Environmental Strategies in Industry

Turning Business Incentives into Sustainability
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This thesis/report contributes to an understanding of how and why actors treat environmental aspects and the concepts of sustainability and sustainable development. The phenomenon of corporate environmental concerns, both empirically and theoretically, is critically analysed. How do firms handle environmental issues internally, how do external actors evaluate firms’ transmitted images and what are the economic and environmental results?

This report is finalised by Dr. Pontus Cerin at the Unit of Industrial Dynamics, Department of Industrial Economics and Management, Royal Institute of Technology, as an academic thesis, in partial fulfilment of the requirements for the Docent Degree, and as a report on behalf of the Swedish Environmental Protection Agency. The report consists of a cover essay and nine separately included papers. Two published articles constitute the lion part of the cover essay. These two articles as well as all individually included papers of the report are published/have been accepted for publication in scientific peer reviewed journals and one in an academic research book. Each one of these eleven papers is scientifically evaluated by two-to-three accredited academic researchers. The author has sole responsibility for the content of the report.

The Swedish Environmental Protection Agency

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Unlike the situation a few decades ago, today in the first years of the 21st century environmental concerns have spread to many groups of society. Even the formerly stubborn resistance pockets in industry have turned around 180 degrees, advocating the greening of industry. In this new agenda: industry is sometimes perceived as the socially responsible guardian of society and actors within industry and Non Governmental Organisations (NGOs) continually reinforce each other's trustworthiness. Notwithstanding this progress major leaps in environmental improvements have failed to appear. This thesis contributes to an understanding of how and why actors treat environmental aspects and the concepts of sustainability and sustainable development. The phenomenon of corporate environmental concerns, both empirically and theoretically, is critically analysed. How do firms handle environmental issues internally, how do external actors evaluate firms' transmitted images and what are the economic and environmental results? It is indicated in the papers constituting the thesis that a discrepancy exists between what firms state in their external communications compared to the real environmental and economic outcomes from their organisations’ operations. There exists, however, also a tendency of blind faith in firms’ statements among actors that for a living inform the public about industry’s societal commitment. As such, sustainability indexes may – due to erroneous selection criteria in the indexes – appear as environmental ideals, leading environmentally conscious customers to invest in large and dirty firms. The voluntary stage which the environmental and sustainable reporting is faced with ought to receive policy support to make reportees report consistently from year to year and comparable to other reporters. Moreover, in order to retain the environmental and economic win-win situations laying around to be picked up by firms as advocates of win-wins have claimed since the mid 1990’s, and nothing much has happened yet, the papers in the thesis argue for policy actions that will take transactions costs into consideration by signing property rights responsibility – e.g. to emit – to those actors who can use the resources most efficiently, turning the problem of open access into a production factor. Then the firms can receive private economic benefits for innovating societal improvements. The papers in the thesis suggest, hence, to delimit the need and possibilities for decouple corporate external information and to promote innovative activities for a better environment by increased public support in extended responsibility, public procurement as well as to spread environmental information to actors that have deficient knowledge of such. One can always call for companies to act more or less altruistic for the benefit of our environment, as is often done, but we have to recall that the common consumer has in many cases proven not to be willing to promote such solutions, nor the companies providing services to them. Consumers, hence, have to take an active position in the rôle of voters, influencing politics to take a stance by the powerful means of the public to promote innovations that are beneficial to society as a whole.
Paper I – Part of the Cover Essay

The Introduction section and the sub-section Notions of sustainability and the use of TLAs – Tools for increased power? of the Cover Essay constitute the lion part of an article published in PIE.


Paper II – Part of the Cover Essay

The sub-section Theoretical Foundation of the Cover Essay constitutes the lion part of an article published in CSREM.


Paper III


Paper IV


Paper V

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Why did I choose to get involved in the long process of writing this thesis? Well, those to blame – partially anyway – are Professor Staffan Laestadius and Professor Gunnar Eliasson who provided a master's level course named Industrial Dynamics that, in my opinion, should be marked to the highest degree by grandeur – superb. They got me hooked.

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Stockholm, December 2004
Pontus Cerin
This thesis analyses through case studies—the individual papers of the thesis—corporate environmental management practices; reasons, benefits and drawbacks; supported by theoretical paradigms in Management Control and Institutional Economics that are permeated by the sociology of organisational theory to compose a coherent theoretical framework for analysing course of events and suggestions for where to go.

The reader may of course read the entire thesis and find it beneficial, but brief guidance will be given here as an aid to quickly find the areas of personal interest. The most efficient way to get an overall picture of the thesis is to browse through the content information, displaying the sections in the Cover Essay as well as listing the included papers. The Introduction of the Cover Essay sets the agenda for the thesis and discusses why there ought to be further concern for environmental issues, despite the voluntary initiatives taken by industry. This section is followed by the Aim of the Thesis. The Cover Essay also introduces a Theoretical and Conceptual Framework. This part of the thesis illuminates the case studies with aid from different theoretical approaches. The clash of theoretical approaches illuminated may foremost be an interest directed toward the social science domain of academia, but could also open up a new and interesting world for others. Here the different theoretical approaches are brought into play as a coherent framework to explain and support the observations made in the specific case studies displayed in the separate articles. The theoretical framework is divided into three areas, namely, 1) Philosophic Foundation, 2) Management Control and 3) Institutional Economics. The Cover Essay also includes a section briefly describing my hands on work-experiences with environmental issues in industry and academic research. In order to provide a concise introduction of the individual papers, papers III – XI, a short description is given for each in the section Presenting the Papers of the Cover Essay. Each abstract is followed up by brief conclusion. The Cover Essay is concluded by the Synthesis and Conclusion discussion, which provides an overall concluding debate of the entire thesis. Happy reading!

The thesis is based on eleven papers of which all are published or accepted for publication in scientific journals. Nine of these papers are enclosed as individual papers in the thesis. Papers I – II are, however, only included as parts of the Cover Essay. Paper I constitutes the lion part of the Introduction section. This introductory paper contains a historical context on the rise of interests in environmental issues and describes the pros and cons of today’s environmental engagement in
industry and society. Paper II presents the theoretical framework of the thesis and constitutes a considerable part of the Philosophic Foundation and the Concluding the Theoretical Framework – A Synthesis, both subdivisions, of the section Theoretical and Conceptual Framework in the Cover Essay. The Cover Essay also includes descriptions on the research process, overall reflections and the briefings of the included papers.

The individual papers, III through XI, are divided into three parts, constituting the three sub-aims of the thesis. Each of these papers can be read individually, together with the other papers in the same part of the thesis – discussing the same sub-aims – or against the introductory paper providing the historical and theoretical frameworks upon which the empirical selection and analytical interpretations in the papers are derived from. The constituting papers (III-XI) belong to different research paradigms, ranging from sociological worldviews and ways of looking at ethics, behaviours in organisations, the phenomenon of voluntarily reporting issues which are negatively associated with the own organisation, looking at stock markets and ethical indexes to finally discuss new policy instruments coping with the unwanted effects of opportunistic behaviour that may lock us into paths of environmental degradation.

**PART I:**
**ENVIRONMENTAL MANAGEMENT – ANALYSIS, ACCOUNTING AND REPORTING**


**Part II:**
**Evaluation – Reporting Firms and External Evaluation of Performance**


**Part III:**

**Proposed Institutional Contexts – Property Rights and Transaction Costs**


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Appendix
Abstract

The Cover Essay integrates the various issues dealt with throughout the thesis. One purpose is to serve as an appetiser, making the reader interested in the encompassed papers, but also to provide the reader with an overview of the thesis. The main thread of the thesis is to be visualised, making the papers a coherent entity, although, dealing with a variety of theories and empirical data. First the cover essay tells the story of the budding of environmentalism and the sustainability agenda and puts it in relation to accomplished environmental improvements lately. Thereafter the aim, and its three sub aims, of the thesis are presented and the deployment of papers likewise. Reflections on own experiences in industry and academia are on display followed by a theoretical and conceptual framework that briefs the reader on the theoretical domiciles. The cover essay is then brought to an end with a presentation of included papers and the reference list.
Environmental concerns within the corporate society have exploded since the beginning of the 1990’s and the environmental initiative is no longer reserved for environmentalists. Without waiting for government regulations some firms produce corporate environmental reports, engage actively in international environmental regulation and standardisation activities and develop new tools for environmental management: management systems, analysis, accounting, labelling and reporting.

The early process of development that these tools have undergone can be characterised as a fluid phase (Utterback, 1996) where an increasing number of innovators enter. When the process matures actor after actor has to accept the emerging dominant design, whether it is superior or not. One reason for these environmental management tools to sometimes fail in achieving real improvements of environmental performance is firms’ strive for legitimacy, seeing that as more important than real results (Wolff, 1986). Akerlof (1970) shows, moreover, that due to difficulties for the external actor to determine the accuracy of information the sustainable markets may very well turn out to be inefficient. The aim of this thesis is to critically analyse this phenomenon of corporate environmental concern: how do firms handle environmental issues internally, how can external actors evaluate their transmitted images and what are the economic and environmental results, and policy implications?

Let us, however, recall the historical origin of the observed growing corporate concerns for environmental and sustainability issues. The alarming reports in the 1960’s created the first substantial concerns in society, questioning the social and environmental merits of the experienced economic growth in North America and Western Europe, in particular. Rachel Carson, one of the first authors in this field, raised the awareness of the hazardous drawbacks with pesticides, eloquently questioning man’s unrestricted faith in technological development in her milestone book *Silent Spring* (Carson, 1962). Being cancerous is one major downside of the, at the time popular, pesticide DDT (Dichlor- + Diphenyl + Trichlor- [C14H9Cl5]). It is readily stored in fatty tissues and accumulates in the food chain, severely affecting those at the top, i.e. ourselves. These insect-killers were at that time perceived...
as the saviour of the world, defending our food supply – to a rapidly growing world population against nature’s vicious insects. In ads one could find slogans like *Murdering fog brings life to agriculture*. After the influential presentation of Carson that depicts an imagined American town where everything was silenced, including its juveniles, such catchphrases in ads did not work as before. As a response to a new public awareness (or perception) agrochemical companies had to create a new image in their marketing, but they were also forced into research to create substitutes for their insect repellents since governments around the world began, one after the other, to ban DDT and putting biocides (=life-killers) at large under stricter surveillance than previously.

Much has happened since then. Firms have changed their behaviour. Environmental policies have been implemented. International agreements have also contributed to the rising international environmental opinion, giving birth to NGO’s concerned with environmental problems. The UN meetings leading to the *Stockholm Declaration on the Human Environment* in 1972, associated with environmental issues, and the *Montreal Protocol on Substances that Deplete the Ozone Layer* in 1987 where the signatory nations committed themselves to a reduction in the use of CFCs and other ozone-depleting substances may illustrate those processes.

The prominent and often cited (e.g. by NGOs and UN bodies) *State of the World* report – on progress toward a sustainable society – has been published annually since 1984 by the Worldwatch Institute. Matters illuminated in the first issue dealt with rates of population growth, debilitating levels of international debt and extensive damage to forests from acid rain *et cetera et cetera*… Despite the fact that milestone agreements have been reached in some areas such as the 1987 Montreal Protocol and a general increased attention (in society) to the severe calamities of the world, nothing much of the most consequential world distresses has been radically improved as stated in *State of the World 2000* (Worldwatch Institute, 2000) regarding the institute’s hopes in the mid 1980’s and their increasingly disillusioned worldview in the turn of the millennium:
By the end of the century, we then hoped, the world would be well on the way to creating a sustainable global economy. Far from it. ... we are about to enter a new century having solved few of these problems, and facing even more profound challenges to the future of the global economy.

(Worldwatch Institute, 2000)

The divide between North and South is still not decreasing. There are even tendencies to the opposite. In the year 2000 the number of overweight people on the world reached the same levels – some 1.2 billion people – as the number of hungry and undernourished (Worldwatch Institute, 2000). In the third world, especially in Africa deceases are severely affecting the population demographics, but multinational pharmaceutical corporations, all western world based, do not find it economical to develop or provide these regions with cures at affordable prices (cf. Worldwatch Institute, 2003).

Other alarming trends, mentioned in the *State of the World 2000*, are the worldwide shrinking of cropland per person, falling water tables, levelling off the fish catch that all will make it difficult to keep up with the world growing food demand. For how long will the current trend of dramatically improving the grainland productivity be able to be at pace (in total, although not allocated to all in need for food) with the accelerating demand for food? Not to mention the disorders with the rapidly diminishing rainforests – annual rate of decrease according to some estimates corresponds to 4.5 times the area of Taiwan – and the increasing number of species, still around in the world today, to be forever extinct. “An evolutionary tragedy”, if using *State of the World 2000*’s wording, is currently taking place. United Nations Environment Programme’s *Global Environment Outlook 2000*, moreover, states that it is too late to make an easy transition to sustainability for many pressing issues that man has created and a full scale emergency exist on them (UNEP, 1999).

Another issue of concern is the power relations in society. On a global scale the most powerful economic entities may not necessarily be the nations of the world, but corporate ones. The lion part of these largest corporations belongs to the car and oil industry closely followed by some Japanese conglomerates harvesting rainforests (Anderson and Cavanagh, 2000). This is certainly a strength distribution worth considering in international treaties, national policies and corporate external communications – both in existing ones and in the development of new. In his agenda setting paper Welford (2002), besides giving attention to the phenomenon of a group of corporations fiscally outgrowing the majority of countries in the world, stressed the adversities from the disorders of globalisation where large parts of humanity are marginalized and the poor are getting poorer. In the latest *State of
the World 2003 (Worldwatch Institute, 2003) a consequence of acute poverty is very well illustrated by showing the strong negative correlation between female secondary school enrolment rate and total fertility rate. A social problem that will, if not solved, make today’s environmental dilemmas appear as negligible.

Other issues have also increasingly been dealt with since the 1960’s such as lead in biocides, controlling emissions from point sources into the air from chimneys, and into water from public and industry wastewaters. The overuse of natural resources was elucidated by Dahmén (1968) in Sweden and followed by a discussion relating economic and population growth to environmental impacts and limiting resources. Considering the interwoven aspects of the economy and the environment, what are the pros and cons for continued economic growth? Not to mention the social equity position. Can we really support a rapidly growing world population (Forrester, 1971; The Limits to Growth by Meadows et al., 1972)? Hence, in the early 1970’s a new branch of economics developed, called environmental economics, which to begin with was anti-growth oriented (Pearce and Turner, 1990). Other writings, however, (by Beckerman, 1974; Our Common Future (also known as The Brundtland Report) by WCED, 1987; Blueprint for a Green Economy by Pearce et al., 1989) reacted to the limited growth advocators. The two latter suggested that preservation of nature and economic growth do not need to be conflicting, arguing for the idea of sustainable development. One underlying assumption was that technology would make it possible to solve the environmental problems while creating economic growth. Beckerman (1974) takes a completely opposing view to non-growth writings, saying that without growth in the economy we will not be able to solve a number of often pressing environmental problems. In the 1980’s and 1990’s the zero-growth and steady state concepts dominating the discussion of the 60’s and 70’s have largely been replaced by the notion of sustainable development (cf. Welford, 1996; cf. Kågeson, 1998).

### Theoretical rifts on how to achieve a better world

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<th>The Environmental Kuznets Curve (EKC) Controversy</th>
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Neoclassical economists sometimes use technological progress as a trump card.

The Georgescu-Roegen Controversy

Ecological Economics

"simply sweeps the contradiction under the rug, without removing it."

"In actuality, the increase of capital implies an additional depletion of resources."

"to be of limited relevance."

not knowing waste
The sustainability discourse has, thus, opened new frontiers for analysis, for politics and business. Although far from clearly defined, the concept of sustainability opened for an alternative to resource consuming and polluting growth other than stagnation. This was also an attractive position for the corporate world. Sustainability became the hub around which the business community could act and respond to challenges from governments, NGOs, consumers and other stakeholders. By jointly applying economic, environmental and social issues – constituting the commonly used triple bottom line in the sustainability discourse – environmental issues can be given a lesser importance by being disrupted and put against the others, and of course visa versa when needed. This introduction of concepts to the environmental problem also increases the risk of actors to decouple information transmitted, to recipients with different interests, but also to real actions (Meyer and Rowan, 1977). To enable progress towards sustainability all three aspects of the triple bottom line are, however, needed. To solve environmental problems without dealing with the considerable social inequalities present is probably not going to be sustainable (Welford, 2002).

In the beginning of the 1990’s numerous environment-business success cases, indicating environmental-economic win-win situations, were published (Elkington and Knight, 1991; Schmidheiny and BCSD², 1992; Smart, 1992; Porter and van der Linde 1995a; 1995b; Schmidheiny et al., 1996; Weizsäcker et al., 1997). It was suggested that environmental improvement could be an integral part of the ongoing industrial innovation process, costing nothing or very little in terms of giving up consumer value, once the preferences for a sustainable development had been made both clearly manifest and effective in marketing. Such ideals, of course, have won receptive ears in the business community and, notably, also among some international non-governmental organisations (NGOs) that have supported similar ideas for years.

The free lunches offered in the debate, however, have been questioned by theorists from different areas (Palmer et al., 1995; Dobers, 1996; Welford ed., 1997). Palmer
et al point to formal errors in some stories and argue that finding a few positive cases (among numerous cases to choose from) is no proof for free lunches in general. But finding a few, however, raises the possibility that major environmental improvements can be achieved at minimum costs, if economic incentives are competently designed. Such improvements may, moreover, need to be supported by others than merely by the business community. Suppose the public can be convinced to demand and made willing to pay for the short and long term improvements of their local and global environments.

1.5 Hijacking environmentalism

Welford (1997a; 1998) – using the phrase *eco-modernism* for the easy to embrace techno-management philosophy (see the success story section above) – sees an inherited risk that citizens become indulged in a sense of security and accept that the corporate community continues its business as usual. There is also, according to Welford, a risk that the environmentalists are being pushed aside from the public environmental debate, by initiatives from the business community, giving environmental and social issues a narrower interpretation. Such limited interpretations are naturally tailored to current business views and scope, delimitations that reflect current legal jurisdictions. The belief in corporate management’s ability and willingness to attend to environmental problems is mirrored by Schmidheiny *et al.* (1996). The book may be interpreted as arguing that the business community should be left alone to solve the environmental problems of the world. In other words these writings may bee seen as an attempt by industry to escape the yoke that frenetic NGO’s and oppressive agencies try to put on them. The leave industry alone view presented by Schmidheiny is strongly commented by Rikhardsson and Welford (1997) as fostering *false consciousness.*

The views and behaviour of the business community on environmental issues are probably as diverse as the number of firms, or rather their numbers of departments and people. Information asymmetries (cf. Akerlof, 1970) – of conflicting resource allocations – is one cause for the opportunistic behaviour that may occur when agents try to gain advantages for themselves within the limits of what they consider their responsibility. On this Arrow (1970) and Papandreou (1994) have demonstrated that the sum of maximised private individual benefits seldom equals society’s net benefit – especially if including our life-supporting nature’s contributions or net value. The aggregated value would exceed the world’s best solution. The best or maximum solution – which of course, always is a social construction – varies over time and place and depends on prevailing cultures, the economic circumstances and available technological solutions. These factors interact with each other, but do also constitute delimitations in actors’ field of visions – cf. walls of self-evidence in Gustafsson (1994) and cf. economic actors’ bounded rationality in Simon (1955) – and on knowledge interest in Habermas (1995).
1.6 The budding of corporate environmental management tools

Parallel to the arrival of success story writings, during the 1990’s, numerous TLA (Three Letter Acronym) tools evolved in the business community, describing various ways to manage environmental aspects and related impacts. This evolving process of environmental management tools has not yet found its final form – within which the amount of tools has been limited by an emerging dominant design (cf. Utterback, 1966). To become dominant may neither be determined on issues such as putting environmental and social aspects foremost nor even economic efficiency in managing them. Nelson and Winter (1982) describe streams of innovations as often being based on engaged technicians and their beliefs on where to find the solutions which clearly is the case here, both in tools for management and analysis. These tools undergo a selection process, which so far has led to a selection of tools that are not necessarily sustainable in themselves (Cerin and Laestadius, 2003 – Paper IV). A danger to the usability of these tools for environmental analyses is that the lion part are developed by academics, who are often interested in slightly new tools – new TLAs coined by themselves – rather than improving existing ones and focusing on efficiency, leading to few implementations among enterprises (cf. Cerin and Laestadius, 2000; cf. Cerin and Laestadius, 2003 – Paper IV; cf, Lindahl, 2003).

Despite the use of this (conceptual) variety of voluntary managerial and analytical tools the major environmental performance improvements have generally not been impressive and on the whole failed to be shown. Having effective managerial systems does not necessarily guarantee positive environmental outcomes (Wood, 1991). Therefore when evaluating the social performance of an organisation the foci should be on outcomes of corporate behaviour rather than on its managerial systems and processes. An environmental management system may in fact indicate that the firm has a higher need to work with e.g. high levels of toxic emissions (Illnitch et al., 1998). Illnitch et al. argue that these circumstances require a deeper understanding of how internal processes and outcomes interact, and the indicators thereof. However, many corporations invest large sums in environmental management systems, especially if they are certified according to a standard (i.e. ISO 14001 and EMAS). Similarly, significant efforts are seen in environmental and sustainability reporting, as well as in the ratings of firms. This environmental reporting practice literary exploded among corporations of considerable size after the Exxon and Union Carbide incidents (Brophy and Starkely, 1996:183). To avoid negative image spillovers, companies in production areas that were associated with these accidents wanted to tell their side of the story. A decade later, Kolk and van

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9 The most well known book, describing these tools is Corporate Environmental Management edited by Welford (1996).
10 As these papers indicate legitimating issues is, among corporate environmental staff and university environmental researchers, one of the driving factors in the development of these tools. These facts, hinting a lack in seeing the overall need of the firm, call for an increased focus on simplicity and transparency to increase the affordability and credibility among the involved actors – in order for these tools to sustain.
Tulder (2004) see environmental reporting as a tool for firms to frame debates with their stakeholders and, as Cerin (2002b – Paper V) illustrates, as a tool for bypassing, steering away from infuriating debates. One reason for real long-term improvements failing to show may be the striving for legitimacy among firms, seeing it as more important to maintain the right image than really achieving the corresponding real results – the identity. There seems to exist a division into operative and legitimising actions (Wolff, 1986, cf. DiMaggio and Powell, 1983).

The discussion just referred to in the paragraph above provides an interesting twist to the management problem. Firms can focus on achieving the good results in terms of creating private economic and environmental win-win situations and/or satisfying consumer preferences. The measurement problems in ascertaining whether firms have succeeded are, moreover, enormous and receivers of such corporate information – as of today – do not always understand what has been achieved. It may, hence, be easier and less costly for firms to create images of positive environmental achievements than to reduce – or contribute to reduction of – emissions.

1.7 Environmental image building

The business idea of some actors in our society is to lend – or rather to lease – their own image of good (e.g. goodwill) – to others. The complexity of modern economies makes it (more or less) impossible for all actors to be fully informed. To overcome information asymmetries and to facilitate communication between actors, intermediate markets and institutional arrangements have been established. The creation of standards facilitates communication between actors on all levels as well as contributes to economy in processes and products. There is family resemblance between standardisation activities and the roles of classification agents but also to phenomena like branding and/or official authorisation. In a world where many actors search for special properties among products and processes highly specialised and competent agents can facilitate their search process. An actor who e.g. produces anchor chains of a specified strength or other products with specific environmental properties may be willing to pay for a label that guarantees these properties on the product. Also the buyer may be willing to pay for such guaranties. We have, thus, during recent decades seen the development of a swarm of national and international non-governmental organisations, certifiers of environmental management systems and products (e.g. according to ISO 14000-series), and rating institutes that rank companies’ sustainability. Competition among these actors, sometimes makes them overextend the use of their good image, neglecting a consistency with the image borrowers’ real identity. Such image-identity decoupling, if perceived as much ado about nothing, will eventually lead to bad image spillovers to the lenders themselves (cf. Brytting, 2002), threatening their own long-term survival.

Recent studies (Kreutze et al., 1996; Halme and Huse, 1997) found that the firms and sectors with the worst environmental pollution records are the ones that report
the most on the environment. A study by Cerin (2002a – Paper VI) on the OM Stockholm exchange confirms that the large and the dirty firms are the ones that produce most environmental reports. Cerin (2002b – Paper V) also showed that the percentage of firms reporting on environmental issues is greater in the Global Fortune 100 than in the Global Fortune 250. Kolk and van Tulder (2004), moreover, in their study of multinational firms’ reporting on the environment selected 100 core firms that fulfil two criteria: They are 1) included in the Fortune 500 list and are 2) internationally the major company within its sector with its own industrial web. They found that an extremely high percentage of these core firms create environmental reports, by far exceeding those in the global Fortune lists. Cerin and Dobers (2001a – Paper VII) found that there were other factors – other than sustainability ones11 – behind the growth of (the aggregated market capitalisation value of the individual firms constituting the) Dow Jones Sustainability Group Index (DJSIGI) that exceeded the growth of Dow Jones Global Index (DJGI)12. The likely reason for this biased choosing is the fact that DJSIGI have selected its components mainly on the basis of information from the companies themselves (Cerin and Dobers 2001b – Paper VIII). Illnitch et al. (1998) see in their evaluation of environmental ratings – pre Dow Jones’ sustainability ones13 – that they seem to rely on public reactions rather than on precise and measurable outcomes. Instead the subjectivity in their formulations may raise a dangerous circularity where the rankings are based on reputation and the reputation is partly based on the ranking (Illnitch et al., 1998; cf. Cerin, 2002b – Paper V). Furthermore, according to Lindfelt’s (forthcoming) interviews, Greenpeace perceives corporate codes of ethics as documents of corporate image building strategies and the codes themselves do not have strategic impacts on the relationships between Greenpeace and the company in question. The wrath of Greenpeace, instead, has to be conciliated by the sustainability of corporate real actions. Since corporate environmental reports are fundamental in the evaluation of firms’ greenness, as described above, it is interesting that a study on environmental reports by multinational corporations suggests that further research is needed to assess multinationals’ actual behaviour, which might be different from there communication (Kolk, forthcoming).

Moreover, Wagner et al. (2001) do not see a correlation between environmental management systems (EMS) on the one hand and a (a) better environmental performance, a (b) better economic performance or a (c) better overall performance on the other. A report by the Swedish Environmental Protection Agency also states

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11 These factors were foremost company size and industry sector belongings as well as their wrongfully back-casting method applied to the DJSIGI.
12 Swedish Environmental Protection Agency (carried out by KPMG’s Swedish subsidy), market their study, in a press release, on Scandinavian Environmental Funds by referring to DJSIGI, believing it is an assessment made by Dow Jones in the US. (See more information on the firm assessing the components of the index in the footnote below.) The resulting claim was, thereby, that sustainable companies have a better increase in share prizes (Swedish EPA, 2000).
13 The two Dow Jones Sustainability Indexes are in fact – despite the image lending – indexes of the company SAM Indexes and the component selection is based upon their view on sustainability. The components selected from are based upon the Dow Jones Global Indexes and Dow Jones STOXX. The SAM name does, however, not signal the reliance in financial relevance as something which is labelled Dow Jones.
that it is difficult to distinguish a linkage between implemented environmental management systems and improved environmental performance. According to the report there are indications that environmental management systems can, in some cases, generate business advantages since it is occasionally expected that the firm has a certified EMS. The report provides three obstacles associated with the usage of EMSs that should be addressed to improve this management phenomenon. Those are: 1) Deficient incentives, 2) erroneous usages and 3) a general lack of knowledge (Axelsson et al., 2003). Despite this, numerous (industry) customers when taking environmental issues into account become satisfied if the vendor has a certified EMS and, hence, stop asking (Lindahl, 2003). The extra workload for the procurer is solved, even though nothing has really been said regarding environmental performance. Environmental management systems have been exposed to critique for their failure to generally show long-term environmental improvements. The main reason for this fault is not due to the standard itself (I would argue), but due to a vital misinterpretation of the scope delimitation of the organisation’s environmental aspects (cf. Cerin, 2000; cf. Cerin and Ramírez, 2000). These activities, involving various environmental tools, also show a positive correlation with organisational size – company size (Bugge, 1998; Holgaard and Remmen, 2000; Stray and Ballantine, 2000; Karvonen, 2000), corporation-unit size (Cerin and Laestadius, 2000) and municipality size (Burström, 2000). Lanoie et al. (1998) observe that the larger the corporation is, the more seriously it is hit by a negative reputation and when studying SMEs Lefebvre et al. (2003) do, however, not find that environmental responsiveness can be translated into hard and lasting financial results, either in reducing costs or increased revenues. Bartol and Martin (1994) see a lack of financial and human resources among smaller firms for these environmental activities which is unfortunate if considering that roughly 70% of global economic activities (in National Product) have been generated by small to medium-sized enterprises (SMEs) (O’Laire and Welford, 1996). The research into SMEs and their work with environmental issues and how their activities affect the environment is somewhat underdeveloped (Hunchinson and Hunchinson, 1996; Lefebvre et al., 2003). To surmount these obstacles that face SMEs to adopt EMSs Welford and Gouldson (1993) suggested regional management systems that are based on the same methodology as ordinary corporate management systems. The

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14 Cerin and Ramírez (2000) found in their 1999 study of a cellular phone plant’s environmental management system that the aspects they could work with, and hence of primary concern, were not the ones of greatest significance. Those more important aspects were decided by the design organisation located far away from the plant site. The design unit had no environmental management system in place since they had no severe environmental impacts, although considerable indirect ones. Cerin and Ramírez detected another plant site producing more or less the same products, but with an implemented environmental management system working with a totally different approach. Cerin and Ramírez suggested A) an integration of production people in the design process (concerning environmental issues, but saw it as an important general problem) and B) the implementation of a management system that incorporated both the design unit and the two production sites, ending up producing its products. A couple of years later the corporation implemented the world’s first certified global environmental management system, taking care of the integration aspect between designer and producer, that has been certified by the British BSI.

15 According to Rowe and Hollingsworth (1996) SMEs in the UK comprise an even larger part of businesses and are estimated to contribute to 70% of all pollution in the UK.
difference is that the delimited is not one single organisation but instead, for example, a county or township. A network approach is according to Korhonen (2002; 2003) needed to achieve a holistic system perspective on a regional basis that comprises SMEs and their services in a system of Management and analysis.

1.8 Asymmetries in information and power leading to unwanted selection of dirty firms

Gray et al. (1996) and Harte and Owen (1992) have found that positive externalities tend to be more readily disclosed voluntarily than negative externalities and Niskanen and Nieminen (2001) argue that environmental reporting (under the current institutional context) cannot be considered to be objective. The position of Ilinitch et al. (1998) is that measures of organisational outcomes, disclosed voluntarily by firms or being unaudited, can be manipulated and misinterpreted. When dealing with corporate environmental disclosures the information asymmetries represent the most serious market failure (Gray, 1992). The recipients of environmental information, moreover, cannot accurately assess the quality due to information asymmetries between the reporting organisations and the common recipients, making bad quality information drive out good. US EPA Environmental Capital Markets Committee concluded in their report that: “Although many firms have come to view their information management strategies as an integral part of their comprehensive strategic business plans, valuing a company’s information assets and the competitive advantage that its information strategies might yield is still a very uncertain science.” (US-EPA, 2000). As a consequence stakeholders are not able to effectively discriminate among reportees and, consequently, not in effect to discriminate against environmental laggards (Schaltegger, 1997b; Cerin, 2002b – Paper V). In Schaltegger’s wording: “…the quality of information in ecological statements is uncertain. In consequence, stakeholders can often neither make more informed decisions nor effectively discriminate environmental laggards.” The positive image signalled by firms is self-generated. Firms present, and often also see, their own motives for producing environmental disclosures in a far more favourable light than other groups in society have, which is a more jaundiced view of their incentives (Solomon and Lewis, 2002). The information asymmetries (Akerlof, 1970; 2002), with signalling (Spence, 1973; 2002) and screening (Stiglitz, 1975; 2002), have here resulted in an inefficient market (for lemons) or rather an inefficient market for accurate corporate images. There is, hence, a need for legis-
Kolk and Mauser (2002) demonstrate that a majority of environmental management models “have a purely academic background” while “general performance evaluation systems have been developed by practitioners rather than academics.” They, furthermore, show that management models are often ill suited for business reality (cf. Hass, 1996; cf. Schaefer and Harvey, 1998). The main deficiency of the models (according to Kolk and Mauser) is in the operational inadequacy since the focus is on environmental management rather than on environmental performance. Moreover, considerable confusion characterises the notion and definition of sustainable development19, especially when it comes to defining operational goals. This uncertainty is also reflected in the great number of models and their three letter acronyms (cf. Cerin and Laestadius, 2005 – Paper III; cf. Harrison, 2000). Environmental performance evaluation systems are developed by practitioners i.e. consultants, banks, governments, NGO’s et cetera to primarily serve these stakeholders’ own use of rating and benchmarking (Kolk and Mauser, 2002). This phenomenon of interest may “give rise to dangerous circularity, whereby rankings are based partly upon reputation” [My Comment: communicated by the evaluated company] and reputation is based partly upon rankings” (Ilitch et al., 1998). Cerin and Dobers (2001a – Paper VII) notice that companies with larger market capitalisation values are better rated in sustainability indexes (such as Dow Jones’) and thus included to a higher degree. This and the other biases found were later on confirmed by Deutsche Bank Equity Research (Deutsche Bank, 2002). Another study illustrates that 3 out of 4 sustainability criteria in Dow Jones Sustainability Index are based on the evaluated firms’ own communication. In other words, evaluated companies create, in part, their own reputation (Cerin and Dobers, 2001b – Paper VIII). The fourth criterion is based on other sources and only adopted when available. Cerin (2002b – Paper V) shows that there are considerable discrepancies in what companies report to various stakeholders – e.g. in environmental and financial reports – and also a decoupling of what is reported and company operations. Marketing theory generally assumes that marketing is a need satisfier. From a critical point of view it is important to show the other side of marketing and then the metaphor “marketing as manipulation” as a relevant description to these activities (Alvesson and Willmott, 1996). The external environmental information is, in some corporations, handled by marketing staff which may from a credibility point of view not be wise. Hochschild (1983) conceptualises organisations as instruments of domination and Schrivastava (1995) sees them as sites for ecological destruction, challenging the linkage between the survival of corporations and their bequest to human value.

19 Brundtland’s definition of sustainable development in ‘Our Common Future’ (WCED, 1987:43) is a prominent reference in articles.
The conclusions of Hochschild (1983) and Shrivastava (1995) do – together with Alvesson and Willmott’s (1996) view on marketing – not constitute a desirable and reliable foundation for voluntary corporate disclosures. It has, moreover, been shown for firms on the OM Stockholm Exchange that the larger the market capitalisation of companies the higher the carbon dioxide emissions rate per unit of turnover (Cerin, 2002a – Paper VI). This fact together with the above shown sustainability criteria (three out of four) in the DJSGI being based on company own generated information, hence, prevent the selection of firms in the sustainability indexes that are less harmful to the environment. Consequently, dirty firms that report – and are pushing their clean-social image – could become over represented in sustainability indexes, that are based upon companies’ own signalling. This may give rise to the paradoxical effect that; people concerned with environmental and social issues are lured to invest, through ethical funds and indexes, in companies emitting more greenhouse gases per turnover than those companies in ordinary funds. To more precisely investigate to what extent this is the case is a worthy topic for future research, but the result from a brief study will be presented here, below, in the cover essay (see figure 1).

Figure 1. The average ratio of CO2 emissions per turnover for companies on the OM Stockholm Exchange, indicating that the firms in the Dow Jones Sustainability Index emit about twice as much carbon dioxide per turnover compared to the firms not included (as of the year 2000).

By applying the data and some of the calculations in Cerin (2002a – Paper VI) the environmental performance and market capitalisation size of the firms on the OM Stockholm Exchange for the year 2000 have been divided into three groups. One

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20 This lack of transparency problem is even worse if considering the average private retail fund investor’s lack of knowledge. In Sweden, only every second private investor knows exactly what funds he/she has invested in and according to the CEO Anders Ek of the largest Swedish retail fund company, Robur, “Many fund investors have obtained a composition they are unaware of” (Weilenmann, 2003).
group consist of firms included in the DJSI (these are by definition also included in the DJGI), another group of firms only included in the DJGI (DJSI components excluded) and the third group of firms not included in any Dow Jones index. The result, from this OM Stockholm Exchange comparison, is that the average ratio of CO₂-equivalents emissions per turnover for the group of firms included in the sustainability index of Dow Jones is about twice as large compared to other companies’ on the same exchange. Compared to the same exchange’s components in the Dow Jones ordinary global index the Dow Jones sustainability firms emits, on an average, even more than twice as much carbon dioxides per turnover. This relationship between emissions and turnover is probably not coherent with the aims of people putting their savings into environmental, ethical and sustainability funds. There ought to be a stronger correlation to firm environmental and social performance in these indexes and funds if they are to sustain themselves in the future. I would, therefore, once again suggest a more thorough research based on a more international sample of firms – from various stock exchanges – on their CO₂ emissions per turnover. This is quite a task since a lot of data needs to be gathered if not individually compiled by the firms themselves.

Considering companies on the OM Stockholm Exchange: not only has SAM Sustainability Group managed to chose components for their DJSI that has about the same CO₂ emissions per turnover ratio that the companies that create sustainability/environmental disclosures have – which is about twice the ratio that the other firms on the exchange have – but SAM²¹ also managed to follow the same proportions regarding firms absolute emissions. Components selected in the DJSI emits on average 714,000 tons CO₂ while the other companies on the same exchange emits on average 114,000 tons CO₂. This proportion is similar to the one between reporting companies, 944,000 tons CO₂ emissions, and non-reporting companies, 60,000 tons CO₂ emissions. These correlations between ratios and absolute emissions may not be that surprising considering that Cerin and Dobers (2001a – Paper VII) found that components of DJSI had an average market capitalisation that is a 2.5 times larger than the corresponding figure in the DJGI and that Cerin (2002a – Paper VI) found that on the OM Stockholm Exchange that environmental/sustainability reporters had an average 5.5 times larger market capitalisation than the non-reporters. Hence, again the suggestion is (as in the paragraph above) a stronger focus on actual performances in environmental and sustainability indexes instead on relying on companies’ disclosures and communication which on occasions may be one-sided (cf. 2002b – Paper V).²²

The following is an example from the vehicle sector on how a large-emitting firm (including its services) was chosen as the most sustainable firm in SAM’s selection.

²¹ As indicated in a footnote above, the company managing the index is not Dow Jones Indexes, but SAM Indexes GmbH which is a subsidiary of SAM Group Holding AG located in Zürich, Switzerland.

²² There is, moreover, another important measurement that Cerin and Dobers (2001b – Paper VIII) argue to be deficiently accounted for in DJSI. That is the performance of produced products. Companies that may emit about the same amount of e.g. CO₂ (Ericsson and Volvo) may have products that emit considerably different (Ericsson’s life-cycle emissions are 5 % of Volvo’s) (Cerin, 2002b – Paper V).
process. SAM Sustainability Group has evidently, when composing DJSI, placed greater emphasis on BMW’s management presentations than on the aspect that the company’s vehicles, and the advertisement of them, promotes excessive driving resulting in: waste in A) resource use (oil), B) emissions (GHGs) and C) lives (deaths in traffic\(^{23}\)). This selection is, however, probably a non-intentional bias, or rather erroneous thinking but nevertheless the selection revealed a fault in SAM’s selection process which failed to acknowledge the effects of the companies’ services (see Cerin and Dobers, 2001b). Lately, when concentrating on greenhouse gas emissions from sold services SAM has together with the aid from WRI discovered that BMW is the one of the least sustainable companies with one of the largest potential impacts of carbon constraints in the auto manufacturing sector (SAM and WRI, 2003). This inclusion of BMW's services is fully in line with previous arguments made by Cerin and Dobers (2001b) in 2001 in response to SAM’s selection of BMW as the sustainability leader in the vehicle sector. In 2004 BMW was still one of the most sustainable vehicle manufacturers in SAM’s DJSI.

1.9 Where are the incentives to protect the environment?

As pointed out in the paragraphs above it is not sufficient to heavily rely on the good faith of the business community. Instead, in contrast to the good faith believers (or advocators), we need institutions that monitor the conditions of the environment, including its capacity to further endure resource extraction and residual emissions without endangering the sustainability of ecology and the social well-being of mankind. To decrease environmental impacts on quality of life the services and products produced and consumed need to be associated with lower environmental burdens at all stages (Welford and Gouldson, 1993). Welford (1996) indicates the need for a greater emphasis put on companies’ value chains, largely determined by the responsiveness of industry.

*Companies must recognize their wider responsibility and manage the entire life-cycle of their products. It is relatively easy for firms to target their internal systems and make changes to improve the environment. Insisting on high environmental standards from suppliers and ensuring that raw materials are extracted or produced in an environmentally conscious way provides a start. But the life-cycle approach should also extend to making every attempt to ensure that environmental damage done during use and disposal is kept at a minimum.*

(Welford, 1996)

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\(^{23}\) According to the European Commission’s Research, The Competitive and Sustainable Growth (GROWTH) Programme, the annual number of road deaths in EU (15 countries) is 40,000 and 1.5 million reported casualties. [The death numbers are much higher in the developing world, perhaps around 1.17 million deaths per year globally.] The programme addresses the “Problems of speeding” and states that the societal problem of increase in deaths as a result of excessive driving as: “Speed has a fatal attraction for many modern motorists, causing needless deaths and injuries.” (GROWTH, 2004)
Accordingly, such delimitations of scope of a producer/designer of the end-product, have to be redefined to the area in which a company is affecting the environment to its activities. Others also take a normative stand, building management tools based on the life-cycle approach (Linnanen *et al.*, 1995; Linnanen *et al.*, 1996; Züst and Schlatter, 1998; Shapiro and White, 1999). In the included papers below the importance of extended responsibility of firms is also stated, but more emphasis is put on the legislative involvement, redefining property rights and altering incentive structures that encompasses aspects of power. Cerin (2000) identifies this scope of responsibility as corresponding with the ISO 14001 standard’s (1996) area of control and defines scopes of reporting as control or influenced based (Cerin, 2002b – Paper V) depending on accounting objective, and applies such delimitations to firm property rights through public policy instruments (Cerin, 2002b – Paper V; cf. Cerin and Karlson, 2002 – Paper IX).

When focusing on the vehicle sector Cerin (2005b – Paper XI) applies a Value Chain Stewardship (VCS) – expanding the environmental responsibility of the design owners to coincide with the area of environmental impacts – to convert emissions cost into a production cost. The paper indicates that the incentives are not strong enough to drive technological change if cost for GHG emissions during usage is charged to the vehicle owner, but if the responsibility is allocated to the design owner the very same additional costs will render it prosperous for the designer to use its information advantage to innovate away from those emissions rendering technologies. In conjunction with extending producer responsibilities, other approaches are suggested such as public procurement and support to initiatives that can act as information bridges – diminishing the information gap including the immense difficulty for consumers to identify operational costs, mileage economy and quality. The manufacturers’ emphasis is instead often on images such as on masculinity and excessive (sporty) driving. The devastating resource consuming SUV and light truck trend is one such example. One way to limit the impacts from these images, in ads and promotions, that sell these SUV’s could be to revise the federal (US) bumper standard from 1982 (NHTSA, 2004) to encompass all vehicle classes. In the US, Canada and the EU car bumper standards require protection in the region 16 to 20 inches (400-500 mm) above the road surface. No such requirements are applied to SUVs and light trucks, leading to ordinary cars being overridden in case of high-speed crashes and costly accident repairs after low-speed crashes due to the bumper mismatch disabling their engagement (Consumer Affairs, 2004)\textsuperscript{24}. This is of serious concern to the insurance companies. So what would happen to the SUV and light truck images if we apply bumper standards that act in accordance with car bumper standards? Would this preference towards these heavy vehicles more or less vanish when the SUV or truck resembles

\textsuperscript{24}In fact the bumper demands on SUVs and, light trucks and vans (LTV) are non-existing which has lead to flimsier bumpers on these vehicles. Toyota RAV4, a SUV, is e.g. totally lacking rear bumper to absorb impact energy. Instead the spare tire in the back works as an anti-bumper transmitting energy to other areas of the vehicle that ought to be protected and causing excessive cost.
a city bus with bumpers low off the ground? Would these vehicles still send an image of masculinity and power?

