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Can the motor vehicle manufacturing industry be sustainable? Exploring the relationships between profitability, the green economy and environmental sustainability in South Africa

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Abstract: This paper discusses the applicability of environmental sustainability initiatives within the motor vehicle manufacturing industry in South Africa. Sustainability principles remain contested because of divergent interpretations although several studies have suggested the concept refers to using resources to meet intergenerational societal needs, whilst ensuring ecological conservation. The South African manufacturing industry which houses vehicle manufacturing has been identified as a suitable industry for pursuing sustainability principles, largely because vehicle industries yield resources and power that can facilitate mainstreaming a green agenda under the 'green growth path' the country has adopted. Using secondary and primary data collected through an extensive literature review and a pilot study, this paper discusses how the automotive industry can align itself with environmental sustainability principles within regulatory structures on a national, regional and global scale. This has been analysed vis-à-vis current debate on the relationship between the 'green economy' and sustainable development, emphasising on environmental sustainability.

Keywords: sustainability; green economy; motor vehicle manufacturing; environmental management systems; EMS; South Africa.

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1 Introduction

Rapid development initiatives that increased production demands and a constant movement away from agricultural societies into manufacturing oriented economies characterise the 21st century society (Swilling, 2010). Manufacturing industries play a central role in the economies of most countries and have been cited as major contributors to environmental degradation (Strike et al., 2006). This can be tied directly to the manufacturing industries' intensive and extensive consumption of natural resources that form the basis of production. Vehicle manufacturers, for example, make use of iron ore for steel production, aluminium and petroleum for plastic, animal hides for interior lining and leather seats, copper for starter motors, wood for interior panels and rubber for tyres, all of which are resources that are directly extracted from the environment and involve the use of heavy machinery which may not be environmentally friendly (Strike et al., 2006). Strike et al. (2006, p.851) identify the motor vehicle manufacturing industry as a 'pollution-intensive industry' that has a tendency of vacillating between acting responsibly and irresponsibly in environmental protection initiatives. It has been argued that profit oriented corporations, from as far back as the 1960s and 1970s, have been in denial of the effects resource extraction has on the physical and natural environments (Hart, 1997).

Petrella (2000), for example, is of the view that manufacturing in capitalist societies has been predominantly driven by profit attainment, seeking competitive edge and outsmarting rival products at the expense of environmental wellbeing and sustainability. Edifying this observation, Markandya (2009) asserts that capitalist societies are now characterised by private ownership of wealth and a relentless quest for profit in production. The motor vehicle production industry forms part of the corporate world and it is part of the manufacturing sloth that plays a significant role in natural resource extraction, exploitation and utilisation. Despite the assumed resource intensity, the industry operates in diverse global environments, which are controlled by different regulatory systems, structures and market forces (Zhu et al., 2007). These systems and mechanisms may have varying influences on the extent to which the industry utilises environmental resources and practices sustainability.

The process of globalisation and technological transformation has in a big way triggered the formation of complex systems, structures and links in terms of information flows and resource distribution. In order to compete globally, many firms have now started franchises, joint ventures, licensing, subcontracting agreements and have created boundaries of monopolies in terms of market and resource access (Van Veen-Groot and Nijkamp, 1999). Srivastava (2007) for example, refers to these global agreements as

mega-ventures and mega-alliances aimed at capturing the market and securing rights of access to specific natural resources.

Motor vehicle manufacturing industries are capital intensive compete aggressively for natural resources globally thereby contributing directly and indirectly to significant environmental changes and degradation. The emergence of technological innovations and advancements for example, has enabled industry to access and exploit natural resources at unprecedented levels. These developments have in a way led to increased environmental dilapidation and destruction both at local and regional as well as global levels (see Swilling, 2010). Technological developments and advancement as observed by Abdul-Wahad and Marikar (2012) have afforded the manufacturing firms with valuable information, equipment, machinery, as well as huge financial resources which have made it easier to access and extract natural resources in large quantities spreading over large geographical scales and within shorter periods of time. Although these developments have improved production processes significantly through computerised systems, highly mechanised robots and a wide range of sophisticated machinery – they have also contributed numerous negative impacts on the environment and associated ecosystems (Borghesi and Vercelli, 2003). Naturally occurring resources, as argued by Abdul-Wahad and Marikar (2012) are constantly being exploited to meet and satisfy increasing human needs and demands. In the process the intrinsic and irreplaceable value of natural resources is trivialised as the goal is to supply more natural resources in order to meet increased demand (Domosh et al., 2015). Marvasti (2000) emphasises that disregarding the environment has resulted not only in the exploitation of natural resources, but also in environmental degradation resulting in contemporary challenges associated with changes in the ecological footprint, climate change and environmental pollution (Van Veen-Groot and Nijkamp, 1999).

It must be noted that the vehicle manufacturing industry to a large extent, draws heavily on government policies that have been developed with a view of promoting economic prosperity and growth, as well as national development. Munasinghe (1999) for example, argues that while national policies are developed to address development issues, they inevitably have negative environmental implications if managed and implemented solely from a profit perspective. The drive for profitability exhibited by multinational organisations and governments has pushed the environmental conservation agenda to the periphery and environmental stewardship has become a rare item in policy discussions and dialogue (Medarevic, 2012). Analysing profit-oriented production, Petrella (2000) identifies economic and political leaders as the major proponents of this system, which creates conducive environments for corporate firms at the expense of the natural environment. He ascertains that 'individualism, marketism and capitalism' are the three principles that form the basis of contemporary societal organisation and operations and these systems have been in practice for over 25 years (Petrella, 2000).

Capitalism as a principle is concerned with wealth (financial) generation and places value on financial profitability. This system promotes the creation of financial capital and is markedly against anything that hinders profitability (Petrella, 2000). The continual transformation of capitalism has afforded transnational corporations immense power over governments, people and the environment (Medovoi, 2002). The motor vehicle manufacturing industry, like most industries, operates on the principle of profit making and is thus heavily embedded and strongly tied to capitalistic influences. These

influences manifest in different ways, but one of the most viable influences has been in increased mass-production of cars and this has been accompanied by aggressive marketing using technologically advanced advertising systems to push up both production and sales. This is done through a strong political narrative and citizenry consumptive behaviour that largely supports production as a means for both economic growth and national development as illustrated in the South African motor industry development plan (MIDP) (Freund and Martin, 1996). While several vehicle manufacturing companies claim to conduct their activities in a sustainable way, Freund and Martin (1996) express the opinion that environmental issues are often ignored in these companies' strategic development plans and that sustainability is often used as a guise to promote the marketability of their products (Spencer et al., 2010).

Corporate social responsibility (CSR) initiatives for example have been adopted by manufacturers to cover a wide range of activities such as human resources management, environmental protection and societal well-being to cite a few (Sheikh and Beise-Zee, 2011). These initiatives emerged as a result of increased pressure on companies to act as good citizens and are designed to improve company reputations within controlled expense parameters to protect shareholders' investments whilst ensuring profits remain favourable (Sheikh and Beise-Zee, 2011). CSR is largely explained under sustainability and companies use it as a business promotion and marketing tool thereby, inadvertently shadowing the importance of environmental sustainability in the process (Du et al., 2010; Sheikh and Beise-Zee, 2011). It has been argued however, that CSR to some extent alleviates some of the ills on the environment, but benefits do not always accrue to the directly affected environment and communities (Sheikh and Beise-Zee, 2011). In fact, Carroll and Shabana, (2010) are therefore, of the view that CSR is usually adopted as a business strategy aimed at increasing the visibility of a corporate entity and financial success, whilst ensuring the reduction of its social and political costs (Du et al., 2010).

