Moving to eco-sufficiency to create a transformative sustainable business model

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Abstract

Eco-efficiency as a concept has long been used by companies as an approach to tackle their significant environmental aspects such as resource use and wastes. This has been relatively successful for balancing economic growth demands with environmental protection. However we argue that there are some global, regional and localised environmental problems that are so serious - such as biodiversity loss, that the cumulated affect of individual companies implementing eco-efficiency policies can only make things worse. We propose that for serious environmental problems identified through scientific consensus that companies implement an eco-sufficiency approach no matter how small their contribution to the serious environmental problem. This means absolute reductions in significant aspects rather than as a ratio to products or turnover as for eco-efficiency. For environmental problems that are not identified as serious, companies continue to implement a policy of eco-efficiency. This dual approach is developed into a framework and is essential for companies with serious corporate social responsibility or corporate sustainability strategies.

Keywords: Eco-efficiency, eco-sufficiency, sustainable business, corporate social responsibility, sustainable development.

1. Introduction

The way companies and organisations tackle sustainable development has been theorised and analysed for many years. In this paper we would like to focus the debate on the most serious environmental problems, such as climate change and biodiversity loss facing the natural environment using an approach called 'eco-sufficiency'. This focuses on companies and organisations reducing and ultimately eliminating their contributions to serious environmental problems rather than the current practice of eco-efficiency, which is reducing contributions per product or service unit. Table 1 provides further details on eco-sufficiency and eco-efficiency. We focus on how eco-sufficiency can be used as a tool in parallel with eco-efficiency by companies to actively prevent or reduce environmental change and develop a transformative sustainable business model. This is essential for companies and organisations who want a creditable Corporate Social Responsibility or Corporate Sustainability, which are organisational responses to sustainable development.

TABLE 1 ABOUT HERE

We contend that there are some environmental problems that companies and organisations should be eliminating from their operations, products and supply chains. Johan Rockström and colleagues in their 2009 Nature paper state that three out of nine earth system processes have already exceeded the Earth's biophysical thresholds or planetary boundaries. The key issues are biodiversity loss, climate change and interference with the nitrogen cycle. The consequences of failures of these systems will be unacceptable global environmental change. This is supported by von Weizsacker *et al*'s (2009) discussion of the role for a factor five improvement in resource productivity; they state that "In the 21st Century, we stand at a crossroads, where the size of the impacts from our global community is now rivalling the size of our home's ability to cope" (ibid p.1). Our paper argues that with business's central role contributing to these serious global (and other regional and local) environmental problems (e.g. Pachauri & Reisinger 2007), the current emphasis on eco-efficiency (relative reductions to production) as an approach to incorporating reductions of environmental impacts into company decision-making is clearly not adequate. We propose a dual approach to reducing differing types of problems. For environmental problems that have not been identified by scientific consensus as being serous or critical, eco-efficiency is at the moment an appropriate approach, which is the current main approach in industry for all environmental problems. However, we advocate that for serious global, regional and local environmental problems; companies should use eco-sufficiency as an approach. Eco-sufficiency applies an absolute, rather than a relative, limit to each company, their products and supply chains. This two-fold technique is named the 'Corporate eco-efficiency – eco-sufficiency' or 'Ce^3s' approach, which is discussed later in the paper.

For non-serious environmental problems, eco-efficiency is perhaps still the best strategy to balance the demands and opportunities of economic growth with environmental responsibility. In this paper eco-efficiency refers to the ratio between value created and resources used or impacts created. Eco-efficiency is often a key component of a business' CSR strategy; linking together the different technical elements of a company's activity, i.e. waste, energy use, transportation etc and in certain (more limited) instances social considerations. Eco-efficiency in this sense produces tangible, measurable objectives but also, importantly, serves to maintain the status quo of the current business model, which is promoted and protected by the use of CSR as a corporate response to sustainable development. We argue that in some cases, as outlined above such an eco-efficiency based approach is acceptable however this is not always the case; in the context of serious environmental problems eco-sufficiency provides a better solution.

