of this article. This article was derived from the master's dissertation of H.M. that was completed in 2017. G.J.H. was the supervisor of H.M.'s master's dissertation.

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