In view of the above observations, this paper explores the extent to which the automotive industry in South Africa positions and aligns itself with environmental sustainability principles within the contemporary regulatory structures which exist on a national, regional and global scale. South Africa as an emerging economy is not immune to developmental pressures and the subsequent global responses linked to industrial activity. Kehbila et al. (2009) for example, point out that vehicle manufacturing dominates the South African economy, but simultaneously contributes significantly to incorrect waste disposal, deterioration of air quality, noise pollution, degradation of land and marine environment and loss of biodiversity.

Despite the above assertion, the vehicle manufacturing industry and its implications on the environment and in a South African context remains an area that is poorly understood due to the absence of information. There is a dearth of information on how the motor vehicle industry has utilised environmental management systems (EMS) to ensure effective and sustainable use of environmental resources while promoting sustainable development (Kehbila et al., 2009). Moldan et al. (2011), for example, highlight that sustainability can be categorised into three distinct pillars namely social, economical and environmental sustainability and all these pillars determine whether development is sustainable. Environmental sustainability focuses on bio-geophysical aspects and deals with maintaining or improving the quality of earth's life supporting systems (Vallance et al., 2011). With this understanding therefore, this paper is an attempt to initiate dialogue and debate on the relationship amongst the motor vehicle industry, environmental wellbeing and sustainability. Moldan et al. (2011) for example,

observe that environmental sustainability issues have been discussed to some extent within contemporary literature and discourses in development studies as well as policy debates and dialogues. Much of these discussions have focused on the role of environmental management in promoting sustainable development and the green economy (Vallance et al., 2011). However, very little effort has been dedicated to exhaustively make the link between the broader relationships of the vehicle manufacturing industry with environmental sustainability, a realm that this paper addresses.

2 Research approach

This paper is based on an extensive desk research and a pilot study that was conducted between March and June 2015. The desk study involved an extensive review and synthesis of various pieces of existing literature on corporate firm resource use, the green economy and environmental sustainability in the vehicle manufacturing and production industries. An initial literature search was conducted through the use of different E resources involving an exploration of a number of academic sources such as Scopus, Airiti Inc., JSTOR, Lesson Planet and ORCID, all of which are multidisciplinary databases and search engines. Key phrases such as green economy, sustainable vehicle manufacturing and profitability were entered into the search engines. Through this extensive search of literature an estimated number of 220 articles focusing on different topics within the discourse of environmental management, vehicle production and sustainability were yielded.

A rapid appraisal of these articles using tools inspired by the process of meta-analysis was employed and resulted in the streamlining of articles focusing on sustainable vehicle manufacturing both on global and regional levels. This exercise resulted in the selection of 30 peer-reviewed articles, working papers and policy documents being included in the study and formed the basis for this paper. In addition to electronic resources searches, other sources of information were explored and these included materials obtained from different university libraries and other research institutions such as the Human Sciences Research Council (HSRC). These materials were in the form of textbooks, monographs, conference papers, grey and other print media materials. A search of these yielded a total number of 18 different pieces of literature with eight articles focusing on sustainability issues in developing countries. In total therefore, 56 articles and books were selected, reviewed, analysed and synthesised and they form the basis for this paper.

In order to have an in-depth understanding of processes within the vehicle manufacturing industry, primary data was also collected through a pilot study involving three vehicle-manufacturing plants in South Africa. The pilot study was conducted between September 2015 and November 2015. The selection of the three vehicle manufacturing industries was performed through the use of a lottery system in which all the names of the major vehicle manufacturing industries operating in South Africa were allocated a unique number and placed in a box. It was decided to randomly draw three numbers and these yielded BMW, VW and Mercedes South Africa. Initial contact was established through their respective public relations offices and the snowball technique was then applied to identify the relevant research participants. Using this technique, ten managers and environmental experts were identified and selected to form a focus

group, while four officials from the Department of Environmental Affairs (DEA) and four officials from the Department of Trade and Industry (DTI) were identified to become key informants. In total, 18 expert research participants were identified, selected and included in the study and provided part of the information on which this paper is based.

3 Corporate firms, sustainability and profitability: a conceptual framework

Motor vehicle production is intricately linked to various production industries within the global and national economies. Vehicle production relies heavily on resources and processes that come from other sectors of the production chain: agriculture, mining, energy, water, etc. Thus, the motor vehicle industry has both direct and indirect impacts on the environment. In view of this assertion, it becomes imperative for motor vehicle manufacturers to rethink their production processes and the way in which these activities can align with sustainability ideals and norms. Hughes (2011), for example, argues that the manufacturing industry, both on a global and local level, is among the industries with the potential of propagating the principles of sustainable development through effective and efficient ways of natural resource use.

The automotive industry, like other corporate organisations, commands significant influence and power on nearly all subsectors of a country's economy, development ideologies and strategies and as such the industry is strategically positioned to articulate and implement specific production practices that would be in alignment with both global and local processes. The OECD/Martinez-Fernandez et al. (2010, p.5) argue that, "the global financial crisis has stressed the need to look at our economic growth model through new lenses and a much more critical approach to our consumption and production practices. The opportunity to rethink global growth models, within the challenge of moving towards a cleaner, low-carbon economy is mobilising intelligence and innovative thinking worldwide to identify policies, measures and strategies for future green growth." Thus, manufacturing can play a pivotal role in this transition as it is at the centre of extensive natural resource extraction and utilisation. Given the complexities surrounding resource sourcing, it has been argued that the fight against resource exploitation moving towards sustainable futures must begin, among others, with the manufacturing industry (Bowen and Kuralbayeva, 2015; Bird and Lawton, 2009). The drive towards preserving the environment and the resources therein, must therefore, be accompanied by the development, adoption and implementation of strategies and policies that ensure efficient resource use, in ways that promote social-economic and ecological wellbeing on an intergeneration scale. With contemporary contestations surrounding the sustainability concept, it becomes imperative to explore whether vehicle production can be considered a sustainable industry, contributing towards the transition from brown to green jobs and economies.

Sustainability as a concept still holds contested definitions despite the Brundtland Commission's elaborate definition: "meeting the needs of the present without compromising the ability of future generations to meet their own needs" [see United Nations World Commission on Environment and Development, (1987) p.8]. Although this definition has been criticised in relation to its practicability in adopting economic

growth models and its heavy dependency on non-renewable resources, it is generally accepted as a framework through which to rethink current development paradigms and approaches, as well as redefine the human-environment interactions on a longevity basis (Ahi and Searcy, 2013). It has been argued that the heavy reliance and the extensive nature of non-renewable resource exploitation by manufacturing industries have directly compromised the ability of present generations to meet their needs. High poverty levels, increased food insecurities, climate change and environmental degradation, have subjected the poor in deprived regions to untold levels of misery. In the context of these trends it becomes difficult to imagine what sustainability really is or what it should entail.