The aim is, of course, to define efficient incentives to reduce environmental degradation without intruding on societal prosperity. It is therefore important to consider theoretical approaches dealing with human opportunistic behaviour, institutions, property rights, transactions costs and information asymmetries in one context in order to establish policy designs that decrease the overuse of our resource today.

1.10 Don’t let your guard down – be prepared for the unexpected

Even though we might believe we have found the solution to severe environmental problems, known today, we always have to be prepared to re-evaluate the proper actions and to take on future unexpected problems. Therefore, it is necessary not only to monitor arising issues of nuisance, but also to implement a flexible institutional structure to enable adjustments and improvements in the way businesses – considering production, products and services – are carried out.

A dynamic development, promoting technological change in fact, has a serious draw back. If we are not sincerely cautious when adopting new technologies, environmentally driven or not, we may cause ourselves severe future calamities, of which some may be just around the corner. Genetically modified food (GMO), and genetic manipulations of life in general, may besides from their huge potential benefits take us in unwanted directions if misused by science and market forces. This process has just began and GMOs, for instance, in addition to the risk of causing unexpected biological effects may make food supply and farmers world wide dependent on a few ponderous corporations, hulking for food supply chain preponderance. Monsanto has designed a resistance into a variety of their plants to its own and very effective Roundup Ready herbicide, thus encouraging farmers to continue with the Monsanto package once they have begun (Eliasson, 2002).

Besides its environmental risks, it may be argued that international trade as it is constructed now does not ensure the social independence of e.g. farmers in the developing world. Trade liberalisation should include both environmental and humanity interests to ensure sustainability (Stiglitz, 1999; cf. Welford, 2002). Environmental and social issues are interdependent and social tensions resulting from increasing social inequalities between North and South, as well as within countries, may become the problem to solve before effectively solving environmental adversities (Welford, 1997b)\textsuperscript{25}. The debate on the future of GMO’s and risks of transfers of transgenic plants (or the genes themselves) has to be put into the context of current downsides with excessive use of pesticides, antibiotics and synthetic estro-

\textsuperscript{25} Compare with Linklaters’ (2002) Measuring America where he indicates that the hierarchical and diffuse ownership forms in the slavery economy of the states in the American south lead to social insecurities social divines, affecting the entire nation as of today.
genic hormones. Having these considerable environmental and social risks in mind, there are vast beneficial opportunities for mankind if, and only if, we play our cards right.

Also worth considering, when introducing new environmentally friendly products that decrease one aspect of environmental degradation is that they may not be positive in other environmental areas. Thus, a precautionary principle has to be applied. The imperative role of serendipity in the societal progress is often forgotten, or perhaps sometimes knowingly neglected. But, it is a fact that millions of human lives in the world have been saved by just one bacteriologist, Alexander Fleming, not keeping his cultivations not well enough isolated from the open air. This sloppiness caused the fungus penicillin to severely affect some bacterium cultures which reviled the positive knowledge of bacteria sensitivity to some fungi. The problem with the phenomenon of finding things not sought for and not even anticipated is that these surprises may not always be that positive.

An alarming problem facing us today are synthetic estrogenic hormones such as those found in birth control pills, detergents, plasticizers (e.g. in food packaging and circuit boards in electronic devices), and pesticides that are literary flooding into nature, including ourselves (although some residuals are caught in sewage treatment plants). These endocrine disrupters are most severely secreting into water animals (i.e. shown in research on alligators, whales and fish), but others are also effected – even humans. Such synthetic hormones simply do not now when not to signal, which may result in feminized males and, hence, decreasing the reproduction rates of the affected animal populations. Perhaps soon, the merry songs by male birds to seduce the opposite gender may be but a memory since these studs have been altered into another type of gay mode. The seriousness, however, is quite shocking: Are we – consciously – wiping out one very core aspect of higher animals’ life functions? Not to mention our rapid devastation of the rain forests, but in general the common man appears to have a good conscience. When Will We Waken? Will We?

\(^{26}\) Eliasson (2002), advocating a net benefit if using GMO’s carefully, sees a necessity in having a competent debate, debating cons and pros of both transgenic and non-transgenic scenarios, in Media which is far from always the case.
2 Aim of the Thesis

The overall research issue of the thesis is why are the environmental and social improvements globally so trivial even though a considerable amount of the corporate (blue-chip that is), NGO and governmental actors are presented, by themselves and others, as the strongest advocates for sustainability. Who is, or rather what institutions and structures are, then against this notion, obstructing the path towards it? The overall aim of the thesis is to contribute to an understanding of how and why actors treat environmental aspects and the concepts of sustainability and sustainable development by critically analysing the phenomenon of corporate environmental concerns, both empirically and theoretically. How do firms handle environmental issues internally, how do external actors evaluate their transmitted images and what are the economic and environmental results? The overall goal of the thesis is to specifically reveal some underlying factors obstructing a progress towards sustainability and to find the analytical, managerial and policy implications that increase the incentives for a more sustainable society with lesser environmental impacts than currently.

The papers in this thesis can be divided into three themes, each one characterised by a sub-aim. Together with the cover essay they create a coherent presentation of the odds and ends of issues dealt with in this thesis, discussing on the underlying factors that obstruct a progress towards sustainability and how to deal with this analytically, and in managerial and policy decisions.

2.1 Part I: Environmental Management – Analysis, Accounting and Reporting

The aim of part I is to present and analyse the characteristics of tools in environmental management for analysing environmental aspects and running organisations’ handling of environmental issues and to compare what is communicated to what is achieved in real improvements. How efficient are these tools, considering economy and the environment, and are they sustainable themselves? These issues are discussed in three papers. Paper III, Environmental Accounting Dimensions: Pros and Cons for Trajectory Convergence and Increased Efficiency, looks into three different paths of environmental accounting; geographic, company and product; that are inconsistent from each other. Paper IV, The Efficiency of Becoming Eco-Efficient; examines the economic and environmental efficiency of corporate environmental tools for management and analysis. Paper V, Communication in Corporate Environmental Reports, compares firms’ own environmental image communicated by corporations in their environmental reports to the image in their annual reports as well as to real actions.
2.2 Part II: Evaluation – Reporting Firms and External Evaluation of Performance

The aim of part II is to examine how actors in society evaluate the information that corporations communicate to them on their environmental and social commitment and explore to what extent the corporations’ real actions are taken into account. What corporate image does the society get, is it critically reviewed by e.g. the financial community? These issues are discussed in three papers. Paper VI, Characteristics of Environmental Reporters on the OM Stockholm Exchange, compares the marketing capitalisation size and emissions per turnover of the environmental reporters and non-reporters on the OM Stockholm Exchange. Paper VII, What does the Performance of the Dow Jones Sustainability Index Tell Us?, examines the market capitalisation size, industry sector and regional belongings differences of the components of the Dow Jones Sustainability Group Index (DJSIG) and the Dow Jones Global Index (DJGI), against which DJSIG is marketed. Paper VIII, Who is Rating the Raters?, looks into the sustainability criteria used in the assessment of components in the DJSIG, discussing the sustainability in the best in industry classification.

2.3 Part III: Proposed Institutional Contexts – Property Rights and Transaction Costs

The aim of part III is to find possible domains for policy solutions to problems indicated in the thesis. By applying property rights to environmental damage previously free environmental services can become chargeable. The thereby lowered transactions costs increases the incentives to find the socially most efficient solution. Of key essence here is the institutional context and the asymmetric information among actors. How shall the power and information asymmetries be altered to create incentives for sustainability? Paper IX, Business Incentives for Sustainability: A Property Rights Approach, discusses how environmental effects from products can be internalised to those actors that have the largest competence in the value chain to activate the desired environmental effects. Paper X, Bringing Economic Opportunity into Line with Environmental Influence: A Discussion on the Coase Theorem and the Porter and van der Linde Hypothesis, argue for adjusting the economic responsibility of firms to coincide with the environmental influence as well as stressing the power of public procurement, to create the strongest incentives for environmentally efficient solutions. Paper XI, Introducing Value Chain Stewardship (VCS), assigns the responsibility for greenhouse gas emissions from the transport sector to the vehicle manufacturers, since the end consumers are not that economically rational when purchasing the vehicle. Under the current institutional settings car producers, gas companies and governments, receiving gasoline taxes, are reluctant to change.
3 Reflections on Corporate Environmentalism and Research

During compilation of the thesis considerable parts of the sub-section Notions of sustainability and the use of TLAs – Tools for increased power? were published in Progress in Industrial Ecology – An International Journal, titled: Where is corporate social responsibility actually heading? (Cerin, 2004).

This section describes some early, and at times somewhat disappointing, experiences from environmental management and management in general. They contribute to the background and to the reason for me to start my research rather than the content of it. Here is, hence, an illustration of the long way still ahead of us before environmental management and corporate activity will be safely on the path towards sustainability in spite of all corporate environmental reports, consultancy models and textbooks on environmental management.

3.1 Experiences from corporate environmentalism – Power and dependencies

When a few colleagues and I during the spring of 1997 made an environmental audit of the environmental management of a multinational Scandinavian based steel company – which occupies the top quality end of the steel industry – we encountered some unexpected obstacles. The review comprised one site encompassing three factories, each constituting a part of individual subsidiaries of the steel corporation. This site is in a city of almost two million inhabitants the second largest energy consumer, only exceeded by the public metro system. Since there was no specific environmental management system implemented we wanted to see if environmental issues at all were dealt with in the certified ISO 9000 quality management system. By finding the documentation we could also retrieve information on how to make an environmental management system efficient, gaining benefits by using similarities with the implemented ISO 9000 system documentation and processes. It took us a few days, however, even to find the documentation to the certified quality system since nobody seemed to really know where anyone had stored – mislaid – it. Finally, we found the documentation, securely stored too, in a safe. The safe contained other important documentation for the company as well, the top management’s golf tournament scores! These different, but important, documentations were archived in a mixed order. One can ask oneself how well implemented these systems really are when nobody knows, seemingly, where the documentation is stored. We found in the study different cultural differences regarding environmental issues within the site’s organisations, namely three. There were, of course, individual exceptions within each group although the dominant cultures were found.
• Top management – knew, more or less, the politically right way of expressing themselves, sometimes in vivid visions, as regards environmental issues.
• Lower management – found themselves, more or less, oppressed by economic efficiency demands and did not want another unproductive paper work on top of the real work\textsuperscript{27}.
• The man on the shop floor – thought, at first, that environmental management dealt with work environment but became enthusiastic when realised that the issue was on the external environment, considering it to be an important concern.

The report indicated these cultural divergences of the three different levels landed, via the site managers of the plants, on the desk of the parent corporation’s executive group.

Another colleague of mine and I carried out a study at a large waste management company. Its Biotech subsidy wanted us to investigate the test implementation of biotechnological cleaning of waste water pipes in apartment buildings instead of using the common method of high pressure water cleansing. One could sense that the biotech subsidy expected a report describing the potential of the new method (but an independent report) and we were fed with success articles and videotapes on wastewater pipes for biotechnological cleaning. We broadened the scope of the study (but still within the vague scope set in the written assignment) to incorporate the English supplier’s application instructions, applications carried out in England of the biological device, the municipal wastewater authority of one major Scandinavian city where the test had been carried out and, finally, how the implementation was handled within the waste management corporation. The shocking truth was that the new biological detergent was not even applicable in vertical pipes due to too dry environments. When investigating the English usage of the biological detergent we found that these applications had not even been carried out elsewhere in vertical environments. The biological application, furthermore, if used on a larger scale could severely destroy the cleaning processes in the municipal wastewater treatment plants. The biotechnological unit saw restaurants as a large potential market, without having considered that the device if applied would wipe out all fat collectors that the restaurants are required to have installed and dissolve the collected fat. If looking at the contribution to the global warming potential the new method, contrary to anticipated, lead to increased emissions. The idea of the business was that the huge vans would not be needed as much as before. Contrary to that idea, more travel was needed, since the job with the new detergent no longer was carried out in one route and the participation from tenants was also required, repeatedly. The electricity use for high-pressure water dropped but taken into a holistic perspective the most efficient change would be to merely exchange the American vans for commercial vehicles with half the gas consumption and continue with the high-pressure activities. This was probably the economically most

\textsuperscript{27} Answers retrieved when interviewees heard the issue of environmental management system. For them it was more than enough with quality management and other existing paperwork.
viable solution as well. The internal managerial execution could also have been improved. The cleansing staff, cleaning the wastewater pipes with high-pressure water, that would have been laid off if the biotechnological detergent had been successful were not informed about the project until they had to answer to an emergency call to save some flats in the experiment from wastewater flooding. In the media this new biological application was published as the environmental and cost friendly alternative. Not having all the facts for the decision, but within one month after the presentation of our study at the waste management firm, the Bio-tech unit was resolved.

The experience from an ISO 9000 certification inspection of a certified production quality control unit within a Swedish based blue-chip corporation was not overwhelming either. At the time for the control of their quality management system the control equipment was treated with an out of the ordinary calibration in order to pass the quality reviewers’ eyes. The equipment that did not meet the quality requirements was simply put aside during the inspection. The unit kept their diploma for another period. What we could say, learning about this, is that organisations may not always achieve quality improvements by having an implemented certified quality system, but the certification and the documentation of the system indicate that they know what to do. Since these reviews are mutually planned, in advance, there is plenty of room for opportunistic behaviour.

Now let us take a look at the food industry. In Sweden a gigantic cooperative industrial bakery was announced to be subjected to a health examination by the Swedish National Food Administration (NFA). In accordance with Swedish customs the review was well announced and planned long ahead. In order to pass the review the management team had to make slight corrections to day-to-day operations. All the mice, rats, sparrows and pigeons living indoor in the bakery feeding on raw materials from production and manufactured products, that was to be sold to consumers, had to be terminated or at least temporarily driven away from places where they could be detected by the inspectors. Instructions to the staff how to handle the bread during the day of review encompassed directives that contradicted directly with the ordinary way of working. So that day the staff should not pick up bread from the dirty floor and they where required to wear gloves. The staff did not need to worry too much though about the stricter rules regarding how to conduct their work, since the next day everything went back to normal.

Sweden has a long tradition of consensus-seeking, which in many cases this might be beneficial. This tradition may, however, open up for opportunistic behaviour which could become dreadful for the surrounding milieu and its ecological systems.

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28 One could ask oneself if it is implemented in this case, as described in the section. Let us stick with nomination certified instead.
29 Other behavioural issues affecting the credibility and usability of the review are how differently auditors may interpret and apply ISO 14001 (cf. Ammenberg et al., 2001).
30 The cooperative organisation is the supermarket chain that describes themselves as the most socially and environmentally conscious alternative. From time to time NGO’s and media are proving them wrong, but that is another story.
or as Dobers (1994) puts it: “Tough enforcement tend to lead to a conflict in the relationship between governmental bodies and the polluting industry. However, control and command is necessary when it comes to large pollution sources, but embody a distrust towards industry.” For diffuse and not easy to measure emissions the role of the local authority is to be a competent partner – e.g. for joint vision. Dobers also show that the policy structure in Sweden is being set at national governmental level while the enforcement is carried out locally. This fact has often put the local authority in difficult situations when having to enforce restrictions on sites belonging to larger corporations since they can effectively set those in relation to openings which can be offered elsewhere.31

In Sweden, moreover, where the emission limits are exceeded very few cases are taken to court and considerably fewer convictions. The emissions, in Swedish plant sites, usually have to exceed the restricted emission levels by 100% to make it worth while for a prosecutor to bring the case to court. Due to lack of resources prosecutors will now, moreover, have to ignore those cases where they cannot prove an intention to discharge, knowing the consequences. The other cases are terminated without any action taken (SvD, 2002). Considering these experiences and setting them in relation to the existing environmental problems that we face today, and most of all by looking at all the good image creation by industry, scientific and consultancy 4-fielder managerial models more or less claim to solve/have solved the world’s environmental and social problems seemingly without being capable by evidence. So, this is certainly a matter worth looking further into.

3.2 Experiences from the research process
– The academic and corporate worlds

Researchers investigating firms’ commitment to environmental issues carried out by merely interviewing top management may face the risks of drawing conclusions that do not reflect the real actions of the interviewed firms. Seeing a change in top management’s answers from one time to another does not, according to our environmental audit of a multinational Swedish based steel company, mean that these answers reflects the thoughts of those firms’ workforces and does not, according to included papers on environmental management (Cerin and Laestadius, 2003 – Paper IV; Cerin, 2002a – Paper VI; 2002b – Paper V), mean that these answers reflects the actual performance of those firms. Moreover, only relying on the top management’s views increases the risks of seeing the firm as a uniform unit, neglecting the prominent internal opportunistic behaviour taking place. Such internal legitimacy actions are sometimes the root to dubious external communication. By achieving external recognition for the organisation in a specific topic the subgroup working with that issue on behalf of the organisation may, thereby, gain some internal influence.

31 Nobel Prize winner Stiglitz (Stiglitz, 2003) describes moreover how the US Baby Bells – regional telecom providers – capture the state legislatures that are supposed to regulate them and thus managed to hinder the, by the federal regulators, anticipated competition in the deregulated telecom market.
Being embedded in industry – as I have been – has been advantageous, seeing environmental management processes from within and being an active part in these as well. By actually working with environmental and social issues in corporations, standardisation secretariats and in the organisation of trade and industry’s environmental managers (Näringslivets miljöchefer – NMC) gives opportunities to see people really committed to environmental issues act on it, but also taking actions to legitimate those issues internally within their own organisations. Notably, when discussing how to clear up an environmental problem among industries, environmental people in sectors with considerable environmental load almost without exception took considerable legitimisation activities to divert actions against them. Such legitimising arguments were often supported by ad-hoc explanations.\footnote{Of course, most people in the room knew what the narrators were up to – and my belief is that even the most frenetic ad-hoc advocates must have felt and known it too, deep down in their most private thoughts.}

I particularly recall a NMC meeting some year ago as an amusing situation. The discussion of the meeting concerned one financial actor’s environmental index which was based on real emissions data on greenhouse gas emissions (GHG), direct and indirect such, among other measurements. The strongest opponents to such indicators were found among the largest emitters of GHGs, not surprisingly perhaps. Some of the arguments were that it is:

1. unfair to be compared with less emitting sectors. The dirty sectors seemed to prefer indexes such as the Dow Jones Sustainability Index, since then companies from all sectors can become sustainable, largely depending on communication of own generated images. My comments: \textit{However, one aim e.g. ought to be to show the financial risk of a firm if policy instruments are implemented to decrease the unwanted environmental effects and, thus, reducing the emissions causing them. Hence, if governments are not protective to sectors being regulated an important indicator would be the unwanted emissions per turnover. Why should sustainability and environmental indexes be protective to sectors that are unwanted environmentally wise? (One point is, of course, to create incentives for competition among the dirty.)}

2. to difficult for financial analysts to understand the relevance of what these differences in emissions really mean. My comments: \textit{However, apparently the financial analysts sometimes manage to read annual reports, which not always are the simplest of readings. Financial analysts, moreover, generally fancy quantified measures, and would probably not appreciate an annual report lacking them.}

3. not an important environmental aspect for an entire corporation to aggregate its GHG emissions. The truck logistics firms and the truck manufacturers argued this. According to them GHG emissions may be important to the subsidiaries which constitute these corporations, but should not be aggregated and reported externally and no one have the right to tell them (in
this case ask for emissions data) what aspects to focus on. My comments: 

This statement that the firm shall itself determine its environmental aspects is correct according to clause 4.3.1 in ISO 14001 (ISO, 1996). However, to argue that GHG emissions from the activities of a corporation in the road transport sector not to be an important environmental aspect in today’s global warming debate and under current Kyoto goals is less convincing.

Similar behaviour was also found among the companies that are not considered being the large contamitators. In fact, firms of substantial size put efforts to steer their environmental communication towards issues which they consider themselves having control over, and being well advanced in handling, to provide a picture of being the caring and proactive company. This is clearly shown in environmental and sustainability reports from the Information and Communications Technology (ICT) and transportation sectors. Seemingly, the former focuses to communicate data on GHGs which is their strong side, neglecting subjects as antenna radiation and flame-retardant bromides while the latter which have a problem with GHG emissions focuses on their implemented environmental management systems (EMS). Papers focusing on these decoupling and bypassing issues in the thesis are Cerin (2002b – Paper V) and Cerin (2005b – Paper XI).

Another aspect of being embedded in industry is a sensitive one if the researcher carries out a case study on a company which s/he also works at. The delicate problem is the reverse to many other researchers’ in the management field, namely that of having too much information. Large considerations have to be taken on not to hurt the company by revealing too much information, positive or negative. The researcher has to figure out for him/herself and together with superiors at the company how much information that would have been retrieved otherwise by a researcher outside the company, which could become difficult. The researcher facing these issues has to consider where to put the line in order to keep his/hers integrity and objectivity. There is of course another complicating issue to consider for those researchers closely involved in a process. That is when being involved in daily actions researchers may become blind to some phenomena occurring by turning out to be enclosed within walls of self-evidence (cf. Gustafsson, 1994) that the organisation has built up, knowingly or not. The thesis contains one case study on this topic (see Cerin and Laestadius, 2003 – Paper IV).

3.3 Research Scopes of the Thesis, Changing of Over Time: In Brief

My interests in research objects and research theoretical schools have changed considerably during the research project. The initial aim was to study environmental reports in order to include financial indicators into them. The scope-incompatibilities of fiscal and environmental reporting should then be looked into since fiscal accounting follows judicial entities while environmental scopes do not coincide with company borders, but rather with its influence on provided services.
Thereafter, funding was received to examine the efficiency of work with environmental issues – i.e. environmental management, analysis and reporting – since indications on inadequacy tools and behaviour had been observed in my research. When participating in a Industrial Dynamics course a new world opened up to me, causing a new twist in my interests and to my research, into entirely different theoretical schools compared to those used in previous papers. By applying this view of the world I saw the gaps in trying to ease the stress on the environment and actors’ opportunistic behaviour merely by management discussions, leaving out theoretical policy studies. The last major change in theoretical support is found in the sociology of organisational research – largely gained when writing the cover essay and teaching it in a PhD course handling the topic in an environmental management context. This sociology approach has contributed to a theoretical structuring of the foundational worldview influencing the other theoretical paradigms applied throughout the thesis.

On the whole it has been very enriching to be an active part of the environmental management work centrally at a corporation as well as from academia being introduced to different theoretical schools. An attempt is made to find common denominators between the theoretical paradigms used, but importantly also to industry experiences and empirical data. Using a holistic approach trying to tell a lot may result in saying nothing, but I have tried to keep the theories applied coherent and to explore a common denominator. Furthermore, even though I have used a holistic theoretical approach in an approach to bridge over walls of self-evidences, I would like to be the first to express that, despite this attempt, I may very well be stuck in thought traditions which I even never have thought of. Hopefully, my way of working during these years have delimited the most erroneous conclusions that otherwise may arise.

3.4 Notions of sustainability and the use of TLAs – Tools for increased power?

I will here very briefly go through some of the terms related to the overall theme of this dissertation and often used by various environmentalists, NGOs, companies, consultants, researchers and policy makers. These expressions are often used, but not always understood by receivers and senders alike. The jargon is sometimes used in such manner that the value of the terms is severely reduced. This is easily illustrated by asking the sender of an idiom containing sustainability what he or she means with it. Often the sender will become stunned by the sudden insight that he/she himself/herself does not know what he/she just said, but also stunned by the act of rudeness that anyone has the guts to ask for the meaning – it is obvious that we should strive towards sustainability and doubts raised on meaning will hinder (are sometimes seen to hinder) reaching that goal (cf. Gustafsson, 1994).

Sustainable development as defined in Our Common Future (WCED, 1987:43) is a world progress that “…meets the needs of the present without compromising the
ability of future generations to meet their own needs.” This development encompasses three aspects; ecology, economy and ethics (A modern Holy Trinity?); and puts the equity in an intragenerational context, as well as in an intergenerational one – i.e. over time (cf. Turner et al., 1994). Sustainability is muddled with some 70 definitions according to Holmberg and Sandbrook (1992). The concept of sustainable development is widely used in politics, business and research. Welford (2000) has, furthermore, observed that: “There exists a strange and fruitless search for a single definition of sustainable development among people who do not fully understand that we are really talking here of a process rather than a tangible outcome.” The concept is, however, not an operational concept which may ironically be one reason for its widely acceptance.

In many presentations ethics and social problems have become free riders on the environmental arguments. This means that the environmental issues, potentially manageable, are been made more problematic to solve, due to increased information complexity. In order not to fall into that analytical trap, I do the opposite in the papers constituting this thesis. I surpass the social problems to focus on the core of the environmental issues.

The dominant definition of the often-used eco-efficiency is often perceived as being coined by Schmidheiny and BCSD33 (1992) and the commonly utilized citation is formulated by them as follows:

Eco-efficiency is achieved by the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the earth's estimated carrying capacity.

The concept of eco-efficiency was, however, first introduced and discussed in the academic press by Schaltegger and Sturm (1990), but in German34.

Another expression often used in the environmental and sustainability context besides efficiency is effectiveness. The terms effectiveness and efficiency may be problematic to distinguish between, especially for non-Anglophones. To provide a simplified picture effectiveness is to do the right thing and efficiency is to do the things right (Luttropp and Züst, 1998; Drycker, 1974). Eco-efficiency is, hence, often referred to and interpreted as a measurement of economic output per environmental impact (cf. Helminen, 2000; cf. Mosovsky et al., 2000). From there Helminen and Mosovsky et al.’s definitions divide into dichotomies of each other. Helminen explains that the concept of eco-efficiency does not embrace the third, ethical, perspective of sustainable development (which is consistent with Schaltegger, 1997a). Mosovsky et al. (2000), however, continues in a different direction,

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33 At the time, prior to 1995, the name of World Business Council for Sustainable Development (WBCSD) was Business Council for Sustainable Development (BCSD).
34 The relationships between environmental performance and economic performance, and the denominations that have been associated to it – environmental efficiency, ecological efficiency and eco-efficiency – are briefly portrayed in chronological order by Figge (Figge, 2005).
“the terms eco-efficiency and sustainability are compatible.” They define sustainability (=1) as a fully achieved eco-efficiency (<=1). Mosovsky et al.’s terminology seems to require a redefinition of sustainability to merely encompass the environmental and ecological dimensions in relation to economic matters which is not a bad idea and could very well be coined to be the concept of Eco-sustainability\textsuperscript{35} (>=eco-efficiency) of a given scope – e.g. the world, a nation or a company. This seems to be what the large number of writers actually mean. Korhonen (2003) sees, moreover, that the exercise of eco-efficiency (and win-win) may, in fact, hinder business world’s contribution to ecological sustainability (See also discussions made by Schaltegger and Burritt, 2000:54). (Author’s comment: If the scope of eco-efficiency is considerable smaller then the scope of interrelating actions affecting sustainability\textsuperscript{36}.)

By some others the concept of sustainability would encompass all three fundamentals of sustainability, but on a delimited scale – not global. An example of such is the commonly referred sustainable firm or service. Since sustainability encompasses the entire world, constraints of scopes that are smaller than encompassing the globe actually indicates a type of an efficiency scope. However, these differences in definitions give us a fairly good picture of what we are dealing with in the field of environmental and sustainability issues, sometimes linked to management control and economic theories. We are, to some extent, dealing with confusion of ideas and concepts\textsuperscript{37}.

\textsuperscript{35} Compare with Wolff and Ytterhus’ (1995) denomination, Ecologically sustainable corporations.
\textsuperscript{36} E.g. if merely focusing on a production process of one component in a tele/data communication system.
\textsuperscript{37} As perhaps noticed this is only a very brief explanation of the meanings of terms. For a more thorough reading turn e.g. to Merriam-Webster’s dictionary (www.m-w.com) or read one of many dissertations dealing with environmental and sustainability issues, often containing dictionary definitions. I nevertheless provide a list of abbreviations below the content to tell what I mean and since the literature is swamped with TLA’s (Three Letter Acronyms).
4 Theoretical and Conceptual Framework

During compilation of the thesis considerable parts of the Philosophic Foundation and the Concluding the Theoretical Framework – a Synthesis, both subdivisions of this section Theoretical and Conceptual Framework were published in Corporate Social Responsibility and Environmental Management, titled: Sustainability Hijacked by the Sociological Wall of Self-Evidence (Cerin, 2003).

4.1 Philosophic Foundation

When dealing with how firms and society handle, and ought to handle, environmental issues finding a common theoretical worldview is not easy. There is no theoretical environmental paradigm explaining how man shall economise on nature and its resources sustainable. Environmental research dealing with these issues often leans on either the socio-theoretical trajectories of business administration or economics, sometimes bridged to natural sciences on conditioning the state of the natural milieu. These complicating circumstances, especially since the areas of business administration or economics are extensive and contradictory within themselves too, lead to considering the need for a theory on the whole (cf. Silverman, 1997). I attempt, however, to show the essence of a rigid structuring of sociological paradigms as a bridge to overcome the walls of thought that obstruct thought and in the end, change. These mind opening bridges can be applicable when studying environmental issues and sustainable development working as a fundamental mindset and philosophic foundation of the researcher.

4.1.1 The wall of self-evidence ensuring business as usual

The phrase wall of self-evidence is coined by Gustafsson (1994), describing how the cultures in which we live make us not just ignorant about many issues of life; values, processes, actions, habits and feelings et cetera; but also totally unaware that we can question them. Such thoughts may, hence, never be raised at all. We do, hereby, empathise and treat considerable basic elements of life in a spontaneous and axiomatic way as being proper or as Gustafsson (1994) elucidates it (own translation):

38 Since, environmental management is a young discipline it relates closely to the traditional management trajectory (Dobers et al., 2001). Dobers et al. (2001) also noticed that management research is a multi-faceted and fragmented field in itself. Environmental management, containing management, is moreover multidisciplinary and heterogeneous. I would say the same goes for economics and environmental economics.
>>Freedom<<, >>democracy<<, >>fairness<< often reside in this level. To ask someone why freedom, democracy and fairness shall be treated as worth striving for, usually leads to astonished dumbness – >>it’s obvious that it’s good<<.

The wall of self-evidence, thereby, fortifies not founded foundational images of the world that we may possess against deductive driven tests39. Alvesson and Willmott (1996) state the importance of recognising underlying value-orientations and their usefulness to unsettle apparent naturalness and taken-for-granted domination of common metaphors. Reverting to Gustafsson, beyond the wall of self-evidence is metaphysics regarding non-inquisitive fundamental assumptions of existence. The etiquettes of acting – within the cultures in which we reside – have an ethos that may appear as absolute. However, in the view of other cultures, the very same appearance is very much relative. Some mores forbid the eating of rats, cats and dogs in favour of consuming beef while in some other cultures this is unthinkable and the vice versa is the rule. The same goes with drug usage: In some cultures it is legal and legitimate to chew khat (e.g. in the Arabic peninsula) while drinking liquor is not and, perhaps not astonishing, the opposite is valid in other traditions (e.g. in the Scandinavian peninsula). These cultural dichotomies of contradictions enable breakthroughs in the thick masonry structure of beliefs – the wall of self-evidence – whose enclosure defends our own patterns of thinking from us (from own reflections). Here, a relativistic approach is preferable to deduct the spontaneous cultural (absolute) rules of self-evidence – apposed to absolutistic views equalising relativism as an offspring of its society – that depend on power and numbers of supporters, making truth (mob psychology) reside within the structures of power (cf. Lakatos and Musgrave, 1974). By looking into other cultures we will, hence, see our behaviours and ourselves in our own world, that otherwise would have been invisible to us and taken for granted (cf. Gustafsson, 1994: 20ff: 91ff).

This clash between scientific paradigms40 is not entirely new even though the advocates of modernism and post-modernism paradigms may pursue us in such a belief41. Already the ancient Greeks divided individualism into a dichotomy of rational calculation based on the individual as the social unit and the family managed by decision-making free men (cf. Ekelund and Hébert, 1997). The former (authoritarian administration of society based on rational calculus – art of administration) characterises the macro idea of individualism while the latter (patriarchal...

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39 This is the same as the a priori assumptions that enter in all statistical tests and classical statistical theory (cf. Eliasson, 1967; referring to Haavelmo, 1944). When used in neoclassical theory very limiting priors, that are never questioned, may lead to misinterpretations of empirical facts.

40 The concept of paradigms – as fundamental worldviews – is, however, a fairly recent occurrence. The phrase is coined by Kuhn (1962). A paradigm provides framework and references, but also tunnel vision (compare with Gustafsson’s wall of self-evidence) which assists interpretations and problem solving. Kuhn states in his foreword being influenced by Fleck’s (1935) writings, describing the concepts “style of thought and collective thought” (“…die Lehre vom Denkstil und Denkkollektiv”). Paradigms are, hence, theoretical models whereas styles of thoughts relates to a collective of thought exchanging thoughts (Laestadius, 1992).

41 Reflections are drawn from various readings. Turn to Ekelund and Hébert (1997) for an analogy on the development of administration of resources back to the one of the earliest economists Xenophon (427-365 B.C.).
decision makers of family based on household management —science of economics) the micro view. In elaborating the administration of society the Greeks developed the theoretical foundation for hedonic calculus, diminishing marginal utility and resource allocations based economic theory. Elements of the latter resemble the meaning of the Greek word oikonomos (oikos house + nemein to manage)\(^\text{42}\) can be found in business administration and management control.

The use of conjectures on both sides of the corresponding epistemological divide can be retrieved in this thesis, attempting to reconcile the more than two millennium old paradigm clashes between administration and economics. To bridge the divide is, conceivably, a chore of mammothian dignity. Not necessarily, since the evolution within these contradicting paradigms, however, have theoretically diversified them into numerous schools and as a consequence, the definitions of contradictions today appear somewhat totemistic. This rift, however, goes back as far as to the absolutistic Plato and the relativistic Protagoras. The former stresses political rationalism while the latter claims no existence of objectivity, only subjective opinions and processes. Also Latour (1999) blames the old Greeks for dichotomising science into mathematics and democracy.

### 4.1.2 Sociological Paradigms and Organisational Analysis

When exploring the worldviews and nature of the non-natural sciences, in order to explain the role of and to justify emancipatory, critical theory and normative inspired research, one common way is to relate and refer to Burrell and Morgan’s *Sociological Paradigms and Organisational Analysis* (Burrell and Morgan, 1979)\(^\text{43}\). In their search for a framework of the nature of sociology, they have structured social theory into a 4-fielder\(^\text{44}\) scheme, containing four paradigms that are positioned along two dimensions (see figure 2). They create a continuum of the nature of (social) science along the subjective-objective axis and the nature of society along the regulation-radical change axis. By using the dimension subjective-objective along with the regulation-radical change dimension in their scheme Burrell and Morgan consider themselves to have “a powerful means for identifying and analysing the assumptions which underlie social theories in general.” The four paradigms with their assumptions of meta-theory, hence, are a frame tool for theorising and modus operandi of social theorist who operate within them.

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\(^{42}\) See Merriam-Webster’s dictionary (www.m-w.com).

\(^{43}\) In fact, one seems sometimes to be more or less obligated to refer to the dominant writings of Burrell and Morgan (1979) in social research. However, should one be obligated to something when committed to emancipatory inclined research?

\(^{44}\) As Gustafsson (1994) rightfully identifies: a considerable number of researchers (e.g. in management control and organisational change), but especially consultants, create squares containing four fields to increase the validity in their standpoint. Binary arguments of tales and thoughts are arranged along dual dichotomies opposing each other. As good as any phenomena can be described and understood in such totemistic manner, creating strong beliefs of truth.
In environmental organisational research Burrell and Morgan’s 4-fielder scheme (see figure 2), describing the paradigms of social theory, has been adopted in several writings, often after various modifications. These schemes, that can be found in the writings of Rikhardsson and Welford (1997), Welford (1997b; 1998), Dobers et al. (2001) and Sandström (2002 [Sandström’s matrix is not altered]) are used for the placing of other writers’ works, often comprising both academic and non-academics, as a foundation for where future environmental research should be aimed.

The Dobers et al. (2001) article on the most cited articles published in the journal *Business Strategy and the Environment*, has organised environmental research in a matrix of sociology. In their 4-fielder the dichotomy of the objectivity-subjectivity approach to social science was changed to a descriptive-normative use of knowledge. The top ten references in the journal *Business Strategy and the Environment* were to a large degree written by non-academics which would mark such a classification (objectivity-subjectivity) misleading. Instead, authors are measured along a use of knowledge axis. The placement on the axis determines if the information is merely described as retrieved refraining from normative suggestion, leaving it up to the reader to form his/her own opinion, or if the information is used for suggesting actions.

The other continuum of this 4-fielder, used by Dobers et al., is the sociology of regulation-radical change which also Burrell and Morgan had used in their presentation of the paradigms. Burrell and Morgan (1979), however, also discuss the corresponding order-conflict axis. In the 1950’s the approaches to study sociol-
ogy were, however, between social order and equilibrium, on the one hand, and, on the other, issues of change and conflict. The contradictory division was termed order-conflict. Burrell and Morgan – not content with this distinction which may lead to misinterpretations of too strong antagonism, overshadowing the strong presence of continuum existing – developed another conceptualisation, namely regulation-radical change for their matrix. The term sociology of regulation is applied to those writers who emphasise society’s underlying unity and cohesiveness. The attempt is to understand the social forces and to explain why society holds together in order to prevent the Hobbesian war of all against all. The term sociology of radical change is to understand structural contradictions and to emancipate man from these constraining structures. A concern here is on what is possible rather than on what is the present situation – i.e. alternatives instead of status quo.

This structuring of nature of society may lead to misinterpretations, by ambiguously dichotomising regulation to radical change. These dichotomised concepts may in fact be significantly overlapping. Defending Burrell and Morgan (1979), they interpreted their axis of regulation-radical change in terms of various concerns which are similar to those of Dahrendorf’s (1959) order-conflict axis. Let us now take an example, using the regulation-radical change continuum: in Dobers et al. (2001) Porter and van der Linde (1995a) and Schmidheiny and BCSD (1992) are placed in the regulation-normative field. Both texts provide us with success stories where firms and their managers see the environment and, more importantly, environmental gains – as a phenomenon of merely win-win solutions. These texts are normative arguing that managers take a proactive stance in technological development, when it is economically beneficial. Regulation serves as an enlightener to the leaders of the business community to the win-wins waiting for them. Regulation should, hence, promote voluntarism. If no economic benefits are available then firms can continue business as usual and such cases under voluntarism are certainly not a radical change approach. However, regulation pointing out what is beneficial is not much of a decree, as alluded in the heavy theoretical critique by Palmer et al. (1995) and Cerin (2005a – Paper X) on Porter and van der Linde’s writings. In fact, the critique is rather on Porter and van der Linde’s axiomatic statements based upon a few and faulty success cases.

So, if it would be cheaper to spread environmental information – read market an image – than pro-actively and voluntarily improved environmental performance, the company would have incentives to just go with green marketing. The environment would be hijacked. Rikhardsson and Welford (1997) identify such legitimising behaviour even among NGOs and academics as well, strengthening erroneous pictures created by firms themselves. Rikhardsson and Welford illustrate the underlying message in one of the World Business Council for Sustainable Development (WBCSD) and Schmidheiny’s writings, Financing Change (Schmidheiny et al., 1996) accordingly: “The main thrust of the book is that business can be trusted and can be left alone to cure the environmental problems of the world.” To make their case more transparent Rikhardsson and Welford cite Schmidheiny et al. (1996):
"We nowhere now claim that tougher regulations improve a company’s or country’s competitiveness. … Our main argument is that … the world is moving towards market frameworks which reward eco-efficiency more systematically.” This is a promotion of business as usual which is based upon alarming false consciousness according to Rikhardsson and Welford. Schmidheiny et al. mention market-based instruments, but place large emphasis on self-regulation and inherited goodness of the market actors by e.g. using concepts like farsighted business leaders and smart companies that will put altruistic concerns foremost. Instead the WBCSD book emphasizes the importance for firms to persuade the market of the economic and environmental efficiencies of its own environmental work. Rikhardsson and Welford also see that Porter and van der Linde (1995a) provide messages “fully consistent with eco-modernism which therefore happily finds receptive ears.”

As Cerin (2005a – Paper X) points out, in order to achieve a radical change that improves environmental conditions, new rules for conducting business under which profits are generated have to be altered. Sometimes the set of laws need to be radically changed too, by accessing ownership and changing the relative strength of actors in the jurisdictional system to emancipate humans (actors) from predominant structures. Regulation may, thus, serve as a prerequisite for radical change, not necessarily being its dichotomy. Croci and Pesaro (1998) and Börkey et al. (1999) emphasise the importance of credible sanctions for non-compliance48 – monitoring actions included – of environmental agreements (cf. Helby, 2002). Even though Schmidheiny et al. (1996) do not identify regulators as a player in the relationship between financial markets and eco-efficiency (business leaders, investors analysts, bankers, insurers accountants and raters) they recognise the necessity of supporting reporting by governmental regulations.

I will, therefore, make a case for altering Burrell and Morgan’s classification regarding the nature of society, the axis of regulation-radical change, to encompass issues dealing with self-regulation and being regulated. Thus, focusing on the continuum of voluntarism-domination has similarities to a sub-element of regulation-radical change, namely, consensus-domination49. Burrell and Morgan mention this terminology of voluntarism in a footnote and the following explanation is given: “By ‘consensus’ we mean voluntary and ‘spontaneous’ agreement of opinion.” In my mind spontaneous agreements may not need to be well founded in organisations which render legitimising actions possible, shielding real identities of organi-

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47 An interesting paradox arises in Rikhardsson and Welford’s (1997) heavy critique on the writings of Porter and van der Linde (1995a) and Schmidheiny et al. (1996). Despite the critical view of Rikhardsson and Welford on these authors that advocates a profound trust in corporations these authors have created the 2nd most (Schmidheiny et al., 1992) and 8th most (Porter and van der Linde, 1995a) cited articles in Welford’s own journal Business Strategy and the Environment as shown in Dobers et al (2000, 2001). One can sense that this has been unknown to Welford and I would argue that his articles (1997b; 1998) shall been seen in that context – as a response to that fact of trajectory.

48 Hobbes (1651) recognised the essence of power behind a goal in order not to turn it to glossy depiction.

49 Burrell and Morgan’s (1979) ‘consensus-mode of domination’ has resemblances to Dahrendorf’s (1959) ‘consensus-coercion’, a distinction which they reject due to the ambiguity within in it. Consensus may, in fact, be the product of the use of coercive force. So extant shared ideas represent a mode of domination.
sations from being altered. As shown in figure 3, two axes intersect, forming operational analysis of social theory, the axis of the sociology of voluntarism-domination and the axis of subjective-objective social science.

Some well cited writers conducting environmental management related studies are non-academics, to whom the descriptive-normative use of knowledge and placing such at different points on a nature of social science continuum would make little sense (Dobers et al., 2001). These texts, thus not focusing on the nature of science, would benefit from being positioned along the axis of use of knowledge (in relation to action), between the extremities of descriptive and normative.