In a passage which usefully sets forth some of the reasons for taking eco-sufficiency seriously, Princen (2003) explains that:

> "Critical environmental threats entail irreversibilities and non-substitutabilities; they threaten vital life-support systems. Overconsumption—resource use beyond regenerative capacities that threatens entire species, including humans—is a real possibility. Saving a species or reducing CO_2 emissions (or even simply slowing the rate of growth in CO_2 emissions) only postpones tough choices. To make such choices, to construct institutions from the local to the global, from the tiny inshore fishery to the global atmospheric commons, requires principles attuned to such threats. If analysts take seriously the trends and accept social responsibility for contributing to the reversal of such trends, then they must go beyond marginal improvement, … cooperation and efficiency, and beyond the descriptive and predictive to the prescriptive. Analysts committed to social change must engage the normative" (p.34).

This passage carries the suggestion that theories which do not accommodate eco-sufficiency-based concerns do not qualify, even formally, as 'normative'. We think this suggestion is strained; it is better to say that theories which do not accommodate eco-sufficiency-based concerns may not be effective in achieving environmental sustainability in all contexts. With this reservation noted, Princen's passage contains a number of good reasons for taking eco-sufficiency seriously.

Eco-sufficiency has an absolute approach, for example Lamberton (2005) takes the Buddhist version of economics to develop a 'sustainable sufficiency framework' for decision making in a social enterprise:

> "Sustainable sufficiency is defined as achieving economic objectives consistent with the principle of right livelihood, ensuring the preservation of the natural environment and the welfare of each individual and society-at-large" (p.61).

In practice we argue that eco-sufficiency is about taking a life cycle approach to identifying where the company has impacts on serious environmental problems. These are then substantially reduced with the aim of eventually making a positive (rather than negative) impact on that issue. We discuss a framework of approaching this difficult issue later in the paper.

This paper will starts by reviewing eco-efficiency as an approach for tackling environmental problems by business. We will then propose eco-sufficiency as an approach for dealing with serious environmental problems. We discuss how for each of the critical earth system process, how a company could move to eco-sufficiency and the likely impacts on the company. We will finish by proposing our Ce^3s approach.

2. Why eco-efficiency fails to tackle serious environmental problems

Eco-efficiency has been one of the big buzz-words in the literature and practice of environmental management. There is little doubt that a sustainable society must be eco-efficient. But will increasing eco-efficiency be enough to make our society sustainable? Many scholars argue that the efficiency of our economies can be raised dramatically and at times there even seems to be a race for the highest possible eco-efficiency improvement factor (e.g. Schmidt-Bleek, 2000; Schmidt-Bleek and Weaver, 1998; Weizsäcker, 1997).

At first sight eco-efficiency seems to provide the key to the reconciliation of economic demands on the one hand and environmental and social demands on the other hand. The more efficient our society becomes the easier it will be to create value using our limited environmental resources. Many of the misconceptions about eco-efficiency are due to the

interpretation of eco-efficiency as a norm rather than a ratio. In this paper eco-efficiency refers to the ratio between value created and resources used or impacts created. Eco-efficiency will be enhanced whenever there is more value created for a given amount of resources or fewer resources are used for a given amount of value created.

The concept of eco-efficiency itself is not new; looking at how much one goal has been attained relative to another goal. The term ecological efficiency e.g. has been used in biology and ecology for quite some time (e.g. Colinvaux and Barnett, 1979; Conrad, 1977; Turner, 1970). The term ecological efficiency is used in ecology to describe the ratio of material and/or energy that is passed on to a higher trophic level (Macfadyen, 1963; Slobodkin, 1960). Later on, eco-efficiency considerations have also been used to describe the relation between environmental impacts or the use of resources and economic activity (e.g. Carlson and Bernstam, 1990). This has been referred to as environmental efficiency (Freeman *et al.*, 1973; McIntyre and Thornton, 1974; 1978) or ecological efficiency (Schaltegger and Sturm, 1990). The popular term eco-efficiency has been coined by the World Business Council for Sustainable Development (WBCSD) (e.g. Schmidheiny and Business Council for Sustainable Development, 1992; World Business Council for Sustainable Development, 2000).