Despite shortcomings in the sustainability discourse, development as a process of change has been identified as a pertinent process that should consider how the natural environment overarches social and economic processes (Blewit, 2008; Elliot, 2011). The assumption is that social and economic processes are dependent on the nature and quality of the environment (Elliot, 2011). While the foregone assertion forms the normative basis for imagining and thinking about sustainability, contemporary and misguided enlightenment ideals have tended to promote the notion of dominancy over nature in the name of promoting human progress and development (Gray, 2010). The emphasis on the use of EMS with specific reference to international standards of operation (ISO) 14000, the emergence of green growth and green economy ideals is a clear indication that environmental sustainability has not been properly addressed. Adopting such initiatives is an attempt to outpace the current environmentally damaging development initiatives (Borel-Saladin and Turok, 2013).

Powerful corporations as major actors in environmental exploitation have in most instances twisted the meaning of sustainability. Gray (2010) points out that sustainability at corporate levels is explained loosely as social responsibility or CSR. The effect of this definition is that sustainability or sustainable development is trivialised or misrepresented (Milne et al., 2009). In fact, the use of terms such as corporate sustainability or corporate reporting as observed by Bassen et al. (2005) show how corporates use a range of terms to persuade the public that they operate in harmony with the environment and that business embraces environmental sustainability. Gray (2010) however, argues that this state of affairs is generally misleading as the focus is taken away from how sustainability is actually attained and how business reporting aids sustainability.

Ahi and Searcy (2013) observe that the danger in the current frames used to view sustainable development lie in that business ignores the essence of sustainability and has created a dominant discourse of what environmental sustainability entails to suit certain business parameters. This has been done in ways that tend to ignore developments surrounding the businesses such as scientific evidence from research or development literature (Gray, 2010; Hopwood, 2009). Most of what is reported as sustainability by business is either not sustainability or holds very little significance to sustainability (Gray, 2010). Tregidga and Milne (2006) are of the view that the ways in which sustainability reports are generated by businesses potentially constrain ideas on dealing with sustainable development. The sustainable development concept appeals to the business world in that it paints a more optimistic picture than economic growth at the expense of the environment. The open definition of sustainability also affords business the opportunity to interpret sustainability for business benefit (Tregidga and Milne, 2006). Bruno and Karliner (2004) as cited by Tregidga and Milne (2006) for example, argue that the Earth Summit in Rio de Janeiro distorted the essence of sustainable

development. The follow up summit that was held in Johannesburg in 2002 was also setup for failure as the corporate voice emerged as strongly as it did in the first summit.

Other attempts have been made in trying to represent sustainability in ways that business understands. Financial accounts, as well as non-financial accounts have been used to show the sustainability position of a company (Gray, 2010). Some of these approaches include: *sustainable costs* of an organisation's activity whereby the sustainable costs highlight the amount of money an organisation would have spent had it been sustainable; *remediation*, which entails the amount of money it would cost for the organisation to reverse any damages caused on the environment; *sustainability gap* whereby the organisation analyses its current activities against sustainable activities and the difference is used to calculate the costs needed to bridge the gap; *sustainable value added* (SVA) takes into account the efficiency and effectiveness of resource use and finally, *sustainability assessment model* which analyses projects and gives an idea of how the project impacts on the economic, social and environmental resources throughout its duration and data helps in identifying the pros and cons of projects and possibly develop strategies to correct negative impacts (Gray, 2010; Jones, 2010; Lamberton, 2005).

Non-financial accounts that have been utilised to represent sustainability include inventory of fauna and flora and the use of ecological footprints (Bebbington et al., 2014; Jones, 2010). Financial approaches have been criticised in that placing monetary values on the environment and social damage is still widely contested (Bebbington et al., 2014). Both the financial and non-financial accounts are generally not attractive in business as they either threaten profit margins, the existence of the business itself or bring out the organisational flaws and point out to unsustainable practices adopted by the business instead (Gray, 2010).

Given such a background it is inevitable that sustainability at corporate level might be difficult to realise. This is because sustainability as a concept spans across ecological and societal spaces and has a broad definition that can be manipulated to suit specific contexts or to underplay the relevance and importance particularly that of environmental sustainability (Bebbington and Larrinaga, 2014). It is of paramount importance therefore to critique the feasibility of translating sustainability meaningfully at corporate level. The corporate voice remains to a large extent the dominant voice and major determinant of what sustainability should entail. Therefore, a relationship consisting of the nature of environment (ecological, societal spaces) and contestations around what sustainability entails and how it is defined, pose further challenges to an already complex and contested discourse – the feasibility of attaining environmental sustainability within manufacturing.

4 Corporate firms, sustainability and profitability in South Africa: a contextual analysis

In South Africa, the manufacturing industry within which motor vehicle manufacturing is located is the biggest industry in the country (Ambe and Badenhorst-Weiss, 2011; Du Toit, 2003; Kaggwa, 2008). Damoense and Simon (2004) assert that the motor vehicle manufacturing industry is a significant subdivision of the national economy that has become more exposed to globalisation from 1994 when South Africa attained democracy. Production in the country has been aligned to parent company operations and this has afforded South African producers a global presence and a position in global value chains (Barnes and Morris, 2008). Examples of corporations that are active in the South African

motor vehicle manufacturing industries include but are not limited to Mercedes Benz, BMW and Volkswagen (Barnes and Morris, 2008). Vehicle manufacturers in South Africa, like in other countries, have to now manufacture globally standardised vehicles and therefore have to adhere to specified performance targets stipulated by the parent organisations in order to remain competitive (Barnes and Morris, 2008).

The vehicle manufacturing industry in South Africa competes actively globally with exports forming a significant share in European and US imports. A total of 276,873 units were exported in 2014, yielding a total value of R70 billion for the year (Lamprecht, 2015). Vehicle exports contributed 11.7% of the total goods exported and within the country the contribution was 7.2% towards the country's GDP as part of the broader automotive industry (Lamprecht, 2015). Barnes and Morris (2008) attest that the automotive manufacturing sector in South Africa has been the most successful sector in the country. South Africa actively encouraged, promoted and revived the motor vehicle industry through the MIDP (Barnes and Morris, 2004, 2008; Black, 2009; Flatters, 2002; Lamprecht, 2006). Global forces tied with the MIDP's government driven industrial policy actively influenced the presence of German multinationals operating within South Africa (Barnes and Morris, 2004). Respondent A for BMW SA highlighted that:

> "Of the total number of cars produced at BMW, 87.5% are produced specifically for the export market. 61% are exported to the USA and this market makes up the largest export market for South African manufactured vehicles. Most cars produced are therefore left hand drives and are built to the highest level of quality standards."

Kehbila (2013) emphasises that success in the vehicle manufacturing industry is, however, tied to environmental degradation and natural resource shortages. These massive industries actively consume natural/finite resources and emit harmful gases such as carbon dioxide in production and throughout the use of manufactured vehicles (Kehbila et al., 2010; Winkler and Marquand, 2009). Brent and Visser (2005) argue that all stages of a product's life cycle from resource extraction, manufacturing, use and reuse, recycling or disposal will influence a supply chain's environmental burden. The South African automobile supply chain contributes to the environmental burden through discharge of toxic substances, greenhouse gas emissions, groundwater pollution, destruction of habitats and solid waste production (Brent, 2005). Consider the illustration from Respondent B who highlighted that:

> "This is plant number 9, the smallest amongst the BMW plants, but it produces 118 cars in 8 hours and 354 cars in 24 hours. Therefore in a working week, 1,062 cars are produced and our operators go through rigorous training to ensure 'zero defects'."