The axis of regulation-radical change in Burrell and Morgan’s classification of the nature of society that is used by Dobers et al. (2001) works well for describing firms’ approaches on sustainability and environmental issues within a set judicial framework, from a managerial perspective. Firms merely implementing law requirements do not, under the present set of rules, work towards a radical change. The opposing side of this axis is the radical change one, if originating from regulation. Radical change is, however, not a dichotomy to regulation. This can be well illustrated by the writings of Schmidheiny et al., if seeing beyond the underlying message. Such writings are in Rikhardsson and Welford (1997) seen as a restraint on environmentalism by arguing firms’ freedom from the yoke of regulation. By leaving out the control dimension on the radical change side the field is open for management actions that are the cheapest in the environmental agenda. Firms themselves may, thus, freely choose – when going beyond regulative requirements in their environmental work – to go for real change and improvements or merely image creation. So, not being regulative in the regulation-radical change approach does not imply working towards radical change, but rather doing more than required which may result in two major types of action: 1) implement process actions leading to radical change with an identity beyond regulation or/and 2) implement communicative actions creating an image that goes beyond regulation.

Rikhardsson and Welford (1997), see Schmidheiny et al. writings as eco-modernism, making business as usual possible – protecting the status quo – by

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50 I would go a step further than Dobers et al. (2001). Plentiful works by so-called academic writers in current management research tradition could rather be referred to as being consultancy reports. In the environmental field (mostly managerial, but to a lesser degree economic research) the consultancy reports that advocate unhampered faith in corporate self-governance obstruct development towards a more sustainable society. These writers are, hence, on errands for those in control, ensuring status quo. See e.g. Rikhardsson and Welford (1997) on Schidheiny et al. (1996) and Cerin (2002) on Porter and van der Linde (1995a).

51 The participants in a PhD course (provided by a few colleges and me handling sociology in an environmental management context, for more information on the course go to: www.index.kth.se/csm/course.html), furthermore, noticed in their analyses of Schmidheinya et al. texts that those are considerably double sided, providing arguments that contradict one another. Large corporations are friendly and will act socially well if left alone, even if they are not doing so as of today.

52 If comparing with the four research paradigms of social theory according to Burrell and Morgan (1979) we see that eco-modernism corresponds to the functionalist paradigm which is dominant in sociologic analysis of organisations. This paradigm applies simplistic models, based on natural sciences, to study human affairs. The result is, hence, a tradition of social positivists defending the being and unable to explain change.
throwing out interventionists. Porter and van der Linde (1995) is according to Rikhardsson and Welford less positivistic, recognising regulation as a catalyst that informs short-sighted business leaders, although, they add that Porter and van der Linde are sending a similar picture by claiming that legislation is mostly needed to inform them about the obvious rewards of polluting less. Dobers et al. provide a slightly different picture (to the one of Rikhardsson and Welford) in their four-fielder scheme for the analysis of corporate environmental management theory. They argue that Schmiedheiny et al. and Porter and van der Linde are both at the far end of the regulative side of the regulation-radical change axis even though the former advocates further change and lesser regulation than the latter. I would argue that the conclusions of the former (Schmiedheiny et al.) is the non-change since they advocate business to voluntary solve its problems – leaving out tougher regulation as a solution for increased competitiveness of a country and its firms. The latter, Porter and van der Linde, claims on the contrary that legislation can increase a country’s competitiveness.

The Schmiedheiny et al. and as well as the Porter and van der Linde texts are all dealing with managerial matters of firms as well as legislative, regulation and policy discussions. However, as I stated above this axis of regulation-radical change may work when describing how companies and its managers relate to current legislative framework, but a prerequisite is that it is understood that the radical change side encompasses actions beyond legislation in either real actions or legitimacy (cf. DiMaggio and Powell, 1983). When dealing with policy issues, such as both the Schmiedheiny et al. and Porter and van der Linde texts, the dichotomising of regulation vs. radical change is inappropriate. Such structuring is in fact hijacking environmental ideals (cf. Welford, 1997a) by enclosing thoughts within walls of self-evidence (cf. Gustafsson, 1994). The status quo-change axis of Rikhardsson and Welford (1997) and order-conflict axis Welford (1998) are more coherent and, thus, more adequate in describing the nature of society from an environmental perspective. These axes overlap, but the former is characterised by states of being (resulting from structures) while the latter by structures (resulting in states of being). Since the order-conflict continuum leads thoughts to structures of being (static or changing) I would like to focus on a continuum of voluntarism-domination which is characterised by power, that constitute structures. By doing so, this axis of power can be used for discussing erroneous societal behaviours as well as policy suggestions that deal with static and change – seen from an environmental and sustainability perspective – in a more constructive way than the order-conflict dichotomisation provides. Larger emphasis will, therefore, be put on micro-level discussions with the individual in focus. That is on issues such as legitimisation and opportunistic behaviour, leading to macro conclusions.
Consequently, the four competing paradigms of the theories in corporate environmental management and economics is illustrated in a four-fielder, figure 3, below and briefly described as follows:

- The concern of the lower-right paradigm field is to explain, by applying models and methods of natural sciences to the society – and hence human behaviour.
- The concern of the lower-left paradigm field is to understand the individual within its framework, which involves questioning models and concepts – e.g. organisations.
- The concern of the upper-left paradigm field is to criticise the societal structures that dominate the consciousness of individuals – wedged from their own.
- The concern of the upper-right paradigm field is to change, due to crises generated by fundamental conflicts of power relationships in society – e.g. environmental.

Figure 3 Four competing paradigms to research of corporate environmental management and economics.

I will focus on the critical theory of social sciences, arguing its appropriateness for environmental studies, both managerial and economic, in order to enable emancipation into change. The core of critical theory is explained by Burrell and Morgan (1979) as: “Critical theory is a brand of social philosophy which seeks to operate simultaneously at a philosophical, a theoretical and a practical level.” The Kantian idealistic critique is the mainstay for these proponents, in a quest to bring to light the underlying forces in society. Critical theory contains schools of thought which are distance from the far end of subjective social science and, in fact occupies the central position of the axis of the nature of science – encompassing areas

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53 The deployment of the papers constituting the thesis into the scheme: “Four competing paradigms to research of corporate environmental management and economics” is illustrated in appendix I.
within the two paradigms Criticise and Change on the domination side of the voluntarism-domination axis (see figure 3). Lukácsians may be seen as evidence of such, seeing social process as the objective acting upon the subjective, or vice versa (cf. Burrell and Morgan, 1979). Welford (1997b; 1998), furthermore, recognises this central role (in the social science continuum) of critical theory as incorporating both the objective and subjective approaches to research, but aiming ultimately to create a social change (improvements) which in its extensions is beneficial to the environment. The agenda setting text of 2001 for the realignment of the journal Eco-Management and Auditing into Corporate Social Responsibility and Environmental Management elucidate these dependencies between social conditions and the environment (cf. Welford, 2002). Prominent during the last three decades in critical theory has been the works by Habermas (see the collective works of Habermas, 1995) which are a reaction to the shortcomings of the sociological paradigms of interpretivism and positivism. These discourses, accordingly, serves the interest of those who use them.

The differences chosen to describe the nature of society from an environmental perspective, on the one hand, as Rikhardsson and Welford’s (1997) status quo-change axis and Welford’s (1998) order-conflict axis and, on the other, as in figure 3 voluntarism-domination axis may reflect some (small but) core differences in e.g. the Rikhardsson-Welford’s and Cerin’s respective trust in firms to achieve improvements in environmental care taking. As shown earlier in this cover essay Welford (1996) indicates that “Companies must recognize their wider responsibility and manage the entire life-cycle of their products...taking every’ attempt to ensure that environmental damage done is kept to a minimum.” achieved partly by discussions, not dominated by industry, but between various societal actors, while Cerin places stronger emphasis on regulators and governmental bodies to exercise stronger legislative power on firms. Both views, however, argue for more public involvement as a way to generate it opportunistic for firms to become greener.

Burrell and Morgan (1979) briefs the outlines of Habermas and the Frankfurt School, to which he belongs, as hermeneutic sciences, predominant in history, aim at understanding circumstances without altering them while the critical perspective aims both at understanding and changing the world. Burrell and Morgan express this welding of perspectives into critical theory as: “which for Habermas must be emancipatory, dialectical (in transcending the philosophical antinomies of subject and object, observer and observed, fact and value), and hermeneutic in its endeavour to understand the socio-cultural world in which subjective meaning is located.” Central to dialectics are, according to Welford (1997b; 1998) the contradictions appearing between the private interest (economic efficiency) and the public interest (social efficiency). Habermas developed a theory of communicative competence in order to deal with linguistic ordeals. By doing so, Habermas provides a link between the macro-structure of politics and individual speech acts. He dichotomises the extent of possible interaction into ideal speech situation – in which symbolic interaction is enabled due to consensus achieved without the influence of
power – and its counterpart communicative distortion – in which unequal power distribution leads to some sort of consensus (Burrell and Morgan, 1979).

Knowledge, however, as Welford (1997b; 1998) points out can never be independent and neutral and is always constrained by the interests of power. In his later works (cf. Habermas, 1976) Habermas identifies the vital dilemma of our capitalist world is the legitimation crises which makes the dialectics in social affairs of concern, opposed to Marxian economism. Critical theorists ought to abolish the idea of objective researchers, since the process of interpreting others requires putting their own gloss on the findings (Alvesson and Willmott, 1996). Alvesson and Willmott lean against Steffy and Grimes’ (1986) explanation that critical theorist researchers should not be passive observers or even a participant, but a reconstructionalist, interpreting false rationalities within empirical structures. Researchers should, thereby, increase the understanding of those being studied by their conditions and, thus, create a foundation for institutional change. Illuminating the structures of society is highly esteemed since these control the consciousness of humans to fit the current social societal structure. Keeping the notion of relativism in mind, according to Gustafsson (1994), will lead us back to objectivism. Social research, as a consequence, has to be rooted in three pillars criticality, truth and intellectual honesty. If not, we can ask ourselves whether it at all can be called research, but rather tragicomic entertainment or glossy consultancy.

Gibbons et al. (1994) discuss the knowledge production as a production of usefulness, practical knowledge, or a production of knowledge for the shelf. Here, in this aspect, we can see how Welford’s and Gustafsson’s view on science, in relation to society, depart. Welford (1997b; 1998) – being more normative than Gustafsson – emphasises the immense need for change in the way business is carried out if the serious and increasing world degradation is to be halted. Therefore, more environmental research should be critical44. The major part of this research on business and the environment, and especially consultancy works, merely reinforces the message from industry in maintaining status quo. A reason for this is, according to Welford, the failure of interpretivists and positivists to separate knowledge (facts) from how it is used (interests), which is a narrative view since knowledge is not independent but originates close to those who use it55. Most importantly in emancipatory critical research is that “researchers should become involved in programmes of change capable of bringing about improvements in the problems identified, making society better. This is the ultimate test of useful research” (Welford, 1997b; 1998).

44 Why do these two organisational researchers divert here, the environmentalist going further by aiming for a change to something seen as better, by the researcher in question? I believe the issue here is a general one differing environmental concerned researchers from others, of course far from always, but a characteristic for the group. My reflection is that it is more likely that the a researcher of environmental and sustainability issues have entered academia with a genuine interest to be able to make a change, or at least by being considerably troubled by the disorders s/he may have seen – environmental, social or economic.

55 The goal is not to point out misbehaving actors, sometimes identified in studies, but to highlight the rationalities behind observed phenomenon, to be constructive giving possibilities to improve the behaviour resulting into environmental and social inadequacies.
4.2 Theories in Management Control

Corporate environmental reporting has become a big issue in recent years. In this section I discuss its purpose and usage in firms by applying theories of accounting research – i.e. agent, institutional and stakeholder theories. In addition I look at legitimacy which may not be viewed as a stand-alone theory but constitute a key concept, a link between institutional and stakeholder theories, at least in this discussion of environmental reporting. The theories are briefly explained and their relevance for the present context illustrated.

4.2.1 Agent Theory

In agent theory, company management and their self-interest are on display\(^{56}\), unlike stakeholder, legitimacy and especially institutional theories (Gray et al, 1995). Agent theory, according to Jensen and Meckling (1976), clarifies the control problems relating company owners or principals to, by them appointed, company management or agents. The control problem arises because of asymmetric information (Barney and Ouchi, 1986). The more informed agents have advantages over the principals. Control is issued to keep agents from acting in their self-interest at the expense of owners. This is expressed as agent costs and is composed of costs for “structuring, bounding and monitoring contracts between agents” (Jensen, 1983:331).

When dealing with voluntary reporting company management agents – following agent theory – tend to show only what suits them. The environmental reporting thus also works as a diversion tool of political attention (cf. Watts and Zimmerman, 1986). The opportunistic behaviour of agents and the relative lack of information of principals and investors lead – in the pure world of neo-classical economics – the agents to attempt to deceive\(^{57}\) the owners (Hendriksen and van Breda, 1992).

Ljungdahl (1999) calls attention to economic agency theory as capable of explaining company environmental reporting as a tool for diversion in the political field and signalling in the stock market. Moreover, Brignall and Modell (2000) show that organisations adjust their reports in line with stakeholder preferences. These stakeholder-suited reports – of which each company may produce several – may very well be contradictory; in fact, reports may be legitimate to those stakeholders that are targeted, but may not be legitimate to stakeholders targeted in other reports. The authors name this paradox de-coupling, a term coined by Meyer and Rowan (1977).

\(^{56}\) The agent theory is based on neo-classical economics presupposing the existence of perfect markets and the rational and opportunistic behaviour of the economic man (Ljungdahl, 1999; Gray et al, 1995).

\(^{57}\) Criticism has been raised to the unlikely assumptions of neo-classical model (the existence of perfect markets and the economic man), but this is not the place for a detailed analysis of that (cf. Eliasson, 1991; cf. Perrow, 1986).
Ness and Mirza (1991) show in their study a greater presence of environmental reports among oil companies than in other sectors and explain this phenomenon – which may appear surprising – with the harsh environmental debate concerning the oil industry cluster. To increase the confidence within the group of company owners and to lower the costs of agents\textsuperscript{58}, Ness and Mirza continue, the company management has an advantage when reporting not qualitative information only, which they often can select themselves. The owners have difficulties to form an opinion from the material.

Union Carbide used environmental reports as a signal tool towards the stock market to limit the negative effects on the stock value after a disaster in one of their chemical plants. The study showed that the chemical companies not reporting any environmental information were the companies which became most affected by the stock market after the accident, even though they had nothing to do with the actual incident (Blacconiere and Patten, 1994).

4.2.2 Institutional Theory
Considerable amount of companies producing separate corporate environmental reports, separated from the annual report, believe that these reports are nothing but a passing phenomenon. These companies seem to feel that they presently will not achieve institutional legitimacy without these separate reports (Ljungdahl, 1999). In these cases the agents’ ability to act are reduced and legitimacy strategies are of subordinate importance, i.e. in annual reports. This practice illustrates the institutional process of companies to use already set and commonly accepted structures and procedures (Suchman, 1995). Ljungdahl (1999:203) observes that such environmental reporting was regarded as necessary among the agents in his study, however they could not explain why. Their explanations had the characteristics of "every body else does it" which is in line with institutional theory. This development of isomorphic environmental reports may be the companies’ way of searching for legitimacy and avoidance of legitimacy threats (DiMaggio & Powell, 1983).

At the annual reward, the best Swedish Corporate Environmental Report of the year 1998 (applied to reports from 1997), initiated by a national-wide Swedish business magazine, a member of the committee explained that they now floodlight companies which do not create environmental reports. This in contrast to earlier years when only the most prominent producers of reports were illuminated (normative isomorphism). The changed strategy was presented as a push to increase the pressure on non-reporters, a kind of peer pressure.

Ljungdahl (1999:203f) has found that the isomorphism in reporting has lead to a disconnection of environmental reports from the ordinary activities. The outside pressure to produce something is, in other words, so hard that the firm develops routines with no connection to company activities, i.e. de-coupling. This is an irra-

\textsuperscript{58} Costs for "structuring, bounding and monitoring contracts between agents" (Jensen, 1983:331).
tional behaviour from an internal efficiency perspective (Meyer and Rowan, 1977), however, and an instance how to manage inconsistent norms.

If the firm decides to *de-couple* its reporting – both to different stakeholders and to the firm’s real actions – it may then adopt an *isomorphic* copying of other firms’ environmental and sustainability reports, that is copying other firms’ communication to stakeholders. This can also enable the firm to conduct its business as usual which is in line with the critique from Rikhardsson and Welford’s (1997) on the business community, for hijacking the environmentalism. Carrying out business as usual is to copy its own past behaviour in its present real actions and performance – *automorphism* (Schwartz, 1997; Czarniawska, 2002). In the case of discrepancy in reporting (image) and actions (identity) we see how an isomorphic de-coupling of image creation to stakeholders defends and encompasses an automorphic business as usual behaviour.

### 4.2.3 Stakeholder Theory

Lowe (1971) recognises the coalition of stakeholders involved in enterprise control. Freeman (1984) defines a stakeholder in wider terms as an all-encompassing actor who influences, or is influenced by the company's activities. These stakeholders may then be divided into subcategories. A distinguishing factor is ownership. Donaldson and Preston (1995) tell those ownership differences apart as those with a *stake* in the company and *influencers* creating opinions on environmental matters. Another way of putting it is to characterise them as *primary* and *secondary* stakeholders (Clarkson, 1995: 106f). Donaldson and Preston (1995) set a normative approach of stakeholder theory moralising good stakeholder management in accordance with a societal view. The grouping into primary and secondary stakeholders is for instrumental usage where company management can estimate the reactions of actions taken and thereby determine the possible effects from decisions made and strategies to encounter those (Freeman, 1984).

According to Jaggi and Zhao (1996) company top management tend to see an advantage in environmental reporting only if it will increase the good will of the enterprise, while others might advocate companies' righteous obligation to report how their activities affect our common environment (DTTI, 1993). An empirical study concerning social reporting by Roberts (1992) shows the data a company reports, as a function of various *stakeholder powers* i.e. strategic poster expenses and economic performances. However, the study did not find any connection between the stakeholder power, diffusion of ownership, and the occurrence of social reporting. Apart from stakeholder powers Roberts also examined other aspects such as line of business belongings and age of company to be influencing social reporting.

In another study on how miscellaneous stakeholders in the financial community receive this information given by corporate environmental reports the data prefer-

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59 In lack of research material in environmental reporting analogies are drawn to the related phenomenon social reporting, which to some extent incorporates environmental information.
ences of different analysts are revealed (cf. Cerin, 2000). General Fund analysts seem to prefer financially linked data while Ethical Fund analysts prefer information regarding environmental performance and risk & compliance data. No clear results could be drawn from the cluster of Credit and Insurance Risk analysts, but they appear to fancy finance data and risk & compliance data (Pettersson and Earl, 1998). No analysts paid much attention to stakeholder involvement and environmental opportunities.

4.2.4 Legitimacy Theory
It may be argued that legitimacy is not related to a theory of its own, but a concept needed to explain what organisations search for among stakeholders and how they do it – within the framework of an institutional theory. Legitimacy seems to be of key importance to unveil the reasons behind environmental reporting, however. That is the reason for analysing it in this context.

The more legitimacy a corporation has gained the easier it is to find support and resources from e.g. investors, but this legitimacy may be somewhat independent and irrespective of the company’s success according to other criteria following Schwartz (1997). One distinguishing feature of large organisations is that they engage more than small companies in legitimising behaviour (Wolff, 1986). Sometimes the environmental and social demands from the world around corporations are in conflict with a rational and efficient production process. Then, Wolff continues, companies may solve this inconsistency by distinguishing between operative and legitimising activities.

Clarkson (1995) states the importance of having the support from stakeholders to provide resource benefits. Clarkson further implies that the resource benefits from secondary stakeholders, influencers, might be the immaterial resources of social legitimacy e.g. by their moral support. Therefore, it is often important for enterprises to canvass these influencers to influence the primary stakeholders.

Legitimacy presumes a correlation between the company's perception of itself and the image that the society has of the company – or merely a correlation between the company's and its stakeholders' perceptions (Ljungdahl, 1999:45f). Pfeffer and Salancik (1978) distinguish between legitimacy and legality. A company may very well receive legitimacy among its stakeholders, even though it does not behave legally in all respects. Ljungdahl continues to explain how the effort saving communicative tactics of justifying some inconvenient occurrence may be a rational substitute for attending to the cause of the occurrence. According to Gray et al (1996:46) a firm with problems may seek to 1) educate its stakeholders about the company intentions to improve its performance, 2) change stakeholders' perceptions of the actual problems in case or 3) change external expectations of its performance. This is a strategic view on legitimacy which is supported by institutional

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60 This involves changing stakeholders' perceptions without any organisational improvements, but to control and steer attentions away from the occurred matter.
When studying social disclosures in American corporations Patten (1991) explored a correlation between the extent of social reporting on the one hand and company size and line of business on the other. He has also shown (Patten, 1992) that, somewhat surprisingly, all corporations within the oil business started to report environmental information around 1990 in order to protect their legitimacy from the image damage of the Exxon Valdez oil tanker disaster in Alaska 1989. Walden and Schwartz (1997) verify Patten's results and discover that the lines of production with the most lasting voluntary environmental reporting were the oil industry and the consumer product businesses. Brophy and Starkley (1996:177ff) argue that the Norwegian state owned oil company Norsk Hydro started the wave of environmental reporting to restore its own image after a spate of bad publicity.

4.3 Theories in Institutional Economics

The institutional schools in economics reject the standard assumption of no transaction costs of the still dominant neo-classical tradition, that removes the need for institutions. Some schools accept the notion of static equilibria as a rational choice model while others totally reject static equilibrium (Egbertsson, 1990; Fridh, 2002).

4.3.1 Property Rights and Transactions Cost Theories

The two articles by Coase (1937; 1960) have become the hallmarks for transactions cost and property rights theory, pushing microeconomic theory through a revolution. The 1937 writing *The Nature of the Firm* was not received with immediate acceptance. The years of debate and the new mode of thinking evolved of the law and economics tradition, however, made the 1960 article *The Problem of Social Cost* an instant success.

The 1937 notion of the firm makes both the existence and the size of firms determined by the limit where the internal and external costs for transaction, business are equal. A firm will continue to exist and grow as long as the internal costs for coordinating activities are lower than the costs for transacting them in the open market61. Neoclassical theory assumes transactions in markets to be costless and all actors fully informed, in the sense of being able to allocate themselves in static equilibrium. Since it is usually very costly to obtain this needed information, note not complete (Stigler, 1966; Williamson, 1985; North, 1987) institutions are also needed to support market transactions. As a matter of fact, positive transactions

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61 See the correlations with Adam Smith's description on Free trade and the burden of America (Smith, 1776): By means of glasses, hotbeds, and hotwalls, very good grapes can be raised in Scotland, and very good wine too can be made of them at about thirty times the expense for which at least equally good can be brought from foreign countries. Would it be a reasonable law to prohibit the importation of all foreign wines, merely to encourage the making of claret and burgundy in Scotland?
costs constitute the lion part of the costs that we deal with in economic life (statistical evidence is provided by Eliasson, 1984; 1996).

The markets, of Western Economies are efficient in reducing transactions costs (North, 1994), especially for those actors dominating it. Therefore, authorities have to govern such markets to prevent monopoly formation. Already Machiavelli (1513) recognised the strong forces in institutions, resisting alteration of status quo and Dobers (1996) describes dominant influences by actors already in the pre-markets, that is, in the creation of institutions that protect incumbent players. Machiavelli recognised fear of the unknown as being stronger than rational expectations, which can partly explain Strannegård (2000)'s identification of politicians as largely being reactive to change, since they are dependent of short term mandate periods and perceptions of their electorates, at least when dealing with environmental matters. This fear, in its turn, relates to the wall of self-evidence, making individuals not seeing beyond the habits of today (Gustafsson, 1994). MacKenzie (1992), furthermore, identifies technological trajectories as a form of institutions which’s sustainability is not primary a question of pure internal logic. On the contrary, the survival is dependent on a profound belief in its own continuance.

Accepting the existence of positive transaction costs means accepting the critical role of the property rights institution, and as well that the outcome of a transaction will be dependent to the initial endowment of properties. Stigler (1966) compared the no transaction cost environment with one owner of resource conflicting aims of usage (thus the most efficient solution will be applied) and concluded that “the Coase Theorem thus asserts that under perfect competition private and social costs will be equal.” In a transactions cost environment, on the other hand, Coase (1991) stated that: “It is obviously desirable that these rights should be assigned to those who can use them most productively and with incentives that lead them to do so and that, to discover (and maintain) such a distribution of rights, the costs of their transference should be low, through clarity in the law and by making the legal requirements for such transfers less onerous.”

External effects such as impacts on the environment have, however, traditionally been regarded as one hurting the other, both in theory by the influential Pigou (1920) and in regulative practice. The consequences from such actions result in attempts to internalise all social costs to the actor causing them. This, according to Coase, means misunderstanding the entire problem, neglecting the reciprocal nature of the externality. The result is that environmental policy instruments will

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62 Monopoly formation can be based on unique knowledge of advantages. If so, it is normally both beneficial to society and temporarily (competitive learning). But it can also be based on economies of scale, raising enormous barriers to competitive entry, and on elimination of competition or protection (privileges) by some legal means. If so the welfare problems become difficult.

63 The external effect on others resembles that from institutions, but there is a risk that everything in society will end up being called institutions. I would argue that what is dealt with here is networks, or rather lose forms of networks with some common interests – but is visualised in the text with the metaphor institutions.

64 Interesting to note is that both Pigou (1920) and Coase (1972) base their arguments on Adam Smith’s (1776) Wealth of Nations and its agents of self-interest. Pigou see erroneous price signals due to exter-
transmit erroneous price signals, steering resources away from allocations supporting social optimum. Following Coase: courts and the law are institutions that enable and lower the costs of transactions, and thus, improve the allocation of resources. The problem shall consider who is allowed to inflict harm on each other and thereafter, that is avoiding the most severe damage. This is according to Domeij (2001) well-established in – e.g. Swedish – case law and known as considering the concerns of turnover. In considering avoidance of most severe harm Coase (1960) stresses the importance in looking at the reciprocal problem both in total and at the margin.

The legal institution of property rights is critical in its support of market transactions (North and Thomas, 1970). In fact, Coase (1960) stipulates that no trade can take place if property rights are absent and property rights should, therefore, be treated as any other production factor in economy. Besides defined ownership, under a positive transactions cost environment, the management regime is of key essence, ranging from private property to open access. The collective use of common property was highlighted as criticised already in the ancient Greece, by Aristotle (350 BC), saying that property owned by all will be ill cared for. Hardin (1968) coined an expression describing this phenomenon, the tragedy of commons.

It is, however, not – as often is stated – only the regime of property that determines the success of the outcomes, but also its management. Already Hobbes (1651) emphasised the importance of enforcing the rights of property, and not only rely on empty words. Recognising management as being of importance to solve resource use conflicts have lead Turner et al. (1994) to rephrase the tragedy of the commons to the tragedy of open access. The regime of property is crucial. Still, the larger the number of actors with access right the more complex the management of them and so is also the risk that they jerk the instrument. Such managerial matters were considered already by Aristotle (350 BC) and some good 2300 years later by Alchian and Demsetz (1972, concerning organisational structures) and Williamson (1975, concerning self-coordinating structures). Arrow (1963) creates the notion of moral hazard and Meyer and Rowan (1977) coined the concept of de-coupling.

4.3.2 Creative Destruction and Unbounded Growth Theories
Problems of dynamics need dynamic theory to be properly attuned to get the priors right. The EOE and the competence block theories have been developed by Eliasson (Eliasson, 1987; 1991) and Eliasson (1990; 1995a) respectively, and Eliasson (1996) for a thorough explanation of them both to attuned to that in a micro-to-macro context. These causal theories build on the Austrian (Menger, 1817) and economic growth and dynamics that was introduced in Sweden by Wicksell (1898),

nalties while Coase see no externalities, but inconsistent resource aims (reciprocal) to be solved with exchange.
65 In legitimising its own behaviour firms and managers may be seen to adopt contradicting information to various stakeholders, decoupled from its real actions. The real problem is then by-passed from external attention and pressure (Cerin, 2002b – Paper V). To be compared with end-of-pipe and process solutions to environmental problems.
Åkerman (1950) and Dahmén (1950; on environmental issues 1968). The main emphasis of early evolutionary Austrian school, of Menger (1871) and Schumpeter (1911) was on uncertainty, ignorance and investment mistakes. Let us look at Åkerman (1950) who defined the four fundamentals of an economy as:

- Interdependence
- Welfare
- Process
- Institutions

Åkerman observed that the neoclassical general equilibrium theory lacked the two latter fundamentals. The expanding state space of knowledge in the EOE becomes a prerequisite for technological competition and innovation, and in economic prosperity and in analyses (see e.g. Cerin, 2005a – Paper X) for the existence of win-win situations. In New Growth Theory (NGT) human capital explains growth. It is accumulated over time (Romer, 1986; Lucas, 1988) including learning by doing as explained in a series of articles, now being seen as key writings in NGT, by Romer (Romer, 1990; 1991; 1994). In both the NGT and the theory of EOE Schumpetarian profit-seeking entrepreneurs make growth endogenous, resulting in knowledge spillovers and knowledge accumulation. The EOE differs from the NGT in being micro based and allowing for business mistakes as the key characteristics of learning and knowledge accumulation. Focusing on the expanding state space firms (in the EOE) operate far below the their production possibilities, constantly making, more or less, serious mistakes (Eliasson, 1996, 2002). The transactions costs are, thus, basically the costs of mistakes. At first sight these mistakes appear to be keeping losers, e.g. putting research into dead end projects, too long. Another characteristic of these costs is that they are rather manageable and measurable in management control systems. The really large cost originate in the cost of losing winners, e.g. discontinuing research into products that would revolutionize tomorrow’s services and returning revenues from them. Actors in the economy (in an EOE setting) are, thus, playing in an almost infinite (from the actors’ point of view) expanding sphere of uncertainties, trying to transform uncertainties to subjectively calculable risks (Knight, 1921; Eliasson, 1996). This view may, hence, be seen as a bridge between traditional institutional economics and managerial institutional theory.

Complete knowledge immediately available at virtually no cost is not possible in institutional theories where the tacit knowledge of core competence is the ability to select competence (Pelikan, 1989). The empirical psychological research by Simon (1955) presented bounded rationality as the normal decision situation of firms, leading them to use simplistic decision models in order to cope with the complex environment. This notion is consistent with the philosophical – utilitarian – approach of Marshall (1919) who really was an institutional economist, despite being the dominant WAD economist of his time (Laestadius, 1992; cf. Eliasson, 1996).

66 To denominate these theoretical developments the Swedo-Austrian school is, hence, a fairly accurate description such as the notions of Wicksell's (1898) permanent disequilibrium financial markets and Schumpeter's (1911) low predictability of micro outcomes.
The conception of bounded rationality as brought into economics from psychology did not fit into the neo-classical (WAD) school of economics and its definition of rationality. It became, however, central in institutional economics upon which transaction cost economics relies (Williamson, 1985; Winter, 1991). Williamson, following Simon, saw the realities of bounded rationality and the costs of transactions to be of key importance when considering governing structures – to efficaciously fit with transaction formations – to enable a change from the status quo. The advantages a firm possess in regards to those who try to cope with them, but which are faced with difficulties in other environments favour the going concern which is the replication assumption according to Nelson and Winter (1982). Eliasson (1996) e.g. stresses the importance of tacit knowledge in organisations as competent teams possessing difficult to transfer tacit knowledge, on which they act as temporary corporate monopolies, earning temporary returns above interest rates.

Since knowledge is usually delimited among actors and has to be acquired at a high price, it is not primarily the demand in physical volumes that the markets can absorb that restricts output – as Smith (1776)⁶⁸, Marx (1867) and Stigler (1951) suggested. On the contrary, the delimitation lies on the other side, on the supply capacity of heterogeneous and tacit knowledge, or competence (Eliasson, 1990). This standpoint puts the analysis into a truly Schumpeterian creative destruction setting. Possessing unique tacit knowledge may thus lead innovators into creating new markets if other institutions such as financial strength, ensuring monopoly and status quo, do not obstruct entry. Despite this fact irrational behaviour is common.

⁶⁷ If, of course, the temporary monopoly is used to disable some of the fundamentals of economy – such as innovate entry of new players – anti-trust policy makers need to step in correcting the rules of the game.

⁶⁸ It ought to be acknowledged, however, that Adam Smith (1776) in fact did incorporate aspects of delimited knowledge and difficulties in obtaining relevant information. To cite him (Smith, 1776: Book I): "The order of proprietors may, perhaps, gain more by the prosperity of the society than that of labourers: but there is no order that suffers so cruelly from its decline. But though the interest of the labourer is strictly connected with that of the society, he is incapable either of comprehending that interest or of understanding its connexion with his own. His condition leaves him no time to receive the necessary information, and his education and habits are commonly such as to render him unfit to judge even though he was fully informed." As a consequence, Smith put large emphasis on the rich creating monopolies that benefited themselves and resulted in "...the oppression of the poor..." Smith was, moreover, concerned with the process of adjustments rather than with equilibrium states, as well as putting emphasis on imperfect knowledge and property rights. Smith’s argumentation for man’s right to use his resources in the way he found most profitable is an establishment of a property rights system (cf. Coase, 1977). Smith did not see the economy as a circular flow with given dimensions, but as a spiral delimited by the rate of replacement of goods, leading to higher outputs. Later, as described by Skinner (1999), Ricardo narrowed down Smith’s broad perspective on the working economy, delinking economics from ethics and history which is an obstruction of Smith’s true intention. Also Stiglitz (2003) acknowledge Smith, often credited for the belief in unfettered markets, for being more circumspect himself. One such narrowing of discussions is the expression the invisible hand which is often referred to be central in Smith’s economic context. A reader of the Wealth of Nations will, however, may have difficulties finding these hands. In fact, as Rosenberg (2003) has detected, the invisible hand exists only once within WN and then perhaps not to describe the efficient market but to attack the behaviour of merchants. This misinterpretation of Wealth of Nations may easily occur, since the main focus of the thesis is not on feelings of benevolence, but on self-interest. Cases of unselﬁshness and irrationality are mentioned from time to time, though, such as the closer the persons are to each other – by relation of friendship – the less selfish are their interactions and that common prudence does not govern every individual – even though the aggregated group is characterised by it (cf. Coase, 1977; cf. Skinner, 1999). It is, therefore, paramount that we see Smith’s Wealth of Nations – WN (1776) and Philosophy of Moral Sentiments – PMS (1759) as parts of one great common work and not as two stand alone pieces. The PMS illuminates the unselﬁsh (controlled self-interest) man while WN illustrates the selfish (economic) man.
in politics, such as the short-term interests of politicians, targeting survival in the next election as their primary concern, e.g. by heavily subsidise industry which is on the verge to bankruptcy and possibly virtually no future. Thereby, resources like skilled labour will be locked into inefficient sectors imposing restraints on growth in other areas of society. In the long-term these resources would have been much better spent elsewhere (e.g. on education, innovations and entrepreneurs). Eliasson (1996) gives many examples of such. In Sweden, and many countries as well, the ship building industry stalled in the 1970’s, mainly due to the oil crisis. The common defence to this crisis was for nations to financially support their own failing industries. The problem was that these efforts demanded immense resources, both financial and labour. By abandoning its support to the Swedish shipyard industry the Swedish government could have spent its resources elsewhere and set labour free to contribute to productive input in other industries of the economy. According to Smith (1776) support to such inefficient production is oppressive to the vast majority who have to pay for badly used resources such as labour. Resources which otherwise could have been used productively and beneficial to the entire society.

By similar actions taken by societal actors; e.g. by governments, labour unions, sustainability indexes; progresses towards a more sustainable society are obstructed, defending the old structures of today. How come that indexes promoting sustainability could be working against sustainability? Well, in order to receive maximum accetpation in society by politicians and industry leaders, each industry sector is to be included in the indexes. Another reason, and the official, is to provide incentives for all companies, even those who operate, from a society perspective, in unwanted industry sectors. Some sectors by definition, however, cannot be sustainable (Cerin and Dobers, 2001b – Paper VIII; Fries and Feldhusen, 2001). So, instead of favouring those in power these indexes could aim at making a change, steering investments and business towards sectors that insignificantly affects our environment.

If having economic growth linked to the resource of knowledge – contradicting the physical output view of Smith-Marx-Stigler – the view on limits to economic growth as presented by the preachers of doom will become obsolete (cf. The Limits to Growth, Meadows et al., 1972). In the Schumpeter-Eliassonian context the limiting factor is knowledge and sustainable growth becomes an attainable objective. There is virtually no end to the possibilities of which most are unknown since they have not yet been thought of. All actors operate with bounded rationality and
have to carry out economic experiments on incomplete information that pushes the opportunity set even further (cf. Eliasson, 1996). This environment leads inevitably to an increased importance to the informational asymmetries, signalling and screening among actors of Akerlof (1970; 2002), Spence (1973; 2002) and Stiglitz (1975; 2002) respectively.

The growth process in Shumpeter’s technological competition undergoes innovation, knowledge acquisition and an entrepreneurial phase where uncertainties are transferred into calculable risks. Such growth according to Eliasson (1995b) requires four mechanisms of economic growth, enabling the important innovative entry but also likewise important competitive exit setting free resources for new vigorous entry. Unfortunately, too many policy instruments are targeted on obstructing competitive exit. Even the environmental instruments to a large extent defend the existing production order (of firms) instead of achieving larger environmental gains as suggested in Cerin and Karlson (2002 – Paper IX) and shown in Cerin (2005a – Paper X; 2005b – Paper XI). One way to increase the likeliness of implementing instruments that e.g. increases the turnover of the actors (entry and exit) is to initially adopt the grandfathering principle. According to OECD’s (cf. OECD, 1999) GREEN modelling the grandfathering principle is also the most efficient way to implement a new trade instrument71. Thereby, the introductory conditions for the actors in the instruments are based on historical data, and the transformation towards a more eco-efficient solution reached according to a set phase-in period (see Cerin, 2005a – Paper X).

This conclusion, however, is not new. Already Machiavelli (1513) understood that existing institutions tend to obstruct change and Adam Smith was concerned with the difficulty in remedy disorders. The case is the same today. Take the press release from the Swedish steel industry (Jernkontoret, 2003) describing their lobbying to the European Environmental Commissioner on the issue of trading greenhouse gases. They reject trading over sectors, and accept only trading based upon carbon dioxide emissions per tonne produced steel. The steel sector has to emit CO2-equivalents when reducing carbon in iron ore and would be more strongly affected than firms in other industries72. As Cerin and Dobers (2001b – Paper VIII) sustainability indexes tend to defend industries that are unwanted from a sustainability point of view.

So, by facilitating the phase out of the most inefficient users of resources (natural and human) first room is made for the innovative entry of new and more efficient solutions. The instrument ensuring such flexibility must be transparent to enable

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71 When discussing how to remedy the dangerous disorders of the mercantile system – in this case the British Navigation Act, granting Great Britain the exclusive right to trade to the colonies of North America – Adam Smith (1776) also emphasised the importance of gradual restoration towards perfect liberty and justice – of trade.

72 Since the Swedish steel industry consumes (almost) purely hydropower and nuclear power they would like to trade carbon emissions per produced tonne steel with other countries.
predictability of expected future environmental and economic outcomes. In other words, the politicians with the short-term focus – to stay in power foremost over the upcoming election – must be forced to keep their hands off these policy instruments once they have been initiated. The capital markets are one such institution which is fairly secured from the whims of current political opinion that also operate at low costs under strict rules of trading. The design of efficient policies governing efficient markets of resources such as limited rights to emit greenhouse or acidification gases should learn from the experience of such trading (Cerin, 2005a – Paper X).

4.4 Institutions

As noted above theorising in management and economics has become occupied with the notion of institutions – despite the old wall of self-evidence is high between the two paradigms. Even though it is arduous or not even thought of to brake through the wall between them there are great similarities between the Moral Hazard in Arrow (1963) and Akerlof’s (1970) Market for Lemons, on the one hand, and, on the other, the Decouple concept in Meyer and Rowan (1977). All these models recognise the irrational behaviour from internal inefficiencies of where actors decouple information from real actions, creating inefficient (lemon) markets as a result. The legitimacy strive of organisations may then result in environmental reports and organisational structures that copies what is perceived to be the best out there isomorphic behaviour (cf. DiMaggio and Powell, 1983).

The evolutionary side of institutional economics is often presented as a distinguishing it from traditional neoclassical economic theory. By including organisational costs such theorising is pushed out of the WAD framework to recognise the evolution of norms, behaviour and technology, or to quote Knight (1956).

Business life in the strictest sense never conforms closely to the theoretical behavior of an economic man. Always history is being made; opinions, attitudes, and institutions change, and there is evolution in the nature of capitalism....

Knight (1956)

Eliasson (1996) puts his own theoretical contribution – and thereby also writers i.e. Schumpeter (1911) and Simon (1995) – to the institutional economics not merely in the micro plane, but in a stage where both economists and business administrators (management controllers) may harbour.

4.5 Concluding the Theoretical Framework – A Synthesis

Theory is bounded rationality (Eliasson, 1994) and may, thus, obstruct analysing observations and abstract thought omitted in the applied paradigm or worldview. Multidisciplinary theorising is therefore necessary to keep an open mind when
studying environmental issues and sustainable growth, applying theories outside their original domains interacting with theories in other fields.\textsuperscript{73} When theory, moreover, is applied outside its domain of origin and found applicable, according to Alvesson and Sköldberg (1994), theory broadening and generation have occurred. My concern is that even theory generated may eventually lead to new truth-systems and imply thought restrictions eventually delimiting its applicability. Applying multidisciplinary theorising may, hence, be viewed as testing theoretical clashes. I have in this thesis used tools from sociology, management and different schools of economics to break down the Gustafssonian (1994) wall of self-evidence where the absolutistic mindset frames relativistic reflections from even occurring. In the spirit of Welford (1997b; 1998) and Gustafsson (1994), social research, specifically on environmental and sustainability issues (Welford), ought to liberate itself from whatever truth-system it is nursed to openly understand what is going on in society by being emancipatory dedicating itself to issues such as criticality, truth and intellectual honesty, ready to make a change.

\textsuperscript{73} The Nobel prize laureate J. Schumpeter (1933) describes in \textit{The Common Sense of Econometrics} the great clash evolved between A) the specialists of Business Administration that have created theoretical walls, completely protecting them from B) General Theory. Schumpeter saw some common denominators, between the two groups of researchers like the matter of cost curves and the need for them to use each others’ knowledge, but his power language puts the blame of the arisen wall on the other theoretical side. He e.g. calls his own theoretical homestead general theory. His theoretical side of the epistemological divide is, however, better known as Economic Theory.
5 Presenting the Papers

5.1 Paper III: Environmental Accounting Dimensions

In Brief
The inventory part, common to all environmental accounting and known as input/output (I/O) analysis, is performed by setting up system boundaries, through which energy and material flows are tracked. This paper indicates three different practices of environmental accounting that have developed along different paths. Even though these practices may benefit from exchange of data it is very seldom done, since practices use different terminology and evaluation methods for the I/O analyses. The need for improving their efficiency is discussed, since studies show that these analyses are time and resource consuming. Today, mainly larger municipalities, companies and product units are performing these studies. The question thus arises: are the environmentally driven organisations becoming large, as a consequence, or is environmental accounting merely affordable for larger institutions? This study compares the three practices and then brings up the problems associated with them such as the control-engineering heritage, the continuous lack of data, the overlapping of practices and the resource consuming work they demand.