Eco-efficiency is often interpreted as a norm or maxim business should follow. This is reflected in some of the publications of the World Business Council for Sustainable Development (e.g. World Business Council for Sustainable Development, 1996; 2000; World Business Council for Sustainable Development and United Nations Environment Programme, 1998). More recent WBCSD publications suggest a radical rethink with a vision for moving towards a more sustainable future and the role that business have to play in this transition but this vision is still essentially based on the underlying premise of eco-efficiency (WBCSD 2010). The importance placed on eco-efficiency in terms of the role of business can play in moving towards a more sustainable society is ever present in the recent WBCSD publication 'Vision 2020: The Agenda for Business (WBCSD 2010). Although there is evidence of language that is similar to that of eco-sufficiency (which we will discuss in more detail later in this paper), namely the underlying vision of 'living well' the critical pathways identified to achieve this 'living well' vision are grounded in eco-efficiency. Such continuing support for eco-efficiency by prominent sustainable business groups, in what is proposed to be a radical vision demonstrates the institutional obstacles that exist to changing current corporate responses to sustainable development.

An increasing number of experts warn that there is a risk that eco-efficiency could become a victim of its own success (for example Berkhout et al. 2000; Herring & Roy 2002; Mayumi et al. 1998). There is a risk that companies successfully become that eco-efficient that they end up using more rather than less environmental and social resources in such a situation a 'rebound effect' is created. The rebound effect has been described in a number of different contexts. It is for example intensely discussed in energy economics, management and policy (e.g. Glomsrød and Taoyuan, 2005; Greening *et al.*, 2000; Herring, 1999) and in a general environment context (e.g. Berkhout *et al.*, 2000; Herring and Roy, 2002; Jevons, 1990; Mayumi *et al.*, 1998). A reason for this rebound effect could be e.g. that a higher eco-efficiency has reduced the cost of production, which in turn results in more demand for the good produced and thus more (rather than less) resources being used. A more efficient company might therefore end up using more rather than less resources. It can be argued that in such a situation some other mechanism that restricts the total amount of environmental resources used is needed. See Figge and Hahn (2004) continue this discussion in more detail.

In conclusion, eco-efficiency has been a success in many cases for companies wanting to reduce their environmental impacts. But to overcome the shortcomings of eco-efficiency in delivering guaranteed absolute reductions in environmental impacts, we argue in the next

section that the principle of eco-sufficiency needs to also be considered by industry, specifically in relation to 'serious' environmental problems.

3. Using eco-sufficiency for serious environmental problems

Due to the fundamental nature of eco-efficiency being able to make more with less and the subsequent rebound effect, we suggest for serious environmental problems including the three described by Rockström et al (2009), companies should apply eco-sufficiency. We argue along with Dyllick & Hockerts (2002) and Young & Tilley (2006) that companies purporting to have CSR strategies have to demonstrate how their business practices go beyond eco-efficiency to include the additional criteria of eco-sufficiency. Otherwise companies with just eco-efficiency as a strategy can only claim to have to use corporate social responsibility as a means of pursuing profit maximisation or, considering the pressure from secondary stakeholders, deterring the loss of profits (Whitehouse, 2006). This situation is also reflected in von Weizsacker et al (2009) work, they argue "even with significant productivity gains the world cannot fulfil all such dreams of consumption and pleasures for an ever growing world population. Our civilizations worldwide have to face eco-sufficiency, or some limits to greed, growth and consumption. The political art will be to make this process satisfying for most sides. We assume that high quality of life and satisfaction based on the two pillars of efficiency and sufficient can be achieved even for a world for seven or more billion people" (*ibid*. p.346 von Weizsacker).