One BMW produced at this plant is made up of 412 pieces of steel sheets, therefore a week's production at the smallest plant uses 437,544 pieces of steel sheets for production. Steel is extracted from mining related activities that cause significant environmental damage. The predicament then lies in tying vehicle manufacturing to sustainability in working towards greening the economy.

The green economy debate reflects the sustainability debate in that it is open to various interpretations. Some players in the green economy advocate for a transition towards an ecologically and sustainable future whilst others view it as a tool towards starting economic growth and innovation. Death (2014) describes four types of approaches that can be adopted in the green economy initiative as green revolution,

transformation, growth and resilience. Green revolution involves a radical transformation of economic activities along with capitalism and state systems to align with natural limits and ecological virtues (Goodman and Salleh, 2013). In *green transformation* economic growth, remains the main progress driver with the environment seen as a resource for development – state systems are used to regulate processes to ensure social justice, equity and redistribution inter-generationally (WCED, 1987).

Green growth perceives green markets as economic opportunities offering new markets, sources of wealth and areas for innovation (Death, 2014). Green strategies in this system present green niches globally and coupled with increasing populations' present viable markets that offer future growth, profits and jobs (Foresight, 2011). Focus is not on limits/scarcity of resources but on new markets, services and type of consumption. *Green resilience* strives to maintain the status quo albeit in a cautious way and seeks to utilise alternative sources for survival such as climate sensitive agriculture and technological innovations (Foresight, 2011; Death, 2014). South Africa is pursuing green growth within manufacturing therefore according to Death (2014), this translates loosely into the country seeking new markets and profits without necessarily caring for the environment thereby indirectly propagating the profit-seeking mandate of corporations. These sentiments are echoed in the interview excerpt below from respondent C from DEA:

> "The DEA is basically powerless – there is only a white paper on the environment and no act. Without an act, the DEA can only suggest and direct and not enforce or bring violators to account. Any environmental activities that either pose a threat to economic activities or challenge economic activities in the country are challenged and nullified. Economic concerns and interests are considered first above everything else."

South Africa, the dominant economic producer in Southern Africa is characterised by rapid development initiatives. Swilling and Southall (2010) elaborate that the new constitution in South Africa makes reference to the right of all South Africans to have an environment that is protected for the benefit of all. Swilling and Southall (2010) elaborate further that the constitution calls for all stakeholders in public and private sectors to engage in ecologically sustainable development. This call is reflected in the vision and mission statements of vehicle manufacturing companies such as VW, BMW and Mercedes. These statements uphold the importance of sustainability and the generation of sustainability reports. What remain questionable however, are the practices on the ground, for example the strict confidentiality procedure adopted by VW brings into question the companies' sustainability practices. VW SA refrained from responding to any questions pertaining to environmental sustainability. Respondent D from VW made it very clear that the company does not divulge information relating to sustainability practices to the public through a curt response:

> "We maintain a strict confidentiality policy regarding sensitive/confidential information. Any communication of such information to the general public would go against this policy."

Responses such as the one given above raises questions about how sustainable the vehicle manufacturing companies are if they are unwilling to engage the public on sustainability issues. The same vehicle manufacturers use sustainability in their corporate sustainability communication whereby they make consumers aware of their commitment to environmental protection initiatives. An example of such communication comes from

VW's 'think blue initiative' (Fricke and Schrader, 2011) that talks about caring for the environment to the public. The company goes on to sell to consumers the fact that the company preserves and cares for the environment in production. The fact that sustainability information becomes 'sensitive/confidential' information upon request by the public casts doubt upon the company's approach and commitment to environmental protection.

The green economy in South Africa is presented as viable and relevant to addressing various challenges that the country is currently facing (Musango et al., 2014). Musvoto et al. (2015) demonstrate that the New Growth Path (2010) proposes to drive growth through a greener economy and ultimately promote social equity and improve human wellbeing. Agreements such as the Green Economy Accord (2011) were signed in which government, business community, trade unions and civil society committed to supporting the green economy and creating green jobs (Musvoto et al., 2015). This is all being done in an attempt to preserve and protect the environment and attain sustainable development. Death (2014) maintains that commitment to the green economy in South Africa is not deep rooted, sustained and coherent. Cock (2012, p.23) emphasises that there is 'corporate capture' of the green economy in South Africa as the corporate world is in the forefront defining what greening the economy entails. Corporations make use of manipulative advertising in what Cock (2012, p.25) terms 'green-wash' but the definitive goal remains profitability.

Discussions held with research participants E and F, for example revealed plastic as one of the major components used in VW production processes. Plastic is linked to the exploitation of resources such as coal, gas and oil. BMW SA on the other hand uses a total of 412 metal sheets in making the BMW 3 Series 4 door Sedan body shell (BMW Rossyln Plant Tour, 2015). This use of metal is one of BMW's selling and marketing bases and it rides on the fact that reinforced metal in the body of the car contributes to the high safety levels afforded by the car. The metal sheets are a combination of steel and aluminium. The plastic, steel and aluminium as examples of some of the materials used in vehicle production can be traced back to mining activities. Mining activities cause significant environmental damage in both the extraction processes and disposal of waste generated therein. Given this background to some of the materials used in production, it becomes problematic to state that sustainability can be realised in vehicle production.

Mining and manufacturing in South Africa relies heavily on coal-powered energy and the South African economy is described as energy intensive deriving above three quarters of its energy demands from coal-powered energy (Cock, 2012; Death, 2014). The Medupi and Kusile coal plants in the country are the third and fourth largest in the world with the Sasol Secunda plant hailed as the largest CO_2 emitter in the world (Death, 2014). The manufacturing industry is heavily reliant on coal-generated energy but has been identified in the OECD (2012) report as a source of green job creation in the green economy. Death (2014) is of the view that South Africa currently falls short of the United Nations Environment Program (UNEP) green economy definition that encompasses low carbon emissions, efficient resource use and an equitable socially inclusive environment. South Africa depends heavily on coal and in 2010 South Africa emitted 9.2 tons of CO_2 emissions (tCO_2e) per capita, compared to 1.7 tCO_2e in India, 2.2 tCO_2e in Brazil and 6.2 tCO_2e in China (World Bank, 2013 cited in Death, 2014). This casts doubt on how manufacturing can supply green jobs, produce sustainably and play a role in decarbonising the economy towards achieving sustainable development. The emphasis in

vehicle manufacturing companies lies in saving energy as respondents G and H highlighted:

> "We have come up with innovative ways to save electricity and lower consumption during production. We have mechanisms within the plants that detect inactivity and dim the lights accordingly. We also invest money in research and development to find more ways of using electricity efficiently."

The focus as shown from the above statements is not on the source of the electricity that is clearly not green but the actual use of the electricity on production sites. These initiatives are relevant but production of the vehicles using coal-powered electricity raises questions as to whether the finished product was made in a sustainable manner.