Conclusions
Environmental accounting has been identified as currently following three different paths, which are independent and inconsistent from each other. The development of environmental accounting is in a control paradigm which may search for ultimate answers with to little efforts spent on economic efficiency. This engineering development of accounting (with obvious historical parallels) may lead to decreased sustainability of the environmental accounting phenomenon itself – although its good intentions. This paper do not suggest scope and thoroughness for such accounting, but do point out the similarities between the different accounting practices as being more of different research traditions and being used by communities in society that seldom exchange experiences. It is indicated that each three accounting practices may use different scope in their studies. By using these scopes we see that different accounting practices do have similarities in the degree of control they account for. Hence, a common framework, converging the different paths, would enable more efficient accounting where the different exchange data and enable aggregations of I/O analyses into different directions – into a larger societal context. Environmental accounting has to be seen from an economic efficiency perspective. However, neither industrialists nor policy makers who look upon themselves as serious dare to have any objections to environmentally motivated activities.
5.2 Paper IV: The Efficiency of Becoming Eco-Efficient

In Brief
The 1990’s has been characterised by a rapid growth in corporate environmental management and analyses. The aim of the paper is to examine the environmental outcome and corporate economic benefits from this work in industry in general – the efficiency of becoming eco-efficient. This is done by using a dominant player in the telecom industry, Ericsson which also is prominent in their environmental work, as a case study from 1997 to 2002. In the late 1990’s a gap is indicated, in the paper, between the needs of company units financing environmental studies and the research scope used by the environmental experts, initiating the work. The environmentally motivated life-cycle studies have not improved ongoing design projects towards eco-efficient offerings.

Conclusions
Corporate product units need time and cost effective procedures and guidelines to enable front-end design. As a consequence, resources for life-cycle assessments (LCA) have decreased while materials declarations still goes on, having a role as a front-end design instrument. Now after the turn of the millennium the hitherto experimental mode in environmental tools for analyses, LCA, has evolved into a method for stakeholder communication of both life cycle environmental impacts for individual products as well as for the entire life cycle impacts of the whole product portfolio of the corporation. LCA’s play a role in design projects, exclusively as a back-end design tool, by having improved the design guidelines used.

5.3 Paper V: Communication in Corporate Environmental Reports

In Brief
This study describes the ascent of corporate environmental reports, during the 1990s, from non-existing to a well-highlighted phenomenon today. The increase in number of companies reporting environmental issues has now plateaued. The critique of this reporting practice claims that there is little real value communicated. The messages in these reports are, hence, examined and compared with messages in other external company communication, foremost to other stakeholders, and also to actual company behaviour. The role and consequences of third-party verifications are discussed and the possible need for stricter accounting rules is likewise illuminated. The stakeholder identification, consultation with stakeholders and the stakeholders’ appraisal are shown to be problematic for most reportees today. Finally, the concepts of eco-efficiency and sustainability are explained, followed by a discussion how these issues may be included into the scope of corporate environmental reports. The inclusion of these issues is also exemplified.
Conclusions
Environmental reporting started off as a party petition – a defence practiced by sectors exposed to impetuous environmental debate. By giving their side of the story these companies could influence the environmental debate which formerly was, more or less, preserved the NGOs. In general, however, these reports often were and often still are wordy and glossy with few covered, especially quantified, environmental issues. This way of protecting and creating the immaterial asset of legitimacy is, when going around the real problem, put into the context of earlier corporate environmental regimes, i.e. the end-of-pipe solutions of the 60’s and the in-process solutions of the 80’s, and is then referred to as by-pass solutions of the 90’s. There is a gap in the compared messages of corporate environmental reports, on the one hand, and other corporate reports and corporate actions, on the other hand. The magnitude of NGOs trying to influence reporting practice may unintentionally help reporting-underachievers, if they do not converge. This paper suggests a larger scope of environmental reports in order to tell something regarding the organisation’s eco-efficiency, covering its possibilities to make a change. A design-owning company would, hence, be responsible for the entire value chain of its offerings, requiring a life cycle scope on reporting and is exemplified on the systems providers Ericsson and Volvo. If policy measures are taken towards global warming their financial risks may be determined by relating possible CO₂ emission costs to organisational turnover.

5.4 Paper VI:
Characteristics of Environmental Reporters on the Stockholm Exchange

In Brief
Corporate environmental reporting has since the early 1990’s risen to a well-known phenomenon among industry and its stakeholders today. Critics of these reports claim that those are only party petitions, constituted of wordy descriptions and glossy pictures. External validation of company – and sometimes product – performance is however often based upon these environmental reports, mainly due to the lack of other information sources. What is the real character of the companies behind these reports, are the reporting companies more eco-efficient? This paper investigates the characteristics of the companies on the OM Stockholm Exchange that provide documented environmental reports on the Internet (DERI) annually. Choosing DERIs since the Internet is an – growingly – important source of information for company stakeholder. Internet presentations of environmental matters not in documented format are excluded since the immense difficulties to grasp the total extent of these reports. The features of the reporting companies are in this study divided into; industry sector, market capitalisation size and emissions (in this case CO₂) per turnover; comparisons.
Conclusions

It was found in this study that the identified environmental reporting companies, annually and in document format on the Internet, constitute less than 10% of the companies on the OM Stockholm Exchange in the year of 2000. It was, moreover, found that the highest percentage of environmental report producing companies still existed in those industry sectors that began reporting some ten years ago; in the sectors of power, chemical & drug and forestry. At the same time the sectors of; retail, research, medical & IT, consumer goods, media and consulting; may be defined as the groups of reporting-underachievers. Among the companies listed on the OM Stockholm Exchange the DERI producers were found to have six times larger average market capitalisation size than the non-producers. The DERI producers were also larger in emitting carbon dioxide per turnover too, namely twice as much. The fact that barely half the companies listed on the exchange could provide emissions data makes the conclusions weaker. The circumstance that only 60% of the DERI producers could present full emissions data regarding their own organisations’ activities does say something concrete about the value of using environmental reports as foundation for external validation of companies’ environmental performance.

5.5 Paper VII: What does the Performance of the Dow Jones Sustainability Index Tell Us?

In Brief

The main message when introducing Dow Jones Sustainability Index (DJSI) 1999 was the claim that it outperforms the more general Dow Jones Global Index (DJGI) due to sustainability driven management. This message has been widely recognised among corporations, NGOs and governental agencies. There is however no studies carried out illuminating the structure of DJSI. This paper, published in Eco-Management and Auditing (Wiley), examines whether the higher growth of market capitalisation in the DJSI compared to growth of the DJGI depends on other factors than sustainability parameters. The distribution in industry sectors, regional location and company sizes of the DJSI and its benchmarked counterpart DJGI are compared, as of January 1st 2000. Each of these distribution asymmetries is then related to the performance of the DJGI. The resulting performance differences of each group, solely due to distribution asymmetries without any influence from sustainability factors, are then finally compared with the total performance difference of DJSI and DJGI (all performances as of Q1:1995 – Q4:1999). Since the first presentation of this study, the individual components of the DJSI are made public, enabling partial derivations in future analysis giving the total performance difference of DJSI, sustainability factors excluded, compared to DJGI.

Conclusions

The largest distribution asymmetry between DJSI and DJGI is found in market capitalisation size followed by the sector and regional distribution groups. The
overweight towards high performing industry sectors in the DJSI, is somewhat surprisingly since the DJSI is a competition within sectors, selecting the top ten percent performing companies within each sector. Why 2.5 times larger companies in DJSI? Are just larger companies adopting sustainability management, or is sustainability driven companies becoming larger than others? Despite the regional distribution differences of DJSI – DJGI their market capitalisation growths, on a global level, are even. However, the asymmetric distribution of company sectors and company market capitalisation size are considerably contributing to DJSI’s better growth compared to the DJGI, 35 respectively 14 per cent unit growth difference compared to the just above 50 per cent unit difference of the benchmarked DJSI – DJGI. Moreover, when backcasting DJSI’s historic growth, as done, only the winners of yesterday are retrieved which might affect the index performance. Despite the explored biases of DJSI towards both the technology sector and larger market capitalisation companies, the DJSI is an important tool for illuminating the performance of sustainability driven companies, if it is made more transparent in its work of making the sustainability of companies transparent.

5.6 Paper VIII: Who is Rating the Raters?

In Brief
On request from the Editor-in-Chief of Corporate Environmental Strategy (Elsevier) this paper investigates the consistency of the framework of outside-in evaluations of companies’ sustainability by the best-known sustainability index – Dow Jones Sustainability Index. The factors behind the superior market capitalisation growth (compared to the Dow Jones Global Index – a general index) are highlighted, but foremost the important question of sustainability criterions used in the assessment of components of the DJSI is investigated. Are the companies being assessed accordingly? The companies themselves have difficulty providing inside-out evaluations of their operations. As a result, external communication to a large extent consists of wordy descriptions and glossy pictures. This paper also indicates that three out of four information sources for the sustainability assessment are based upon information provided by the companies, the fourth source furthermore only where available. Other issues raised in the article is the selection of “the best in industry” where the top ten percentage performing companies in each industry sector are selected as well as the seemingly focus on companies areas of responsibilities instead on their services’ actual performance.

Conclusions
By, to a great degree, basing the evaluating of companies on the information provided by the companies themselves and “the best in industry” approach, have resulted in the inclusion of companies with very questionable social responsibility. “The best in industry” practice used selects companies in sectors which by definition can not be sustainable and may also work as a preservation of resource-inefficient industries, obscuring the transition to efficient and sustainable players.
The need for holistic possibility based delimitations is illustrated in this paper, covering services’ performance. If so, the selection of manufacturer (as number one in industry), producing high fuel-consuming cars that stimulate excessive driving could have been avoided. Despite the deficiencies indicated in the DJSI, the index is a good starter giving a lot of attention to sustainability issues. There is, however, a need for continuously discuss criterions for sustainable investments, as done in this paper, to further improve these indexes.

5.7 Paper IX:
Business Incentives for Sustainability:
A Property Rights Approach

Abstract
In response to the demand from public and private stakeholders firms have developed strategies to decrease their impacts on the environment. Even though companies are committed, principal improvements often fail to occur. The major reason for this is that environmental burdens from products often appear as externalities, outside the legal boundary of the producing company. This lack of incentives structure is unfortunate since these companies often possesses the best information how to optimise the environmental performance of their own products. Legislation has, moreover, traditionally been occupied with tightening environmental standards, making corporate plants aiming for merely hedging over the lowest possible demand. Instead of this control-and-command regulations with the notions of added costs approach several writers have since the mid 1990’s advocated for exploring corporate win-win situations residing in the product life-cycle as well as instruments giving up-stream incentives for change, but not enough abatement of environmental impacts have emerged in reality.

Conclusions
The win-win articles from the mid 1990’s lack theoretical support and do not provide guidance on how to economise on environmental product improvements being beneficial in other stages of the life-cycle than in the company’s own phase. The suggestion is: by adopting property rights and transaction cost theories actors that posses the most appropriate information and hence can use resources most productively should be given the incentives to do so. In the proposed concept for trading of product life cycle emission rights the actor possessing most information, i.e. often the product and system provider, would be motivated by economic incentives to take an increased responsibility for information flow and initiatives for product improvements. We would thereby lessen the negative impact from asymmetric information in the value chain where e.g. customers often possess insignificant product knowledge. These market base instruments could supply the product providers with clear and reliable incentives to decrease life cycle impacts of their products.

Abstract
Environmental concerns and tightened environmental policy parameters have been associated with the notion of additional costs of compliance rather than with innovation and sustainability. The contrary has also been suggested, claiming that strict environmental legislation merely serves as a catalyst for firms to retain obvious economic and environmental mutual gains – so called win-wins – laying around waiting to be collected. Such implications can be seen from the Porter and van der Linde writings, heavily criticized by Palmer et al. as being built on faulty examples. This paper investigates both conclusions and uses property rights and transaction costs theories to find private incentives to explore the win-wins for those actors who have the largest potentials to diminish the pressure on our environment.

Conclusions
By applying the Coase theorem, emphasising transaction costs and property rights, this paper argues that strong public support is needed to create private incentives for exploring economic and environmental win-win innovations. The public support suggested is to A) extend producer responsibilities – where the same costs which may be neglected by the end consumers will, if transferred to the design owner, be viewed as a production cost – and to B) enforce environmental public procurement. Both may be combined with a support to C) actors (such as non-governmental organisations and consumer agencies) acting as information bridges by informing the consumers. The negative effects of asymmetric information among actors can, thereby, be diminished as well as the low interest to primarily care for the environment among common consumers.

5.9 Paper XI: Introducing Value Chain Stewardship (VCS)

Abstract
For half a decade now, the international negotiations to limit the greenhouse gas emissions have not yet resulted in consensus. The goals set by the early UN Framework Convention on Climate Change seem not to be met around 2010 as agreed. The global trend has, on the contrary, taken an opposite path, increasing the emissions causing global warming. This paper takes an industry sector approach, focusing directly on firms instead of the heavily debated national emission targets. The largest incentives to innovate new solutions may be retrieved by reassessing the responsibility for emissions on the actor that has the largest potentials to use
them most efficiently. One sector largely contributing to the global warming is the road transport sector and a few multinational actors principally control the shape of the vehicles. Therefore, this paper examines a scenario where the auto manufacturers are made responsible for emissions from the entire value chain of their products, making the delimitations of economic prosperity and environmental influence coincide.

Conclusions
By focusing on the industries primarily, this paper has identified benefits that are worth to further investigate and debate. Since the housing and the transport sector emitted one third and one fifth of society’s total greenhouse gas emission this paper has enlarged the responsibility of the car design owners to coincide with the area of environmental impacts that their products’ emissions cause outside current judicial borders will turn such emissions into a production cost for offered service. Incentives are, hence, given those (the design owners) that have the largest possibility to innovate new designs to also do so. Under this context and trade in GHG emissions to achieve the Kyoto goal it will be beneficial for the car design owner to switch to hydrogen powered engines. If on the other hand, there is no extended responsibility the consumer would face the higher cost, but in Europe the extra cost would not be much more than an annual increase in gas price. Simultaneously, the consumer will be fed with images, by the car design owner, on other aspects of the car owning such as horsepower and SUV size, which is shown to be the case even today.
6 Synthesis and Conclusions

6.1 Synthesis

Apparently, the discussion below, and perhaps earlier as well, may appear to be the voice of the bore of a naysayer, seeing only the clouds. Environmental consultants and academics often bring environmental success cases forward, sometimes also arguing them to be the custom (cf. the Palmer et al., 1995 critique on Porter and van der Linde, 1995b). However, if one wants to improve something – regardless if it is bicycling, calculus et cetera – one will not progress that far if only focusing on those aspects which one already is a master of. The same goes also here. Of course, there are companies, NGOs and also private consumers that may have succeeded in creating solutions that are better for our common milieu. Some actors are perhaps also on the verge of being altruistic. These actors, however, usually do not represent the vast majority of societal players – far from it. Two great obstacles faced by these proactive agents are, on the one hand, the fact that it may be cheaper not to care and, on the other, if a respectable image is vital it may very well be more economically to put efforts in external communication which does not necessarily follow “...the whole truth and nothing but the truth...” So, by focusing on the obstacles in the discussion below we may see more sunshine later on.

6.1.1 Discussion Part I

The first part of the thesis indicates that there are considerable decoupling activities among companies that produce external corporate environmental and sustainability reports. It is shown that this information may be decoupled not only from the annual report, but also directly contradictory. Decoupling, moreover, goes also for external reports, on the one hand, and, on the other, company real actions. The studied tools for environmental assessments were in many cases not economically efficient and had another drawback: the results from the environmental product assessment tool – life cycle assessment – where not ready in time to be used in marketing, even less so for influencing the ongoing design phase. In some cases the assessment findings did not became available until the time when the studied product was to be phased out from the market, even though the fact that the assessment and the design process started almost simultaneously. One resource consuming aspect of the environmental assessments is to find data. Data collection represents about 80% of the total amount of the work consumed in environmental analyses. If the data between different tools for analyses and the paradigms to which they belong to could be exchanged the data, by having the same system for storing and aggregating data, workload collection could be somewhat lowered. It is necessary to find less resource consuming routines and models to make these tools for less resource consumption and sustainability sustainable themselves.
6.1.2 Discussion Part II

The second part of the thesis indicates that the players in society who for a living act as information bridges pass on from the information from the firms they supposedly are evaluating merely without assessing it. There is hence an inherent risk that evaluations, indexes and funds based upon that information is biased, especially so if the original information is decoupled from the reporting organisations real activities as found to be the case in the Discussion Part I. In this second discussion part it was also found that on a stock exchange those companies providing a corporate environmental or sustainability report in document format on the Web had a good four times larger market capitalisations value than companies that did not report. More disturbing is the fact that those that did report on the environment emitted more the twice as much GHGs per turnover as those not producing an environmental report (see Figure 1). The components of the studied international sustainability index indicated similar findings. The criteria for selection components were as good as exclusively based on firms own generated information, either through questionnaires or from corporate environmental or sustainability reports. As a result, the distortions as shown on firms in the stock exchange study where transferred and magnified into the sustainability index. The market capitalisation size of the components in the sustainability index were two-and-a-half times larger than the components the general world index, to which the growth of the sustainability index was benchmarked. No data on greenhouse gas (GHG) emissions was available. If looking into the skew distribution of components of sustainability index, compared to the general one, it is clear that the components of the sustainability index emits more GHGs per turnover than the components in the general one. This fact signals a false impression to the environmental conscious investors, making them believe they invest in lesser environmental impacts.

6.1.3 Discussion Part III

The third part of the thesis indicates that the great advocators of retaining environmental and economic win-wins that more or less claimed, since the mid 1990’s, win-wins to be laying around to be picked up by firms. Legislation would merely be needed for informing firms, working more or less as a catalyst. Since then, however, no dramatic general improvements, benefiting the environment has occurred this way. This approach of voluntarism as found in the Discussion Part I and Part II would serve as a way of leaving firms with the option to continue business more or less as usual. Instead, it is suggested in the papers, that policy actions that will take transactions costs into consideration by signing property rights responsibility – e.g. to emit – to those actors who can use the recourses most efficiently, turning the problem of open access into a production factor. Then the firms can receive private economic benefits for innovating societal improvements. The papers in the thesis suggest, hence, to delimit the need and possibilities for decouple corporate external information and to promote innovative activities for a better environment by increased public support in extended responsibility, public procurement as well as to spread environmental information to actors that have deficient knowledge of such. We consumers may, thus, have a greater influence as citizens by acting environ-
mentally conscious in elections setting pressure on politicians to make emissions a production factor and employ the power of public procurement to work for a better environment.

6.2 Conclusions

The thesis consisting of odds end ends of papers has by entering into different schools of theories; ranging from the sociology of organisational research, management control to economics; attempted to provide explanations, interpretable such, on how and why actors treat environmental aspects and the concepts of sustainability and sustainable development the way they do, considering why the progress towards the concepts are in doubt. The studies in the thesis indicate that there is a gap between the images that firms transmit to different stakeholders and their own identities – that is firms’ real actions. There is a tendency for firms to highlight environmental issues that do not pose a potential threat to the reporting organisation, but to avoid those issues that are. It is, moreover, shown that the tools for managing and analysing environmental issues are not always that efficient, irrespective of dealing with economic or environmental such. Firms may gain legitimacy, but the primary interest behind such actions may in some cases simply be the legitimacy of the environmental staff and their organisations to survive and prosper internally within their own firms. External stakeholders do not always see these skewed images which result in false impressions of firms’ identities. As shown in the studies in the thesis these phenomena occurs – e.g. among the environmental and ethical analysts – in the financial community, making them the carriers and augmenters of firms’ own generated images. When focusing on the entire value chain of a product or sector the thesis shows that there is an enormous asymmetry in power and information among the actors along these chains. Especially the so-called consumer power is, in this thesis, indicated to be weak in many cases, leading to few improvements of products. The discussion is, therefore, focused on those actors that have the largest potentials to improve a design – the design owning firm – and to impose incentives to them to act towards a better environment by giving the rights to emit (polluting substances) that coincides with their degree of influence e.g. over the value chain – in some extreme cases this could encompass emissions from the entire cradle-to-grave of their offerings. If then the right to emit is delimited the value of not polluting is then tradable to other actors, making the economic players compete to improve the environment. Of course, such changes in regulations are not easily imposed. So far the numerous tools created by environmental management research, spread by consultants and applied in industry all coined with different TLAs (Three Letter Acronyms), but not always being considerably different in design, have not yet managed the task of an improved environment or anywhere near a sustainable development. There is a need to redirect the attention from tools for environmental analyses to incentives for the environment. The Stiglitzian economist therefore strives to establish governmental control over markets in order to steer towards a normative goal – which is similar to the governmental power focus in the discussion relating to the axis of the sociology of voluntarism-domination shown in figure 3. The constituting papers and the
conclusion of the thesis (this section – section 6.2) may well be described by using Stiglitz’s (2003) explanation for writing his book on the market failures of the 1990’s: “...I believe that while markets are at the center of the success of our economy, markets do not always work well by themselves, why they do not solve all problems, and why government will always be an important partner to them.” So, instead of relying on actors’ altruistic behaviour the legislator should put stronger emphasis on actors’ competitiveness in creating decentralised decisions and construct the overall rules, steering the incentives of the market and the behaviour of the actors to coincide with a progress towards an improved environment – both ecological and social. There is, thus, still a heavy task ahead to create the means and conditions enabling such a process, facilitating altruistic and opportunistic actions to work in the same directions: towards sustainable development.
7 References


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**PAPER VI**

**PAPER V**

**PAPER II**

**PAPER I**

**PAPER X**

**PAPER XI**

**PAPER VII**

**PAPER VIII**

**PAPER IX**


**PAPER IV**

**PAPER III**


http://naturvardsverket.se [October, 2003]


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Environmental Accounting Dimensions: Pros and Cons for Trajectory Convergence and Increased Efficiency.

Implementing Environmental Management Accounting: Status and Challenges.

Forthcoming

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Environmental Accounting Dimensions: Pros and Cons for Trajectory Convergence and Increased Efficiency

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Abstract

Three dimensions of physical based environmental accounting are indicated – regional, company and product accounting – that have developed along different paths. In the globalised and highly specialised economy of today, company activities and their services are multinational and are to a decreasing degree to be seen as a subset of regions. Consequently, these accounting practices intersect each other, in three dimensions, from micro to macro levels. Even though they are all based on physical and energy I/O-analysis the differences in terminology, structure and evaluation methods make it difficult to exchange data and use them efficient. This paper explores several aspects of these three environmental accounting dimensions such as the control engineering tradition, the lack of adequate data and the resource consuming work within them as well as the incompatibility, overlapping scopes and aims between them. The conclusion is that the three accounting dimensions are similar in construction in spite of a development in independent paths. The differences are not primarily the three letter acronyms of the tools but the objectives and control scope used in studies. If adopting a common framework and a global all-dimensional nomenclature there are great potentials for increasing the work efficiency, making the tools towards sustainability more sustainable.

1 Introduction

The early phase of an innovation process is characterised by several different streams – or development paths. Ideas flourish, providing the foundation for new technologies, methods, products, firms and institutions. As time goes by these new phenomena stabilise into what may be called a dominant design and the number of actors – and technical solutions – is dramatically reduced (cf. Utterback, 1996).

The innovation of environmental management accounting (EMA) seems not to be an exception to this general model although there may be differences in the details. Just a short glimpse into the rapidly
growing amount of texts (books, papers published in journals or presented at international conferences) provides a good picture of the growth of varieties within the families of environmental systems, management and standards. Analysing them in more detail – although from a friendly critical point of view – you may get the impression that this flourishing of new environmental management systems and dimensions has developed along paths which are challenging in the short run for those of us who are concerned with long run sustainability and eco-efficiency.

The aim of this paper is to capture the variety on the flourishing meadow of the accounting part of green management and analyse the problems and challenges facing these tools in which many academics and consultants – of which the authors of this paper are no exception – have vested interests. In this paper the authors argue that the innovative diversity which characterises the present fluid phase in environmental management – and which is propelled by an environmentally friendly business climate in general – hitherto has developed a set of complex and resource consuming tools which threaten the long run sustainability of environmental management. The authors also argue that the ambition to feed all these environmental management systems with data will not only demand large resources but may – due to their inert and centralised character – also create fundamental problems regarding industrial dynamics.

The paper handles the problematique identified above as follows. In section 2 three dimensions of environmental accounting practices, and accompanying management fields are identified: regional, company and product. The practical use of the three dimensions is illustrated and analysed – i.e. the lack of data, the border areas of dimensions and their resource consuming work – in section 3. A concluding discussion on the lacking compatibility between these systems follows in section 4, which also suggests why and how to integrate essential parts of the diverting dimensions.

2 Three dimensions of environmental accounting and management

The development of environmental management and accounting – accompanied by a large family of systems, methods and standards – follows several different paths which differ significantly from the general direction of practices for management and accounting. Are we here witnessing the development of highly complex and incompatible systems? In the corporate world environmental management systems often seem to be detached from existing activities due to isomorphism where external pressure make organisations adopt these tools, letting integration with its own activities come second (DiMaggio and Powell, 1983). Cerin and Laestadius (2000; 2003) and Wagner et al. (2001) have found that in firms environmental accounting and management may not be well incorporated into the day-to-day work. This is consistent with what Burström and Lindqvist-Östblom (2001) have found regarding how municipalities deal with environmental issues and analyses. Cerin and Laestadius (2000; 2003) and Schaltegger and Burritt (2000) are concerned about the considerable resources these tools consume. These downsides utter threats against the sustainability of these tools, as well as against the environmental agenda, in the long run if improvements are not achieved. Let us now identify such areas in environmental accounting.
First of all one may identify a *regional dimension* of environmental management, or rather a family of approaches, primarily focusing on intra- and inter-regional material flows. This school has obvious similarities with the regional input-output models which were popular among economists in the decades around 1950-60 although the economic models were concerned with economic data rather than physical entities/material flows. (cf. Leontief, 1936; cf. Isard and Kuenne, 1953; cf. Dorfman *et al.*, 1958). In this EMA dimension the region is typically the unit of analysis and the aim is to measure the environmental conditions inside and outside the system and the exchange across the border. The authors see here three major discourses: 1) judicial (municipal/country) accounting, 2) Hinterland accounting and 3) Metaland accounting.

Secondly the authors identify a *company dimension* in environmental management and accounting, i.e., where the company is the typical unit of analysis – or parts of it such as sites (plants) and/or daughters depending on the corporate structure. The services of these units may in some analysis be superimposed. Major readings in the company environmental accounting field are Gray *et al.* (1993) and Schaltegger and Buritt (2000) that also adopt a bigger decision-policy picture. Basically the aim of corporate environmental accounting is to provide some kind of measure on the environmental impact of corporate activities on various levels of aggregation. The authors see here two major discourses: 1) judicial (company) accounting and 2) value chain accounting.

Thirdly there is the *product dimension* in environmental accounting/management. The dominant management system in this area is life cycle assessment (LCA) and related methods that follow the impacts associated to the product during all, or chosen, life-cycle phases (value chain) included in the scope of the study. The typical unit is the function performed by the product or service.

These three dimensions, or families of tools, may be combined with different foci on how to capture the environmental impact, i.e. what data to collect and analyse. In fact both the *material accounting focus* and the *economic accounting focus* have shortcomings in estimating sustainability, in particular, but also eco-efficiency. None of these foci e.g. are well suited to analyse ecological phenomena such as biodiversity. In our taxonomy it seems that the material and substance flow I/O analysis (/accounting) focus is dominant in the regional (Material Flow Analasis – MFA¹) and product (Life Cycle Inventory – LCI) approaches while economic data primarily are in focus in the company approach. The assessment of environmental impacts is also core to the product dimension, based upon the I/O LCI. There are thus elements of I/O accounting in all three dimensions.

Input-output analysis has often been associated with material (and energy) flows entering and exiting the system boundary (e.g. site, process, company or product) being studied (Jasch, 1999; cf. Rikhardsson, 1999). Within economics Input-Output Analysis (IOA) has for over a half a century been used for national (regional) accounting of sectors (see Leontief, 1936). In fact Leontief (1970)

¹ Sometimes substance flow analysis (SFA) is used instead of MFA, but denotes as a specific analytical tool.
introduced environmental aspects to these accounts. Materials based input/output-analyses have also been carried out for quite some time (see Berthouex and Rudd, 1977).

Taxonomy suggested here is, of course, not the only possible one. CHAINET (1998) made efforts to place analytical tools for environmental aspects into a socio-political framework. This is done in three product group case studies where it is determined what tools are needed for retrieving relevant environmental information in each case. Numerous authors (Tukker, 1999; Moberg, 1999; Burström and Frostell ed., 2000) have carried out systematic categorisations of Environmental Analysis (EA) tools, differently though. Tukker (1999) created a map over the relations between system definitions used in environmental evaluation tools. The top dichotomy is; functional (LCA and functional SFA) and regional (regional SFA, hybrid LCA/SFA, MAF, EIA and RA) approaches; tools in both approaches are then divided into descending size order. Finnveden and Moberg (2001) is another example, categorising EA tools into five objectives, four focuses and two perspectives. These studies serve to a high degree as a disposition and enumeration of environmental evaluation methods and are not positioned to illuminate the possibilities for increased efficiency by finding potentials for streamlining their frameworks and nomenclatures. In Kleijn and van der Voet (2001) analytical tools that can be used in environmental decision-making are divided into specific environmental risks, analysis at the micro-level (products and services) and analysis at the macro-level (countries, cities, sectors of industry). Cerin and Ramírez (2000), in their corporate study, emphasise that the system boundaries and environmental aspects of study may be as important as the methodology chosen. Sinclair et al. (2001) focus on LCA as a tool for integration (in waste management) of data collection and presentation. They divide the analytical tools into physical and non-physical metric ones. Schaltegger and Buritt (2000), in contrast promote environmental company site accounting, audited such, which is then aggregated to retrieve data for the life cycle of products (or firms). This concept is introduced by Schaltegger (1997a) as site specific LCA, but only presupposing aggregations of global impact on a global level (Schaltegger, 1997b). In Udo de Haes (2001) environmental information tools are divided into two groups that provide information on environmental consequences based upon physical data and monetary costing of environmental consequences. The design of various taxonomic frameworks and displacement of tools in respective framework – as done in the papers mentioned in this paragraph – may very well be discussed in detail, but this is certainly a topic for further research and future articles.

3 Intra and Inter Environmental Accounting Dimension obstacles

Utterback (1996) divides the innovation process into an early phase (the fluid phase), characterised by many development paths (of methodologies, tools and data), followed by a maturing phase where these new phenomena stabilise into what may be called a dominant design and the number of actors – and technical solutions – is dramatically reduced. Environmental accounting is still in such a fluid phase. Before stabilising into a dominant design, this is the – late – time to point out the weaknesses, and indicate what may be changed. This is also the time to consider how far reaching and detailed our management and information systems have to be. How much control to facilitate the development towards sustainability? And what kind of control?
It seems possible to identify a control culture and even control discourse more or less independent of our traditional understanding of political ideology (cf. Levin, 2000). The role of the visible hand and the role of control in long term industrial development has e.g. been analysed by Chandler (1977) and Beniger, (1986). Engineering culture and engineering management has historically to a large extent consisted of controlling industrial and technical processes in their detail. The vision of perfect technical rationality and optimal allocation of resources through the control of details may be illustrated by the Taylor system. The Taylorist vision, applied on the micro level of the industrial system – the plant – was to collect extremely detailed information on the labour process, to analyse it "scientifically" and to organise, control and optimise the system in the most resource efficient way (cf. Laestadius, 1992). There is a strong intellectual heritage in engineering culture which favours centralised control oriented strategies to solve complex industrial problems. This may be seen in much of engineering management literature (Meima and Welford, 1997; Emerson et al., 1997), in the discourse around the Taylorist methods (cf. Laestadius, 1992 for further references) and in the scarce research on the ideology of control (cf. Levin, 2000). The mirror image of this was, of course, also the development of accounting systems.

There is a vast literature on the advantages and disadvantages with this heritage. Changing to probabilistic methods solved parts of the problems. As regards accounting the most well known reaction against the self propelled growth of accounting data collection was formulated by Johnson and Kaplan (1987).

Also Soviet planning, to depart from another angle, was based on the vision of collecting enormous amount of data, controlling, analysing and optimising the system. The means for this macro level planning was ambitious material balance matrices on inter and intra sector material flows connected into an enormous input output system (cf. Wilczynski, 1970). As is well known these models for control encompassed severe shortcomings in promoting flexibility, creativity and dynamics on the micro as well as on the macro level of industry.

It may be argued that there is a family resemblance between the mentioned models for control and several of today’s approaches in environmental management. The material flow based model on the industrial metabolism has similarities to the material balances of the Soviet planning system e.g. It may even be argued that the focus on molecules in some of the resource models of today will make the analytical system still more complex (cf. Burström, 2000). As tools for understanding, models like these may be useful; the fundamental problem is whether it is possible to manage complex systems like these through fine-tuning.

3.1 The continuous lack of adequate data

One of the consequences of the control ambitions connected to the present growth of environmental management is a continuous lack of adequate data. The conclusion and complain regarding shortage of data is considerable in the literature related to all environmental accounting dimensions (cf.
Ljungdahl, 1999; Cerin, 2000; Danius and Burström, 2001; Cerin and Laestadius, 2003). The issue is not only to face a phenomenon of whether to allocate more resources to data collection in general but of identification and selection of what kind of information to focus on. In this computerised world, where enormous amounts of data can be stored and handled, it is more important than ever to base our information gathering on a good theory or at least good hypotheses on what kind of data which is necessary to get a reasonable control of the sustainability problem.

Is it really necessary to gather data on everything at the policy level of municipalities and companies? What is the necessary and/or sufficient strategic information which can be transformed to knowledge on the important environmental parameters and which can direct general policy decisions? For municipalities Burström and Lindqvist-Östblom (2001) pointed out the need to identify the very basis for environmental information management before developing a monitoring system. So far, few municipalities seem to be aware of why they are collecting the information they actually do collect.

Quite a large portion of environmental accounting work today is related to shovel data back and forth. Estimations also show in the case of LCA’s that the handling of I/O data in the LCI stage represents a great part of the total time spent on a complete assessment (cf. Östermark et al, 2000; cf. Cerin and Laestadius, 2000; 2003). Within the regional environmental accounting dimension, often no assessments and classification of environmental impacts are made, but like the other tools the data-handling phase is immense, consuming considerable resources. Moreover, when someone shovels the data back and forth without having a good picture (deficient transparency) of other works (sometimes in other trajectories), someone else may already have done the job earlier (cf. Zobel et al., 2002), a problem that may also arise within larger organisations (cf. Cerin and Laestadius, 2003).

3.2 The Incompatibility of Accounting Dimensions

The regional approach, the company approach and the product approach only partly intersect as regards their goals, the target groups for their analytical work and consequently their need for data. As mentioned, company based information may only by accident be relevant for regional analysis, a problem which is enforced by the fact that there may be significant material movements across regional borders without being captured by environmental control authorities. In fact this phenomenon increases as world trade is liberalised and probably will continue to be so as well as the creation of continental trade blocks around the world, such as the EU. And product based data – obtained in LCA-activities – are not necessarily possible to brake down to company or regional level.

There is, hence, a great variety in space delimitations between the three indicated dimensions. On top of this there are also differences in time aspects applied between the three accounting dimensions identified. The time aspects, however, also greatly vary within each dimension between the different tools and a thorough analysis of the time problem is certainly a research paper of its own. The same can also go for modes of analysis such as impact assessment. There are also great differences within and between the accounting dimensions, regarding average versus marginal studies, objectives of studies and types of impacts considered. Some of these differences above can
also be seen within individual tools. Another division within tools is pro and retro perspectives that can be applied e.g. on LCAs and LCCs (cf. Finnveden and Moberg, 2001). A chosen perspective may have impacts on the delimitation in space and time of the studied object (cf. Tillman, 1999).

One immediate reaction to this incompatibility problem from a strong control point of view is to create elementary information systems. It is possible, in theory at least, to imagine databases, where material information is broken down to elementary units (cf. ISO, 2001) which are supposed to be useful for aggregation to all environmental management systems and all levels of analyses in all dimensions. To enable such exchange between the different accounting dimensions and multidimensional aggregation the nomenclature and units of measurement for the I/O data must be the same. This is a task of key importance that still, today, is a problem for ordinary Management Control Systems (and probably will be in the future too). The lack of common economic nomenclature is a common obstacle for implementing corporate wide accounting systems, especially after the merger of different corporate cultures. Immense costs rose e.g. in the merger of Astra and Zeneca when creating a common economic accounting system even though they had the very same enterprise resource planning system, SAP R/3².

3.3 The overlapping delimitations of the different accounting dimensions

Even though the environmental accounting tools in e.g. industry and municipalities show family resemblance (based on I/O-analysis) and provide bases for chain analysis (Udo de Haes et al., 1998) these tools differ since they intend to answer different questions (cf. Burström, 1999; Finnveden and Moberg, 2001). There are, of course, areas in environmental accounting where different analytical tools are applied to similar problems and delimitations. See e.g. table 1 on scope and degree of control.

Data handling corresponds to the lion part of the working time spent in accounting (as described in section 3.2). Despite the need for data there are presently cultural and linguistic barriers between the different accounting dimensions, disabling interchange. In Lindeijer’s (2000) review on land use impact categories he indicates the lack of data as one major obstacle that has to be dealt with, as LCA practitioners cannot solve this problem by themselves. In Vogtländer et al. (2002) a class model is tested and found applicable for both EIA and LCA. Municipalities and the corporate world are working with similar I/O analyses, unfortunately without co-ordination of data and database structure. In the corporate world some firms have chosen to merge different system boundaries (scopes and even different dimensions) of accounting. At Ericsson the database structure, from storing unit process data up to how to present the aggregated results has been combined into one single database structure and linguistics. This database structure applies products, company sites, geographic areas (as in a Stockholm suburb together with other actors³) and for the entire global corporation. Ericsson maintains these approaches within the same I/O database which is also used

³ The other actors are the telecom operator Telia, public transportation, the gas company Statoil, an office area, a housing area and Royal Institute of Technology among others (internal Ericsson information).
for aggregations (however aggregated in different flow directions) and impact assessments. The work is denominated Environmental Aspects but prior to 1998 the designation was LCA (cf. Ericsson, 2001; 2002). The database follows the data modelling process described in ISO 14048 (cf. ISO, 2001).

There are environmental international studies describing land use e.g. portrayed by Lindeijer (2000) and agrarian production (e.g. Brentrup et al., 2001) which are based upon I/O inventories. Hence, data collected in these unit processes (smallest portion of a studied system) may very well, to our minds, fit under the descriptions of regional MFAs. The distinguished groups of LCA in Lindeijer (2000) are e.g. functional and land use classes (i.e. natural, modified and cultivated systems) while groups of (regional) MFA in Burström (1999) are regional or functional. The inventory part of the Brentrup et al. (2001) LCA dealing with agricultural production is, as Lindeijer and Burström, focusing on nitrogen flows. A study by Joosten et al. (1999) of flows through society, not an LCA, is structured in its chain analysis much like an ordinary LCA into tables of supply and use – based on materials production, materials processing, assembly, consumption and waste processing. The European Commission has supported a meso-scale LCA study (Sarigiannis and Triacchini, 2000) of environmental policy impacts on a region if implemented – an impact assessment method that is not far from ordinary regional MFA boundaries.

MFA may be interpreted as 1) a tool for analysing regional metabolism (Burström, 1998) but may also 2) be used in a functional approach (cf. Burström, 1999). Examples of functional approaches are e.g. a MFA on sludge management plants (cf. Ramírez, 2000), a LCA based agricultural study (Mattsson et al., 2000) and a MFA based agricultural study (Viglizzo et al., 2001) which deals not only with N (as well as P and K) flows but also with the changing of functions. A LCA resembling study by Smith Cooper (2001) conducts a product targeted MFA on fuel cell design concepts, with connections to national level implications, recognises the linkages to LCA principles. As Cerin and Ramírez (2000) argue there are great similarities between MFA and the life cycle inventory (LCI) process that is the by far most time consuming part when conducting an LCA, merely distinguished by the goal and scopes commonly chosen and, cultural differences such as grade of standardisation and actors conducting the studies. Authorities usually perform MFAs while LCIs are mostly employed by industry, which may have influenced the development of the tools.

Despite these shown similarities (also indicated by Burström, 1999) and overlappings (e.g. in corporate management analyse-dimensions indicated by White et al., 1995) cultural divides between e.g. company judicial and product accounting, can indicated. Schaltegger and Burritt (2000) criticise life-cycle assessments as being "... of poor quality and ... of little value for decision making and accountability purposes." Opposite views do – to indicate the gap between different dimensions of environmental studies, in this case between judicial company environmental accounting and product

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4 However, mostly based upon internal Ericsson information.

5 For a more thorough example on system structures turn to the ISO 14040-series (cf. ISO, 1997).
based analysis – exist such as Hedblom’s\(^6\) (1998) explanation that LCA enables companies “to obtain scientifically defensible descriptions of good and bad interrelationships between industrial product systems, the human society, and the external environment. ... that most often reflect the negative impact of industry or society’s activities.”

According to Schuster (2000) corporate environmental accounting and reporting in Scandinavian countries to a larger extent seem to address external stakeholders while Germanic have internal groups more at foci. An outline is done by Jasch (2000) of the in Germany common EU-EMAS site delimited EMS and the more holistic scope of ISO 14001/ISO 14031 (ISO, 1996: 2000a). Both reporting focuses, however, use I/O – analysis. The former is delimited by company geographical sites (compare with regional accounting delimitations) and the later by LCA on all products produced by the company. Contrary to this division, Frei and Wüst (1997), Caduff (1998), Schlatter (1998) and Schlatter and Züst (1998) have earlier recognised the key importance of corporate environmental information systems that, not only cover the I/O of a production unit, but also cover the product fluxes as well as the product design units.

Carlson and Pålsson (2001) also belong to the group\(^7\) that indicate similarities in information need on describing environmental aspects in EMS and LCI. These authors consider the scope (components and boundaries) and flows (in- and outflows) depending on the responsibility of management. Consequently, the managed system consists of sub-systems which are aggregated in different flow directions. Udo de Haes \textit{et al.} (2000) describe tools for analysing environmental impacts i.e. MFA, SFA and LCA as all being based on fixed input-output relations characterized by the nature of their flow objects. They moreover come to the conclusion that distinguishing the modes of analysis – region (MFA) and function (LCA) – strengthens the idea of a coherent family of tools for environmental systems analysis.

![Figure 1. Input and output flows to and from the process box of one- and three-dimensional environmental accounting scopes.](image)

Figure 1 shows that the essential differentiation of the three dimensions is chosen scopes used and further indicates the actual similarities in data and process handling. The boxes in figure 1 represents

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\(^6\) Dr. Mats-Olov Hedblom is the Environmental Manager of Ericsson whose holistic product-value-chain view incorporated into company management has gained positive attention from Dow Jones Sustainability Index in 2001 by selecting Ericsson as the sustainability leader in its industry.

\(^7\) The group at Chalmers University [http://www.cpm.chalmers.se] also provides a LCI database containing substances and materials used by some of Sweden’s largest firms.
the core component in any environmental accounting, namely the process box with input and output
flows to and from the process (see data modelling process in ISO, 2001). The arrows, in the figure,
are in- and outflows from the box where the direction depends on the accounting dimension chosen –
depending on the responsibility of management chosen. The one-dimensional (coloured) box on the
left hand side could represent the LCI of an LCA (or any other accounting dimension) and all other
I/O-arrows in that accounting scope would be horizontal – following the value chain (VC) of the
studied product. If using the very same process box in other dimensions as shown in the three-
dimensional box on the right hand side the other I/O-arrows used for accounting other dimensions
may (in general) only follow that process box of the VC and follow other scopes relevant to their
studied companies or regions.