The discussion of eco-sufficiency has largely been focused on the individual level (see McDonald et al 2006) rather than at the organisational level of business (see Lamberton 2005, Dyllick and Hockerts 2002, Alcott 2008, Young and Tilley 2006). The concept of eco-sufficiency is primarily concerned with the reduction of consumption and 'living well on less' in absolute terms in relation to impacts on the natural environment not society more widely. According to Herring (2006), it is advocated by deep greens but so far remains a mainly ethical exhortation rather than a fully worked out, concrete practical approach. It can be argued that eco-sufficiency is a strong form of sustainability while eco-efficiency (see Jackson, 2004 for a comprehensive review) is the weak form. The idea of practicing eco-sufficiency can be seen as a solution to the moral, social and environmental problems of 'excessive' consumption (Herring, 2006). For Alcot (2008) two concepts are required in order to define eco-sufficiency adequately; the first being the presupposition of purchasing power and the second the concept of environmental motivation. It should be noted that Alcot's discussion is grounded in the investigation of individual action, and more specifically investigating the North-South relationship, rather than that of business. However, Alcot's discussion is still useful in the investigation of eco-sufficiency in the debate on the role of business in sustainable development.

Herring (2006) argues for a policy of eco-sufficiency there is a need to delink economic growth from resource consumption, which is again reflecting the idea of 'living well on less'. The implementation of an eco-sufficiency-based scheme involves a massive challenge to the present dominant ideologies of free market capitalism and 'consumer choice'. In their efforts to combat climate change, most Western governments eschew political controversy and instead seek technical fixes, such as energy efficiency, to solve the problem. Hence the popularity in government and business circles of such books as *Natural Capitalism*, despite the heavy criticism of this book by some reviewers (Herring, 2006). This stance is also reflected in the importance placed on Marginal Abatement Cost Curves (MACC) (as introduced by Naucler and Enkvist (2009) in relation to a transition to low carbon society. A key element of these curves are that they only include 'technical abatement and excludes all measures that have "a material effect on the lifestyle of consumers"" (Ekins et al 2011 quoted in Naucler and Enkvist 2009 p.9).

Like eco-efficiency the rebound effect has been discussed in terms of (eco)-sufficiency; Alcott (2008) argues that when demand decreases, in response to a move towards eco-sufficiency this reduces the market price whilst can then lead to marginal consumers increasing their consumption of that resource. Therefore negating the impact of the initial eco-sufficiency move and indeed may lead to an overall increase in use of resources and thus environmental impact.

Princen (2003) puts forward eco-sufficiency principles as comprising the following measures and goals:

> "[R]estraint, precautionary, polluter pays, zero, and reverse onus, which have the virtue of partially resurrecting well-established notions like moderation and thrift, ideas that have never completely disappeared but have only become subordinate to efficiency." (p.46-47).

We take this and adapt it in Table 2. This appears simplistic but relies on the interpretation, implementation and self-management by companies wanting to readdress their contribution to serious environmental problems. This places great responsibility on the company to judge itself how to operationalise the ideas and principles.

TABLE 2 ABOUT HERE

Princen (2005) in his book 'The Logic of Sufficiency' discusses in detail how three essentially resource based case studies. These case studies provide an interesting insight how eco-sufficiency can be put into practice and the benefits not only to the natural environment but also to the organisations. From the outside and in hindsight it is clear why these case studies applied eco-sufficiency; they were protecting the very natural environment (forestry, fish stocks and eco-tourism) their organisation depended for the long-term benefit of the organisation, financially and socially. But how can companies in other industries use eco-sufficiency?

Barter and Bebbington (2010) research was based on interviewing companies with a core strategy based on environmental protection showed that these progressive companies are indeed using eco-sufficiency "…as a counter to maximisation, implying the companies researched, if not pursuing maximisation, have some notion of 'enough'"(ibid: p.10). They highlight that applying eco-sufficiency was more of a decision by decision process rather than as a coherent strategy. Their research also highlights the difficulty of implementing eco-sufficiency if the company is public listed. They suggest that this put further demands on the company managers to prioritise the interests of shareholders above all others (Whitehouse, 2006). One route though is to become a 'not for profit' organisation and to stay small like social enterprises. The majority of the companies in the Barter and Bebbington (2010) report were in this category, many favouring employee or producer owned to bring in environmental and ethical concerns into the strategic direction of the company.