Focus in production is on customers and customer satisfaction such that the lines between environmental sustainability and quality control/management become blurred. In trying to ascertain whether BMW takes any measures to protect the environment or to minimise damage to the environment during production, the response from a marketing representative was:

> "We take pride in doing it right first time and we build cars that are of the best quality possible, we ensure our suppliers adhere to our standards and any faulty supplies are returned-even manuals that come with folded page."

This quality management mindset filters through to the protective gear handed out at the beginning of every tour. The impression is that the visitor is to be protected from possible harm within the plant, which is of course true to some extent. Further explanation however was given and the reason behind protective gear was:

> "We protect our cars from potential scratches from watches, rings and any sharp metal objects – remember the goal is do it right first time."

The ultimate goal is to ensure that the finished product meets the quality standards, will not be returned or found defective in any way thus contributing to a successful sale and ultimately profit.

This profit drive raises considerable concern as South Africa is actively involved in green economy initiatives and has come up with the National Climate Change Response White Paper (NCCRWP). The country however does not have a Green Economy Act in place as yet. The White Paper therefore acts as a platform for giving suggestions and formulating direction. The limitation however, is that whatever is suggested within the White Paper is not enforceable in the absence of an act. This uncertainty and lack of clarity filters through to the environmental regulatory departments. The DEA for example, has a green economy team in principle, but getting environmentally related input from them proved unfruitful as there is a lack of structures determining who the team members are. The responses from the members specifically given as contacts and experts in environmental management included statements such as:

> "I am not the best person to deal with this, colleagues please advise on who can give the best responses to the enquiry my knowledge is limited to a specific area not environment? We will revert back with a response once we have all the necessary information."

The responses from environmental authorities at provincial and municipal levels were very similar to those mentioned above. Most of the individuals who were referred to as experts in sustainability explained they were either not responsible for environmental sustainability or not clued up on sustainability aspects. This reinforces the fact that

approaches to sustainability and green economy initiatives within South Africa are neither clearly coordinated nor interlinked.

Brent and Labuschagne (2003) and Labuschagne et al. (2005) make reference to the fact that regardless of the country's active involvement in green economy initiatives, vehicle manufacturing still contributes to environmental problems. Kehbila et al. (2009, p.311) highlight that sustainable development initiatives in South Africa generally 'lack clarity and determination'. Cock (2012) explains that sustainability has been incorporated into practices such as CSR thus avoiding requisite transformative change. Policy documents in the country reflect a commitment to shift towards greening the economy but the real economy remains carbon intensive without clear legislation on carbon reduction (Cock, 2012). This evident lack of political will and poorly enforced legislation thus brings into question the sustainability of the vehicle manufacturing industry. Musvoto et al. (2015) assert that the information and policies required to support the green economy drive are not fully developed in the country. There is significant contradiction in government actions as seen through the expansion of coal and nuclear powered energy through a $3.75 billion loans from the World Bank (Cock, 2012). The movement therefore towards green jobs/green growth reflects the hypocritical approach to addressing sustainability and environmental protection initiatives. These observations reinforce the disconnection from policy and implementation as observed in the interactions with the DEA.

Respondents C and H confirmed that the DTI and DEA also have a troubled relationship – the economic focus is given preference over any environmental concerns. This can potentially interfere with the way business represents and addresses environmental sustainability as economic sustainability aspects get preferential treatment. Contestations are highlighted in the sentiments expressed below from respondents C and H who highlighted that:

> "Any environmental policies from DEA that challenge economic yields from manufacturing industries are either ignored or the DTI challenges these policies outright."

The resultant effect is that DEA exists but generally operates without a voice in environmental matters. Sustainable costs and remediation for example if reported pose a potential threat to the image of the company and from a CSR perspective this has the capacity to threaten economic yields. The end result is the promotion and fostering of profitability at the expense of the ability for future generations to derive comparative gain from the use of undiminished natural resources upon which to base on their own development. Ultimately business receives favourable treatment over environmental concerns.

5 Towards a green economy and sustainable future in South Africa

It has been argued that the motor vehicle industry as part of the manufacturing industry holds great potential towards contributing to the creation of a green economy (Musango et al., 2014). Although the green economy initiative is a relatively recent development, it seeks to move away from capital/resource intensive development systems to eco-friendly forms of production and resource use (Musango et al., 2014). Business processes in the green economy as argued by UNEP (2009), deliver better returns on investments

(economic capital, natural and human) whilst contributing to the reduction in greenhouse gas emissions, use of fewer natural resources and creation of less waste. The green economy concept emanated from increased global awareness on the importance of preserving the environment and seeks to grow mainly by reducing resource consumption (Swilling, 2010). In view of the increased environmental problems there is an increased movement away from capital and resource intensive production towards the 'green economy', the 'global green new deal', the 'green growth' approach or 'green development' (Swilling, 2010).

According to Vazquez-Brust and Sarkis (2012), green growth is more than balancing economic growth with environmental protection. Green growth seeks to reduce carbon emissions, use energy efficiently through clean technology and market goods and services innovatively. Shin (2009) cited by Vazquez-Brust and Sarkis (2012) observes that it is important to use green growth to break the usual cycle whereby the environment deteriorates and poverty levels increase without attaining the desired sustainable economic growth. Hart (1997) and Ersty and Winston (2009) however, are of the view that the driving force behind companies going green has mostly been economic gain and not necessarily for the benefit of the environment. They further observe that the green imperative has been attached to cost cutting or risk reduction and not necessarily for the benefit of the environment.

Edifying this observation, Orsato and Wells (2007) and Monden (2011) express the opinion that although a number of manufacturers in the automotive industry have made great strides in reducing the impact on the environment, the initiatives have not been developed to benefit the environment, but are aimed at cutting costs and ultimately increasing profitability. An example of this type of approach is identified as the Toyota Production System (TPS), which seeks to eliminate waste from all processes and activities (Monden, 2011; Aguado et al., 2013). The TPS has come to characterise the basis for lean production and eco-factories and the essence of this practice is to attain some level of waste reduction and eventual elimination in the production chain (see Orsato and Wells 2007; Balakrishnan, 2015). Despite the development of such initiatives, there are still strong arguments and debates that question the credibility of such innovative moves in contributing towards environmental sustainability. Moreira et al. (2010) argue that these initiatives have been developed by automakers such as Ford and Toyota to increase and gain competitive edge in business.

In some cases, developed countries have achieved green production through transferring pollution intense industries (such as heavy manufacturing) to emerging economies such as China and India (Gurtu et al., 2016). This gives a false attainment of greening production as carbon emissions and environmental degradation are consequently captured as environmental ills occurring in the emerging economies (Gurtu et al., 2016). Emerging economies face challenges in that environmental regulations are not properly enforced, therefore increased industrial activity and economic growth in emerging economies poses extensive environmental threats therein (Blackman et al., 2010). The energy produced in most emerging economies is usually coal powered thus driving the manufacturing industry on this energy will ultimately result in higher levels of greenhouse gas emissions (Hart, 1997). A transfer of the heavy manufacturing industries to emerging economies despite their nature of energy generation therefore shows the hypocritical nature of business and its incessant drive to attain profits at all costs without addressing practical sustainability concerns (Dauvergne and Lister, 2013).