The development of ISO 14048 (2001) has followed the idea of adopting one single database
structure for several methods of environmental accounting (as was the case at Ericsson, see above
in this section), moving from being solely a Life cycle assessment data documentation format (ISO,
2000b; cf. Carlson et al., 2001) to a more general data documentation format today, making it
applicable for other environmental accounting tools as well. Some of the forerunners in this work
(Carlson and Pålsson, 2001; Carlson et al., 2001) have stated the importance of data structure, data
storage, and transparency between system modules. They also stress that besides the current lack
of data is the even greater lack in documentation of data. Lacking this meta data the transparency
becomes muddied and the same goes for the credibility. The precision is then hard to estimate,
affecting the overall reliability as well as relevance (cf. Pålsson, 1999). Gathering meta data is
resource demanding which is often avoided – by practitioners. This phenomenon, however, makes
quality control, review and of course exchange of information more difficult and less attractive,
opposing the needs set in Schaltegger (1997b) and Carlson et al. (2001).

The authors have therefore made a basic model – see figure 2 – constructed into three phases. The
model should consist of a common database structure for input/output data, meta data and process
data, which is aggregated in flows suitable for the study’s accounting scope and dimension. Then
communication of impact assessment and visualisation shall be able to be performed coherently –
and how depends on the scope and objectives such as total mass flows or into environmental impact
categories. This schematic description, moreover, holds true for the environmental aspects database
structure at Ericsson described above in this section, employed for environmental analysis regarding
life-cycles of products, judicial corporation and community-site interaction. The database and its
structure have evolved from working with local databases and paper sheets, requiring resource-
demanding exchanges of data – often concerning materials declarations and LCIs (How resource
consuming some analysis have been – e.g. noticeably affecting company segment revenue
negatively – is shown in Cerin and Laestadius, 2003; cf. also Cerin and Ramíres, 2000)8.

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8 The information regarding database development is retrieved not only from these case studies, but also by
working at Ericsson with environmental analyses and corporate environmental reports for a number of years.
Table 1 shows the relationships between different accounting dimensions as primarily being scopes depending on responsibility of management chosen rather than being widely different tools for environmental analyses. The degree of responsibility cuts through the different accounting dimensions in the table. The control based responsibility goes for the company and regional dimensions, the influence based responsibility goes for all dimensions while the attention based responsibility goes only for the regional dimension. The table indicates that company accounting that is based on a possibility to change (influence based) have more in common in terms of scope (value chain) with the life cycle of products than with company controlled based accounting that strictly follows the judicial borders of the studied organisation. If a common framework, congregating the diverted paths, for the different dimensions of environmental accounting existed it would also increase the possibilities to put products into a larger societal context.

Table 1. Relationship between different environmental analyses and their scope versus the degree of control.

<table>
<thead>
<tr>
<th>Accounting Dimension</th>
<th>Control Based</th>
<th>Influence Based</th>
<th>Attention Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Life Cycle</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Company Judicial</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>Company Value Chain</td>
<td></td>
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<td>✓</td>
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<tr>
<td>Regional Jurisdiction</td>
<td>✓</td>
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<td>Regional Hinterland</td>
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<tr>
<td>Regional Metaland</td>
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<td>✓</td>
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</table>
4 Concluding Discussion

The authors have in this paper, on the one hand, focused on the internal incompatibility of the present development of environmental management accounting systems along three dimensions; regional, company and product. These developments have been more or less inconsistent even within the identified dimensions. In addition, the authors have argued that the present development of environmental accounting systems is dominated by a control paradigm which – although of good intentions – may be looked upon as searching for an engineering solution of the sustainability problem. Hence, too little efforts are spent on the economic efficiency of these systems.

The objective in this paper has not been to suggest detailed alternatives to the present modes for environmental management and accounting. Neither has the intention been to select among the existing ones or develop them further. The abbreviations used for the accounting tools are not the primary gap between them but the choice of scope (influence) used in studies is which depends on the object of study. The authors do, hence, recognise possibilities to streamline the I/O-analyses of the three dimensions of environmental accounting as regards e.g. common structure and all-dimensional global nomenclature for data storage. By doing this it will be possible, to a higher degree, for environmental accounting tools and its practitioners to use the same databases reusing the data and processes already stored, with relevant meta data, cutting down the time and costs for data handling. The streamlining of I/O-analysis would enable to cut costs for the most resource consuming part of these studies. Although the problems with using environmental impact categories in assessments should not be underestimated, the authors do also see that an increased usage of them in the different assessment paths may be useful and could contribute to compatibility between the various dimensions of environmental accounting where potential environmental impact is estimated. Such common framework, congregating the diverted paths, for the different dimensions of environmental accounting would also increase the possibilities to place products into a larger societal context.

According to the authors, the phenomena discussed above taken together may promote the development of complicated and resource consuming tools for environmental management which are not sustainable in themselves. The growing awareness on the enormous environmental problems which still are ahead of us has created a climate which in general is very positive towards the greening of industry and municipalities and the development of sustainable technologies and industrial systems. Involved actors do, however, have to look into the efficiency and similarities of these accounting tools as well as their differences in objectives in order to avoid a major future backlash, bridging over spurious hinders due to tradition and historical trajectories of tools. In other words: it has to be made sure that the tools intended to contribute to sustainability are themselves sustainable.
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6 References


Paper IV

The Efficiency of Becoming Eco-Efficient


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Abstract The 1990s has been characterised by a rapid growth in corporate environmental management and analyses. Examines the environmental outcome and corporate economic benefits from this work in industry in general by using a dominant player in the telecommunications industry, Ericsson which also is prominent in its environmental work, as a case study from 1997 to 2002. Indicates a gap in the late 1990s between the needs of company units financing environmental studies and the research scope used by the environmental experts initiating the work. The environmentally motivated life-cycle studies have not improved ongoing design projects towards eco-efficient offerings. Corporate product units need time and cost-effective procedures and guidelines to enable front-end design. As a consequence, resources for life-cycle assessments (LCAs) have decreased while materials declarations still goes on as a front-end design instrument. Now LCA has evolved into a method for stakeholder communication of both life-cycle environmental impacts for individual products as well as for the entire life cycle impacts of the whole product portfolio of the corporation. LCAs play a role in design projects, exclusively as a back-end design tool, by having improved the design guidelines used.

1. Introduction
Following the growing concern for the environment in society a rapid increase has taken place in the use of environmental analyses and environmental management systems during the 1990s. The growth rate of corporate environmental staff has been high and so has the production of literature on corporate environmental management. The benefits of these environmental management tools have been widely discussed, but the costs for conducting the studies have often been largely neglected according to Schaltegger (1997) in his economic analysis of life cycle assessments (LCAs). To obtain credibility and to stay sustainable within the corporate environment, however, the environmental management systems have to be efficient for the organisational unit that will bear the costs. Our hypothesis is that this is a general problem in the corporate world: many of the presently growing systems are characterised by high complexity and need large amounts of data.

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input. The problem is also the location of and the distance between responsibility, knowledge, incentives and payments among the involved actors.

Our conjecture is that present development of environmental management systems takes the path towards more detailed regulation, opposite to general corporate management practice which has for a long time developed towards lesser regulation. As a consequence, environmental management work has become complicated, time demanding and costly.

If, on the one hand, the environmental work in enterprises is found to be inefficient in either economic or environmental terms, the people working with environmentally-related issues will most likely find it difficult to justify their existence within the company. On the other, if efforts to attain eco-efficiency are integrated into company management, they will gain not only legitimacy, but also may contribute a strengthened competitiveness of their firms (see Porter and van der Linde, 1995a, b; Facheux et al., 1998).

The paper uses environmental analyses at Ericsson[1,2] as an empirical foundation for two comparative cases. Cost, time consumed and achieved goals from environmental analyses are examined. The primary aim is to establish how the results from the life-cycle studies are communicated to the company organisation and to what extent they influence corporate activities beyond strengthening the green image of the brand name. We have no reason to assume that the environmental work at Ericsson is in any way inferior to industrial practice in general; on the contrary, the company has received highest ratings in comparisons of corporate environmental management by the most prominent sustainability indexes, i.e. by DJSI and FTSE4Good. In fact the value/weight ratio of Ericsson’s output should indicate that the environmental challenges facing Ericsson (as well as significant parts of the information communication technology (ICT) industry) and thus demanding environmental management activities are smaller than the industrial average. This makes Ericsson an interesting case study – since it is prominent and advanced in its environmental management work, analysis and management – and if resource inefficiencies are indicated here it would make the relevance of the question asked in this study even stronger. What is the efficiency of becoming eco-efficient?

The paper is divided into three sections besides the introduction. How life-cycle assessments are handled at two different parts of Ericsson is compared in the second section. In the third section, different ways of conducting materials declarations, the foundation and point of origin for life-cycle assessments at Ericsson, are displayed. Lastly, in the fourth section, we discuss how environmental work towards sustainable offerings in product design and in marketing may provide a sustainable situation for itself within the company, i.e. become not only eco-efficient, but also deficient from a more traditional point of view.
2. Two approaches to life cycle assessment

This section is divided into two parts, comparing how environmental analyses, mainly LCA, have been used at two different Ericsson units, according to the structure of Ericsson as of 1999 which has been changed a few times since then. The products, or rather systems, of these business units are very similar in terms of components, manufacturing and use and are therefore suitable for comparisons. The environmental aspects in the usage phase are relatively easy to analyse while those in the component production are tremendously complex:

- One business unit, producing radio base stations (RBS), has developed a comprehensive method, based on a model which groups electronic components into three different types. These types are then used for applying life cycle inventory (LCI) data to the components, which constitute the base station of the study. Inventory data for the larger components, i.e. frames and cases, are accounted for merely by using inventory data for the material extraction-production of generic type.

- The other business unit, which produces enterprise exchanges, has developed a more thorough methodology based on several inventory models. Its electronic module consists of 16 type electronic components and the mechanical model is constructed of three types of mechanics. There are also models for environmental aspects from organisations, i.e. development and marketing, and for the end of life treatment phase.

In the comparisons below, the costs for computer databases and software evaluation tools for LCAs and their inventory data, have not been included. These expenses have been shared among the different Ericsson business segments. The annual costs in the late 1990s corresponded to about US$25,000. Most of these costs however, herein are from Ericsson’s internal data unit (which recently has been outsourced) which maintains the databases.

2.1 Life cycle assessment on radio base stations: a comprehensive method

The first studies. At the Ericsson business unit selling RBS for mobile systems, environmental analyses have been performed since the beginning of the 1990s. First, a number of materials declarations were created, which later began to constitute the core base for the company’s LCAs. During 1994, a first LCA was carried out, comparing two different releases of RBS for the US market (Malmodin, 1994). The conclusion was that the newer release had considerably lower environmental impact than the older one. More important, however, the study indicated areas with significant environmental impacts, e.g. the production of integrated circuits (IC), environmental priority strategy (EPS), the at the time in Sweden dominant evaluation system for LCAs, provided (by its assumptions) a link between high production costs and resulting environmental loads (see Steen, 1996; Ryding, 1995). Analogies were drawn
to the production costs of ICs. At Ericsson high production costs became correlated with large costs for environmental burdens from production and, hence, to large environmental impact as well.

An IC study became, therefore, necessary and was conducted at an Ericsson component production unit (Malmodin, 1996). These two projects reached the conclusion that ICs and printed circuit boards (PCBs) are of greatest importance when estimating the environmental loads from raw material extraction to the sale before usage. These findings have later been verified by other studies (Cerin, 1998; Östermark et al., 2000; Andrae et al., 2000), also carried out at Ericsson. Such component studies on components have later been adapted to studies with greater scopes, such as on switching centres and entire telephone systems.

The Stockholm-Sacramento study. A major study was performed on two entire citywide telephone systems, Stockholm and Sacramento, comparing the resulting environmental impacts from cradle to grave. This study was carried out together with Telia during 1997 and AT&T during 1998. At Ericsson, LCI data were gathered from its own plants producing printed board assembly (PBA)[3], cellular phones, cables and electronic equipment. Inventory data from the usage phase, were collected in collaboration with the two telecommunications providers. The Stockholm-Sacramento study was presented in 1999 both at Ericsson in Stockholm and at an Institute of Electrical and Electronics Engineers (IEEE) conference in North America (Weidman and Lundberg, 2000).

The person at Ericsson that to a large extent carried out this study stated: “It is not healthy to keep on working like this when considering time and costs related to outcome” (Ericsson, Interview A, 2000). The person continued, however, explaining that the study gave Ericsson access to important data concerning operators and their activities for services and maintenance. Data had also to be acquired by sending questionnaires to Ericsson’s suppliers. These data are not complete LCI data, covering resources used in upstream processes; on the contrary, the data only cover the materials left in the purchased components (see section 3 dealing with materials declarations). To estimate the cumulative use of resources in the upstream processes, analogies were drawn to data from own production, within Ericsson.

Now, due to the study, Ericsson has identified in which phases, from cradle to grave, the most significant environmental impacts occur in accordance with ISO 14001 clause 4.3.1. (see ISO, 1996). The most significant aspects, if using CO₂ emissions, are primarily found in customer activities, then in product operation and third in supplier manufacturing (see Figure 1).

Ericsson spent totally eight months of work on this Stockholm-Sacramento study. The time consumed by Telia for the research was five months. As a result of similarities of scope, the time used up by AT&T is estimated to be similar to Telia’s five months.
Figure 2 describes schematically the methodology used in the Stockholm-Sacramento study, as we (authors) have anticipated it. However, in practice a reverse order was adopted for the product life-cycle phases upstream of the company (Ericsson) performing the study. First the hardware is examined and thereafter divided into four component groups for which the manufacturing process data for primary suppliers were estimated. Based on these calculations, the impacts from raw material extraction are calculated. Impacts from own assembly, energy consumption plus operator activities during use and end of life treatment (EOLT) are added as shown in Figure 2.
If applying the at the time internal wage cost at US$75/h and excluding IT costs these LCAs – comparative RBS, IC and Stockholm-Sacramento – totalled US$40,000. There were also other LCA studies conducted in the same Ericsson unit during the same time period (1997-2000). All together these LCA studies totalled US$170,000. Since then the LCA activities have decreased to a lower time and costs use per project.

This comprehensive model of conducting LCAs starts with a holistic view to locate the most significant aspects. Thereafter, depending on time, the study goes deeper into the data. To ensure finding the most significant aspects of production despite the lack of resources for a thorough study this comprehensive model divides the populated printed circuit board into three component groups PCBs, integrated components and other electronic equipment plus a fourth for the surrounding mechanical equipment (mechanics). Each group is given class data which then are applied to components either by weight of components, area of components or production process-cost dependencies.

The conductor of these LCA-studies (Ericsson, Interview A, 2000) has the opinion that ongoing analyses cannot provide information to influence the design process of new products, but the forthcoming ones. The reason for this is that the LCAs are quite time demanding and require that most parameters of the design have to be set in order to conduct the inventory and assessment. It is already at that project stage – when all the parameters of the design are set and the LCA may be initiated – too late to be able to change the design. The results may at best, be used for future design in coming design projects or similar products. These studies, the manager continues, can, however, also be used to examine total environmental impacts from a new part of a new system release to explore possible environmental advantages and disadvantages. Such a part can be the hydro cooling equipment, which during use consumes less than 50 per cent energy of air cooling (used in switching centres and RBS today), but has unwanted impacts from its cooling liquids.

2.2 LCA on enterprise exchanges: a thorough methodology

The first studies. In September 1996, two projects concerning environmental impacts were initiated. One study compared the environmental impacts from the extensive documentation (a paperback documentation was compared with a CD-ROM version) of an enterprise exchange (Beckman, 1997). The information from the research was, however, not reused in the following LCA project comparing two releases of the enterprise exchange (see below). The other study created materials declarations for the components of the same exchange. The declaration of a good 1,000 components prolonged the project, for obvious reasons, until the autumn of 1997. A component expert also worked on the project for four months. Consequently, approximately 16 months were spent on the project (see Andrae, 1997). The project of declaring one enterprise
exchange (the MD 110 version BC 8) was a result of customer requests of having up to 98 weight-per cent of the exchange declared.

After having declared the content of the exchange a new comparative project started, looking three years and two releases of the product ahead. The aim of this project was initially to lower the environmental burdens by half, and therefore named the Factor 2 project (F2). The Swedish-based index system EPS (Steen, 1996; 1999a, b) that was used turned out to be problematic in its application[4], however, and was finally abandoned. The EOLT scenarios were investigated by another project (Koch, 1998). Further studies dealt with energy consumption during use and main supplier assembly plant operation.

Comparative LCA on MD 110 versions BC 8 and BC 10. Based on the earlier studies (shown in section 2.2), a comparative, exchange MD 110, LCA study was initiated in mid-1998. An institute (Chalmers Industriteknik) from Gothenburg, working with environmental issues, came into the project and 80, gate to gate[5], LCI questionnaires were sent out. The answers, which, after numerous reminders, started to come back after two to five months, also had to be modified[6]. There were 47 and belonged to 27 types of processes. The project, however, ended up completing 16 class processes for electronic equipment as displayed in Figure 3. Later on this project received a new name “Life Cycle Assessment of MD 110”. Now contribution from own Ericsson office activities plus a comparison of different packaging were performed. An institute in Copenhagen reviewed this research quite a few times before accepting the quality of the assessment as a basis for a verification of the study.

The number of persons having worked in this study at some time period is 12, including the three persons mentioned earlier, plus the time for co-ordination from the project manager. The total time they spent (working time) on the project, from the autumn of 1996 is approximately 85 months and the duration of these projects was somewhat less than four years (September 1996-April 2000). Three years duration if we exclude the foundational materials declaration project. Applying the, at the time, internal wage cost at US$75/h this LCA (consisting of three subprojects; materials declaration, F2 project and comparative LCA) amounted US$1,325,000, if excluding related IT costs. These assessments were financed by different product units’ design projects.

This comparative LCA of two MD 110 releases may be viewed as a breakthrough for the environmental research community occupied with product evaluation (see Erixon, 1999). The prominent input of methodology has been retained from within Ericsson itself and by the involved environmental consultant from Chalmers Industriteknik (see Andrae et al., 2000). The study has developed a methodology for how to conduct LCA on electronics, by its modularised LCI data, with several thousand components and multiple suppliers for each component. A sign of this initiatory is the following review statement: To the experience of the reviewer, LCAs on electronic products have till now, been lacking data on composition and manufacture of electronic
Figure 3. The life cycle inventory data module for MD 110 developed in the comparative life-cycle assessment of versions BC 8 and BC 10.
components, and the work done in this LCA is, thus, pioneering. We do not deny that this research could be beneficial for the whole of Ericsson and; in addition, for at least the electronics line of business as well as research institutes. When estimating the benefits for the product unit financing the study, however, its advantages are not that obvious. These studies have not changed the actual design of MD 110 version BC 10 and have not been used for marketing purposes, except for an environmental declaration of the exchange (Ericsson, Interview B, 2000).

One serious obstacle with this comparative environmental study is the duration of the project. To extract the information needed, as shown earlier, the study stretched over close to a four-year time period (September 1996-April 2000). Even if similar studies today would take much less time, these LCAs may not serve as front-end design tools affecting the ongoing design projects. Furthermore, the design work of new exchanges stretches approximately 1.5 years and to be influential in the forthcoming design there is a very short period of time (we are here talking about a couple of months), in the start-up phase, in which changes to the design can be made. Preferably, the environmental issues to consider should be included already in the specification for the project (Ericsson, Interview C, 2000). Hence, if focusing on the design process now, such time-consuming studies may only be used for back-end design giving checkpoints to designers on what to aim for[7]. A release of the enterprise exchange MD 110 is expected to be produced and sold during a period of one to two years. The revenue for the product unit of MD 110 is not official and is not that relevant due to internal Ericsson transactions resulting in fictive values. The business segment’s (enterprise solutions) operating margin; however, is known. For fiscal 1998 (MD 110 core product of the segment) and 1999 (now a newly started unit providing IT services also constitute part of the segment) these margins were US$9,600,000 and US$6,400,000. Let us assume the version BC 10 is being sold for two whole years and also that the corresponding business segment revenue for that time period is US$16 (9.6 + 6.4) million. Consequently, the environmental studies, leading to the comparative LCA on MD version BC 8 and 10 (US$1.3 million), corresponds to at least 8.3 per cent of the revenue which was linked to the release BC 10. If we extract the cost from the work with materials declarations which at the time had a strong expressed customer demand, the environmental studies (US$1.1 million) then constitutes 7 per cent of segment margin. Moreover, this occurred at a time when the telecommunications sector was booming.

3. The materials accounting
In this section we go to the core of making LCAs at Ericsson, namely, the materials declarations of a product’s components. The customers, buying switching centres from Ericsson, have, during the 1990s, increasingly
requested data on the materials content of these products. This phenomenon has led Ericsson, initially somewhat unstructured, to ask its suppliers about the materials content in their components often as a base for conducting a LCA. To avoid duplication of work and to enable future applications (i.e. faster and more accurate customer answers), a materials database (Matilda) is now established at Ericsson requesting its suppliers to provide materials information into the database via forms on the Ericsson Internet site. However, constructing such a database is complex, and making it a supply chain management tool by involving component suppliers does not make the task easier. The materials database is below compared with and put in context with the former unstructured way of working as well as to the opportunity of receiving material contents from a shredder. During the end of the 1990s the interest in materials content information from customers decreased due to the approaching producer responsibility legislation in Europe and Japan. This fact, however, does not decrease the importance for Ericsson (and its competitors) of managing the materials content of their products.

### 3.1 Materials declarations pre-Matilda

As shown in section 2, comparing LCA methodologies, materials declarations of components, e.g. in switching centres constitute the foundation for the conducted Ericsson LCAs. Since the beginning of the 1990s these declarations have been put together by various parts of Ericsson and sent out to suppliers in order to answer its own customer requests (from telecommunications operators). During 1994-1995 the requests started to concern environmental risk materials. To avoid suppliers receiving multiple requests from Ericsson regarding materials in their components, people at Ericsson, from time to time, collected the information already retrieved from other parts of the corporation. However, there existed no common database; therefore, this work was carried out by comparing printouts, and later also, Excel and Access files and even stored data in a, hard to use, inflexible LCA database [8].

To enable exchange of materials information within Ericsson, in 1996 a common structure was established for materials declarations together with a uniform document to send to suppliers when asking for declarations. These declarations, for example, of switching centres, are quite time consuming in terms of calendar waiting time. If we include the time for making a report, the duration was approximately one year for declaring the materials content in a switching centre in the late 1990s. When declaring materials content the first task was to search for similar declarations done at Ericsson. Thereafter, data were retrieved by finding out which components that could be declared by using the information in materials declarations of similar components and the information in the ordinary Ericsson component database. If it is not possible to declare the component with generic data, due to insufficient information, a
search through Ericsson’s supplier database was performed to find one or more suppliers of the actual component to which questionnaires could be sent.

During the second half of the 1990s (in the pre-Matilda era) about 15 persons at Ericsson were at times working with declaring content of products. The estimation is that these persons used approximately 50 months for creating materials declarations during the late 1990s. Much of that time has been spent on comparing existing declarations within Ericsson and sending out requests and reminders to suppliers asking them to declare their own components. This pre-Matilda work is estimated to have consumed US$625,000.

3.2 Materials declarations using Matilda
To make the work with materials declarations more efficient, Ericsson started from corporate level to create a materials database, Matilda. The first attempt to establish the database within the company took place in 1996, but the project had to wait another two years before being initiated again. The first pre study for the database was performed during the autumn of 1998.

As no consensus on materials declaration questionnaires was achieved within the international electronic community Ericsson went ahead and started to make its own materials declaration questionnaires and, thereafter, a database tool, Matilda. This database aims to minimise work done both at Ericsson and its suppliers[9]. The tool is also a device for promoting Ericsson’s unofficial standard for materials declarations. This database is linked to other Ericsson data tools i.e. the structure database Prim, structuring the part of designs. The Matilda database is also linked to the supplier database Eliza (used by the procurement staff) and even the product specification database (used by sales staff). An international standard is progressing today in which Ericsson and its Matilda is an influential actor.

The process of retrieving data from suppliers proceeds as follows: mail to supplier, supplier may insert information in Ericsson’s external Web site which is protected from other visitors. Thereafter the answer goes through check and correction and finally approval. The specific company information is protected; as a result, most Ericsson employees only see average component data, unlinked to suppliers. The internal interface is also Web based on the intranet.

In the beginning Matilda handles two methods of materials declarations that projects in Ericsson may chose to work with. One method is more thorough than the other one containing data part name, mass, element and, element and substance weight per cent of part. The simpler version contains only information regarding certain element names and their weights. Data saved in the more thorough format may be extracted from the database in the simpler format, but if the materials data are saved in the simpler form there is no way of using them in aggregations of data in the thorough format. One of Matilda’s strengths is that it allows aggregation of data from component levels to more
complex levels with compound products. This function, however, gives all aggregations in the simplified format.

The budgeted costs for building this materials database, Matilda, was US$800,000 from autumn of 1998 to April 2000. The implementation was delayed in the beginning due to internal clash of opinions between different Ericsson units. The cost for people in the Matilda reference group is at least US$50,000, spread out on other projects.

Thereafter, in operation, the annual cost is calculated to be a good US$100,000 per year. Moreover, we have the costs for internal Ericsson courses, US$200 fee per person and then the own daily wage costs US$600. Courses are also made for the suppliers that shall complete the forms, regarding their products’ materials content. A considerable future cost is the time which the purchase departments or component engineers have to spend on each new products; explaining to and demanding suppliers to fill out materials declarations. These costs are assumed to be close to US$100,000 per year.

Ericsson designers are also to use this materials database, e.g. when designing new systems. Moreover, the suppliers have to spend some time on filling out the requests, which is a cost to them and might also become a purchase cost to Ericsson. As a matter of fact, this is precisely what the procurement unit is afraid of. They see a danger of getting increased component prices if having a general demand on suppliers, requiring the suppliers to declare their own products. Even though Ericsson is the dominant player in the telecommunications systems industry it is a small player within the electronics industry and, hence, also a small customer of electronics (compared with the giants) which affects the procurement power. Hence, it has been up to each design project to decide if they want to put the efforts to ask suppliers to declare components. Since the year 2000, however, the design directives require that projects that have started after that date have to obtain materials information from suppliers for the components that are to be used in the new design. Smaller design projects, that can go under the definition updates of earlier releases prior to year 2000, do only have to follow the old design directives. This is, however, an easy and simple possibility for design leaders which soon will become but a memory.

3.3 Materials declarations by scrapping
At Ericsson research and development another method for declaring materials content has been developed, focusing on time and cost efficiency (Ericsson, Interview D, 2000). When there is a need to know the materials content, i.e. after the design phase, populated PCBs (also named PBA) are sent to a shredder (SGAB Analytica) in northern Sweden for analysis. The components, mostly PBAs are first ground into small pieces, which then are chemically dissolved from which the content is analysed. The scrapping firm then provides information on certain element content covering a good 90 weight per cent (in
some cases up to 97 per cent). This service costs Ericsson US$460 per PBA [10] and takes two weeks. If Ericsson wants a faster result, this is then arranged at a somewhat higher charge. An advantage with the method is that it is not dependent on generic data which may tell the wrong story, pending on the magnitude of assumptions. These data are, however, only specific for the analysed consignment of an individual PBA with a specific product number. If these data are used on other PBAs with the same product number the data will become generic. How does this happen? Well, since each component of an electronic product, in this case a PBA, can be supplied from circus three to five suppliers and there are hundreds of components to track. These analyses of materials content have been going on since June 1999. When summing up the costs for these analyses between June 1999 and March 2000 the total expenditure is US$80,000. The estimated annual cost for materials analyses of new products is US$50,000. The cost of own work at Ericsson, however, related to these bought analyses, has been 16 per cent higher than for the analyses themselves. The results from the analyses are stored in Ericsson’s newly started materials database, Matilda.

The scrapping of a PBA costs US$520 and is equivalent to 7 hours of work (US$75/h). If declaring a new PBA, with both the pre-Matilda and the Matilda methods the person doing the study has to wait for all the answers coming in. A longer time delay for getting started compared with the one for materials declarations by asking suppliers. This scrapping procedure will probably be faster with Matilda since at Ericsson a steady rate is reached where approximately 50 per cent of the components in new PBAs are already declared (Ericsson, Interview E, 2000-2002) already in 2000. However, the answering time for suppliers is set to 60 days in Matilda. In the mid 1990s the time could be cut down by sending the PBA to a shredder, because the chemical analysing company gives a response within two weeks. On the other hand, as pointed out above, the research done by scrapping cannot start until an entire prototype is being made. Materials declarations using existing declarations and by sending out questionnaires – as well as LCAs – can be initiated when most of the parameters are set on paper in the development projects of the new product, but takes longer time to conduct. This is, however, not the case today since 80-90 per cent of the components’ elements of a PCB are declared and stored in the database Matilda already at the start of the design project.

4. Discussion

4.1 LCAs

As pointed out regarding both LCA models in sections 2.1 and 2.2, these studies cannot be and have not been used in the ongoing design processes themselves to provide information on how to decrease the environmental impacts that will come from the product being introduced. One major obstacle is the duration of these LCAs, ranging from six months up to a few years. The introduction of a
new product within telecommunications systems typically requires 12 to 18 months and most parameters of a design are set in the very beginning of the design projects. Another and related obstacle is the late stage in the product design process in which a LCA can be introduced. At this late stage most product parameters (especially hardware) are set and are difficult to change since these components are already used as a prerequisite for the product being designed.

Consequently, these LCA studies, as they are performed today, are not a front-end design tool. Moreover, the conclusions are often more or less the same (and easy to forecast) in many of the analyses, arguing for less energy consumption during use as well as less material content in products and highlights that the contribution from offices is not to be neglected[11]. These studies may, however, be used as a tool for marketing, giving the company a good reputation. The relevance of these LCAs in improving product designs and usefulness for designers and financing managers (of these design projects) have been minor. This is a result that is in line with a “usefulness of LCA” study at ABB (Laestadius and Karlson, 2000). Some attempts have been made to use the studies in connection with product sales. Ericsson was the first actor to present an environmental product declaration (EPD) for an entire telephone system which was verified by a third party. This work was carried out in a very short time period – as well as consuming modest resources – compared with the few that had foregone this declaration in other business sectors, e.g. on an electric power generator. Results from these studies are also used for other purposes, however. These are, for example, marketing the whole company by using the results in the annual environmental report (which nowadays is extended in its scope to encompass sustainability issues) or, as a performed work, paying for Ericsson’s participation in an environmental research program managed by an university institute in Sweden[12]. We see here a paradox: LCAs have evolved as a tool for marketing, legitimating an entire company, and not primarily for improving the company’s environmental performance (Ericsson is no exception in this case, in fact this seems to be the general situation (see Cerin, 2002)).

This paradox may also be formulated in terms of an internal management contradiction: some product units paid for large environmental studies in the late 1990s and in some cases even developed them which the whole of Ericsson have gained from, giving the corporation a competitive advantage externally (at least in presenting a good company image). The financing units, however, received little benefits in return i.e. in terms of improvements of their own products or specific marketing thereof. Since information is transferred more or less freely within the company, and hard to charge for, the knowledge creating units receive internally a competitive disadvantage. Being the forefront unit becomes, hence, a less desirable position.
Within the electronics industry, LCAs more or less, come to similar conclusions and; who really cares if material content, e.g. constitute 3 or 5 percent of the total environmental impacts from a product’s life cycle? Perhaps the units of short-lived product versions, financing these studies, do not motivate this accuracy. For research institutes, however, some processes early in the value chain are really interesting cloud of electronic components to investigate (see Erixon, 1999) even though from environmental point of view they may be negligible. These model developments and data maintenance could to a greater extent be performed by research institutes themselves. Designers at company units may, however, create larger positive economic benefits and lesser environmental impacts if they have design guidelines, with environmental aspects and consideration included, in the start-up phases of design projects.

If these studies are to be sustained in the future, they have to fulfil the need of the project party paying for them. The unit that financed the thorough study has since then not committed itself to any new LCAs and is reluctant to future studies since the experience is that neither time nor budget restraints are fulfilled. The main reason for the gap between the scope of the conducted LCA and the needs of the LCA is a result from the work of an inspired environmental project leader at the enterprise exchange business unit that managed to persuade his managers of the great benefits for the business unit. This is a common problem to managers, trying to estimate the value of a group with a very specialised competence area – i.e. estimating the usefulness of IT investments (Karlander, 2001)[13]. This asymmetric distribution of knowledge and incentives has in combination with escalating costs for the ongoing environmental project resulted in considerable resources spent. Nowadays, major LCAs are financed jointly on corporate level or by a financially strong Ericsson unit, that more easily can bear the extra overhead cost alternatively can afford such marketing strategies. The competence gap between the corporate environmental unit and the persons carrying out the environmental assessment is also smaller than it is for a line manager.

This thorough LCA study was, however, in another sense a great success, bringing a knowledge regarding materials for numerous components (98 percent of total weight) and, especially, creating a methodology for LCIs by dividing components into different product categories. This knowledge has been valuable to Ericsson in developing their LCAs to encompass larger accuracy than the previous simplified model developed at the radio base unit, but with an almost similar efficiency. How was this possible? One major reason for this is due to the close co-operation; exchanging ideas, methods, structures and data; between the two persons most involved in and responsibly of these LCA studies. In this case the somewhat opposing ideas of performing an assessment did not evolve into a hostile fight over superiority, but into co-operation. This is, of course, not always achievable from a managerial level,
but the Ericsson internal environmental assessment group discussions, more or less on equal bases, may have been a good breeding ground.

These LCA studies may; on the other hand, be used as a back-end design tool and marketing, i.e. through EPDs. In the very start-up of design projects, conclusions from previous LCA studies may be applied, i.e. as checkpoints in a guideline for the designer to consider. There are, however, some problems associated with relying on back-end design checkpoints:

- **Rapid technological change.** The design process has to rely on environmental data retrieved from studies performed on old product releases since the most recent one is not finished.
- **Radical technological change.** Environmental consequences from major changes in design are hard to predict by using the information retrieved in old studies.
- **Slow technical change.** If the time span between design projects is long (e.g. a decade) the inventory data used in the last environmental assessment may be out of date.

4.2 Materials declarations

If a materials database like Ericsson’s Matilda is to be successful, it must include many declared products to enable fast implementation in design projects – by keeping the number of components that has to be declared down. Today, design directives include environmental demands, based on experiences from earlier work with environmental analysis, i.e. LCAs and materials declarations. The new requirements[14] by Ericsson that all components in its new products shall be declared, can make Matilda much more efficient in the long run. The suppliers may, however, take such an action as a reason for increasing their prices on those customers who ask (or care). Another reason why suppliers are reluctant to carry out materials declarations (and also process data) is that well-informed customers may use knowledge about products and production details to lower purchase prices. This can especially be a problem if process data as well is required (as in LCIs), illuminating the suppliers’ yields and resource use – in other words their costs for production. This may be an argument for an international standard for materials declarations and database structures within electronics, making all companies adopt the same routines. Due to the lead and experiences Ericsson has from working pro-actively with materials declarations and Matilda, Ericsson is now a prominent actor within the electronics industry’s international work to create an international standard for materials declarations.

If these obstacles remain the materials declaration by scrapping is a resource-effective solution, providing very accurate and fast answers, not being restricted by generic data. Moreover, in the transition phase in which Ericsson finds itself today, due to ongoing outsourcing, fewer and fewer electronic
components are bought directly. Instead, Ericsson is increasingly buying products composed of several components i.e., PBA and hence need not have detailed information on each little resistor; especially since these PBAs are being sent to scrappers for material recycling.

5. Conclusions
A necessary long-term demand on environmental tools is that they can contribute to eco-efficiency, i.e., facilitating management decisions that effectively will reduce environmental impacts (Schaltegger, 1997). As shown in this empirical paper based on experiences from Ericsson, it is doubtful whether the LCAs and the materials database has been efficient or even useful in promoting eco-efficiency (see Schmidheiny and WBCSD, 1992) and sustainability (see Bruntland Commission, 1987), thus, helping the firm to develop environmentally more efficient products and services. In fact it may even be argued that the environmental progress achieved by Ericsson is largely due to the dominant technological development: an evolution rapidly decreasing the resources used, materials content and energy consumption, per function, which have developed independently from the environmental management and analyses performed. To really affect the base components in their offerings, Ericsson needs the support from the gigantic consumer electronics industry to put demands on suppliers. The telecommunications industry has too small purchase volumes to achieve this turnaround itself.

It will not be sustainable if environmental studies and tools developed and used are solely financed by company product units, but almost merely ensuring the development of industry sector models for research institutes. There is, hence, a gap between the need of the company unit and the aim of the environmental experts, often initiating the studies. This asymmetric knowledge in environmental issues between these actors (see Akerlof, 1970) may result in opportunistic behaviour (see Freeman, 1984). The environmental work also has to be better incorporated into the corporate management to make these analyses effective (see Facheux et al., 1998; Cerin and Ramirez, 1999).

This experimental mode of analyse tools that Ericsson has experienced has been valuable and it has formed areas in which these environmental tools are shown to be efficient such as in EPD and company reporting. The Matilda database is expensive to run, but it is necessary for a design owning company such as Ericsson to have an understanding about its systems’ material content since they will be responsible for the end of life treatment of them. The database could constitute a foundation for a materials and process information structure along the value chain where all actors fill in their own real life contributions, making the information package following the product. However, to attain a situation in the value chain where all actors involved show materials data (and in the longer run process data for LCIs) for each stage that follows the product as an aggregated information package along the value chain.

The efficiency of becoming eco-efficient
Matilda may be a good starter. Such development would be much more cost efficient if looking at total costs for an entire value chain, but is probably immensely difficult to implement if not supported by international legislation or at least an unofficial standard for materials declaration (perhaps followed by an international standard). It would also be a solution to the unwanted dependences on generic data as we are today. If no such policies arrive in the future, it may unfortunately be cheaper and more efficient for the actor to make these requests to a scrap and chemical analysis of ready prototypes and only make corrections when (or if) some alarming values arise.

If changes to product design are necessary after chemical analysis these will be more expensive (or even impossible to carry out) than if the information comes from the Matilda database – that is in the beginning of the design process.

The analyses and evaluations at Ericsson studied here have not always been that efficient in terms of cost and improving design; nevertheless, it may be argued that they are a part of a start-up phase of learning. With gathered knowledge, they may become more efficient and influential on design and marketing. However, if the net costs of the analytical work itself, excluding work with environmental improvements, on, e.g. one segment’s core product correspond to a good 8 per cent of the segment’s revenue during the time period under which the product is sold, then the environmental work will not be sustained in the company.

Some of the methods have, after the experimental mode, become more efficient and gained a larger area for application in the sense that a larger organisation (unit in this case) is benefiting from it and also, more importantly paying for it – such as with corporate reporting and environmental product declarations. These findings go hand in hand with those of Holgaard and Remmen (2000) regarding company size and rate of conducted LCAs and Burstrom (2000) regarding municipality size and rate of environmental work.

The results from these studies have, hence, become useful in communicating and marketing environmental efficiency. However, the front-end design applications of LCAs have been absent and some minor new inputs to new designs have come from newer LCAs (that were not known form previous studies). The LCA tool is, hence, primarily not a design tool but for marketing and communication of environmental aspects and efficiency. This is one reason, as we see it, for the decreased use of and interest in LCA at Ericsson – as we suggested and predicted in our earlier analysis (Cerin and Laestadius, 2000). Hence, this means that we and Schaltegger (1997) are wrong in the short-term efficiency (application in marketing), but probably not in the long term (application in product improvements).

As of today, despite the improvements shown, e.g. in LCAs, they are resource consuming and indications here show that the tool is already used to lesser degree. The problem whether environmental management should develop in the form of incremental innovations along paths already entered or
if there are less resource and time-consuming models, that is more efficient ways to become eco-efficient. This is a topic for future research.

Notes
1. Ericsson is a dominant player in the telecommunications market, being the world number one producer of telecommunications systems for mobile and fixed telephony, but prominent in other communication sectors as well. The corporation is Swedish based and has, during the last decade had an average number of employees about 100,000. During the last year’s crisis in the telecommunications industry, mainly due to excessive operator bids on 3G licenses, Ericsson and its competitors have all downsized their staff considerably.
2. Ericsson. 1997-2002. In order to obtain information needed for this paper we have interviewed: five persons working with environmental studies and related tools; three persons working with system design and one person in marketing. Moreover, we have closely followed, and in some cases participated, the environmental studies at Ericsson for five years.
3. PBAs are printed circuit boards equipped with electronic components.
4. The EPS tool is full of assumptions and mixes present and future costs of one action without discounting and, of foremost importance, neglecting the dynamics of economy enabling change of solutions and resource dependencies and geographical local conditions (see Schaltegger, 1997).
5. Gate to gate describes an LCA which has its delimitation of the study starting after the cradle (resource extraction) and ends before the grave (end of life treatment) of the studied products’ life cycles.
6. Interesting to note here is that it was considerably easier to retrieve data from European and East Asian suppliers than from US-based ones. Two factors that can explain this phenomenon is the fact that the USA is not faced with the extended producer responsibilities that are developing in the other regions as well as a need in the US regulatory environment to be more careful with company information than in, e.g. Europe.
7. The knowledge retained in LCA studies at Ericsson is used in design guidelines as input for designers in product development projects.
8. During the last five years, however, great improvements of these software tools have taken place, which also is the case with the EcoLab Software used by Ericsson.
9. The work done by most suppliers may not decrease, since in general, little work had (and has) been carried out by them so far. But, if we compare the future work for suppliers, under pressure from its customers, the database and structure, if commonly accepted as a standard, would also decrease their work.
10. PBA is an abbreviation for printed board assembly which is a circuit board populated with components.
11. Why are these results similar? Does the generic data in the 27-process groups applied cause these similarities in results? There is no indication so far in that direction, since various independent studies on electronics give similar results. If the models used are simplified, providing answers fast at a low cost there is an inherent risk that the studies will not detect any new unknown and unanticipated results, since the data were not present in the generic model.
12. Ericsson has now left this group since they do not find it beneficial (sustainable) to pay for supplying other actors with knowledge (and not always getting recognition for it).
13. The actors of the unit may take advantage of the information asymmetries that exists over
the unit borders, holding their own self-interest foremost (see Freeman, 1984).
15. As suggested by Schaltegger (1997) in his critique on LCAs and its dependencies on generic
data.

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Paper V

Communication in Corporate Environmental Reports

Corporate Social Responsibility and Environmental Management.


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COMMUNICATION IN CORPORATE ENVIRONMENTAL REPORTS

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Since the beginning of the 1990s the number of companies producing environmental reports has increased considerably, a rise that now has reached a plateau. Some critics claim environmental reports are merely an exercise in public relations. This study describes the ascent of and the motives behind corporate environmental reporting and examines the extent to which the messages communicated in environmental reports correlate with the messages contained in corresponding annual reports and actual corporate behaviour. The indicated praxis of steering attention away from environmental problems – a by-pass solution – can involve providing contradictory information to various stakeholders. This article looks into third-party verification impacts on the credibility of environmental reports and calls for stricter reporting rules. The paper also discusses how eco-efficiency and sustainability demands placed on the scope of environmental reporting could enhance the sustainability of this reporting phenomenon, by for example doing away with merely limiting reports to company-judicial borders. Copyright © 2002 John Wiley & Sons, Ltd and ERP Environment.