However, we suggest that companies with strong environmental sustainability strategies should be implementing eco-sufficiency for the most serious environmental problems because it is morally right to make real environmental improvements (or the companies are green washing) and to capitalise on first mover competitive advantage for issues where legislation and stakeholder pressures will surely follow. These companies will have to adopt transformative sustainable business models and in doing so have developed innovative products and services ahead of the inevitable market move and potentially regulatory moves in some areas. In the next section we propose an approach of how companies can use the eco-efficiency and eco-sufficiency together as the basis of a new business model.

4. A corporate eco-efficiency eco-sufficiency (Ce^3s) approach?

What is of particular interest when looking at eco-sufficiency from a business perspective is that it can be seen in terms of both production and consumption? We can address the production and organisational management elements of the system and it provides a much more holistic mechanism than eco-efficiency alone in addressing the corporate response to serious environmental problems.

Within the current economic market system there are the two models where companies would engage with eco-sufficiency. The first is where government force companies to reduce their absolute environmental impact through such a schemes like the EU Emissions Trading Scheme and the UK Carbon Reduction Commitment Energy Efficiency Scheme (CRC) (CRC). The EU Emissions Trading Scheme uses the market mechanism, which allows participating companies to buy and sell carbon credits if they want to emit more CO_2 or are not emitting to their credits. Over time the EU reduces the amount of carbon credits available in the scheme, hence dictating eco-sufficiency levels and forcing participating companies either to pay a higher price for the credits or reduce their absolute CO_2 emissions. However this scheme is a rarity and will remain so due to the cost and complexity of the approach. In addition this scheme has not been as effective as hoped Blyth & Bunn (2011). More recently the introduction of the CRC Energy Efficiency Scheme (CRC) in April 2010 makes the beginning of mandatory efficiency measure in the UK. As the CRC is currently in its infancy it will be a waiting game to see if it drives businesses beyond low-level efficiency to make real headway in achieving carbon reduction. However, with this system new/different approaches will be needed as trading develops (if a real market emerges) to create more appropriate levels of carbon reduction, maybe eco-sufficiency is one such alternative approach. The question of regionalised approaches comes into play, with most businesses, both large and small are affected by the globalised market place and therefore changes in business models need to allow for this.

The second context for eco-sufficiency in the current system is through voluntary up-take of eco-sufficiency, drawing on the debate previously introduced in this paper. As part of credible CSR programmes, companies will limit their impacts on serious environmental problems without being forced to do so by their stakeholders (though there will be pressures and opportunities). Voluntary eco-sufficiency may be driven by resource limitations (see Princen, 2005), for example, tourism industries which are based in areas of conservation would need to preserve their environment in order to sustain their business, this maybe in the form of limiting use regardless of demand. The other case of resource-limited eco-sufficiency may come into play particular in the current economic climate where economic resources available for expansion are limited and businesses need to consolidate their business rather than expand it in order to survive.

Figure 1 outlines our 'Corporate eco-efficiency – eco-sufficiency (Ce^3s) approach'. This approach helps companies more clearly identify and deal with different environmental problems. Some environmental issues are important due to the company's operations (including products, services and supply chains) and others are important in a global perspective or in specific geographic context. The approach starts by using the conventional method for identifying environmental aspects (company operations that could have an impact on the environment) as outlines in various standards such as ISO14001 Environmental Management System or GRI Sustainability Reporting Guidelines. The key to the Ce^3s approach is to separate the different environmental problems organisations contribute.

The standards use the term significant environmental aspect for any interaction with the environment – such as resource use or emissions that can contribute to an environmental problem. We suggest that an additional category of 'highly significant' aspects is added. The 'significant' aspects are those identified through the standards above but are related to the

company's activities, products, services and supply chain. Eco-efficiency targets i.e. relative to output/turnover are then developed and implemented causing incremental changes in the company's environmental performance and require continuous review in case of change. This is practice is widespread in industry.