The value of a finished vehicle potentially contains up to 80% of various materials and components from suppliers in different industries, therefore purchasing departments in the vehicle manufacturing industries have become highly sophisticated in order to compete for favourable prices from suppliers (Closs et al., 2011; Orsato and Wells, 2007). This in a way shows the power that the automobile industry exerts in its interactions with the other constituents in the 'organisational field' [Orsato and Wells, (2007), p.990]. Given such a scenario where components are derived from various sub-sectors, it becomes problematic to assert that sustainability and green jobs or green growth can be attained comfortably within the automotive industry.

Attempts have been made to come up with alternative systems to ensure that manufacturing activities have fewer negative impacts on the environment. The most common of the alternative EMS include the ISO 14000. These global systems were created in an attempt to standardise environmental management criteria across the globe (Melnyk et al., 2003). EMSs focus on those processes that contribute to the creation, management and elimination of pollution, as reduction of waste translates into reduction of manufacturing costs (Melnyk et al., 2003). Companies are thus incentivised to move away from pollution reduction towards adopting pollution prevention strategies (Khanna et al., 2009). A radical shift is therefore required to replace the existing technology bases in most companies, namely; the production companies and their spheres of influence with more sustainable technologies.

Sustainable technologies in this regard are essential as the environment contains limited resources and disposal spaces (Gungor and Gupta, 1999). The planetary boundary approach expands on this by highlighting that development of human societies ought to be carried out within safe operating zones, based on our understanding of the interconnectedness of the Earths' systems (Steffen et al., 2015). Increased industrial activity and the resultant population growth have led to a dramatic destabilisation of the environment thus threatening the very essence of human survival. Planetary boundary frameworks in this regard aim to prescribe safe operating spaces within which human society can continue to thrive and develop (Steffen et al., 2015). Planetary boundaries are placed well before biophysical thresholds are reached in order to allow society time to attend to early signs that movement is towards unwanted change (Steffen et al., 2015).

6 Conclusions

The power and influence that is wielded by corporations contributes towards working against sustainable imperatives (Shiva, 1993). This is because corporations emerge as the dominant voice and are able to influence sustainability initiatives in ways that make business sense as opposed to sustainable sense. The corporation was birthed out of capitalism and has a strong profit-seeking mandate (Petrella, 2000). This profit seeking behaviour occurs at the expense of the environment and workers. The state and civil society's attempts at holding corporations to account have been rendered useless by the power financial access has afforded corporations (Gray, 2010). Shiva (1993) explains that a number of the major environmental threats have been caused by corporations as they have wider access and control of resources spanning across continents. Application of sustainability initiatives at corporate level tends to be complicated as these initiatives threaten the profitability mandate that forms the essence of manufacturing. Corporates

would have to restructure the way natural resources are harnessed, transported, utilised in production and the way in which waste is disposed of.

Drawing from the global debates on environmental protection, the development of ISO [e.g., ISO 14000 for example] and the link between vehicle manufacturing, profitability and environmental degradation, it is evident that sustainability within motor vehicle manufacturing remains an aspiration for the near future. Sustainability is still open to various contested definitions with the corporate voice in the forefront, defining what sustainability entails. The green economy initiative in many ways tends to display the same poorly defined parameters such as those evident in sustainability debates. Environmental regulations particularly within South Africa are not well enforced or policed thus weakening the sustainability mandate within the country. Corporations, especially in vehicle manufacturing have the financial power to dictate to suppliers and government thereby further weakening any efforts that may speak to decarbonising the economy and protecting the environment for future generations. The green growth position currently adopted by the country adds further complexities to the sustainability initiatives. Manufacturing within the country still needs to address aspects such as energy harnessing, what sustainability entails, green growth and manufacturing as well as corporations' activities.

Vehicle manufacturers in South Africa are largely protected by government regulations that favour economic development, as well as a lack of clear and defined environmental regulatory structures. Access into the way in which vehicle manufacturers attain sustainability in production remains restricted and protected from the public. The raw materials that go into production are never acknowledged as contributing to environmental damage at their point of origin. Vehicle manufacturers are more concerned with sustainability within the actual plant where the car is manufactured. Emphasis is placed on energy and water use as well as waste disposal specifically on the plant. Even though efforts are used to save and use energy responsibly, energy in South Africa is derived from coal. The use of coal-powered energy tarnishes any effort towards environmental sustainability as well as any claim towards producing in sustainable ways.

The green economy initiative in the sustainability debate has also been accorded various interpretations based on the motives of the user. The 'green growth' adopted by South Africa is argued to be focusing on attaining new markets from green niches without taking into account the planetary boundaries. Green growth particularly for the country answers to future growth, jobs, new markets and ultimately profits. Vehicle production therefore in many ways answers to the profit mandate dressed to fit into the green economy by offering 'green jobs' and 'green products' without addressing environmental concerns. Manufacturing is adamant that a radical shift towards greening production kills business and profit. Taking into consideration the flaws in the definitions of sustainability and the green economy, the profit seeking nature and financial powers of corporations, the SA energy complex and the capital and resource intensity of vehicle manufacturing, platforms for dialogue need to be created amongst the government, manufacturers/corporations and civil society to determine what sustainability should entail in the country.

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References

Abdul-Wahad, S.A. and Marikar, F. (2012) 'The environmental impact of gold mines: pollution by heavy metals', *Central European Journal of Engineering*, Vol. 2, No. 2, pp.304–312.

Aguado, S., Alvarez, R. and Domingo, R. (2013) 'Model of efficient and sustainable improvements in a lean production system through processes of environmental innovation', *Journal of Cleaner Production*, Vol. 47, pp.141–148.

Ahi, P. and Searcy, C. (2013) 'A comparative literature analysis of definitions for green and sustainable supply chain management', *Journal of Cleaner Production*, Vol. 52, pp.329–341.

Ambe, I.M. and Badenhorst-Weiss, J.A. (2011) 'South African automotive industry: trends and challenges in the supply chain', *Journal of Contemporary Management*, Vol. 8, No. 1, pp.337–362.

Balakrishnan, N. (2015) 'Toyota production system', in *Dependability in Medicine and Neurology*, pp.239–260, Springer International Publishing, Switzerland.

Barnes, J. and Morris, B. (2008) 'Staying alive in the global automotive industry: what can developing economies learn from South Africa about linking into global automotive chains', *The European Journal of Developmental Research*, Vol. 20, No. 1, pp.31–55.

Barnes, J. and Morris, M. (2004) 'The German connection: shifting hegemony in the political economy of the South African automotive industry', *Industrial and Corporate Change*, Vol. 13, No. 5, pp.789–814.

Bassen, A., Jastram, S. and Meyer, K. (2005) 'Corporate social responsibility', *Journal for Business, Economics and Ethics*, Vol. 6, No. 2, pp.231–236.

Bebbington, J. and Larrinaga, C. (2014) 'Accounting and sustainable development: an exploration', *Accounting, Organisations and Society*, Vol. 39, No. 6, pp.395–413.

Bebbington, J., Unerman, J. and O'Dwyer, B. (2014) *Sustainability Accounting and Accountability*. Routledge, New York.

Bird, J. and Lawton, K. (2009) *The Future's Green: Jobs and the UK Low-Carbon Transition*, Institute for Public Policy Research.

Black, A. (2009) 'Location, automotive policy and multinational strategy: the position of South Africa in the global industry since 1995', *Growth and Change*, Vol. 40, No. 3, pp.483–512.