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INTRODUCTION

During the past decade, a new branch of corporate reporting referred to as corporate environmental reporting (CER) has developed from insignificance to an important channel for communicating company environmental issues and performance to its stakeholders. Today, mainly larger companies listed on the stock exchanges in OECD countries1 produce environmental

1 The Global Environment Business Magazine Tomorrow lists these Corporate Environmental Reports (CER) on the Internet,
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In the corporate environment, environmental reporting has become an important channel for companies to communicate their environmental performance and corporate responsibility. This report discusses the ascension of corporate environmental reports, their development, and the challenges and opportunities they present.

The voluntary nature of reporting together with the increased interest in the environment shown by corporate stakeholders has created a new area of company competition and thereby driven the rapid growth in environmental reporting witnessed over the past few years. In other words, the underlying driving force for conducting these reports is chiefly one of corporate self-interest. It can be argued that communication through these separate reports has been performed where a net benefit for the company is achievable (Gray et al., 1990). These net benefits may be difficult to estimate however, especially for the corporation executive teams.

Companies continue to exhibit a range of different strategies and benefits from their environmental reporting; for example adopting reactive positions in debates on environmentally damaging issues, or proactive positions in relatively less damaging sectors. Hence, corporate environmental informatics has evolved in a diverging manner, creating incomparable as well as implausible reporting. The divergence of content often fails to convey the actual information wanted or needed by the targeted stakeholders, and may instead contain verbose accounts of what scant relevant material there is available within the business.

Ljungdahl (1999, pp. 59ff) shows that while there has been only a small increase in the number of information categories and an even smaller incremental enlargement in the number of quantitative categories being reported on, there has been an explosion in the number of pages per environmental report.

This paper describes some of the reasons behind environmental reporting as well as the development of the voluntary reporting phenomenon. This paper discusses the credibility of these corporate reports and attempts to illuminate the gap between messages in environmental reports, on the one hand, with messages in annual reports and actual corporate behaviour, on the other. This paper also attempts to determine preferable delimitations on environmental reporting if these are to say something on sustainability issues.

The following section of this report presents an outline of how the practice of environmental reporting evolved. Reporting customs are then presented in the next section. We then illuminate the differences between environmental reporting, non-environmental corporate reporting and corporate action. The next section deals with third-party verifications and recipient appraisals. Illustrations are then presented covering how to incorporate eco-efficiency and sustainability considerations plus measurements into environmental reporting. The last section addresses issues in designing environmental reports, discussion and a concluding comments.

THE ASCENT OF CORPORATE ENVIRONMENTAL REPORTS

Corporate environment reports have quickly become the key channel for companies to communicate their environmental performance and, just as important, have become an effective tool to demonstrate company-wide integrated environmental management systems, corporate responsibility and the implementation of sustainability strategies.

World Wide Web [www.tomorrow-web.com]. CERs can also be viewed at the Sunderland University site, Centre for Environmental Informatics [cei.sund.ac.uk]. The Corporate Register online database has a collection of environmental reports from companies on the Internet at [www.corporateregister.com/].

Agent and institutional theories are applicable here for describing the control problem of specialized company units for corporate executive teams and how each unit is fighting for survival and expansion. For more thorough theoretical descriptions, please see Corporate Environmental Reporting: an Innovation of Accounting? (Cerin, 2000).

Stakeholder identification is central to many reporters on environmental data.

Ljungdahl (1999, p. 554) divided environmental reports into 11 categories based on the recommendations from the UNCTC (1991) and the model used by Almer et al. (1992) and Ljungdahl (1995).
of industry voluntary codes of conduct (UNEP–Sustainability, 1994).

From being the subject of professional interest chiefly amongst environmentalists and scientists in the 1960s, interest in environmental issues has nowadays moved into the mainstream of our society. Various sub-communities, consisting of politicians, NGOs, businesses, environmentalists and the media as well as ordinary citizens can have widely differing approaches and aims driving their environmental efforts; noted by Lars-Olle Larsson (1997, p. 15). Due to the increase in society’s interest in the environment, it has become increasingly important over recent years for companies to communicate their environmental performance to their company stakeholders. Stakeholders impact on companies in various ways, via investments, sales, governmental pressure and ultimately the size of future business profits (Hollander, 1998). Moreover, good environmental performance (or resource productivity) is being viewed as an advantage in dynamic corporate competition (Bonifant and Arnold, 1995; Porter and van der Linde, 1995a, 1995b). Therefore environmental concerns have to be integrated into corporate objectives, emphasizing that economic decisions underlie the holistic life-cycle approach to products, from the ‘cradle to the grave’ (Yakhou and Dorweiler, 1999).

Environmental information may be presented to the world outside a company via a fiscal report or some other separate report. The term usually used for this is environmental reporting or corporate environmental reporting. According to some researchers, only the stand-alone reports ought to be referred to as corporate environmental reports (Brophy and Starkey, 1996). The current wave of producing separate environmental reports is strong; however, many reporters believe that this is a passing trend (Ljungdahl, 1999). This was noted during the proceedings for the ‘Best Swedish CER of the Year 1998’ award (Brärfelldt, 1999, 2000)\(^5\), where the awarding committee noted that the amount of financially related data was on the decrease, and was often being replaced with verbal explanation. In the following year (1999), the number of separate environmental reports entered in the same competition had dropped by 13%, mainly due to an increased focus on ethical and other social considerations (Brärfelldt, 2000). The USA, which had the highest proportion of companies producing environmental reports in the KPMG 1996 survey, was the only nation where the reporting practice had dropped in the KPMG 1999 survey, showing a drastic drop from 45% to 30% (KPMG, 1999). Moreover, Brärfelldt (2000) identifies a similar development emerging in England.

Corporate environmental reporting emerged in North America in the 1970s in businesses wishing to conduct social reporting. The regulatory support was at that time scant or non-existent (Brophy and Starkey, 1996, pp. 177ff; Gray, 1994). The current approach to environmental reporting was initiated in 1989 when the state-owned Norwegian oil and chemical corporation, Norsk Hydro, was pressured by massive environmental campaigns to report on its activities in order to salvage and restore its reputation. In North America, Monsanto was the first company to report on its toxic emissions in a separate environmental report. Union Carbide and Exxon along with other companies found to be responsible for environmental disasters also produced environmental reports relatively early on (Brophy and Starkey, 1996). Dye (1985) and Patten (1991) demonstrated that most companies operating in sectors afflicted by environmental disaster began to report their environmental data. Those companies that chose not to report were indirectly affected by the disaster-driven attention, despite having nothing whatsoever to do with specific woe. Stakeholders reacted with suspicion to non-reporting companies as

\(^5\)The author of these articles, Lars-Eric Brärfelldt, is one of the members on the committee for electing the best CER of the year in Sweden.
though they had something to hide (Patten, 1991; Walden and Schwartz, 1997).

This type of voluntary disclosure provides pressured businesses and sectors with an avenue for expressing their side of the story in the environmental debate themselves, thereby protecting their own immaterial asset— their legitimacy (Ness and Mirza, 1991; Patten, 1991). In the public’s mind, companies have little or nothing to lose by reporting after an environmental disaster.

Apart from those companies struggling with environmental disasters, other early reporters of environmental data were businesses in sectors characterized by being in close contact with end-consumers, and contributed considerably to environmental stress. As described earlier, these enterprises often have the spotlight turned on them by environmentalists as well as the mass media (Brophy and Starkey, 1996). Even within sectors associated with relatively small negative environmental impacts, some companies discovered relatively early on the worthwhile benefits of efforts put into to elucidating the environmental burdens they created; two such companies were Electrolux and The Body Shop. For these companies, making their environmental concerns public have therefore become a new weapon in the competitive struggle (KPMG, 1999).

In a survey conducted by Deloitte Touche Tohmatsu International (DTTI), the International Institute for Sustainable Development and SustainAbility Ltd. (1993), asking companies why they voluntarily reported their environmental performance to their stakeholders, the most common response was that it was their ‘duty to the environment’. Gray et al. (1993) also found the most common reason for environmental reporting to be duty based. However the intention of company management is most likely to be the creation of added value for the company shareholders—the universal imperative of any business. In other words, ensuring the stockowners receive maximum profits (or satisfaction) from environmental disclosure is of major importance to company management (Bergström et al., 1998, pp. 23f; Gray et al., 1990; Gray, 1990, pp. 67f; Jaggi and Zhao, 1996). The asset gained by reporting could be an immaterial asset, such as moral support from secondary stakeholders (Clarkson, 1995). Gray et al. (1993, p. 209) also state that ‘Motives for voluntary disclosures are unlikely to be simple’, and that the underlying reasons depend largely on the culture within the company.

From the somewhat contradictory outcomes of the various different studies referred to above, it can be deduced that the boundaries defining the underlying evolutionary force are not sharp, and according to Skillius and Wennberg

Surveys have shown that the most common reasons given for voluntary reporting were duty-based, such as duty to the environment or the public’s right to know. Motivation for disclosure can also be one of self-interest, with companies choosing to report if they judge that the benefits exceed the costs associated with environmental reporting. However, the motivation for reporting is not likely to be based solely on duty or self-interest but will contain elements of both (Skillius and Wennberg, 2000).

It may be argued that the stakeholder group represented by ‘duty to the environment’ in the DTTI questionnaire is not a true stakeholder group. According to the definition of stakeholder provided by Freeman (1984), stakeholders are those entities able to influence a company or those that are influenced thereby. Identifying ‘duty for the environment’ as a stakeholder group thus opens the way for applications outside the limits of stakeholder theory. The formulation of the DTTI survey encourages a politically correct and moral response, in line with prevailing institutional theory. However,
there may be a cultural change in the attitudes and values within engineering professions and businesses, progressing beyond the theories of agents, institutions (legitimacy) and stakeholders. Laestadius (1996), Frostell and Laestadius (1997) and Halme (1997) all describe the perceived strength of such cultural changes.

Gray et al. (1993, p. 209f) quotes a major chemical company describing the growing impression among corporations today that

It is increasingly realistic to recognise the need for environmental disclosure. The political climate is changing and it will become impossible to resist it. We also want to take our medicine early and to go through the pain barrier early in the process. We also want to tell people what we have done.

It is still today mainly the larger corporations based in the industrialized world that provide environmental information to the public (Brändfeldt, 1999, pp. 34f). There also remain entire branches of business in the industrialized world today that do not normally conduct external environmental disclosures, in for example the following sectors:

(i) finance,
(ii) IT,
(iii) mining and metal industries and
(iv) agriculture.

Companies in these branches may not yet have realized, as Gray (1994) puts it, the market potential of being green, or have not yet been pressured into becoming green through concrete demands made by customers, investors and the legislature. However, the financial sector’s attention is being increasingly drawn to companies that underperform or supply inadequate information. The Dow Jones Sustainability Group Index, for example bases 30% of its entire sustainability criterion on external communications written by companies about themselves. Another example is the Swedish Green Index, which focuses attention on under achievers in reporting quantified environmental data.

A probable cause for the failure of many companies to see the net benefit in this sort of reporting in some branches is the low level of demand placed on them by customers and focused environmental opinion, as well as in many cases the existence of significant distance to the end-consumer (Ljungdahl, 1999, p. 169). For instance, mining and metal industries often deal solely with industrial customers, that do not place the same level of environmental demands on their suppliers as end consumers do. Therefore these businesses have often settled for reactive environmental efforts, such as simply complying with the demands of the legislature. Schuster (2000) sees that environmental reporting is also an important information tool within the industrial sector in a study including Tetra Pak and Ericsson. An explanation for this may be that the brand names of the two companies are exposed to end consumers (either directly or indirectly) through the services that they themselves or their customers provide.

Gray et al. (1993) see that it would be useful to study why so many companies at that time (1993) did not carry out any environmental disclosures. Since then, the number of

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6 Allan White, Chairman of the Global Reporting Initiative’s Workshop in Stockholm, 1999, brought up the same phenomenon. The importance of company size is shown when comparing the environmental reporting studies of Global 100 (Krut and Moretz, 2000), the Fortune Global Top 250 (Kolk et al., 2001; KPMG, 1999) and Fortune Global 1100 companies (KPMG, 1999).

7 According to Olof Herolf, Price Waterhouse, as well as the chairman of the jury for awarding the best Swedish CER of the Year, 1998.

8 Miljö index is the Swedish name of the Green Index developed by the Insurance company Försäkrings AB Folksam, the daily financial paper Finanstidningen and the small environmental consultancy, the Green Index.

9 ‘Die Notwendigkeit ist aber auch im Industriesektor bereits vorhanden, wie dies bei den Gesprächen mit Tetra Pak und Ericsson erkennbar war.’
companies producing separate environmental reports has risen by 1000% globally (1993 to 1999), according to a prognosis contained in *Miljörapporten* (1999, p. 35). The Tellus Institute (1999) found similar development in their estimations of the numbers of companies producing environmental reports annually during the 1990s. Moreover, when extracting data from the Corporate Register web site (2000), which is a world directory of published corporate environmental and social reports, it becomes clear that a rapid growth in the number of environmental reports occurred between the years 1992 and 1999. This was followed by a drop in the number of reports produced in 2000. However, despite the rapid increase of reporting during the 1990s, there are still very few companies producing environmental reports. A report from the New Economics Foundation (2000) shows that a very small proportion of the companies listed on either the New York or London stock exchanges produce these types of report. Furthermore, this study detected a similar occurrence on the Stockholm Exchange (see below). The study also found that those companies altering the practice of producing separate environmental reports to including environmental sections in their annual reports all belonged to sectors having considerable environmental impacts.

A workshop for experts in the field, held during the 1996 *Eco-Management and Auditing Conference*, concluded that there was a need for standardizing the reporting format, the reporting of significant effects and quantifiable targets. The majority of the participants also saw the making environmental reporting mandatory as beneficial for increasing the information flow from companies (Brophy and Rikhardsson, 1997).

The latest development in environmental reporting incorporates it into the triple bottom line of corporate responsibility – environmental quality, social equity and economic prosperity (GRI, 1999; Tarna, 1999; Wheeler and Elkington, 2001).

**MOTIVES BEHIND ENVIRONMENTAL REPORTING**

At the ceremony for awarding the Best Corporate Environmental Report in Sweden for the year 1997, the CEO for Scandinavian Airlines System (SAS), Jan Stenberg, explained the motives behind the company’s award-winning performance to the audience, using the following: ‘an honourable environmental profile is profitable’; ‘a true conscience is a bonus’ and the urgent need to ‘escape shabby political discussions’.

The profitability of an environmental profile refers to the gains made by the stockowners; a phenomenon explained using *economic man* behaviour and *stakeholder theory* (Jaggi and Zhao, 1996). Stenberg’s *true conscience* could be represented by the stakeholder group *duty to the environment*, used in the 1993 DTTI study referred to above. Avoiding political debate and actively steering public opinion are two efficient evasive communication tactics. Creating a positive image of the company is often monetarily more effective than implementing sweeping changes to one’s own organization (Ljungdahl, 1999; Wolff, 1986). However such behaviours can be seen as *by-pass* solutions. This term can be compared with the *end-of-pipe* solutions of the 1960s and 1970s, and the *in-process* solutions of the 1980s.

Electrolux claims that environmentally friendly products sell well and are keen to show how the company could gain business advantages by being proactively green, e.g.
through their environmental reports. Their environmental department had successfully demonstrated to management that green range products returned higher revenues per product to Electrolux than the average product fleet did. Companies that understand the advantages of being perceived as concerned about nature are trying to present a credible image of themselves to the public. Therefore by attempting to gain moral support from secondary stakeholders (Clarkson, 1995; Gray, et al., 1996, p. 46), reporters may explain in their reports that their ultimate purpose is to create shareholder value. Therefore it is in the name of self-interest (increasing shareholder value), that Electrolux takes environmental concerns seriously.

When the performance of the green products yielding better returns was presented to Electrolux management, they soon realized that the green range was restricted to the more exclusive products. Products that may generate higher revenue than the average product fleet – environmental performance excluded – since this green range was adopted to more exclusive products with e.g. more control buttons. Electrolux has nevertheless gained a lot of positive attention as a result, and benefited from free advertising in for example, ISO TR 14032 (1999, pp. 63ff), wherein the Electrolux study was presented as an example of applying ISO 14031, Environmental Performance Evaluation, for reporting an increased shareholder value through good environmental product performance.

One reason why many companies report environmental data is the constant and increasing demand from their customers for environmentally related product and organizational information via for instance questionnaires, observed by Ljungdahl in the Swedish pulp and paper industry (1999, p. 169). Furthermore Naturvårdsverket (Swedish EPA) (1999) indicates that the identified stakeholders have been of immense importance since 1993 (SustainAbility, 1996; DTTI, 1993).

Skillius and Wennberg (2000) argue that carrying out external environmental reports may have positive effects within the reporting company itself. Hence companies experienced in corporate environmental reporting often perceive gaining greater benefits from the internal information gathering procedures themselves rather than from the external communication. The information gathering process can work as an environmental tool, informing and engaging employees.

The way environmental information is handled within a company determines the nature and extent of these gains. Companies often work on their CERs in a centralized, project-oriented organizational structure. Within a specified timeframe (normally a number of months) a few selected individuals gather information relating to environmental performance under constant time constraints. The information gatherers usually work closely with the group responsible for environmental disclosures; however, the information gathered is not destined to be used in the everyday management of the corporation. These project-orientated routines do not enrich the results with adequate accuracy or transparency. Instead, this could be better managed if new operational methods aimed towards continuity of data flows were designated, enabling faster as well as more rigorous feedback (Isenmann and Lenz, 2000a, 2000b). Moreover the environmental performance would then be accessible to those closest to where the effects occur, thereby giving them the opportunity to reach the data in almost ‘real time’, and avoiding having to wait unnecessarily for an inaccurate annual environmental report. The process of collecting

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13 According to Henrik Troberg’s PhD lectures at the Royal Institute of Technology, Stockholm, 1999.

14 The award for the Best Swedish CER of the Year is announced by Företagskonomiska Institutet in co-operation with the business magazine Affärsverlden each year. Wennberg, as a member of the committee, mentioned the importance of seeing CER as a process and not as an annually recurring ‘project’.
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data could thereby become an integrated part of the environmental management system (EMS), providing input to everyday decision making, as ought to be the case in the ongoing process (ISO FDIS 14031, 1998, p. 3.1).

Despite the motives described here, many studies indicate that no clear positive or negative correlation exists between environmental and economic performances (Schaltegger and Figge, 2000; Ilntich and Schaltegger, 1995; Johnson, 1995), and hence represent low economic benefits to company owners. Stanwick and Stanwick (2000) however found a relationship existing between moderately performing companies (financially speaking) and high rates of environmental disclosure and environmental commitment. Higher-performing companies had a lower rate of disclosure (contradicting the hypothesis of the study), and the lowest indices of environmental disclosure were found amongst lower-performing corporations. Environmental reporting has the potential to be used as a tool for two-way communication for (i) determining stakeholder preferences and (ii) improving the internal EMS, but is usually used merely for one-way information disclosure (Herremans et al., 1999).

DISCREPANCIES IN REPORTED MESSAGES

The reliability of corporate environmental reporting has been brought into question (Azzone et al., 1996a; Maltby, 1997; Ljungdahl, 1999; New Economics Foundation, 2000). Niskanen and Nieminen (2001) have compared the positive and negative information contained in the environmental disclosures of publicly listed Finnish companies with widely known and related events, and concluded that ‘...the environmental reporting sample firms cannot be considered objective...', which is likely to be mainly due to a lack of legislation and strict standards.

The main environmental disclosure messages conveyed by companies listed on the OM Stockholm Exchange through their environmental and annual reports presented in document format on the Web have been compared in this study. These companies are referred to in the report as DERI producers15. Within this group, 20 out of 24 companies produce separate environmental reports. The forestry company AssiDomän and the energy supplier Graninge have integrated their environmental reports into their annual reports for the fiscal years 1998 and 1999 respectively. The investment company Industrivården, on the other hand, continues its long tradition of producing integrated environmental reports describing their investment policies and the environmental work relating to their core holdings. Within the DERI group, there are some discrepancies seen between the strategic importance of environmental issues contained in the environmental reports and the financial reports. This paradox is in line with the findings of Brignall and Modell (2000), in the area of public sector management accounting, regarding the balancing of conflicting stakeholders through de-coupling; inducing organizational stability rather than change (cf. Bergström et al., 1998).

The messages conveyed in the strategies, policies, visions, mission statements and the words of the CEO contained in the environmental and annual reports of the investigated companies have been compared in this study. For instance, ten environmental reports out of 24 talk about the importance of environmental concerns for the company, while the corresponding strategic sections of the annual reports for the same companies fail to mention the word environment altogether. It should be mentioned, however, that annual

15 Companies that provide documented environmental reports on the Internet (DERI). For more information regarding the study describing those companies on the OM Stockholm Exchange that produce DERIs, see Cerin (2000).

reports containing strategic sections that are totally lacking environmental concerns do normally include subsections about the environment elsewhere in the report. These environmental/social sections are normally located further back in the annual report, varying from one column to two pages. Nevertheless – contrary to this practice – the European Commission’s study on corporate environmental reporting (Jones, 1999) recommended the following in relation to inclusions in annual reports:

Chairman’s or Chief Executive Officer’s Statements… should include references to the existence of environmental policy/principles, Environmental Management Systems, environmental targets and objectives, and refer the reader to locations within the annual report, environmental report or other publications where more detailed information can be found (Jones, 1999).

Akzo Nobel mentions the importance of a good environment in its environmental report. In its 1999 environmental report for instance, it states that ‘Concern for health, safety and environment is an integral part of Akzo Nobel’s business policy’. The company fails however to mention environmental concerns altogether in the annual report’s strategy and policy section (The 1999 Akzo Nobel Environmental Report and the 1999 Akzo Nobel Annual Report, 2000).

Four companies among the 24 DERI companies on the OM Stockholm Exchange are currently foreign based. Of these four, only one manages to mention environmental issues in the annual report’s strategic section: Boliden. Boliden has been found responsible for causing two major environmental incidents in the late 1990s, one in Spain and one in Sweden. The former incident, a dam failure in southern Spain, is well known, where almost 3000 acres of farmland and the Dañana National Park including a 40 km range of river channels were affected, leading to the decimation of local agriculture, and habitat for numerous bird and fish species. Boliden estimates the cost of setting aside provisions for the accident to total US $42.5 million. This does not include the costs to the environment nor the immense loss of credibility for the company. In response, Boliden is now including phrases in the titles of their annual and environmental reports, such as ‘rebuilding value’ and ‘continued responsibility’ respectively.

Swedish-based companies also show dis-similarity paradoxes. The telecommunications provider Telia, which has direct, end-consumer contacts, declares in its business concept and environmental policy contained in its environmental report for 1999 that ‘The environment constitutes a prominent part of Telia’s business’ (translated from Swedish to English by the present author). However in the corresponding section of their annual report (1999), it fails to mention environmental issues altogether.

**Table 1. Discrepancies in the strategy and policy sections of AstraZeneca’s environmental and annual reports in 1999, describing the strategic importance of environmental concerns**

<table>
<thead>
<tr>
<th>Environmental report</th>
<th>Annual report</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Safety, health and environmental (SHE) considerations are core to… all our activities shall take account of social, environmental and economic factors… ’</td>
<td>‘The core of AstraZeneca’s strategy is the application of science and technology to deliver a continuous flow of effective new products, designed to meet the needs of healthcare providers and patients; products which deliver true value in the treatment of disease.’</td>
</tr>
</tbody>
</table>

Messages Conveyed in Environmental Reports and Corporate Action

Not only are there discrepancies found to exist between messages conveyed by various
company reports, but there are also cases of discrepancies occurring between what is reported in their environmental and social reports, and what has actually been done in reality. This was found by the New Economics Foundation (2000), who presented several examples of discrepancy between what companies report in their environmental reports and what they actually do in reality, using large companies such as BPAmoco and Ford as examples.

Four out of the five corporations mentioned earlier – with an indicated de-coupling in their reporting to different stakeholders and also to what they do – are also members of the Dow Jones Sustainability Group Index (DJSGI), the exception being Ford. Several indexes, derivatives and funds, have either directly or indirectly (through bolstering credibility by DJSGI listing) based their evaluation of companies largely on the companies’ own external communication. As this screening process is based on these companies’ own communication, it therefore selects corporations with the highest market capitalization value, thus the highest growth thereof (Cerin and Dobers, 2001a; Patten, 1991). Later on in the same year, the New Economics Foundation (2000) raised the following question rhetorically: ‘…we reward a company which manufactures harmful chemicals by placing it at the top of the Dow Jones Sustainability Group Index. Why? In part, because it produces a social report’ (see also Fries and Feldhusen, 2001; Cerin and Dobers, 2001b). Furthermore, the Foundation also states that

To date, there is no concrete evidence that social reporting results in improved social and ethical performance, and without the pressure that would be required for increased uptake, few companies will take on the responsibility to issue the data, unless required to do so (New Economics Foundation, 2000).

Ljungdahl (1999), Pettersson and Earl (1998), KPMG (1999) and Bränfeldt (2000; 1999) identify a need for increasing the level of quantified data in environmental reports, and thereby meet the needs of stakeholders through solving some of the discrepancy problems.

THIRD-PARTY VERIFICATION, REPORTING STANDARDS, RECIPIENTS AND STAKEHOLDERS

Third-party verification

By using the Corporate Register database on the Internet (2000), information can be retrieved regarding various kinds of environmental and social reporting from businesses and other organizations. The environmental reports produced in Sweden during 2000 have been investigated in this study. Not even one-third of these reports (31%) were verified by a third party. Similar results were gathered from the KPMG 1999 study on environmental reporting, which shows that amongst the 100 largest companies in each of 11 countries (a total of 1100 companies) only 24% produced environmental reports. Of these 296 companies, only 50 (19%) had their reports verified by a third party. Two sectors stood out as underachievers in the study, being electronics and computers, and construction and building materials, where no reports were verified; while the sectors of oil and gas, and utilities occupied a leading position with respect to verification. Country wise, the UK occupied a prominent position, where just over 50% of the environmental reports were verified. In contrast, only one US-based company subjected itself to external verification. Interestingly, only 15 verifiers carried out all these third-party verifications, with a select few accounting firms dominating totally. According to the same KPMG study, KPMG are the largest of the
companies on this list (the 1100 companies), beating the second-place verifier, PricewaterhouseCoopers, with twice as many assignments. Of those companies retrieved from the Corporate Register database that were verified by Swedish verifiers, Deloitte and Touche and Den Norske Veritas were the dominating verifiers.

Important to keep in mind here (and which can often be forgotten in the CER debate) is that these accountant and management consultancy firms are themselves stakeholders in this reporting development. In the short term, the uncertainties from loose and diverging standards provide fertile ground for profitable management consulting commissions instead of a regime of simply merely reviewing assignments.

The credibility problem – a case study
Nike is the largest of all the sports retailers. In their reports, the company has stated that they are, ‘the only buyer to require a full cash minimum wage’, and that their ‘corporate policy is to keep orders at or below the level equivalent to 48 hours of work’ per week (Nike, 1998; Clean Clothes Campaign, 2000www). Ernst and Young and the World Bank have for example undertaken verifications of such statements. There are several indications that Nike does not practice what it preaches. For instance, Boje (2000) states the following in his article on Nike:

There have been abundant reports of Nike corporal punishment: women in China being locked in cages for poor sewing (Chan, 1996), arrests of workers for organizing in Indonesia (Ballinger, 1997), seven toilets for ten thousand workers in Indonesia, . . . (Manning, 1997) (Boje, 2000).

Boje goes on to list others.

Ernst and Young (E&Y) had been carrying out internal audits at Nike since 1994, investigating the correlation between Nike’s principles and its labour practices. An internal audit performed by E&Y in 1997 found discrepancies between these policies and practices in a Vietnamese sneaker18 factory, contradicting the last five years of public declarations by Nike (Knight, 1997). In spring 1998, one Nike employee went public with the report, damaging the credibility of both Nike and E&Y. Some 77% of the employees in one Vietnamese plant were reported to suffer from respiratory problems due to carcinogen levels in the air that were many times higher than the amounts allowed by Vietnamese regulations. Other contradictions of Nike’s principles related to emissions released into nature by subcontractors, salaries, working hours and child labour. The entire E&Y report on discrepancies between what Nike say and do was available at Corporate Watch (URL http://corpwatch.org/trac/nike/ernst/audit.html); (see also www.cnn.com/US/9711/08/nike.vietnam/).

As is apparent above, consultants carrying out environmental audits normally report to company management. Environmental audits are hence mainly of an internal managerial character (Maltby, 1995). Ball, Owen and Gray (2000) disturbingly found in their study on external transparency or internal capture of third-party statements that the current verification practice manifests itself as a managerial consultancy rather than a commitment to transparency and accountability.

Reporting Standards

The first phase of the development of corporate environmental reporting has been
unstructured and diverging. In the current phase of development, an obstacle to third-party verification is that there are usually at least several NGOs and national bodies, all trying to influence reporting in their preferred way. Applying Utterback’s (1994) theory of innovation dynamics this can be seen as an interim and fluid phase characterized by innovation in CERs and the attempt to achieve a dominant design in reporting. The interests trying to affect the CER process in the period after the emergence of CER are many, leading to a divergence within the process. The European Commission (Jones, 1999) indicated that there are 15 different guidelines being used by companies producing environmental reports. Naturally, not all these parties share the same goals, and hence the development of reporting has not yet progressed in a converging way. The heterogeneity of information contained in environmental reports makes them incomparable (Jones, 1999). Today, initiatives aimed at converging the practices are being taken by for example the Global Reporting Initiative (GRI), which has received strong support and acceptance worldwide for its guidelines on sustainability reporting (see GRI, 2000). There exist also several guidelines for verifying environmental reports.

The core question for most reporting standards is for the reporters to ascertain who the stakeholders of the company are and to adjust the report thereafter. Thus a similar practice to what has been common practice in social reporting is being advocated (Roberts, 1992). In the current early phase of development of the ISO guideline for environmental communications (external and internal) stakeholder identification is recognized as of key importance and will be dealt with further (ISO, 2001).

Recipient appraisal

Recipient appraisals of these reports do not seem to judge them highly. A study looking at social reports reveals that less than one-third of British shareholders expect that companies producing environmental reports are run better than those not producing them. Only 15% of British stakeholders thought that these reports reflected a real change in corporate culture. Some 50% of business and financial journalists regarded these reports as merely glossy PR with little real substance, while 31% of the shareholders expressed the same sentiment (MORI, 1999).

A study by Pettersson and Earl (1998), investigating the environmental reporting requirements made by the financial communities, shows that they all ask for important quantitative data to be included in environmental reports. To them, the important data describe risks, costs and strategies in measurable terms. However, the analysts did not appear to appreciate information about environmental opportunities to any great extent. Bränfeldt (1995) also reported similar findings a few years earlier, from a Swedish context. Analogous results were also extracted from a report by Naturvårdsverket (Swedish EPA) (1999), who found, moreover, that there are discrepancies in the target readers identified by the reporters and the actual readers of the environmental reports.

Stakeholder identification and consultation

Both Pettersson and Earl (1998) and Naturvårdsverket suggest increasing the focus on targeting those whom the report makers want to reach. GRI (2000), Skillius and Wennberg (2000) and Haines et al. (1996) also highlight the importance of the stakeholder identification process. Azzone et al. (1996), Azzone et al. (1997) and, Brophy et al. (1999) as well as IBM (1995) and Nortel (1995) also analyse the formatting requirements on environmental reporting of key stakeholders. Perhaps not so very surprising is that having knowledge about what is desired by the stakeholders makes it easier to arrange the
environmental information to obtain a higher degree of message penetration.

After first identifying the stakeholders, the process can then continue by consultation. Stakeholder consultation is found to be highly important in sectors that have a high level of public exposure. Stray and Ballantine (2000) have come to following conclusion:

If environmental disclosure is used to legitimise a company’s activities in the eyes of its stakeholders, then it can be argued that consultation with those stakeholders about their concerns is a relevant and necessary activity (Stray and Ballantine, 2000).

The Stray and Ballantine study shows that the energy sector followed by the food and drink sector and water sector puts the most effort into stakeholder consultation. The electronics sector, followed by the banking sector, is least likely to conduct discussions with interested stakeholders. The importance of early stakeholder identification is shown in the ISO Working Group for Environmental Communications – ISO 14063 (2001).

ECO-EFFICIENCY AND SUSTAINABILITY DEMANDS ON ENVIRONMENTAL REPORTING

As Utterback (1994) points out, there are many parameters other than superior product functionality that determine what will evolve to be a dominant design. This paper points out the emergence of a converging trend focusing on stakeholder identification in the process of conducting CERs. However, this section intends to show the projected scope of an environmental report, if steering towards eco-sustainability as a stakeholder is pursued.

Stakeholder identification and tailoring reports thereafter is central in many environmental reporting guidelines, as indicated earlier. Roberts (1992) indicates that stakeholder-adjusted reports are also common in social reporting; another reporting area that is not governed by a strict set of rules.

What information do company stakeholders need reported if they are to steer companies towards eco-efficiency and/or sustainability? Firstly eco-efficiency has to be defined. One definition which is often referred to comes from the World Business Council for Sustainable Development (Schmidheiny and WBCSD, 1992) and is commonly cited as follows:

Eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the Earth’s estimated carrying capacity.

Sustainable development as defined in Our Common Future (Bruntland Commission’s Report – WCED, 1987, p. 43) is world progress that ‘meets the needs of the present without compromising the ability of future generations to meet their own needs’. This paper deals with the environmental and economical aspects of sustainability, mainly excluding the social dimension – an eco-sustainability.

19 The sectoral division used in the Stray and Ballantine (2000) study is automobile, banking, electronics, energy, food and drink and water.
20 The authors (Stray and Ballantine) found this surprising since the electronics sector may perceive themselves as having larger environmental impact than the banking sector. After having browsed through numerous CERs I found that the mean environmental policies of the electronics community are to a larger extent focused on sustainability and the low life-cycle impacts of their products. Some companies are dealing with lowering the environmental burdens of the customers with their equipment. The banking sector, however does not have a tradition of environmental concerns, as they have very little direct environmental impact. As a consequence, banking has traditionally not as strong a focus on sustainability in general, and a greater need for orientation guidance by its stakeholders. If indirect impacts are included, banking may have much larger environmental impacts, through financing activities that are harming our life-supporting milieu.

21 Compare with the case of VHS versus Beta standards where the inferior technology became a dominant design.
Hence, focusing on eco-sustainability on a global level encompassing the eco-efficiencies of lower levels (Cerin and Laestadius, 2000).

In ISO 14001, Clause 4.3.1 (ISO, 1996) states that 'The organization shall... identify the environmental aspects of its activities, products or services... to determine those which have or can have significant impacts on the environment... these significant impacts are considered in setting its environmental objectives.' ISO 14031 deals for example with how to report and communicate an organization’s environmental performance (ISO FDIS 14031, 1998). In the case of the companies undertaking environmental reporting, a considerable number are system designers for end products and are large in size. When adopting the concept of eco-efficiency and the scope of an environmental management system stated in for example ISO 14001, it is insufficient to merely report on the carbon dioxide (CO₂) emissions limited to the judicial borders of the company divided by turnover. An improvement in emissions within the judicial limits of the company may, within the scope of the whole life-cycle of the functions offered by the product and/or service, be a worsening of eco-efficiency (Cerin and Ramírez, 2000). It may, and in many cases should, be asked to what extent can life-cycle assessments (LCAs) efficiently handle this problem? Among the strongest critics are Schaltegger and Burritt (2000), whose comments on life-cycle assessments include the following: ‘...of poor quality and... of little value for decision making and accountability purposes’. The present author and co-researchers concur with this view, recognizing that the accuracy of LCAs are not as high as input/output analyses of small company units (see Cerin and Ramírez, 2000). However, it ought to be argued strongly that it is better to address the right issues (see ISO 14000, clause 4.3.1, and ISO 14040 series) in a fairly careful way than the wrong issues (or accounting with too narrow a scope) optimally. Regarding the question of accountability, the abolishment of judicial I/O for the use of life-cycle scope will impose great difficulties on the aggregating of data to macro-level, due to considerable risks for double accounting.

Nevertheless the need for one scope does not need to exclude the need for another. On the contrary there is a need for scopes covering both the control-based delimitations – as in judicial fiscal accounting – and the influence-based delimitations – as in ISO 14001 clause 4.3.1. (see Figure 1). The control-based delimitation corresponds to direct financial risk, since the organization is directly affected by e.g. new environmental policies, and the influence-based delimitation to indirect financial risk, since other actors along the value chain are primary affected. The case study below illuminates the potential size of CO₂ emission costs from judicial entities and product life-cycles.

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22 This implies for example that a company owning a design should include the entire chain of value of its products and services in its considerations when setting the environmental objectives for its organization (see also ISO 14040 series, 1997).
The financial risk from product life-cycle emissions – a case study

Cerin (2000) states that only 60% of the online-CER producing companies in that study could provide complete information regarding CO₂ emissions within the limits of the judicial company over turnover. Even fewer companies can extract information covering total emissions of CO₂ from the various different parts of the product life-cycle and relate it to the designer company. Ericsson is one of the few companies that can. Ericsson’s total CO₂ emissions (from both primary and secondary energy used for example in heating, travel and production) in 1999, from all sites, plus travel (including commuting) and product transports come to 0.8 million tonnes. Corresponding emissions for the entire product life-cycles during the same year (1999) were 7 million tonnes (Ericsson, 2000). Restricting the focus to only CO₂ emissions from the judicial entity ‘Ericsson’, which is the same delimitation as used in financial accounting, would only include the CO₂ emissions from primary energy use, which would be 200 000 tonnes. Hence, Ericsson’s judicial CO₂ emission contribution is around 3% of the total CO₂ emissions generated by Ericsson products’ entire life-cycles. Note that this percentage would have been even lower if the activities of suppliers and customers also had been included in the total figure.

In Economic Outlook (OECD, 1999) the OECD states that the implied carbon price required to achieve the Kyoto targets would on average be US $200 per tonne emitted carbon¹ (US $54 per tonne emitted CO₂, since 27% of total weight is carbon). Using the OECD emission costs with the Ericsson data produces the following:

<table>
<thead>
<tr>
<th>Delimitation</th>
<th>CO₂ emissions (tonnes)</th>
<th>Cost (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ericsson 1 (judicial entity (JE) hence only primary energy)</td>
<td>200 000</td>
<td>11 000 000</td>
</tr>
<tr>
<td>Ericsson 2 (JE + secondary energy and transports plus commuting)</td>
<td>800 000</td>
<td>43 000 000</td>
</tr>
<tr>
<td>Total life-cycle of products</td>
<td>7 000 000</td>
<td>378 000 000</td>
</tr>
</tbody>
</table>

Ericsson’s gross margin² for the fiscal year 1999 was US $14 654 000 000³ (SEK 89 522 million). Thus the CO₂ emission cost for the entire life-cycles of their products produced during 1999 comes to 13% of Ericsson’s gross margins (which was the best gross margin² in this company’s history). The emission costs limited to the company only were not negligible, but much smaller at 0.38% (Ericsson 1) (1.5% (Ericsson 2)) of the gross margin².

Volvo can be used as an example of a vehicle manufacturer. Volvo’s gross margin² for the fiscal year 1999 was US $10 494 000 000³ (SEK 89 522 million). Corresponding life-cycle costs for the CO₂ emissions relating to the products produced by Volvo during 1999 over Volvo turnover is estimated by using data from Volvo’s annual and environmental reports, the Green Index (2000) and from to Albrecht (2000, 2001). The CO₂ emission cost for the entire life-cycles of the products produced during 1999 is equal to 64% of Volvo’s gross margin².
<table>
<thead>
<tr>
<th>Delimitation</th>
<th>CO₂ emissions (tonnes)</th>
<th>Cost (US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volvo</td>
<td>614 000</td>
<td>33 000 000</td>
</tr>
<tr>
<td>(JE + bought energy (not all transport–commuting))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total life-cycle of products</td>
<td>174 000 000</td>
<td>9 400 000 000</td>
</tr>
</tbody>
</table>

A Compare with existing tax in Sweden levied on the CO₂ content in fuels, being US $43 per tonne emitted CO₂ (0.37 SEK/kg CO₂) (SOU 1999, p. 11).

B Similar calculations may be carried out using for example value added in the denominator instead of gross margin, thus showing the impact of CO₂ emissions on activity rather than profit. The value added is – besides volatile over time – more difficult to estimate, especially externally compared with the gross margin.

C Exchange rate in December 1999 was 8.53 SEK/US $.

The life-cycle scope reporting, as is shown here, may be of interest to the financial community for determining the entrepreneurial risks resulting from financial impacts of possible tightening future legislation relating to eco-sustainability and the Kyoto goals (cf. Matten, 1996).

CONCLUDING DISCUSSION

The environmental reports in their current forms started off at the beginning of the 1990s, when businesses in the petroleum and chemical sectors wanted to provide their own side of the story in the environmental debate. These companies thereby took the public debate initiative, which was formerly more or less reserved for NGOs. In sectors plagued by environmental disasters, most corporations started to report in order to avoid the negative stakeholder impression that they had something to hide, even though these companies themselves may have had nothing to do with any specific environmental incident. Therefore by environmental reporting, businesses protect and expand their material asset of legitimacy.

Studies have pointed to the fact that there is little quantifiable substance, such as emission performance indicators or quantifiable targets, contained in environmental reports. Despite the rapid increase in the use of corporate environmental reports during the last decade, it is primarily the giants among corporations that produce environmental reports. This growth has now also slowed considerably.

Companies in sectors under public pressure attempt to gain legitimacy by telling their side of the environmental story, steering public attention into more positive directions and therefore away from actual problems. This phenomenon could be compared with the end-of-pipe solutions of the 1960s and 1970s, and to the process solutions of the 1980s. Reporting practices wherein attempts are made to report around the real environmental problems are referred to as by-pass solutions; perhaps the additional dimension of environmental work aroused in the 1990s.

There are many guidelines drafted by various NGOs and governmental bodies that companies are currently encouraged to follow; but the majority of companies do not follow any particular practice. Consequently, there is great variety in the content of what is reported. Moreover, a gap is indicated between what companies state in their environmental reporting, what they state in their annual reporting and what they actually do in reality.

Providing company stakeholders with information tailored to fit the sole aims of the reporters has resulted in contradicting strategic messages being conveyed in environmental
reports on the one hand, and annual reports and company actions on the other. This phenomenon has been illuminated and supported by other articles using institutional theory.

This phenomenon with its double messages, as well as immense inherent difficulties in comparing environmental reports, creates a credibility gap. The large number of organizations trying to influence how and what to report on does not necessarily make the situation any better. By failing to work together towards a common goal, NGOs may in fact be beneficial to the underachievers in environmental reporting, since these reporters do not have to stand out from a homogenous crowd of environmental reports.

From a macro-perspective, this paper indicates a need for at least one accounting ingredient to be applied to environmental reporting – CO₂ emissions relating to either company turnover, value added or gross margin. One scope of emissions may follow the judicial entity enabling national aggregations as well as the direct financial risk due to possible environmental policy action to be ascertained, and the other scope follow e.g. the life-cycle of the products of the companies owning the design, thereby elucidating the companies’ overall financial risks as well as the opportunities presented throughout the entire value chains, on which it is dependent. I call these two scopes of environmental reporting respectively control-based and influence-based delimitations.

If environmental reports are to be deemed credible, they have to be underpinned by a firm set of rules preventing opportunistic behaviour by the reporting parties. The sustainability of environmental and related reports depends heavily on reducing the credibility gap. If the gap is not decreased, the decline in environmental reporting that we can already see signs of today may escalate. Today’s companies seek legitimacy by impression via the production of environmental reports. These company-based reports merely present the company’s side in the environmental debate, while the regulated area of annual reporting, with its well developed reporting practices, forces companies to seek legality – legal legitimacy. The environmental reporting of today, therefore functions more as a marketing tool than an accounting innovation.