The new category called 'highly significant' aspects are in essence a ring fencing of some of the current significant aspects that for example ISO14031 Environmental Performance Evaluation standard guideline suggests should be identified using the reference of the 'condition of the environment'. To date the tendency has been to not include global environmental problems as much in company CSR programmes or popular standards such as ISO14001. We suggest that 'highly significant' aspects are identified from information and experts outside the organisation such as UN declarations and significant agreement within the scientific community, such as the Rockström et al (2009) paper. The aim here is to identify serious global environmental problems that need to be addressed through serious changes in companies operations, products, services and supply chains. So in the Rockström et al (2009) case this would be contributions to climate change, biodiversity loss and disruption to the Nitrogen cycle. Other local and regional significant aspects can also be classified to the 'highly significant' aspects if there are serious environmental changes such as to a local river or lake eco-systems to the organisation's site.

For 'highly significant' aspects eco-sufficiency principle should be applied. In practice this should mean an absolute reduction in that highly significant aspect for the company as a whole including the life cycle of it products, services and supply chain. As seen in the environmentally driven companies in Barter and Bebbington's (2010) research, this could mean having an overall eco-sufficiency strategy that in practice occurs on a decision by decision basis. However, these companies are small and more easily able to implement this strategy than large companies, that would have to use systems to create consistence and information feedback loops specifically focused on eco-sufficiency objectives. It is also likely that in large companies organisational and cultural change will be required; which is likely to take longer and need a more unified strategy.

For climate change there are already absolute targets that have been set at national level and particular industrial sectors. In fact many companies have already set their own ambitious targets such as Walmart, Marks & Spencer, Interface FLOR and Unilever. The effects of the implementation on the greenhouse gas emissions and if it will create transformation in their sustainable business model has yet to be witnessed. However, what is important is that there is an acceptance in principle here that eco-sufficiency has to be applied for serious global environmental problems and stakeholder pressure, after scientific consensus can push companies to take action.

In the case of biodiversity loss, there is already consensus on the seriousness of the impact but there seems to be an even more ad hoc approach to dealing with the problem at national and industry level. However there are examples of companies using product labels such as the Forest Stewardship Council mark and the Rainforest Alliance label as a means to deal with this issue. It is for others to debate if these labels are a good method for reducing biodiversity loss (e.g. see Jacquet & Pauly, 2008) but it is an indication of how to deal with such a complex issue. In this case eco-sufficiency, unlike eco-efficiency, reduces the environmental impact by restricting output or value created.

The third issue outlined by Rockström et al (2009) issues is disruption to the Nitrogen cycle caused mostly by the fertilizer and agriculture sectors. There is much to be done here and there has been some efforts but it has by and large been ignored in favour of mass food production. The organic sector is dealing with this issue as part of a wider environmental agenda but it still remains a small part of the food produced.

By implementing our Ce^3s approach, we want companies to tackle serious environmental problems in a different manner to other environmental problems by applying eco-sufficiency. This will undeniably have profound effects on company operations, products, services and supply chains, but without it, industry will continues improving incrementally while declaring they have advanced CSR programmes. To be credible, CSR programmes should implement eco-sufficiency for serious environmental issues, which may impact on their financial profits but in the long run may provide these companies with innovative transformative sustainable business models fit for the future. This is further discussed in the conclusions.

Neither eco-efficiency nor eco-sufficiency will deliver environmental sustainability in isolation. Eco-efficiency and eco-sufficiency have different strengths and weaknesses. Proponents of eco-efficiency argue that we must aim to be efficient when there is scarcity. Only if we aim to be efficient we will be able to deliver the economic return we require while protecting our base of environmental resources. Only a system, like the market economy, that is geared towards efficiency will optimise the use of the environmental and social resources. If we assume that the majority of individuals in our society are not keen to reduce their consumption for the sake of environmental sustainability then being more efficient appears to be the only solution to achieve environmental sustainability as it will be the only strategy that is not based on voluntary restriction. Calwell (2010) also argues for a combination of both efficiency and eco-sufficiency in his call for 'a change in the voluntary and mandatory efficiency policies and programs are implemented to systematically implement eco-sufficiency and progressive [eco-] efficiency concepts' (ibid:1).