Blackman, A., Lahiri, B., Pizer, W., Planter, M.R. and Pina, C.M. (2010) 'Voluntary environmantal regulation in developing countries: Mexico's Clean Industry Program', *Journal of Environmental Economics and Management*, Vol. 60, No. 3, pp.182–192.

Blewitt, J. (2008) *Community, Empowerment and Sustainable Development*, Green books, UK.

Borel-Saladin, J.M. and Turok, I.N. (2013) 'the green economy: incremental change or transformation?', *Environmental Policy and Governance*, Vol. 23, No. 4, pp.209–220.

Borghesi, S. and Vercelli, A. (2003) 'Sustainable globalisation', *Ecological Economics*, Vol. 44, No. 1, pp.77–89.

Bowen, A. and Kuralbayeva, K. (2015) *Looking for Green Jobs: The Impact of Green Growth on Employment*, Global Green Growth Institute.

Brent A.C. and Labuschagne, C. (2003) 'Evaluating environmental performances for supply chain management in the manufacturing industry', *Business Strategy and the Environment Conference Proceedings*, University of Leicester, pp.52–60.

Brent, A.C. and Visser, J.K. (2005) 'An environmental performance resource impact indicator for life cycle management in the manufacturing industry', *Journal of Cleaner Production*, Vol. 13, No. 6, pp.557–565.

Brent, C.A. (2005) 'Integrating LCIA and LCM: evaluating environmental performances for supply chain management in South Africa', *Management of Environmental Quality: An International Journal*, Vol. 16, No. 2, pp.130–142.

Carroll, A.B. and Shabana, K.M. (2010) 'The business case for corporate social responsibility: a review of concepts, research and practice', *International Journal of Management Reviews*, Vol. 275, No. 1, pp.85–106.

Closs, D.J., Speier, C. and Meacham, N. (2011) 'Sustainability to support end-to-end value chains: the role of supply chain management', *Journal of the Academy of Marketing Science*, Vol. 39, No. 1, pp.101–116.

Cock, J. (2012) 'The 'green economy': a 'wolf in sheep's clothing' or an alternative development path in South Africa?', Paper presented at the *International Sociological Association Conference*, Buenos Aires, 1–4 August.

Damoense, M.Y. and Simon, A. (2004) 'An analysis of the impact of the first phase of South Africa's motor industry development programme (midp), 1995–2000', *Development Southern Africa*, Vol. 21, No. 2, pp.251–269.

Dauvergne, P. and Lister, J. (2013) *Eco-Business: A Big-Brand Takeover of Sustainability*, MIT Press, USA.

Death, C. (2014) 'The green economy in South Africa: global discourses and local politics', *Politikon: South African Journal of Political Studies*, Vol. 41, No. 1, pp.1–22.

Domosh, M., Neumann. R. and Price, P. (2015) *Contemporary Human Geography: Culture, Globalisation, Landscape*, Freeman and Company, New York.

Du Toit, A.S.A. (2003) 'Competitive intelligence in the knowledge economy: what is in it for South African manufacturing enterprises?', *International Journal of Information Management*, Vol. 23, No. 2, pp.111–120.

Du, S., Bhattacharya, C.B. and Sen, S. (2010) 'Maximizing business returns to corporate social responsibility (CSR): the role of CSR communication', *International Journal of Management Reviews*, Vol. 276, No. 1, pp.8–19.

Elliot, S. (2011) 'Transdisciplinary perspectives on environmental sustainability: a resource base and framework for IT-enabled business transformation', *Management Information Systems Quarterly*, Vol. 35, No. 1, pp.197–236.

Ersty, D. and Winston, A. (2009) 'Green to gold: how smart companies use environmental strategy to innovate, create value, and build competitive advantage', John Wileys & Sons, New Jersey.

Flatters, F. (2002) *From Import Substitution to Export Promotion: Driving the South African Motor Industry*, The Service Group: SADC Secretariat on Trade and Investment Policies, Gaborone.

Foresight, U.K. (2011) *The Future of Food and Farming: Challenges and Choices for Global Sustainability*, Government Office for Science, Foresight, Final Project Report.

Freund, P. and Martin, G. (1996) 'The commodity that is eating the world: the automobile, the environment and capitalism', *Capitalism Nature Socialism*, Vol. 7, No. 4, pp.3–29.

Fricke, V. and Schrader, U. (2011) 'Corporate communication to promote consumers' social responsibility?', *Okologisches Wirtschaften-Fachzeitschrift*, Vol. 25, No. 4, p.25.

Goodman, J. and Salleh, A. (2013) 'The 'green economy': class hegemony and counter hegemony', *Globalisations*, Vol. 10, No. 3, pp.411–424.

Gray, R. (2010) 'Is accounting for sustainability actually accounting for sustainability…and how would we know? An exploration of narratives of organisations and the planet', *Accounting, Organisations and Society*, Vol. 35, No. 1, pp.47–62.

Gungor, A. and Gupta, S.M. (1999) 'Issues in environmentally conscious manufacturing and product recovery: a survey', *Computers and Industrial Engineering*, Vol. 36, No. 4, pp.811–853.

Gurtu, A., Searcy, C. and Jaber, M.Y. (2016) 'A framework for reducing global manufacturing emmissions', *The Journal of Environment and Development*, DOI: 1070496515623821.

Hart, S. (1997) 'Beyond greening: strategies for a sustainable world', *Harvard Business Review*, January–February, Vol. 75, No. 1, pp.66–76.

Hopwood, A.G. (2009) 'Accounting and the environment', *Accounting, Organisations and Society*, Vol. 34, Nos. 3–4, pp.433–439.

Hughes, G. (2011) *The Myth of Green Jobs*, The Global Warming Policy Foundation.

Jones, M.J. (2010) 'Accounting for the environment: towards a theoretical perspective for environmental accounting and reporting', *Accounting Forum*, Vol. 34, No. 2, pp.123–138.

Kaggwa, M. (2008) *Modelling South Africa's Incentives under the Motor Industry Development Programme*, PhD thesis, University of Pretoria, Pretoria.

Kehbila, A.G. (2013) 'Auditing and communicating business sustainability: a South African perspective', *International Journal of Energy, Environment and Economics*, Vol. 21, No. 1, p.35.

Kehbila, A.G., Ertel, J. and Brent, A.C. (2009) 'Strategic corporate environmental management within the South African automotive industry: motivations, benefits, hurdles', *Corporate Social Responsibility Environmental Management*, Vol. 16, No. 6, pp.310–323.

Kehbila, A.G., Ertel, J. and Brent, A.C. (2010) 'Corporate sustainability, ecological modernization and the policy process in the South African automotive industry', *Business Strategic Environment*, Vol. 19, No. 7, pp.453–465.

Khanna, M., Deltas, G. and Harrington, D.R. (2009) 'Adoption of pollution prevention techniques: the role of management systems and regulator pressures', *Environmental and Resource Economics*, Vol. 44, No. 1, pp.85–106.

Labuschagne, C., Brent, A.C. and van Erck, R.P.G. (2005) 'Assessing the sustainability performances of industries', *Journal of Cleaner Production*, Vol. 13, No. 4, pp.373–385.