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COMMUNICATION IN CORPORATE ENVIRONMENTAL REPORTS


Information has also been retrieved from:

The environmental reports (including social and sustainability reports) and annual reports covering the fiscal year 1999, available on the Internet in document format from 26 companies listed on the

OM Stockholm Exchange. (Printed versions were published in 2000).

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Paper VI

Characteristics of Environmental Reporters on the OM Stockholm Exchange

*Business Strategy and the Environment.*


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Environmental Strategies in Industry – Turning Business Incentives into Sustainability
CHARACTERISTICS OF ENVIRONMENTAL REPORTERS ON THE OM STOCKHOLM EXCHANGE

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External validation of company environmental performance is normally based on corporate environmental reports, due to the lack of other information. Critics of these reports, however, claim that these are no more than public relations exercises, consisting mainly of wordy descriptions and glossy pictures. It is therefore important to turn the spotlight on the real character of the companies behind the reports. Fewer than 10% of the companies listed on the OM Stockholm Exchange, however, provide documented environmental reports on the Internet (DERI) annually. The highest DERI percentages are found among those industry sectors that began reporting some ten years ago. Data from the Dow Jones Country Index Sweden shows that DERI producers have an average market capitalization some six times greater than non-producers. Moreover, the DERI producers emitted twice as much CO₂ per turnover as the non-DERI producers. The fact that less than half of the companies on the OM Stockholm Exchange presented CO₂ emission data somewhat weakens the conclusions on emissions. The fact that 60% of the DERI producers could not provide complete CO₂ emission data for their companies does say something concrete about the usefulness of current DERIs as a tool for externally determining company environmental performance characteristics. Copyright © 2002 John Wiley & Sons, Ltd and ERP Environment.

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INTRODUCTION

Since the early 1990s, a new branch of corporate reporting has emerged from relative insignificance to an important information source for discussing company-related environmental issues and communicating performance to stakeholders. Today, mainly the larger companies listed on the stock exchanges within the OECD countries¹

¹ For more information see the following: The Global Environment Business Magazine Tomorrow lists corporate environmental reports (CERs) on the Internet, World Wide Web at www.tomorrow-web.com. CERs can also be viewed at Sunderland University’s site Centre for Environmental Informat-ics at cei.sund.ac.uk. The Corporate Register online database on the Internet at http://www.corporateregister.com/ houses a collection of corporate environmental reports.
conduct environmental audits. Reporting, furthermore, is separately from their financial reports, even though – in most cases – this is not required by law.

The voluntary nature of reporting in conjunction with the increasing interest in environmental issues shown by corporate stakeholders has created a new field of inter-company competition and the rapid growth in environmental reporting seen in the past few years. In other words, the underlying driving force for conducting these reports is corporate self-interest. It can be argued that communicating through these separate reports has been performed primarily where a net corporate benefit has been achieved (Gray et al., 1990). These net benefits may, however, be difficult to estimate. Lately, there have been some indications that growth in the number of environmental reports produced in some markets is flattening out, for example in Sweden and the UK (Bränfeldt, 1999; 2000a; 2000b; Corporate Register, 2000). A report from the New Economics Foundation (2000) shows that, despite this, only a very small proportion of the companies listed on either the New York or the London Stock exchanges produce these types of report. A similar occurrence has been observed in this study on the OM Stockholm Exchange, where only the larger companies report annually (see below).

Different companies have different motives for commencing reporting on company-related environmental issues and performance data. For some industrial sectors, what one usually calls industries, such as oil, transport and chemicals, and in particular those companies within these sectors responsible for well publicized environmental disasters (such as Exxon and Union Carbide), there has been little, and in some cases nothing to lose by reporting on the impacts on ‘our common’ environment caused by their own activities.

On the contrary, by producing environmental reports these companies use the opportunity to tell their own side of the environmental story (Brophy and Starkey, 1996, p. 183). These sectors still remain under environmentalist or legislative pressure (or both) today, and produce some of the best environmental reports (according to e.g. KPMG, 1999). In addition, companies manufacturing products for ordinary citizens (end consumers) and the firms retailing these products have quickly realized the potential of showing their environmental concerns to their stakeholders. Good examples of these companies are Electrolux and The Body Shop (KPMG, 1999).

While there has been a small increase in the number of information categories and an even smaller – incremental – enlargement in the number of quantitative categories, there has been an explosion in the number of pages in each environmental report (Ljungdahl, 1999, pp. 59ff). Hence, instead of an increased focus on quantifiable performance issues such as the amounts of resources consumed and substances emitted, the opposite appears to be the case. As early as 1982, Wiseman concluded that there is no correlation between the length of an environmental disclosure (in corporate annual reports) and its quality. The positive correlation that Wiseman (1982) found is one between social disclosure and market performance, but not between social and market performances. There was, moreover, a tendency towards lengthy disclosures omitting costs. Ingram and Fraizer (1980) notice the lack of

2 Industry sectors are often referred to as industries in economics, but the financial markets and related literature uses the term sectors. This paper will use sectors when referring to industry sectors.

3 In the UNEP–Sustainability Benchmark Survey (1997), the magazine Tomorrow presents their ranking of the best environmental reports by sector in the following descending order: pharmaceuticals, transport, retail, electrical engineering and banking.

4 Ljungdahl (1999, p. 554) divided the environmental reports into 11 categories based on the recommendations from the UNCTC (1991) and the model used by Almer et al. (1992) and Ljungdahl (1995).

5 Cerin and Dobers (2001a) found that companies with large market capitalization have a higher market performance than medium-sized and small ones. The authors, moreover, found that this is one reason why Dow Jones’ sustainability index outperformed the Dow Jones Global Index. Dow Jones and SAM Sustainability Group had, however, marketed the caring for sustainability issues to be the sole reason.
external monitoring of these social disclosures as an explanation of the deficiency in quantitative data (and lack of reporting requirements, Rockness, 1985), enabling the poorly performing companies to bias their selections in their disclosures (cf. Cerin, 2002, on decoupling in environmental reporting and company performance).

Through the variety of means at their disposal, and by illuminating unquantified data, companies are able to choose what to report to suit their purposes (Ness and Mirza, 1991). Stray and Ballantine (2000) identify environmental disclosure differences across industry sectors and see a correlation between the higher rate of disclosures and increasing company size. The writers do not, however, study the correlation between rate of disclosures and rate of emissions — an eco-efficiency indicator. As Stanwick and Stanwick (2000) describe environmental reporting messages from firms, ‘However, not all firms incorporate this environmental leadership philosophy (Dechant and Altman, 1994) into their day to day operations’. Schaltegger (1997) describes the accounting phenomena — where in most cases the quality cannot be assessed by the recipients — as being due to existing management incentives together with loose accounting requirements, where bad information quality tends to drive out good quality reports. This situation differs markedly from fiscal accounting, which is based upon a strict set of accounting rules, predetermined by legislation and professional associations of accountants.

The aim of this report is to provide a state-of-the-art study on the distribution of environmental-reporting companies on the OM Stockholm Exchange, by industry sector, stock market value and ratio of CO₂ emissions per SEK turnover. The following section of the report relates the environmental-reporting distribution amongst companies listed on the OM Stockholm Exchange to type of industry sector and stock market value. The same distribution by ratio of CO₂ emissions per SEK turnover is described in the next section. We conclude with a discussion.

DOCUMENTED ENVIRONMENTAL REPORTS ON THE INTERNET (DERI)

Along with its Scandinavian neighbours, Sweden is often referred to as a world leader in the adoption of IT and mobile telecommunications services (Berggren and Laestadius, 2000; McGuire, 2000; Wired, 2000). Access to information on the World Wide Web can decrease the time needed by stakeholders to retrieve information they are looking for. Moreover, information on the Internet also provides opportunities for decreasing the amount of paper used in the process of obtaining information. However, the vagaries of human behaviour are difficult to predict and may in fact lead to an increase in paper consumption through an increasingly positive predisposition to printing out reports.

In a country where Internet penetration is comprehensive, corporate Internet sites are important tools for both accessing and providing access to stakeholders. When browsing the environmental information available at corporate web sites it soon becomes apparent that data stored on an electronic document format is relatively easy to use for extracting specific information with the help of, for example, search tools. However major difficulties can be encountered in relation to ascertaining whether or not all of the relevant information contained in a web-based report has been retrieved, or whether part or all of the web site is up to date and therefore whether or not all of the environmental disclosures correspond to the current fiscal year and the corresponding annual report.

The focus of the study has been on the environmental messages retrieved from documented environmental reports on the Internet (DERIs). The DERIs used in the study are all

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6 Akin to the theoretical concept developed by Akerlof in his Noble prize rewarded article ‘The market for lemons’ (1970).
updated annually at their respective corporate web sites.

The companies listed on the OM Stockholm Exchange have been evaluated in this report to find out the extent to which they produce DERIs. The OM Stockholm Exchange consists of two lists: the A list and the O list. It is the listing committee that decides on the respective listing of each company. According to the exchange, in simple terms, ‘The larger companies are listed on the A list’ and ‘The O list is intended for other companies, for example companies which lack the requisite operating history for listing on the A list.’ (OM Stockholm Exchange, 2000). There are also other determinants of list residence, such as stronger demands on ownership structure and external communication. More information regarding listing requirements can be found at the OM Stockholm Exchange web site (http://www.omgroup.com/transaction/).

The Swedish-based environmental consulting firm, EcoManagement SE (2000), provides Internet visitors with a list of the companies listed on the OM Stockholm Exchange that have DERIs or similar environmental reports (e.g. html-based ones) available at their respective web sites. This can be viewed on the branch index page and shows that, of the 88 companies on the A list, 22 create DERIs annually. After visiting all the respective company sites during this study, it was found that 20 of these 22 companies provided an environmental report on an electronic-document format – in other words DERIs all in PDF. The remaining two companies provided their environmental information solely on the format of html-coded pages. On the O list, just four out of the 219 listed companies provided environmental reports on the Web. These four are all available as electronic documents. In total, 24 DERI producers were, hence, identified. A validity check has been made on Eco-Management’s work, dividing companies into those which produce environmental reports on the Internet, and those that do not. The review is incomplete however, and includes the majority of the 307 companies listed on the OM Stockholm Exchange but not all of them. The analysis resulted in finding one company originally categorized as a non-producer, that was in fact a DERI producer (and therefore included with the 24 DERI producers above).

**DERI-producing companies, by sector**

The companies listed on the A and O lists have been divided into 16 industry sectors in this study. This enables the companies to be assessed by industry group with respect to the availability of their electronically stored environmental report documents on the Internet. The results have been plotted in Figure 1. The \(x\)-axis contains two numbers in parenthesis after each industry-group name.

(i) The first is the number of constituent companies within the industry group.

(ii) The second is the number of companies within the group that provide DERIs at their web site.

The two end-parentheses that are followed by an asterisk indicate that one of the companies within the sector providing environmental data on the Web is not presenting it in an electronic document format and it is, thus, not an actual DERI.

The industry-sector data shown in Figure 1 may not provide a solid enough foundation for making comprehensive and rigid conclusions regarding each sector’s behaviour. Moreover, the industry-sector information may be difficult to grasp at first glance. However the data do contain several underlying messages as presented below.

(i) The highest percentage of environmental reporting on the Net is found in the power, the chemical and pharmaceutical and the forestry industry sectors. These sectors also contain some of the earliest environmental reporters, such as petroleum and pharmaceutical firms.
(iii) The chemical and pharmaceutical group consists of seven companies. Three of these seven produce environmental reports on the Internet. Two of these are DERI reporters and the other, a former Swedish and now US-based company, has stopped publishing their electronic document and now displays their environmental messages briefly on their web pages. Organizations within this sector that are not listed on the stock exchange also provide environmental information on the Net in document form.

(iv) The forestry group is based on nine companies. Three of them document their environmental data on the Internet. This industry sector is annually rated as the best reporting sector in the prestigious award the best Swedish CER of the year.
Numerous sectors contain at least some companies producing environmental documentation annually. Often, however, they make up less than one-sixth of the total number of companies. A good example is the large manufacturing industry sector and the industries of raw materials; transport; real estate and construction; banking and investment and service providers. The formerly inactive (environmentally speaking) banking and investment sector today includes two companies providing environmental documents on the Web.

The real underachievers, failing to present any annual environmental reports stored in document format on the Internet, are the following sectors: retail; research, medical and IT; consumer goods; media; and consulting.

These findings agree reasonably well with those from the following two studies: ‘Percentage of companies in the Fortune global top 250 companies producing a corporate environmental or HSE report’, and ‘Corporate environmental and HSE reports for 1100 companies, by sector’, both KPMG (1999) studies. In the sub-study of 1100 companies, the three sectors showing the greatest proportion of reporters were chemicals and synthetics; forestry, pulp and paper and utilities (including power). Similar findings per sector were made in the Fortune Global 250 study by Kolk et al. (2001). Clarke and Gibson-Sweet (1999) found in their legitimacy-based study that companies within sectors experiencing high levels of public exposure and producing large (direct) environmental impacts are more likely to communicate environmental information in their reports. Kolk et al. (2001) also found this to be the case.

DERI-producing companies, by market-capitalization size

The data underlying the sector distributions in Figure 1 clearly indicates reporting differences between the A- and O-listed companies. For instance, one in every four A-listed company provides environmental reports on a document format on their web site, while less than one in 50 O-listed companies do. The Dow Jones Database at http://indexes.dowjones.com was used to estimate the capitalization size of the reporting companies. This world index database covers approximately 95% of the underlying market capitalization on each regional exchange. Companies listed on the OM Stockholm Exchange that today are based in other countries (such as ABB, Akzo Nobel, AstraZeneca) are excluded from the Dow Jones Country Index Sweden7. On the OM Stockholm Exchange, the group consisting of large (LRG) and medium-sized (MID) companies contains 28 companies (of which only three are LRG), ten of which produce environmental reports in the form of electronically stored documents on the Web. Using the Dow Jones market capitalization range codes, it can be seen that a good one-third of the large and medium-sized companies produce environmental reports on the Web. The corresponding numbers for small companies (SML), totalling 31 listed companies, is five. In other words, only one-sixth of the small companies produce a DERI. The remaining 239 stock exchange companies not covered by the 95% of the OM Stockholm Exchange market-capitalization value (which is included in the Dow Jones Country Index Sweden) are smaller than the SML companies on the Dow Jones indexes and are referred to in this study as ‘tiny’ companies (TNY). Only six TNY companies produce DERIs, which is one in every 40 (Figure 2).

The market capitalization size is retrieved from the Dow Jones Database for each company as of 28 November 2000. Applying these data both to companies that electronically store their environmental-report documents for public access via the Internet and companies that do not shows that the average market capitalization of the former is more

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7 These corporations are all examples of mergers and acquisitions that have led to migration of their abodes abroad, away from Sweden.
than USD 8700 million and the latter less than USD 3700 million. This means that the companies electronically storing their environmental-report documents for public access via the Internet that are also included in the Dow Jones Country Index Sweden are in general 4.2 times larger than the rest of the companies within the same country index (Figure 3). If TNY companies were also included in the comparison between DERIs and non DERIs, the company market-capitalization differences would be considerably greater.

It is possible to roughly estimate the size of TNY companies. In these calculations, the average size of the TNY companies storing electronic environmental-report documents for public access on the Internet and those that do not is assumed to be about the same. There are six TNY companies that store their environmental reports on the Web, and 233 that do not. Assuming that company size is equal will therefore not bias a comparison with all companies on the OM Stockholm Exchange. Moreover, applying the assumption (equal average TNY size) further to the larger company groups (LRG, MID and SML) would decrease the differences in market capitalization size (shown above) between DERIs.
and non-DERIs. Consequently, the calculations show that the average market capitalization for both TNY company groups is (at least) USD 49 million. Excluding foreign-based companies, companies publishing environmental-report documents on the Internet number 21, whereas non-reporters number 277. The corresponding market-capitalization size for these two groups is USD 6200 million and USD 370 million respectively. Hence the DERI group is 16 times larger than the non-DERI group in terms of average capitalization.

The data and telecommunications company Ericsson dominates the OM Stockholm Exchange as well as the Dow Jones Country Index Sweden. Ericsson’s market capitalization, for example, constitutes almost 40% of the entire Dow Jones Country Index Sweden at the closing date 28 November 2000. This over-weighting towards Ericsson increases the average market-capitalization size of the environmental-reporting companies on the Internet in the comparison. If Ericsson is excluded from the Swedish-based companies on the OM Stockholm Exchange a significant difference in the mean company-market-capitalization values, however, still remains between those companies reporting environmental issues in document format on the Internet and those that do not. The relative size difference between the two groups is in excess of 5.6 times (Figure 4).

These findings are in agreement with those of the KPMG International Survey of Environmental Reporting 1999 (however not commented on by them). In the KPMG study, the reporting rate amongst the Fortune global top 250 companies was 35%, while the corresponding rate for the 1100-company sub-study was 24%. Moreover, Patten (1991) found social reporting was more common amongst larger corporations early in 1991. Stray and Ballantine (2000) also found that the mean turnover of companies disclosing environmental information was almost ten times as large as the mean turnover for those that do not. Similar results have been found regarding environmental management, environmental-aspects identification and environmental assessments by Bugge (1998), Karvonen (2000), Wagner et al. (2001) and Holgaard and Remmen (2000) in small electronics companies, by Cerin and Laestadius (2000) in smaller corporate units and by Burstöm (2000)

8 Ericsson is a DERI producer.

9 Perhaps KPMG did not think in these terms – of firms’ market capitalization differences.
in smaller municipalities. Cerin and Laestadius (2000) showed that, not surprisingly, the environmental analyses carried out at smaller units constituted a larger share of unit revenues and, thus, were more difficult to finance. Lanoie et al. (1998) indicate, moreover, that larger firms are more severely hit by negative environmental information (i.e. regarding bad environmental performance and penalties) reaching the capital markets. Bartol and Martin (1994) found the limited human and financial resources in smaller companies to be a main reason for these management differences. This is unfortunate as 70% of global GNP may be generated by small to medium-sized companies (SMEs) (O’Laire and Welford, 1996), plus they are most likely to be important with respect to the environment too. Cerin and Dobers (2001a; cf. Fries and Feldhusen, 2001) found that the companies retrieved from the Dow Jones Sustainability Group Index have been selected on the merits of their own communications, which has led to the selection of large companies with respect to market capitalization.

**COMPARISONS OF RATIOS OF COMPANY CARBON DIOXIDE EMISSIONS PER TURNOVER**

Folksam, a large Swedish insurance company, and Finanstidningen, a daily Swedish business paper, have teamed up with a consultancy firm called GreenIndex to develop an environmental index called the Miljöindex. The aim of the index is to provide a clear picture of how companies listed on the OM Stockholm Exchange perform environmentally in terms of, for example, real quantified emissions.

The key indicator, which has received most attention, relates company contribution to potential global warming (GWP) to company turnover. This index also provides a picture of the financial risk the company faces, for instance where new policy instruments are implemented to decrease contributions to

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**Selecting the large reporting firms – a case study**

The Swedish based construction company Skanska, by far the largest company in the Swedish construction sector, is one such example. The company has exhibited great ability in communicating their environmental work, for which it has been given awards in environmental report competitions. The company has been selected by Dow Jones’ two sustainability indexes as the sustainability sector leader. Skanska is, hence, (rated as) the most sustainable company in the world, within the construction sector. Despite this reward, Skanska have currently built house moulds before being ready for use, and bridges that may collapse due to lost support structure one year after construction – the bridges having to be closed and reconstructed. More serious is the ongoing investigation in Sweden where Skanska and a few other construction companies are accused by the antitrust authority of having split the Swedish construction market among them. Skanska and NCC constitute together 70% of the Swedish construction market. NCC has already admitted its wrongdoing and documents said to show Skanska’s involvement are now in the possession of the state attorney. The cartel is estimated to have cost Swedish municipalities considerable resources that could have been used, e.g. in schools and care of the elderly. Skanska, however, denies any involvement, so far. Information in the ongoing investigation carried out by the Finnish antitrust authority, however, also claim Skanska’s and NCC’s involvement in a cartel of the Finnish construction market. The Swedish Taxation authority, moreover, accuses the four largest construction companies for seriously avoiding to pay social fees in their construction projects. The largest Swedish environmental disaster in the 1990s was, moreover, caused by Skanska when trying to bore a tunnel through a boulder ridge in southern Sweden. Surprisingly enough, they failed to finish the tunnel, but managed to lower the surrounding water table considerably. When Skanska, eventually, tried to stop this lowering of the groundwater table nearby farmland was contaminated, cattle stock had to be destroyed and food from the area was declared not suitable for consumption. The workers, moreover, got the cancerous chemical, Roca-Gil, into their blood through their skin and by inhalation. When the environmental scandal became established, in late 1997, the railway project was stopped. If this Skanska, in fact, is the world’s most sustainable construction company, how then do the other construction firms act?

a As discussed by Cerin and Dobers (2001b), this sustainability rating is heavily based on qualitative information provided by the evaluated companies themselves.
global warming. The main constituent of GWP for most energy types is carbon dioxide (CO₂) emission.

The validity of the Miljöindex could, however, be made higher. Of 311¹⁰ companies listed on the OM Stockholm Exchange, 184 chose not to complete the environmental index questionnaire. Nevertheless, this is the most ambitious known attempt in Sweden to quantify comparisons of environmental performance. Of the 127 companies listed on the A list (containing mainly large companies), 61 fully or comprehensively reported their CO₂ emission data. Of the 184 non-responding companies, only 29 were listed on the A list¹¹.

In this article, firm environmental performance on the Miljöindex for the year 2000 (based on those companies that have reported emission data) has been divided into two groups: one group that presents its environmental-report documents annually on the Web, and the other that does not. The

¹⁰ The reason why GreenIndex have a total of 311 companies listed on the OM Stockholm Exchange while the firm EcoManagement SE only has 307 companies on the very same exchange (in their lists on environmental reports provided on the Internet) is that these two firms have extracted the companies listed on the OM Stockholm Exchange at different times.

¹¹ For further information regarding the methodology used by GreenIndex see the URL http://greenindex.com

commonly used ratio company¹² CO₂ emissions per company turnover can, for example, illustrate how a CO₂ tax would financially affect a company¹³. Using the company ratios, it is found that the average emission ratio for the reporting companies is 26 tonnes of CO₂/turnover (SEK million), which is twice the emission ratio for the non-reporters of annual environmental data, at 12 tonnes of CO₂/turnover (SEK million) (Figure 5). Hence, the financial risk for the non-reporting companies may be just half that of the reporting companies, with respect to possible implementation of CO₂ abatement policy instruments.

Due to the uncertainties associated with this environmental index the highest and lowest ratios within each of the two groups have been omitted from Figure 6. Even without this correction, however, the difference between

¹² Both direct emissions from the judicial borders and indirect emissions are included in the index. The latter are connected, for instance, to purchased electricity and transports. A more appropriate measure would be emissions that originate from within the judicial entity per added value. This definition corresponds directly with what has been generated in the studied company and with traditional accounting practice. Unfortunately, such a ratio will vary widely depending with fluctuating revenues and hence give a distorted picture of company performance.

¹³ The company’s financial risk may be due to the conditions elsewhere in the value chain of its various products and services. To account for these risks a ‘from-cradle-to-grave’ technique has been used for these emissions.

Figure 5. The average ratio of CO₂ emissions per turnover for companies producing environmental report documents on the Web (DERI) and those that do not (non-DERI)
the averages of the two groups remains considerable.

To estimate the potential financial impacts on companies from the use of a possible policy instrument the Kyoto protocol carbon emission targets will be used together with the estimated initial cost for emitting one tonne of carbon dioxide to USD 54 – according to the OECD Green model (OECD, 1999). Hence, the potential initial costs for DERI and non-DERI companies per turnover will be\(^\text{14}\) 1.5% and 0.7% respectively. Using these indicators on firms in different phases in the value chain of offered services – emitting carbon during use – we can clearly see that the direct financial risk from carbon emissions of a manufacturing company is not that important. The indirect financial risk originating in the use of their products by their customers is, however, large (see Table 1 – a brief version of the table in Ericsson, 2001\(^\text{15}\)).

The companies that present annual environmental reports in document form on the Web generally show poorer environmental performance with regard to CO\(_2\) usage, and are, therefore, less eco-efficient in this regard\(^\text{16}\). These findings are in line with those of Kreutze \etal (1996), who claim that companies within sensitive (highly polluting) sectors report more frequently. This was also found to be the case by Halme and Huse (1997), stating that ‘Corporations in industries which are traditionally considered to be polluting, report most on the environment’. Moreover, Wagner \etal (2001) showed that there is no correlation between registered environmental management systems (EMSs) and (i) better environmental performance, (ii) better economic performance or (iii) better overall performance. Even more surprising is the fact that among the companies producing environmental reports 60% could not provide complete information about how large their CO\(_2\) emissions were. This is astonishing, especially considering

\(^\text{14}\) If using the exchange rate in January 2002, 10.40 SEK/USD.
\(^\text{15}\) Sector financial risk calculations made by P. Cerin for Ericsson Environmental Report 2000.

\(^\text{16}\) This fact may be surprising to some, due to the fact that environmental funds and indexes are largely based on external company communication and the positive attention ‘good’ reporters have received in environmental reporting contests. The worst emitters (per turnover) are however the agents with the largest interest in achieving legitimacy gains.

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Table 1. Potential company CO\(_2\) emission costs per net sales, described per business sector

<table>
<thead>
<tr>
<th>Line of business</th>
<th>Tonne CO(_2)/net sales MUSD</th>
<th>Potential emission cost/net (%) sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing companies</td>
<td>IT and telecom</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>Vehicle manufacturer</td>
<td>0.46</td>
</tr>
<tr>
<td>Service producers (users)</td>
<td>Mobile telecom provider</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Road transport</td>
<td>22(\times)</td>
</tr>
</tbody>
</table>

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the importance attached in the Kyoto Protocol to limiting emissions of substances that contribute to global warming. This lack of data is also astonishing since, as Cerin and Dobers (2001b; cf. 2001a) point out, numerous environmental indexes and environmental investment funds base their sustainability criteria heavily or exclusively on companies’ own – self-generated external – environmental communication.

**CONCLUDING DISCUSSION**

Despite the rapid increase in the use of corporate environmental reports during the last decade, often only the corporate giants produce such reports and the growth in reporting has flattened considerably in recent years. On the OM Stockholm Exchange, only 8% of the Swedish-based companies produce documented environmental reports on the Internet (DERIs). When excluding the largest single company on the OM Stockholm Exchange (itself a DERI producer), this shows that the Swedish-based, DERI-producing companies on the exchange still have an average market-capitalization almost six times greater than the non-reporters. Comparisons with other studies (see above) show that environmental work is complex. The costs of environmental work are, hence, too high for the SMEs. This is also assumed to be the case in producing DERIs. Moreover, it was found that the power, plus chemicals and pharmaceuticals and forestry sectors, today have the highest proportion of DERI-producing companies on the OM Stockholm Exchange. The same business communities, in fact, were the ones to begin producing CERs (corporate environmental reports) around the world about a decade ago.

Studies point to the fact that that there is little quantifiable substance in these environmental reports, for instance in the form of emission-performance indicators. Some 60% of the DERI companies could not provide complete information about their CO₂ emissions despite the facts that CO₂ emissions and their resulting risks for global warming are central step issues in the current global environment debate.

A correlation between environmental-reporting practice and company CO₂ emissions per turnover could be observed. On the OM Stockholm Exchange the average CO₂ emissions/turnover for DERI companies is twice as large as it is for non-DERI producers. We may, hence, conclude that companies producing DERIs on the OM Stockholm Exchange are less eco-efficient than the non-DERI companies when concerning contributions to global warming. The emission data, however, vary considerably depending on the extent to which the companies report their relevant data, and on the way they do it.

Polluting companies (those emitting relatively large amounts of carbon into our atmosphere) exhibit a greater inclination to report their interest in the environment. By spending a considerably smaller amount on an impressive environmental report, large companies may both gain environmental legitimacy (through positive PR), and save millions by not having to attend to the real problem of improving their environmental performance. This is actually a case of decoupling environmental information from firm activities as well as a bypass of environmental public attention to other environmental issues other than those that may be of sensitive character to the firm. For a small company, expenditure on such reports may be difficult to cover due to smaller turnover and emissions, and relatively little public pressure.

As indicated, there is a risk in basing the sustainability criteria of environmental indexes, environmental and classifications in investment funds heavily or exclusively on companies’ own – self-generated external – environmental communication. This may lead to the selection of companies that are large with respect to capitalization, and more importantly, of companies with higher ratios of CO₂ emissions per turnover. How then will society’s stakeholders – i.e. environmental and sustainability indexes – be able to induce the
corporate community to move towards sustainability if it is not possible to determine just how eco-efficient companies actually are, through reading available reports?

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What does the Performance of the Dow Jones Sustainability Index Tell Us?

Eco-Management and Auditing.

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WHAT DOES THE PERFORMANCE OF THE DOW JONES SUSTAINABILITY GROUP INDEX TELL US?

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The Dow Jones Sustainability Group Index (DJSI) is really a family of indexes used to identify and track the performance of sustainably run companies. When the DJSI was introduced in September 1999, it was claimed to outperform the more generalized Dow Jones Global Index (DJGI) with respect to market capitalization growth. Corporations, NGOs and governmental agencies often refer to the DJSI for illustrating that integrating economic, environmental and social factors into the operations and management of a company increases shareholder value and business activity transparency. The DJSI is also used by global corporations to legitimize the efforts they put into sustainability. However, there have been no studies carried out to date that illuminate the business activity transparency of the DJSI. This study investigates the structure and transparency of the DJSI compared with the DJGI. The results of this study show that the DJSI focuses more on the technology sector than the general DJGI does. The average market capitalization value of companies listed in the DJSI was found to be two-and-a-half times the corresponding average for those listed in the DJGI. This raises some legitimate questions. Does the superior performance of the DJSI reflect the greater efforts DJSI companies put into sustainability, or a dependence on asymmetric distributions in company sectors, world regions or market capitalization? This paper therefore endeavours to illustrate the transparency of the DJSI. Copyright © 2001 John Wiley & Sons, Ltd. and ERP Environment.

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ASSESSING ENVIRONMENTAL PERFORMANCE

Several attempts have recently been made to assess the environmental performance of corporations. These can be categorized into three approaches: (i) holding general discussions about environmental reports (Kolk et al., 2001; Niskanen and Nieminen, 2001; Wheeler and Elkington, 2001); (ii) addressing how environmental reports can be used to
guide corporations in their learning about their environmental performance (Herremans et al., 1999) and (iii) formulating environmental reports to optimize their reliability, consistency and relevance (Kolk, 1999; Ljungdahl, 1999). It has been shown that setting environmental goals (Ransom and Lober, 1999) and conducting environmental audits (Diamantis, 1999) prior to the formulation of environmental indicators can illuminate relevant processes, and experience from the US shows that, when institutionalized effectively, environmental performance indicators have proven to be quite successful (Stead et al., 1998). What the three environment-assessment processes mentioned above have in common is that they provide sustainability-focused corporations with a means to measure their environmental performance, while at the same time increasing its visibility and transparency (Ball et al., 2000; Bowen, 2000). These methods attempt to reflect company sustainability from the inside out. Change can also be triggered by specific internal processes within a corporation that radiate outward. These changes can be referred to as inside-out changes, and can be triggered, for example, by a corporation's focussed efforts to achieve recognized standards of accreditation such as ISO 14001 or the British Standard, BS 7750 (Robinson and Clegg, 1998).

An inside-out approach to achieving sustainability is by definition initiated by the corporation and does not necessarily include an evaluation of the corporation itself. On the other hand, an outside-in approach is based on an independent evaluation and comparison of various corporations and their activities, their influences on a particular industrial sector, company size and even the type of internal environmental regulation (Baylis et al., 1998; Dobers, 1999). The recently launched Dow Jones Sustainable Group Index (DJSI) attempts to achieve sustainable business processes from the outside in. It is claimed that the DJSI, which includes corporations that exhibit good, active sustainability track records in the areas of social, environmental and economic performance, has actually shown better development than the Dow Jones Global Index (DJGI) (Dow Jones, 1999a).

It has been suggested recently that the DJSI will improve global transparency and benchmarking, thereby improving current methodologies for screening processes aimed towards achieving sustainability (Dobers and Wolff, 2000), but they also state that

The point is not that the Dow Jones methodology is perfect or correct... (but) that one of the global players in the financial market gives legitimacy to issues that were previously treated as 'soft'. The new index will contribute to forcing companies to make transparent, report and evaluate continuously, as well as communicate their measures in the sustainable framework (Dobers and Wolff, 2000, p 147).

This paper discusses the DJSI in detail, analysing its structure, focusing on market capitalization, regional and sector distributions compared with other Dow Jones indexes. This paper attempts to increase the transparency of the DJSI itself in the wake of claims that it enhances the transparency of sustainability processes within international corporations. Though the criteria used for sustainability within the DJSI are themselves important, they have not been examined here. After first presenting DJSI objectives, concepts, key attributes, assessment criteria and evaluation systems, the paper then focuses on sector distribution, regional distribution and market capitalization of the DJSI, comparing these with corresponding DJGI distributions.

THE DOW JONES SUSTAINABILITY GROUP INDEX

I welcome the efforts of Sustainable Business Investor in Europe to engage investors in delivering sustainable development. Businesses will face many challenges and opportunities as we try to deliver a sustainable Europe. We have already seen firms that are acting in a sustainable manner enjoy a distinct advantage over their competitors, and we can expect this advantage to increase in size and frequency. Investors have an
important role to play in monitoring and encouraging sustainability in businesses – both for their own and for society’s sake (Margot Wallström, EU Environment Commissioner on the homepage of Sustainable Business Investors Europe in association with Dow Jones Sustainability Group Indexes and SAM Sustainability Group: http://www.sbi-e.com/ [13 February 2001]).

In September 1999, the Dow Jones Sustainability Group Indexes GmbH (a partnership between Dow Jones Global Indexes and the Swiss-based SAM Sustainability Group) launched the first global indexes for tracking the performance of sustainability-driven corporations worldwide, the DJSGI. As corporate sustainability has long been assumed to increase long-term value for shareholders, the DJSGI is seen as creating a ‘hard’ benchmark for corporations genuinely interested in sustainability issues, rather than just superficially canvassing the ‘soft’ issues associated with sustainable development (WCED, 1987; Dobers and Wolff, 2000, pp 147f). Though the DJSGI is committed to addressing the economic, environmental and social elements underpinning sustainability, the superior performance of pro-active, cost-effective and responsible corporations is directly related to their commitment to the following five corporate sustainability principles (Dow Jones, 1999a):

- **innovative technology** – in products and services;
- **corporate governance** – including management, organizational capability, corporate culture and stakeholder relations;
- **shareholder relations** – based on sound financial returns and long-term economic growth;
- **industrial leadership** – by demonstrating commitment – and
- **social well-being**.

These principles facilitate the quantification of sustainability performance in corporations (especially in the financial sector), aiming to pursue sustainability opportunities and avoid sustainability risks.

The DJSGI is really a family of 20 different indexes derived from the DJGI. Five of these indexes are geographical in character: the world as a whole, Europe, North America, the Asia–Pacific region and the USA. Each geographical index is then crossed with subset indexes that exclude stock associated with corporations involved in tobacco, gambling or alcohol. Some 226 of the largest 2899 corporations in the DJGI have been included in the DJSGI. Selection is based on analysis and evaluation of information returned via questionnaire from top-level management, contained in company policies and reports and continuous review of stakeholder relations as seen through the relevant media. The top-ranked 10% of performers in each industry group are included in the DJSGI and subject to annual review. The sustainability performance of corporations included in the DJSGI in 1998 has been ‘backcast’ to 1993 to chart their historical performance.

The DJGI on the other hand (against which the DJSGI has been benchmarked) seeks to cover 80% of the market capitalization on the major stock exchanges throughout the world (this figure increased to 95% in mid-2000). Various exclusion factors play a role here; for instance, where non-residents are prohibited from controlling more than 25% of company stock, then only 25% of this market capitalization is included in the DJGI. The DJGI with its 2899 companies is divided into various regional indexes, which are in turn crossed by 122 industrial sectors.

THE DOW JONES SUSTAINABILITY GROUP INDEX AS A BENCHMARKING TOOL

The DJSGI is designed to provide a worldwide benchmarking tool for new products and services introduced by financial institutions. Institutions interested in using the DJSGI to compare the performance of their own financial instruments are required to pay a fee. Since the launch of the DJSGI in September 1999, 25 licences have been issued to financial institutions in 11 countries. These licensees have created a variety of
index-based financial products including active and passive funds, equity baskets and warrants (see Table 1).

Four market-driven DJSGI attributes have been highlighted as accounting for its suitability as a benchmarking tool (Dow Jones, 1999a):

- **global representation** – of sustainability-driven companies from the global DJGI;
- **rational assessment method** – a multi-factor analysis including equal weighting of environmental, social and economical criteria;
- **consistent method** – including an industry specific questionnaire, the analysis of company policies and reports as well as stakeholder relations – and
- **flexibility** – inclusion of certain regions and exclusion of others.

While the aim of the DJSGI is to function as a tool for benchmarking historical performance, it is important to note that the choice of corporations for inclusion in the DJSGI was based on sustainability analysis and ranking carried out in late 1998 and early 1999. In order to achieve a benchmark for comparing historical performance, the performances of the DJSGI corporations were backcast to 31 December 1993. This method was chosen pragmatically to overcome the near impossible task of recreating the selection process of sustainability analysis and rankings used in the past. All indexes are expressed in monthly price returns in US dollars. Table 2 shows how DJSGI stocks have performed better than DJGI stocks in all regions except Europe during this period.

### METHODOLOGY

In order to find out whether any non-sustainability-related factors have contributed to the higher growth seen in the DJSGI (compared with the DJGI), a formula has been constructed here to enable differences in the distribution between the index families to be studied by sector, region and market capitalization value (see Formula 1). The DJSGI – DJGI distribution differences are then related

<table>
<thead>
<tr>
<th>Licensee</th>
<th>Country</th>
<th>Type of Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baloise Insurance</td>
<td>Switzerland</td>
<td>Fund</td>
</tr>
<tr>
<td>Banque Générale de Luxembourg</td>
<td>Luxembourg</td>
<td>Fund</td>
</tr>
<tr>
<td>Bear Stearns</td>
<td>UK</td>
<td>Capital guaranteed note</td>
</tr>
<tr>
<td>Cordius Asset Management</td>
<td>Belgium</td>
<td>Fund</td>
</tr>
<tr>
<td>Credit Suisse Asset Management</td>
<td>Switzerland</td>
<td>Fund</td>
</tr>
<tr>
<td>DWS</td>
<td>Germany</td>
<td>Fund</td>
</tr>
<tr>
<td>Folksam Sak</td>
<td>Sweden</td>
<td>Fund</td>
</tr>
<tr>
<td>Fürst Fugger Privatbank</td>
<td>Germany</td>
<td>Fund</td>
</tr>
<tr>
<td>Gerling Investment KAG</td>
<td>Germany</td>
<td>Fund</td>
</tr>
<tr>
<td>GZ Bank</td>
<td>Germany</td>
<td>Equity linked note</td>
</tr>
<tr>
<td>HypoVereinsbank</td>
<td>Germany</td>
<td>Warrant</td>
</tr>
<tr>
<td>ING Fund Management B.V.</td>
<td>Netherlands</td>
<td>Fund</td>
</tr>
<tr>
<td>Invesco</td>
<td>Germany</td>
<td>Fund</td>
</tr>
<tr>
<td>Kepler Fonds KAG</td>
<td>Austria</td>
<td>Fund</td>
</tr>
<tr>
<td>Nikko Asset Management</td>
<td>Japan</td>
<td>Fund</td>
</tr>
<tr>
<td>Oppenheim KAG</td>
<td>Germany</td>
<td>Fund</td>
</tr>
<tr>
<td>Robeco Groep</td>
<td>Netherlands</td>
<td>Fund</td>
</tr>
<tr>
<td>Rothschild &amp; Cie Gestion</td>
<td>France</td>
<td>Fund</td>
</tr>
<tr>
<td>Skandinaviska Enskilda Bank</td>
<td>Sweden</td>
<td>Fund</td>
</tr>
<tr>
<td>SPP</td>
<td>Sweden</td>
<td>Fund</td>
</tr>
<tr>
<td>State Street Global Advisors</td>
<td>Germany</td>
<td>Fund</td>
</tr>
<tr>
<td>Sustainable Asset Management (SAM)</td>
<td>Switzerland</td>
<td>Fund</td>
</tr>
<tr>
<td>Sustainable Performance Group</td>
<td>Switzerland</td>
<td>Investment company</td>
</tr>
<tr>
<td>Westpac Investment Managements</td>
<td>Australia</td>
<td>Index fund</td>
</tr>
</tbody>
</table>

Table 1. DJSGI licensees by country, February 15, 2001
(http://www.sustainability-index.com)
Table 2. Comparison between the historical performance of the DJSGI and other benchmarking indexes, 3/95–3/00 (Dow Jones, 2000d)

<table>
<thead>
<tr>
<th>Index/Region</th>
<th>World (%)</th>
<th>Europe (%)</th>
<th>Americas (%)</th>
<th>Pacific (%)</th>
<th>(*) USA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DJSGI</td>
<td>164.46</td>
<td>128.22</td>
<td>312.19</td>
<td>60.86</td>
<td>297.78</td>
</tr>
<tr>
<td>DJGI</td>
<td>138.76</td>
<td>148.71</td>
<td>221.50</td>
<td>7.36</td>
<td>236.18 (**)</td>
</tr>
</tbody>
</table>

(*) Included in Americas.
(**) Benchmark in this case is: S&P 500.

to the performance of the DJGI for each of the three groups. These three sets of outcomes are then individually compared to the DJSGI – DJGI performance difference. The performance values cover the full period 1995–1999 and the distributions the turn of year 1999–2000.

Formula 1. Comparing the performance of distribution groups to the benchmarked performance difference.

\[
P_{\text{Total}} - P_{\text{Distrib. Group}} = (P_{\text{DJSGI}} - P_{\text{DJGI}})_{\text{Total}} - \left( \sum_{i=1}^{n} ((D_{i}^{\text{DJSGI}} - D_{i}^{\text{DJGI}}) \times P_{i}^{\text{DJGI}}) \right)_{\text{Distrib. Group}}
\]

\[
P = \text{performance as of Q1:1995–Q4:1999}
\]

\[
D = \text{distribution as of Q1:2000}
\]

\[
n = \text{number of distribution elements in distribution group}
\]

\[
i = \text{iterations of elements}
\]

SECTOR DISTRIBUTION COMPARISONS

In February 2000 a new global industry-classification structure was applied to the business sectors in the DJSGI. This accounts for the changes to the DJSGI sector divisions that appeared after 2000. This paper focuses on the DJSGI sector distribution reported on up until January 2000. The pre-2000 structure is therefore used for estimating asymmetric sector distribution impact and the post-1999 data converted accordingly. This facilitates valid comparison of the new and the old sector distributions. Companies included in the pre-2000 DJSGI contribution are divided into nine economic sectors, which in turn are sub-divided into 73 industry groups. The DJGI companies are also divided into the corresponding nine economic sectors, but sub-divided into 122 industry groups and subgroups.