Critics of eco-efficiency and proponents of eco-sufficiency will argue that there can be no guarantee that a drive to eco-efficiency will reduce environmental impacts sufficiently to be in line with the carrying capacity of the Earth. We therefore need a system that guarantees that environmental impacts will be reduced sufficiently irrespective of the economic return that is generated. Critics of the eco-sufficiency approach will argue that eco-sufficiency is not sustainable for yet another reason. The eco-sufficiency approach presupposes that companies will be ready to self restrict their consumption. They would bear the full (private) cost of the foregone consumption of the environmental resources while society at large would benefit from the reduced resource consumption. Put differently, the reduction of the consumption of environmental resources is a public good. Financing public goods is notoriously difficult.

5. Conclusions

In considering the appropriateness of corporate responses to sustainable development it is important to consider the link between eco-efficiency and CSR as a business strategy. In relation to this paper the importance of this relationship lies in the premise that CSR as a voluntary business tool is serving to maintain the status quo of business model which are firmly grounded in the neo-liberal tradition. The authors suggest that the popularity of CSR over other possible corporate tools to respond to sustainable development is its ability to appear to be progressing the debate but in fact it is serving to avoid challenge to the status quo. To certain extend eco-efficiency can be viewed in a similar vein, as touched upon earlier, but what is also important is the use of eco-efficiency within a model of CSR, both in terms of activity and reporting, this context needs to be born in mind in the following discussion with regard to moving towards a business model which is based more on the concept of eco-sufficiency.

We call for a change in company practice away from those that contribute to serious environmental problems but this raises the question about who will decide on how resources will be allocated. Market mechanisms that follow an efficiency-logic are praised for the way

they allocate resources. What will be the allocation key for other mechanisms and will they be as efficient? There is a substantial risk that other allocation mechanisms will be environmentally effective but will result in a less efficient allocation of resources; i.e., there is a risk that a call for eco-sufficiency results in a lack real of efficiency.

So why would companies self regulate using the eco-sufficiency approach that would impact their bottom line, activities, products, services and supply chains? There a maybe five points here:

1. The moral argument is that large companies with large impacts and influence operating CSR strategies should be take the lead on tackling these serious environmental issues that affect the natural environment and ultimately society.
2. Eventually, such as has happened in the case of climate change, legislation and binding targets are placed on companies, hence pro-active companies can stay competitive and stay ahead of legislation and start dealing by problems in a voluntary manner.
3. Before legislation becomes a driver, stakeholder pressure will affect the company's brand image causing poor press reports and associate affects on investors and customers.
4. In tandem with legislation, some of these serious environmental problems may lead to scarcity of resources that the company sources, pushing the price up and affecting the company's competitive advantage.
5. Business will directly face risk and impacts as a result of environmental change.

Finally, we have suggested an approach to dealing with serious environmental issues and overcoming the limitations of eco-efficiency. There is still much to work out in practice not least the impacts of eco-sufficiency on company operations, products, services and supply chains. Further research needs to be conducted with leading companies on how the approach would be implemented and any rebound effects and associated large impacts on other environmental problems would be avoided/dealt with. However, for companies to play their role in society they must significantly reduce their impacts on serious environmental problems and the proposed approach provides a starting point to move business forward to really achieve this.

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Figure 1: The Corporate eco-efficiency – eco-sufficiency approach