Lamberton, G. (2005) 'Sustainability accounting-a brief history and conceptual framework', *Accounting Forum*, Vol. 29, No. 1, pp.7–26.

Lamprecht, N. (2006) *Analysis of the Motor Industry Development Programme (MIDP) as a Promotional Tool for the South African Automotive Industry in the Global Automotive Environment*, Unpublished Masters Thesis, University of South Africa, Pretoria, South Africa.

Lamprecht, N. (2015) *South Africa Automotive Export Manual*, Automotive Industry Export Council, Arcadia.

Markandya, A. (2009) 'Can climate change be reversed under capitalism?', *Development and Change*, Vol. 40, No. 6, pp.1139–1152.

Martinez-Fernandez, C., Hinojosa, C. and Miranda, G. (2010) *Green Jobs and the Skills: The Local Labour Market Implications of Addressing Climate Change*, Working document, OECD [online] http://www.oecd.org/cfe/leed/44683169.pdf (accessed 3 January 2016).

Marvasti, A. (2000) 'Resource characteristics, extraction costs, and optimal exploitation of mineral resources', *Environmental and Resource Economics*, Vol. 17, No. 4, pp.395–408.

Medarevic, S. (2012) *Environmental Corporate Social Responsibility and the Carbon Economy: A Case for CSR, the Triple Bottom Line and Obliquity* [online] http://epublications.bond.edu.au/cgej/25 (accessed 12 January 2015).

Medovoi, L. (2002) 'Globalization as narrative and its three critiques', *Review of Education, Pedagogy, and Cultural Studies*, Vol. 24, Nos. 1–2, pp.63–75.

Melnyk, S.A., Sroufe, R.P. and Calantone, R. (2003) 'Assessing the impact of environmental management systems on corporate and environmental performance', *Journal of Operations Management*, Vol. 21, No. 3, pp.329–351.

Milne, M.J., Tregidga, H. and Walton, S. (2009) 'Words not actions! The ideological role of sustainable development reporting', *Accounting, Auditing and Accountability Journal*, Vol. 22, No. 8, pp.1211–1257.

Moldan, B., Janouskova, A. and Hak, T. (2011) 'How to understand and measure environmental sustainability: indicators and targets', *Ecological Indicators*, Vol. 17, No. 2012, pp.4–13.

Monden, Y. (2011) *Toyota Production System: An Integrated Approach to Just in Time*, CRC Press, New York.

Moreira, F., Alves, A.C. and Sousa, R.M. (2010) 'Towards eco-efficient lean production systems', in *Balanced Automation Systems for Future Manufacturing Networks*, pp.100–108, Springer, Berloin, Heidelberg.

Munasinghe, M. (1999) 'Is environmental degradation an inevitable consequence of economic growth: tunneling through the environmental Kuznets curve', *Ecological Economics*, Vol. 29, No. 1, pp.89–109.

Musango, J.K., Brent, A.C. and Bassi, A.M. (2014) 'Modelling the transition towards a green economy in South Africa', *Technological Forecasting and Social Change*, Vol. 87, pp.257–273.

Musango, J.K., Brent, A.C. and Tshangela, M. (2014) 'Green economy transitioning of the South African power sector: a system dynamics approach', *Development Southern Africa*, Vol. 31, No. 5, pp.744–758.

Musvoto, C., Nortje, K., De Wet, B., Mahumani, B.K. and Nahman, A. (2015) 'Imperatives for an agricultural green economy in South Africa', *South African Journal of Science*, Vol. 111, Nos. 1/2, pp.1–8.

OECD (Local Economic and Employment Development (LEED) Programme) (2012) *Enabling Local Green Growth: Addressing Climate Change Effects on Employment and Local Development*.

Orsato, R.J. and Wells, P. (2007) 'The automobile industry and sustainability', *Journal of Cleaner Production*, Vol. 15, No. 11, pp.989–993.

Petrella, R. (2000) 'The future of regions: why the competitiveness imperative should not prevail over solidarity, sustainability and democracy', *Geografiska Annaler: Series B, Human Geography*, Vol. 82, No. 2, pp.67–72.

Sheikh, S.R. and Beise-Zee, R. (2011) 'Corporate social responsibility or cause-related marketing? The role of cause specificity of CSR', *Journal of Consumer Marketing*, Vol. 28, No. 1, pp.27–39.

Shiva, V. (1993) 'The greening of the global reach', in Brecher, J., Childs, J.B. and Cutler, J. (Eds.): *Global Visions: Beyond the New World Order*. IPAM, Canada.

Spencer, F., Swilling, M., Everrat, D., Muller, M., Schelschenk, J., du Toit, J. and Pierce, W. (2010) *A Strategy for a Developmental Green Economy for Gauteng: Preliminary Report, Draft*, Report prepared for the Gauteng Province Department of Economic Development.

Srivastava, S.K. (2007) 'Green supply-chain management: a state-of-the-art literature review', *International Journal of Management Reviews*, Vol. 9, No. 1, pp.53–80.

Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., Bennett, E.M., Biggs, R., Carpenter, S.R., de Vries, W, de Wit, C.A., Folke, C., Gerten, D., Heinke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B. and Sörlin, S. (2015) 'Planetary boundaries: guiding human development on a changing planet', *Science*, Vol. 347, No. 6223, DOI: 1259855.

Strike, V.M., Gao, J. and Bansal, P. (2006) 'Being good while being bad: social responsibility and the international diversification of US firms', *Journal of International Business Studies*, Vol. 37, No. 6, pp.850–862.

Swilling, M. (2010) 'Growth, resource use and decoupling: towards a 'green new deal' for South Africa', in Daniel, J. et al. (Eds.): *New South African Review 1: Development or Decline*, pp.104–134, Wits University Press, Johannesburg..

Tregidga, H.M. and Milne, M.J. (2006) 'From sustainable management to sustainable development: a longitudinal analysis of a New Zealand environmental reporter', *Business Strategy and the Environment*, Vol. 15, No. 4, pp.219–241.

UNEP (2009) *Global Green New Deal: An Update for the G20 Pittsburgh Summit*.

United Nations World Commission on Environment and Development (WCED) (1987) *Our Common Future (The Brundtland Report)*, OUP, Oxford.

Vallance, S., Perkins, H.C. and Dixon, J.E. (2011) 'What is social sustainability? A clarification of concepts', *Geoforum*, Vol. 42, No. 3, pp.342–348.

Van Veen-Groot, D.B. and Nijkamp, P. (1999) 'Globalisation, transport and the environment: new perspectives for ecological economics', *Ecological Economics*, Vol. 31, No. 3, pp.331–346.

Vazquez-Brust, D.A. and Sarkis, J. (Eds.) (2012) *Green Growth: Managing the Transition to a Sustainable Economy, Greening of Industry Networks Studies*, Vol. 1, DOI: 10.1007/978-94-007-4417-2_1, Springer Science + Business Media, Dordrecht.

Winkler, H. and Marquand, A. (2009) 'Changing development paths: from an energy-intensive to low-carbon economy in South Africa', *Climate and Development*, Vol. 1, No. 1, pp.47–65.

Zhu, Q., Sarkis, J. and Lai, K. (2007) 'Green supply chain management: pressures, practices and performance within the Chinese automobile industry', *Journal of Cleaner Production*, Vol. 15, Nos. 11–12, pp.1041–1052.