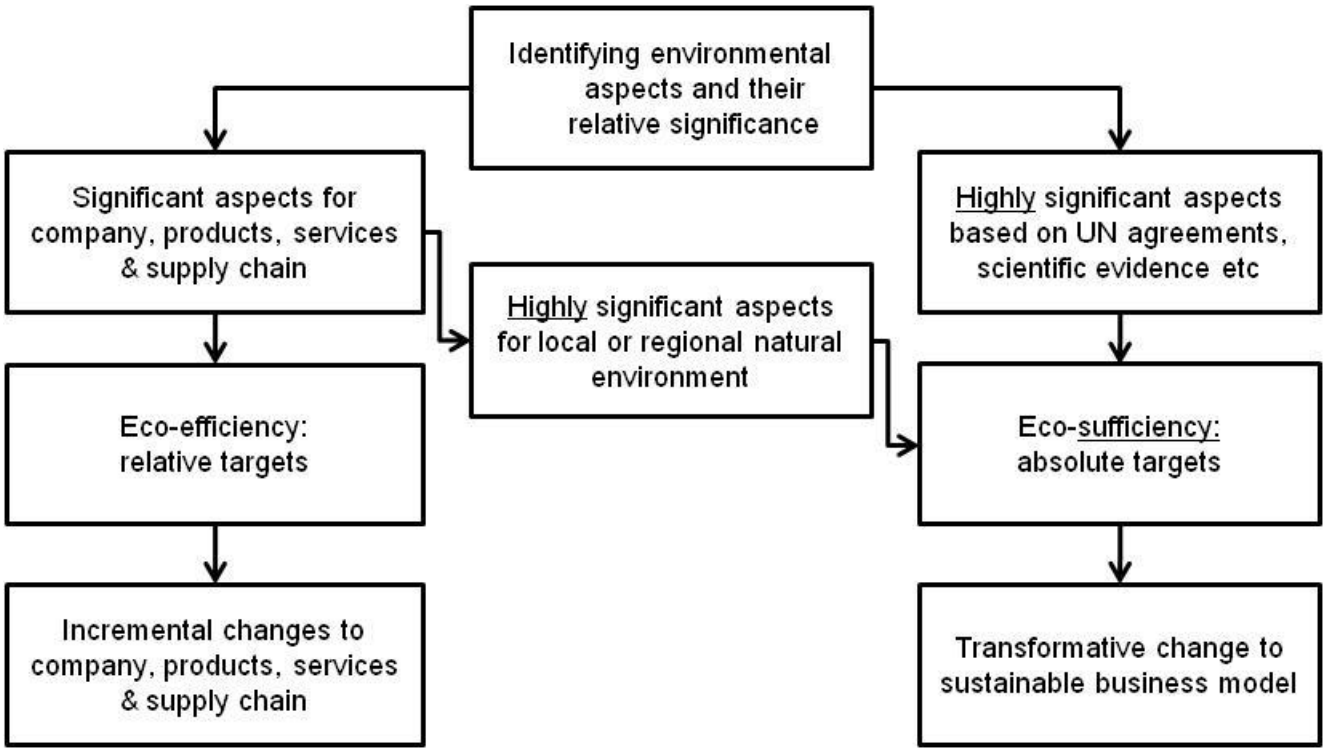

Table 1: The main characteristics of the eco-efficiency and sufficiency approaches.

	Eco-efficiency	**Eco-sufficiency**
Primary goal	Get more economic return per unit of environmental and social resource	Reduce environmental and social resource consumption
Secondary goal	Reduce environmental and social resource consumption	Satisfy the needs of individuals
Allocation logic	Efficiency driven. Resources should be allocated where they create the highest return.	Need driven, normative.
Typical institutional setting	Free market economy, decentralised decision making	Command and control (non-market), centralised decision making
Opportunity	Focus on win-win opportunities, acceptance independent of commitment to sustainability	Focus on ecological and social effectiveness
Threat	Ecological and social effectiveness not guaranteed	Efficiency not considered. Acceptance depends on commitment to sustainability

Table 2: Eco-sufficiency hierocracy (adapted from Princen 2003, Lamberton 2005 and McDonald et al 2006).

Principle	**Operationalisation**
Zero	No consumption or resources or pollutants that have major irreversible impacts, e.g. CO_2 emissions.
Simplicity	Produce products and services without excess.
Dematerialisation	Shift to service without externalising impacts.
Restrict	Slowing down production and consumption of resources or pollutants with some impacts.
Precautionary	Do not use chemicals etc where the impact is unknown.
Polluter pays	Internalise environmental impacts.
Reverse onus	Prove products or services have no impacts.