The study has found that technology and energy have been over-weighted in the DJSGI’s nine economic sectors. The technology distribution was 4.7 percentage points, and energy 3.1 percentage points higher in the DJSGI than the DJGI. DJGI performance in these sectors shows total 5-year growth of 863 and 188%, respectively. The DJGI has on the other hand a larger distribution of financials (2.3 percentage points) and industrials (5 percentage points) than the DJSGI, with a DJGI performance for total 5-year growth of 126 and 95% respectively. Multiplying these sector distribution differences by the actual DJGI performance illustrates the difference in growth for an index with DJSGI sector distribution and DJGI sector performance to be compared to the DJGI itself. Table 3 illustrates an asymmetric sector distribution between the DJSGI and the DJGI, with the DJSGI exhibiting a 35 per cent unit higher performance than the DJGI. This finding agrees with Swedish-based, international technology funds that show large growth rates during the 1990s, far outperforming general funds (Dagens Industri/Fondstar, 2000).

Multiplying the DJSGI – DJGI sector distribution differences by DJGI sector performances reveals that a large portion of the better DJSGI performance may originate from the relatively high market distribution toward sectors with higher growth. The largest difference in sector distribution between the DJSGI and the DJGI is found in the very-high
Table 3. Sector distribution comparisons between DJSGI and DJGI performances applied to the DJSGI sector distribution (DJGI performances serve as the reference base)

<table>
<thead>
<tr>
<th>Market sector distribution</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
</tr>
</thead>
<tbody>
<tr>
<td>DJSGI Q1: 2000</td>
<td>4.4</td>
<td>3.2</td>
<td>1.2</td>
<td>15</td>
<td>0.18</td>
</tr>
<tr>
<td>DJGI Q1: 2000</td>
<td>3.2</td>
<td>3.1</td>
<td>0.2</td>
<td>42</td>
<td>0.84</td>
</tr>
<tr>
<td>DJSGI–DJGI distribution difference</td>
<td>1.2</td>
<td>0.1</td>
<td>0.42</td>
<td>138</td>
<td>0</td>
</tr>
<tr>
<td>DJSGI performance Q1: 1995–Q4: 1999</td>
<td>0.18</td>
<td>0.84</td>
<td>0.42</td>
<td>138</td>
<td>0</td>
</tr>
<tr>
<td>(%)(%) (%) (%) (%)</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
</tbody>
</table>

Basic materials
Cyclicals
Non-cyclicals (incl. healthcare)
Energy
Financials
Industrials
Technology (incl. datacom & biotech)
Utilities (incl. telecom providers)
Independent/others
Total

*The reported DJSGI–DJGI performance difference is however 50.03 percentage points.

performing technology sector, which is in surplus in the DJSGI.

REGIONAL DISTRIBUTION COMPARISONS

The DJSGI is divided into regions following the structure of the benchmark index, DJGI. This section of the paper examines the top-ranking regional distribution of the two indexes by market-capitalization size, and where differences exist explores how these may affect the index performances. Comparing the performances of the regional indexes over the second half of the 1990s provides an indication of how these distribution differences might affect the outcome of the DJSGI (see Table 4).

In order to illustrate how the regional distribution differences may be affecting the performance of the DJSGI, the DJSGI–DJGI regional asymmetries are multiplied by the regional DJGI performances (see Table 5).

Table 4. Regional distribution comparisons between DJSGI and DJGI

<table>
<thead>
<tr>
<th>Regional distribution</th>
<th>DJSGI World (%)</th>
<th>DJGI World (%)</th>
<th>Difference (percentage points of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas (excl USA)</td>
<td>5.67</td>
<td>3.26</td>
<td>2.41</td>
</tr>
<tr>
<td>USA</td>
<td>37.81</td>
<td>49.50</td>
<td>−11.69</td>
</tr>
<tr>
<td>Europe (excl. S. Africa)</td>
<td>43.28</td>
<td>29.49</td>
<td>13.79</td>
</tr>
<tr>
<td>Pacific</td>
<td>13.04</td>
<td>17.74</td>
<td>−4.70</td>
</tr>
<tr>
<td>World (excl. S. Africa)</td>
<td>99.80</td>
<td>99.99</td>
<td>−0.10</td>
</tr>
</tbody>
</table>

Table 5. Comparison of DJSGI and DJGI performances by regional distribution applied to the DJSGI regional distribution (DJGI performances serve as the reference base)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas (excl. USA)</td>
<td>2.41</td>
<td>128</td>
<td>3.08</td>
</tr>
<tr>
<td>USA</td>
<td>−11.69</td>
<td>266</td>
<td>−31.10</td>
</tr>
<tr>
<td>Europe (excl. S. Africa)</td>
<td>13.79</td>
<td>233</td>
<td>32.13</td>
</tr>
<tr>
<td>Pacific</td>
<td>−4.70</td>
<td>41</td>
<td>−1.93</td>
</tr>
<tr>
<td>World (excl. S. Africa)</td>
<td>—</td>
<td>170</td>
<td>2.18*</td>
</tr>
</tbody>
</table>

* The reported DJSGI–DJGI performance difference is 50.05.

Information retrieved from: Table 5 and Dow Jones (1999b, 2000a,b) available at http://indexes.dowjones.com/djgi as well as the 5-year performance data retrieved from DJGI data server.

Despite the predomination of European corporations in the DJSGI, as of 31 March 2000 market capitalization is fairly evenly divided between the two major regions, Europe and the USA. This is due to the fact that the US corporations achieve a market capitalization of more than double their counterparts in Europe (see Table 6).

Multiplying DJSGI – DJGI regional distribution differences by DJGI regional performances has shown that a small portion of the higher DJSGI performance may originate from the asymmetric regional market distribution. The largest differences in the regional distributions of the DJSGI (predominantly European) and the DJGI (predominantly US) neutralize the resulting performance differences.

<table>
<thead>
<tr>
<th>Regional distribution</th>
<th>Number of corp.</th>
<th>Market capitalization (million US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas (excl. USA)</td>
<td>18</td>
<td>300 661</td>
</tr>
<tr>
<td>USA</td>
<td>46</td>
<td>2 006 654</td>
</tr>
<tr>
<td>Europe (excl. S. Africa)</td>
<td>112</td>
<td>2 296 797</td>
</tr>
<tr>
<td>Pacific</td>
<td>46</td>
<td>691 894</td>
</tr>
<tr>
<td>World (excl. S. Africa)</td>
<td>222</td>
<td>5 296 006</td>
</tr>
</tbody>
</table>

**AVERAGE MARKET CAPITALIZATION COMPARISONS**

The DJSGI is made up of some 226 of the DJGI’s total 2899 companies and represents about 20% of the DJGI’s capitalization value. By dividing the total capitalization values of the respective indexes by the numbers of incorporated companies contained in each, the average capitalization value of corporations in each index can be estimated. Table 7 shows an asymmetric distribution of the average market capitalization value of companies in each of the two indexes. The average market capitalization of companies in the DJSGI is two-and-a-half times larger than the corresponding value in the DJGI (Dow Jones, 1999c, 2000c,d) (see Table 7).

Large capitalization companies in the DJGI have an average of 5.2 times the average market capitalization of the same index. Table 8 shows that large companies have a 14 percent unit higher growth than the DJGI as a whole. Another indication that large market capitalization results in higher stock market performance can be shown by introducing the Dow Jones Global Titans Index (DJGT), which represents 50 of the world’s 100 largest corporations. The DJGT outperformed the DJGI from the first quarter of 1993 to the fourth quarter of 1999 by approximately 45 percentage points (Dow Jones Indexes, 2000e). This performance is quite similar to the surplus of larger corporations in the DJSGI compared to the DJGI. Adding the capitalization of all the DJGT
companies together produces a total market capitalization of US$ 6 203 232 million. The average corporate capitalization in the DJGT comes to US$ 124 065 million, which is about six times larger than the corresponding figure in the DJSGI and 14.3 times larger than the corresponding figure in the DJGI (Dow Jones Indexes, 2000e).

The Dow Jones STOXX Index and the Carnegie indexes show that large and extremely large companies experienced higher market capitalization growth rates than middle- and smaller-sized companies during the 1990s. There appears to be a correlation between companies showing larger market capitalization and their higher performance in the stock markets. As the average market capitalization value of companies in the DJSGI is found to be two-and-a-half times larger than the company average in the DJGI, some of the higher performance in the DJSGI may result from larger market capitalization. About 14% of the DJSGI’s higher growth than the DJGI is due to company size.

DISCUSSION AND CONCLUSIONS

Results of ‘backcasting’ from 1998 to 1993 reveal that the DJSGI outperforms the DJGI (Dow Jones, 1999a). Historical data from the DJSGI in 1999 and graphs of the performance of the DJSGI in 2000 indicate no major change in this trend (Dow Jones, 2001). A regional exception to this is Europe, where the DJSGI has slightly under-performed the DJGI. According to the Dow Jones Sustainability Group Indexes GmbH, the reason for the performance difference in favour of the DJSGI is that those corporations included in the DJGI have been more profitable than their DJSGI counterparts at dealing with economic, social and environmental opportunities and risks (Dow Jones, 1999a,b, 2000c,d). This is certainly hoped to be the case.

However, as pointed out in this article, there may be other underlying factors positively influencing the DJSGI’s sustainability performance, for example (i) the DJSGI focuses to a higher degree on the technology community than does the more generalized DJGI and (ii) the market capitalization value of corporations in the DJSGI is two-and-a-half times larger than the corresponding average for the DJGI. High market capitalization value and technology are seen here as contributing to the better performance of the DJSGI in 1993 and 1999 (see Figure 1). The superior performance of the DJSGI might not therefore be exclusively due to successful management of...
This study serves merely as a starting point for further research. It raises questions such as whether large corporate market capitalization results from sustainability-driven corporations, or the converse. Partial indications are revealed in studies on municipal regions, where larger municipalities appear to have greater unutilized resources tucked away, enabling them to become early movers in sustainability (Burstrom, 2000). Turning to indications in the electronics industry, smaller companies and smaller units within large corporations appear to have fewer resources available to commit to environmental analysis (Cerin and Laestadius, 2000; Holgaard and Remmen, 2000).

There are two interesting regional differences in US and European performances. First of all, in the USA, the DJSGI performed 61 percentage points higher than the DJGI, but 20 percentage points lower in Europe (compare this with Table 2). Calculations in this study show that corporations in DJSGI Europe achieve half the average company capitalization of corporations in the DJSGI USA. The second regional difference alluded to above is that DJSGI Europe has proportionately fewer companies in the technology sector than the DJSGI USA (Carle, 2000). The two regional differences in DJSGI performance between USA and Europe discussed here may explain why the DJSGI outperforms the DJGI in USA and why the converse occurs in Europe.

An area of concern relating to the methodology of ‘backcasting’ the performance of clusters of companies in the DJSGI ought to be raised here. The method carries with it an inherent risk for making erroneous assumptions that may result in incorrect index growth values. Jagren has analysed the growth of both large and small Swedish companies over time (Eliasson, 1985; Jagren, 1988). Jagren found that the number of companies at the beginning of these studies had dropped considerably in comparisons undertaken 30 or more years later. Growing companies not only expand organically but also through acquisitions, and most of the companies in these studies had either gone into bankruptcy or been acquired. ‘Backcasts’, such as those that the DJSGI study is based on, have to take into account the fact that today’s companies are a selection of yesterday’s winners. In order to increase the transparency of the DJSGI even further, it would be interesting to study how ‘backcasting’ the index influenced the performance, especially the market capitalization growth.
Another concern here is the fact that the questionnaire for establishing the DJSGI performance figures is based on company-intrinsic processes at the cost of neglecting products and services. This raises several questions. Could individual companies in sustainability-problematic industries be included in benchmarking tools such as the DJSGI? Would it be analytically possible to enclose a life-cycle perspective in such an index? What would actually be measured?

No quantitative data on the generation of emissions or consumption of resources by companies, or their products or services, appears to have been used in the sustainability assessment criteria for the DJSGI. Managerial measurements are used extensively (accounted for by a number of management tools). We may not actually be comparing valid equivalents here. In addition, we do not really know what comes first – are sustainability-driven companies indeed becoming larger, or are larger companies adopting management tools for sustainability? We see the mere existence of the DJSGI, the use of DJSGI by investment managers and the many references by managers to the index as a sign that sustainability efforts have indeed been hijacked (Rikhardsson and Welford, 1997; Welford, 1997).

Despite the concerns raised, and its bias towards both the technology sector and larger market capitalization, the DJSGI provides analysts and others with an important tool for illuminating worldwide sustainability-driven processes. If the DJSGI is to remain a useful tool in the long run, it has to itself become more transparent in the process of bringing transparency to the sustainability of companies. Further research ought to examine the actual sustainability criteria used in the selection of DJSGI companies.

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Paper VIII

Who is Rating the Raters?

Corporate Environmental Strategy.


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Who is Rating the Raters?

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The growing interest in applying sustainability criteria to investment observed throughout the industrial world has resulted in the creation of numerous sustainability funds. The Dow Jones Sustainability Group Index (DJSGI), which is probably the best-known sustainability index, was presented by Ivo Knoepfel in Issue 8/1 of Corporate Environmental Strategy. In his article, the methodology underlying the DJSGI is said to have had a consistent framework. However, in a recent study we have highlighted some of the major elements upon which the DJSGI is based, and have found evidence to suggest that there might be other factors, unrelated to sustainability, contributing to the apparently superior market performance of the DJSGI, and which may bring its framework consistency into question. This response attempts to illuminate some of these factors.

How Consistent is the Framework?
The DJSGI was launched with much ado in 1999, amidst claims that its market-capitalisation growth outperforms more generalised indexes such as the Dow Jones Global Index (DJGI). Corporations, NGOs and government agencies often refer to the DJSGI to illustrate that integrating economic, environmental and social factors into company operations and management increases value to the shareholder. Our study investigated and compared the structure and transparency of the DJSGI with the DJGI. The results of our study show that the DJSGI focuses more on the technology sector than does the more general DJGI. The average market-capitalisation value of companies listed in the DJSGI was found to be two and a half times the corresponding average for those listed in the DJGI. This raises some legitimate questions. For example, does the superior performance of the DJSGI reflect the greater efforts DJSGI-listed companies are actually putting into sustainability, or is it merely a reflection of asymmetric distributions across company sectors, global regions and/or market capitalisation? Investigation reveals that a considerable portion of the superior economic performance of the DJSGI is attributable to a higher mean market-capitalisation value and an asymmetric distribution across industry sectors.

The historical performance of the DJSGI has been analysed through “backcasting” a selection of companies listed in the DJSGI in...
1998. The performance of the “sustainable” companies selected was tracked from 1998 back to 1993. An inherent risk with this type of selection is that it includes only those companies that survived through to the end of the investigation period and excludes those that did not. This in turn impacts on the performance of the index and draws into question the overall consistency of the framework.

Sustainability — Criteria and Assessment
Understanding the criteria and assessment of a sustainability index are essential for its correct interpretation. What are the underlying issues regarded as vital to sustainability, and how are companies assessed accordingly? Companies being assessed can experience difficulty in extracting quantifiable data, which can often result in their drafting external communications of a glossy and wordy nature. Problems arise when this sort of information is used by investors and raters attempting to accurately evaluate the efforts that these companies are actually putting into sustainability. Many indexes are, therefore, rating qualitative information provided by the companies, which can lead to an assessment-credibility problem. This is particularly relevant to the DJSGI, as the first three of the following four sources of information used in the assessment if the DJSGI are provided by the companies themselves: (1) questionnaires; (2) submitted documentation; (3) policies and reports; and (4) public information — where available.

Categorising companies into business groups or sectors is one way to stimulate companies within environmentally harmful sectors to work towards improving sustainability. At the same time, categorising companies by “the best in the industry” approach can obscure the forces acting in a dynamic economy shifting investment toward the most efficient players and inadvertently protecting polluting or resource-inefficient enterprises that will never achieve sustainability. An investor in a sustainability fund might well be more concerned with these issues than in protecting established, ageing industry structures.

Perhaps due to its over-dependence on information provide by companies about their own activities and “the best in the industry” approach, the DJSGI includes some companies with questionable sustainability, such as Suncor and Nike. For companies manufacturing energy-consuming products (such as motor vehicles), the emissions released during use often correspond to a large portion of the entire product life-cycle emissions (for example 90% for CO2 emissions). This calls for a scope that covers companies’ area of impact and possibilities to make a change. With this in mind, it is somewhat surprising that the car manufacturer BMW is the leading “sustainability” company within its industry group, yet it produces cars with high fuel consumption and performance, capable of and perhaps encouraging excessive speeds in comparison with others. One reason for BMW’s inclusion is the existence of its innovative prototype hydrogen-powered car (other manufactures are making similar attempts), attracting publicity since 1995. When it will actually be released en masse and make a real environmental impact remains to be seen?

Concluding Remarks
It is pretty safe to say that no rating system is perfect, and that continuous discussion amongst stakeholders ought to be encouraged for the ongoing development of system frameworks. Despite the imperfections alluded to above, we believe that the DJSGI has importantly drawn a lot of attention to sustainability issues through linking them to financial performance. However, we are only at the beginning of the process and more work needs to be done in the area of formulating sustainability criteria for investment, and illuminating their structure. We need to critically highlight these instruments and thereby facilitate their improvement.
Endnotes

1. For more information about ongoing research in the area of corporate environmental management and communications at the Royal Institute of Technology, Stockholm, please contact the authors.


Paper IX

Business Incentives for Sustainability: A Property Rights Approach

*Ecological Economics.*


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ANALYSIS

Business incentives for sustainability: a property rights approach

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Abstract

Public and private demands for sustainable development put pressure on firms to develop strategies that include environmental concerns. Environmental effects from products often appear as externalities, outside the legal boundary of the producing company. These companies often possess the best competence to optimise the total life cycle environmental performance of its products. They are, however, neither obliged nor stimulated enough by policy incentives to do so from a sustainable development perspective. The policy instruments used today are mostly of a control-and-demand type, i.e. they do not create sufficient incentives to go further than hedging over set requirements. Environmental concerns and tightened environmental policy parameters have mostly been associated with the notion of additional costs and thus a restriction on economic performance. However, since the mid 1990s, several papers have called for corporate win-win situations as well as instruments giving up-stream incentives for change, but not enough abatement of environmental impacts has emerged in reality. Perhaps this is due to the lack of proper connection between economic theory on the one hand, and incentive advocating articles and instruments on the other. We propose a concept for trading of product life cycle (PLC) emission rights, based on property rights and transaction cost theories considering the problem with asymmetric information over the value chain. The initial financial impacts from such PLC instruments are shown to be significant for the system provider, since emissions—and resource use—become production costs. This provides economic incentives to take an increased responsibility for information flow as well as initiatives for product innovations. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Business incentives; Sustainability; Property rights; Transaction costs; Asymmetric information; Social costs; Coase theorem; Product stewardship; Product life cycle emission rights

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1. Introduction

Increasing demand for sustainable development during the last decades has initiated actions from governments as well as firms and individuals. Governments have reacted by translating these demands into policies and laws, mostly of a CAC type. Firms have expanded the scope of corporate responsibility to include environmental issues in all levels of their operation, and a major development of environmental corporate strategies (Welford, 1996), as well as a green-washing of industry has been observed (Welford, 1997). Porter and van der Linde (1995a,b), Jaffe et al. (1995), Palmer et al. (1995) suggest corporate strategy changes to enhance environmental as well as business performance of firms. Despite all these preventive actions a continuous increase in environmental impact has been observed. Global warming, in particular, has been considered as one of the most severe and difficult to handle (see, for example, UNFCCC, 1997). An important question is if actions taken have been optimally designed viewed from a holistic environmental perspective, and consequently, if there is a need for policy instrument changes as suggested by OECD (1991, 1993, 1995, 1996, 1998, 1999), Opschoor and Turner (1994), Paras (1999), European Commission (2001).

Ownership rearrangements of life cycle emissions and the responsibilities that comes with it, central to our theoretical analysis, is one potential method to allocate responsibility for environmental harm. In practice, however, barriers to such a policy principle is likely to be considerable due to the influence by powerful stakeholders in society, opposing radical changes.

The paper is structured as follows: section two outlines the economic theoretical foundation for this paper with a focus on social costs, transaction costs and property rights. The third section discusses different environmental policy instruments beginning with CAC measures, concluding with business incentive solutions based on property rights rearrangements. The latter solutions are further discussed in the fourth section. Thereafter, the concept of the Kyoto Protocol is explained in section five. In the sixth section, pros and cons regarding trade with product life cycle (PLC) emission rights are discussed. In section seven, the potential financial impacts on firms are calculated under our proposed holistic ownership conditions. Finally, we conclude our findings in section eight.

2. Economic theory

2.1. A brief historic perspective

Adam Smith (1776) in ‘The Wealth of Nations’ presents the economic man as acting in his self-interest, solely co-ordinated by the external price mechanisms of the market, known as the invisible hand, producing a total outcome that is best for all partners. Later Pigou (1920) included negative external effects as disturbances in Smith’s price mechanism. The outcome was no longer one-sidedly positive because price signals become distorted. Pigou suggested that environmental policy instruments, taxes, might adjust or correct distorted control signals (price). The aim of these instruments was to internalise the costs to those responsible for the external negative effects in order to compensate those negatively affected. Hence, the internal cost for the polluter could be made equal to the cost for the caused damage in monetary terms. The pigovian tradition soon became well established in economic theory (cf. Bohm, 1997; Brännlund and Kristöm, 1998; Dixon et al., 1994; Pihl, 1997) and implemented in numerous environmental policy instruments. In 1972, OECD established the polluter pays principle (PPP) influenced by Pigou’s writings.

2.2. Social cost, transactions cost and property rights

Coase’s (1960) article on ‘The Problem of Social Cost’ criticises Pigou (1932, 1912) for a too narrow view on externalities. The Pigovian tradition, he argued, entirely neglects the reciprocal dimensions of the problem. The Coase Theorem, coined by Stigler (1966); cf. Coase (1988) states that the problem is not one hurting the other, but instead a situation with incompatible allocations of resources, viewed from a society perspective.
Reciprocity means that causality is dual, both sides of the problem are liable and should be considered. The optimal solution is to minimise the damage. Stigler uses Coase's example (Coase, 1960) on the cattle raiser and the farmer when defining the Coase theorem: "... the correct social results ... would arise if the cattle and grain farms were owned by the same man. The Coase theorem thus asserts that under perfect competition private and social costs will be equal" (Stigler, 1966).

Coase points out, transactions costs for inspection and control may be costly (also identified and further developed by Eliasson, 1996, as a key aspect in the dynamic economy) and should be considered. The advantage of governmental command and control type regulations may then be overestimated since, with them, neither the firm nor the market has to seek efficient abatement solutions. In his Nobel prize lecture 1991, Coase states that the best solution, if transaction costs are present and low, is to give property rights to the players such that incentives are established for them to use the production factors in the most productive manner. Fullerton (1995), furthermore, demonstrates that compliance costs are usually high relative to revenues or benefits from separate environmental taxes since regulated areas are too narrow. He and OECD (1999) conclude that the large industrial polluters are often exempted from policy and sometimes, in fact, even receive subsidies to avoid eventual competitive disadvantages to firms of other nations.

The duality issue raised by Coase and the evidence on compliance costs shown by Fullerton may explain why the current methods of internalisation of costs are inefficient. Coase also points out (Coase, 1960) that property rights are an even more important aspect than the product itself when different actions should be stimulated, and suggests that property rights should be seen as a production factor in economic analysis. If treated in this way, it is easier to understand that the right to pollute (a property right) must also be treated as a production factor. The cost to use this property right is then equal to the loss somewhere else when used. No transaction costs presume defined property rights and, if so, it does not matter who initially owns the rights. Hence the presence of property rights is of key importance.

The more incomplete property rights are, the higher uncertainties, the higher transaction costs. This observation opens up to the theory of ownership (Hart, 1993).

Arrow (1970) argues that the sum of all an individual's utilities, which is proper to him alone, is lower than the total utility available under the assumption of externalities. These optima would, however, be equal if the premium were the same for all individuals. Transactions costs are important in reality, but they are not much treated in economic theory, and Demsetz (1993) claims that the costless information assumed in the perfect competition model makes the model itself ineffective. Transactions costs are all costs connected to the use of the price mechanism driving a wedge of welfare loss between buyers' and sellers' prices (Arrow, 1970). One reason for these costs is asymmetric distribution of information (Barney and Ouchi, 1986) which also affects the order of power among the participants (Eisenhardt, 1989) and the constantly expanding state space, making the amount of attained information a strategic choice (Eliasson, 1996).

Thus, in a positive transactions cost environment Coase explained in his Nobel lecture (1991): “It is obviously desirable that these rights should be assigned to those who can use them most productively and with incentives that lead them to do so and that, to discover (and maintain) such a distribution of rights, the costs of their transfer should be low, through clarity in the law and by making the legal requirements for such transfers less onerous”.

The conclusion from this short theoretical review is that the design of an efficient policy system, enforcing responsibility for the resource inefficiencies that create environmental problems, should consider many different types of aspects. These aspects span from social aspects, like user preferences and equity issues, to more technical issues, like minimising life cycle impact of products and services. We will, however, delimit our discussion to the PLC environmental impacts by analysing the impact from both PLC stewardship and property right perspective, assuming policies enabling low transaction costs for environmental information.
3. Present environmental policies

3.1. Traditional environmental policies

Environmental policy instruments have been increasingly implemented during the last couple of decades. The most common instruments are command-and-control (CAC) and market-based-incentives (MBI; Turner et al., 1994). CAC type of approaches have been found to be efficient, for example, in handling hazardous waste risks and in the process of banning hazardous substances. CAC-based instruments force the regulated firms to hedge over the set polluting limit, often based on best available control technologies (BACT), but no further radical improvements are stimulated. However, with MBIs, i.e. taxes, subsidies and charges, firms may choose how to adjust to policy by paying for abatement, install BACT or implement radical new innovations (cf. Porter and van der Linde, 1995a,b).

Fullerton (1995), however, shows that environmental taxes may be designed for different purposes; to discourage an activity that causes harm, to place the impacts on those responsible for the problem or to minimise the administrative cost of the taxes. A common use for environmental policies, he continues, has not been to discourage pollution, but to (the second objective) collect income from those responsible. Paras (1999), furthermore, identifies a tendency of environmental taxes to be designed to pursue revenue-raising objectives for the policy maker. These environmental policy instruments have mostly been associated with a notion of additional costs and thus a restriction on economic prosperity.

Traditionally, policy instruments have mostly been designed to decrease local and regional pollution such as heavy metals, sulphur dioxide and organic substances. These substances are often relatively easy to measure both as emissions and resulting impacts. Major environmental impacts do, however, also occur during the use of products produced—especially for energy consuming products—and spill outside the national jurisdiction with which they originate—a global spillover of environmental impact. Consequently, polluting products keep being produced, and the emissions creating global impacts have continued to increase.

3.2. Product stewardship and extended producer responsibilities

Products and services are fundamental in creating both economic development and quality of life, but at the same time they are the source of considerable global environmental impact. The globalisation of environmental problems has among other issues provided a concern for the full life cycle environmental impact from products. One potential solution to this problem could be to extend the limits for the producers’ property rights to the use of the product. One argument for this is information asymmetries within the value chain, i.e. the fact that the manufacturer of a product often possesses the best information on how to improve the environmental performance over the product’s life cycle.

Change of focus in legislation in the industrial communities has extended the liabilities for the producer to include the effects from end-of-life treatment of the products/services. Take-back systems have been implemented in Sweden and Germany for beverage packages. Similar take-back systems are now also developed and implemented for other product groups. For example, Switzerland, the Netherlands, Norway, Sweden and Japan (for some electronics) have now extended producer responsibilities for electronic equipment covering terminal scrapping. These producer responsibilities will probably also be implemented in all EU countries. The use phase, e.g. the product energy consumption, that often gives the dominant global environmental impact over the full life cycle is, however, not at all addressed by these take-back systems or any other currently used extended producer responsibility systems.

The European Commission (2001) has presented a more holistic approach, Green Paper on Integrated Product Policy (IPP). The goal is to propose a strategy to strengthen and refocus product-related environmental policies to promote the development of a market for ‘greener’ products. A mix of instruments is suggested to support this development. This proposal focuses
on the following issues: ecodesign of products, information and incentives. Their conclusions fit very well into the thoughts and suggestions outlined in this theoretical paper, since one major question is how to support the greening process with market forces by creating economic incentives. One sub-goal in the IPP proposal is the internalising of external costs through various policy instruments, resulting in a price also reflecting environmental impacts.

4. Business incentives

Viewed from the business perspective the environmental awareness influences the competitiveness of companies. Porter and van der Linde (1995a,b) discuss the changes in competitiveness of industrial organisations driven by environmental regulations. Innovative solutions from the regulatory pressure not only decrease the environmental problem, but also result in more eco-efficient products and better competitiveness. They also stress that the legislation must be based on a long-term governmental policy so that companies can adapt the requirements within their corporate strategy in an orderly way. Porter and van der Linde argue that the dynamic perspective is necessary for promoting innovations contrary to current more static regulation and policies. Also, those environmental strategies pro-actively adopted among companies must, and presumably may, be developed to live up, not only to sustainability and eco-efficiency, but to competitiveness as well.

‘Factor four-doubling wealth, halving resource use’ by von Weizsäcker et al. (1997) is in line with the findings of Porter and van der Linde. They present 50 concrete examples or success stories where higher resource efficiency has improved both the technical and the economic performance of the product. In many of the discussed examples economy and ecology ‘go hand in hand’, and the authors identify a unique possibility for both business leaders and the society to grab the possibilities and make money, technical and social benefits out of them.

There are two major issues to deal with: the above-described win–win situations are not usually obtained in reality; because often the largest environmental impacts and costs of product/system/service occur outside the responsibility of the company setting the product parameters. Hence, the firm responsible for the major part of the environmental impacts, by design, does not have the property rights for them.

The asymmetric information among the actors (cf. Barney and Ouchi, 1986; Williamson, 1975) within the product value chain makes it difficult for consumers to obtain a clear picture of the product characteristics (environmental included), which are set by the product designers (cf. Eisenhardt, 1989). In accordance with Coase’s Nobel lecture, those actors that can use environmental impact property rights most efficiently should be given those rights and the possibility to decrease overall transaction costs. Here, a vertical integration (internalisation) is in place (cf. Joskow, 1990).

Either the life cycle stewardship should be integrated into one firm, if transaction costs are too high to internalise environmental degradation efficiently (cf. Coase, 1937), or rules to create an efficient market with low costs should be set up. Domeij (2000) states the importance of judicial stability and predictability in policies to enable efficient and decentralised decision making regarding resource use.

5. The Kyoto Protocol

During the last decade global warming has been paid a lot of attention, not least from the United Nations (UN). In the 1992 UN Framework Convention on Climate Change (UNFCCC) no concrete undertaking was accomplished by the signing countries to restrict their own emissions of carbon dioxide and other greenhouse gases (GHG), with potentials of creating global warming. Therefore, another climate meeting (UNFCCC) was held in Kyoto in 1997. There are 160 signatures to the Kyoto protocol, but only countries within the industrial world have committed to abate their own emissions; in other words,
none of the developing countries (140) has signed the protocol (Edin, 1999). For the period of 2008–2012, the industrial world shall have their GHG emissions reduced by 5% relative to their 1990 levels. Corresponding numbers are for the OECD 7%. Nevertheless, emissions have been rising in most countries, contradicting the set reduction targets. Where GHG emissions have fallen, it is usually due to collapses in output in transition countries of the former communist world (OECD, 1999).

6. Trading of product life cycle (PLC) emission rights

Based on the social costs of Coase (1937) and Coase theory (Stigler, 1966), the first concept of allowing rights to pollute was put forward by Dales (1968), suggesting the province authorities in Ontario to sell transferable rights to pollute provincial watercourses. Hence, the authorities control the total amounts of emissions, while the companies themselves decide the allocation of emissions among the actors. Later on, Montgomery (1972) mathematically showed the economical cost efficiency of the tradable permits instrument.

We suggest that the possibility to develop the concept of PLC emission rights should be explored further. Since this is a multidisciplinary global issue, several actors in the society providing a wide range of perspectives should take consideration. One idea valid for emissions causing global impacts, i.e. GHGs, could be to use intergovernmental bodies such as branches of the UN to determine the necessary abatement of emissions. The market of tradable permits itself, however, determines the most efficient allocation of these abatements. How such markets may impact on firms is described in Section 7. We do not attempt to outline a detailed suggestion for a PLC emission rights trading policy instrument. Instead we aim to provide a theoretical foundation—underpinned by some industry-specific examples—that may be used as one input in such development.

7. Potential initial financial impacts on firms

We select CO₂ emissions as a base for the calculation of life cycle emissions since a number of bodies have stated the importance of emissions creating global warming. We use the estimation done by OECD for a carbon price on USD 100–300 per tonne carbon emission (for CO₂ = 0.27 times total weight.) that is needed to fulfil the goals from Kyoto without trade. Thus, the average CO₂ emission price of USD 200 per tonne is used in the calculations in this paper. In Section 7.1, we show that even though different manufacturing sectors have somewhat similar potential emission costs per turnover, their customers using the products have an immense difference in potential emission costs per turnover. In Section 7.2, we give an example of potential initial financial impacts for one manufacturing company, designing the product. These two subchapters illustrate the importance of a life cycle perspective if striving towards sustainability.

7.1. Potential financial impacts on different business sectors from judicial emission

The ratio of carbon dioxide emissions to company turnover is a relevant indicator for two reasons. Firstly, from a sustainability perspective, a high value could potentially represent a financial risk if policy actions are taken to achieve the Kyoto targets. The financial risk may both be direct, by a high CO₂/net sales rate on a judicial company, or indirect, by high CO₂ emissions during use of products. Secondly, reductions of this indicator may induce a competitive advantage, especially so, if the performance of products decreases the CO₂ emissions for customers.

A closer look at the table below shows typical carbon dioxide release for Swedish companies on the OM Stockholm Exchange. The carbon dioxide emissions per line of business show that there are immense differences in financial risks. Even though the CO₂ emissions per net sales ratio is quite similar for those production companies that manufacture equipment, corresponding ratios for their customers are quite different. The emission cost per net sales may vary between one-tenth of
a percent to ten percent. These differences in financial risk will also affect the financial outcome of the production companies indirectly.

Potential emission cost/net sales for companies in Table 1 illustrates the large difference between business sectors and, hence, a variance in economic risk if carbon dioxide is charged per legal entity. Another observation is the similar economic risk among manufacturing companies. The risk picture will, however, be totally different if the risk of their customers—service providers, the product users—is also included.

If a product stewardship instrument is implemented, the PLC costs will be shared among the actors within—as well as between—value chains. The actual cost sharing depends on, e.g. power, information and innovation advantages.

7.2. Potential initial financial impacts on the telecom company Ericsson

During fiscal 1999, Ericsson emitted 0.8 million tonnes of carbon dioxide from its activities, sites, travel (including commuting) and transports. These emissions constitute, however, only 11% compared with the total 7 million tonne emissions from its products’ entire life cycles that are produced during 1999 (Ericsson, 2000).

Using the USD 200 per tonne CO₂ emission costs as stated earlier with the Ericsson data shows potential life cycle CO₂ costs for Ericsson (see Table 2) if a product stewardship is implemented, and consequently, a large economic incentive for decreasing CO₂ emissions.

The Ericsson gross margin for fiscal 1999 was (SEK 89 522 million) US $10 494 000 000. Thus, the CO₂ emission cost for entire life cycles of the products produced during 1999 equals 13% of Ericsson’s gross margin. This was the best gross margin in the company’s history. The emission costs from the company’s scope were not negligible but much smaller, 0.38% (Ericsson 1) [1.5% (Ericsson 2)] of gross margin.

Even if the products in this case have minor total emissions, the potential financial impacts on
the producer will be substantial. There are considerable amounts in CO₂ emissions, in relation to company net income, that could be avoided also here. However, the costs for carbon dioxide abatement are high compared with the potential costs for emission rights. In many cases there might not be any gains at all by exchanging powering from OECD electricity supply, i.e. installing solar power for a radio base station due to the present cost of solar equipment. However, IT and telecom firms have the potential to affect other sectors in society, reducing the environmental impacts. Hence, this calls for a joint PLC CO₂ emission market covering more than one sector, increasing the probability for such solutions.

Another fact talking for intersectoral (between business sectors) emission bubbles is: The transportation sector is responsible for 22% of the global CO₂ emissions (IPCC, 1996). Corresponding number in the EU for telecommunications is 0.5% (Ericsson, 2000). Improvements alone in the telecommunications sector would only incrementally abate the CO₂ emissions while interaction with other sectors has the potential to accomplish larger savings.

8. Concluding discussion

Current strategies including environmental concerns have not led to a clear path towards sustainable development since the major environmental effects from products generally appear as externalities, social costs, outside the legal boundary of the company providing products and systems. These actors often possess the best competence to optimise the products’ total life cycle environmental performance; however, they are neither obliged nor stimulated enough to do so from a sustainable development perspective. This asymmetric information—over the value chain—may be used proactively in a market-based model, increasing the efficiency of future policy instruments. In the proposed concept for trading of PLC emission rights, the actor possessing most information, i.e. often the product and system provider, would be motivated by economic incentives to take an increased responsibility for information flow and initiatives for product improvements.

Even if a number of successful win-win business cases have been demonstrated there is no broad implementation of these kinds of actions in the business world; on the contrary, command and control instrument are still dominant. According to us, this is due to the lack of adoption of profound economic transaction cost and property rights theory, supporting proper actions by policy makers as well as by industry.

This paper points out a need for extending the property rights of firms’ environmental impacts, covering not only the judicial entity, but also the entire PLC’s of their services. This market-based PLC stewardship could stimulate incentives for innovations that lowers global environmental impacts over the entire value chain. However, we see obstacles if implementing such an instrument due to the influence by powerful stakeholder groups opposing changes (even though some actors within those groups may support changes, i.e. companies seeing competitive advantages), which does not make this theoretical study less interesting. Such trading over the value chain could, of course, also cause unwanted effects—such as equity ones—which have to be explored. As with all policies this suggestion has to be put into the context of other policies and regulations.

The property rights for environmental impacts and, thus, the responsibilities to take actions should initially be assigned to the actors who have the largest possibilities to influence the PLC environmental impact most efficiently. Furthermore, a transparent market-based instrument enables an efficient information flow, decreasing the transaction cost for regulated actors as well as for policy makers. If the instrument withholds too large uncertainties, i.e. is not predictable, transaction costs will rise in form of insurance and law firm revenues. These market-based instruments should provide the systems providers with clear and reliable incentives to decrease life cycle impacts of their products.

Trading of emission rights has been accepted as an effective market solution to solve local and regional environmental problems. Our suggestion is to further explore the possibilities to develop a trading instrument for these emissions, e.g. per business segment or even in larger, joint-segment,
markets, driven by each firm’s own business incentives to reduce emissions. This concept for trading of PLC emission rights is based on property rights and transaction cost theories, considering the problem with asymmetric information over the value chain. This provides economic incentives to take an increased responsibility for information flow as well as initiatives for product innovations, making PLC emissions—and resource use—production costs for the system provider.

These PLC-based policy instruments should be implemented on an international level, in broad agreements, e.g. in EC, UN or OECD, since the environmental problems are of a global character. The design and the implementation of such systems need to be further developed.

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References


Paper X

Bringing Economic Opportunity into Line with Environmental Influence:
A Discussion on the Coase Theorem and the Porter and van der Linde Hypothesis

*Ecological Economics.*
Forthcoming.

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Abstract
Environmental concerns and tightened environmental policy parameters have been associated with the notion of additional costs of compliance rather than with innovation and sustainability. The contrary, has also been suggested, claiming that strict environmental legislation merely serves as a catalyst for firms to retain obvious economic and environmental mutual gains – so called win-wins – laying around waiting to be collected. Such implications can be seen from the Porter and van der Linde writings, heavily criticized by Palmer et al. as being built on faulty examples. This paper support that conclusion and uses property rights and transactions costs theories to find private incentives to explore the win-wins for those actors who have the largest potentials to diminish the pressure on our environment. By applying the Coase theorem, emphasising transaction costs and property rights, this paper argues that strong public support is needed to create private incentives for exploring economic and environmental win-win innovations. The public support suggested is to A) extend producer responsibilities – where the same costs which may be neglected by the end consumers will, if transferred to the design owner, be viewed as a production cost – and to B) enforce environmental public procurement. Both may be combined with a support to C) actors (such as non-governmental organisations and consumer agencies) positioning themselves as information bridges by informing the consumers. The negative effects of asymmetric information among actors can, thereby, be diminished as well as the low interest to primarily care for the environment among common consumers.

Keywords
Property rights, transaction costs, asymmetric information, environmental impacts, sustainability incentives scheme.

JEL classification
D23; K32; K33; L15; L22; L90; Q21; Q28
1 Introduction – the Problem
The growing concerns for the environmental and a sustainable society have increased during the last two decades. The Non-Governmental Organisations (NGOs) are no longer alone debating sustainability. Regulators stress the importance of a prosperous society that is not destroying the environment and depleting our natural resources. Many articles and books have demonstrated the great economic potential companies can unlock by becoming proactively green (Porter and van der Linde, 1995a, 1995b; Jaffe et al., 1995; von Weizsäcker et al., 1997). One could, thereby, even assume that environmental degradation is no longer much of an issue. This view, however, such as the hypothesis of Porter and van der Linde, has been criticised by Palmer et al. (1995), Faucheux and Nicolaï (1998) and Faucheux et al. (1998) as not being theoretically well founded.

The paper draws on the theories of property rights, transactions costs and institutions – concepts introduced by Coase (1937; 1960) – to discuss policy design and to establish the potential of unexploited, perceived, externalities. I use these theories to explain how a win-win situation with both privately and socially (environmentally) profitable results could emerge from well designed policy instruments that create incentives for exploiting new opportunities by discovering technologies not known today. The essence of environmental public procurement is highlighted and the optimum delimitations for company economic responsibility are studied and aligned with environmental influence as well as to companies’ ability and knowledge advantage to improve provided services. Therefore, a four-step Sustainability Incentives Scheme (SIS) is introduced to structure these issues of public support to give innovative incentives among the actors who have the largest potentials to change an environmentally unwanted economic activity. This scheme is created by structuring Coase’s (1974) article on lighthouse economics.

In section two the theories of property rights and transactions costs are introduced to establish a context of joint environmental policy design and an exploration of business opportunities. Property rights regimes and the problem of open access are discussed in the third section. Section four presents the win-win literature. How to, by the appropriate design of incentives and legal requirements, make the scope of environmental responsibility and environmental impacts coincide, e.g. over the value chain, is considered in section five. A Sustainability Incentives Scheme is described in section seven in order to generate incentives for socially desirable new solutions. This paper is concluded in section six.

2 Externalitys, property rights and transactions costs
In his Wealth of Nations Adam Smith (1776) saw people – or economic man – acting solely in their own self-interest. These economic men were coordinated by the external price mechanism of the market, the invisible hand. Neoclassical economists, still base their analyses on a stylised version of Smith’s verbally formulated model, and assumes that it is possible for each agent to be almost fully informed at a minor cost and time delay. In his Principles of Economics,

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1 Jaffe et al. represent a more moderate view on the correlation between competitiveness and environmental regulation.
2 Adam Smith developed this concept of the invisible hand already in his early – and career making – work, The Theory of Moral Sentiments (1759) when explaining man’s beneficial social patterns (characterised by natural fellow-feeling) as being the outcome of human action, not by human design.
3 Barring the imprecision caused by white noise.
4 Opposed by the Grossman-Stiglitz paradox saying that if a market (e.g. a financial market) was informationally efficient – i.e. all relevant information is reflected in market prices – no agent would
Marshall (1890:221)\textsuperscript{5} introduced the concept of externalities as one part of the explanation of economic growth, which later became the foundation for Porter’s (1985) *Competitive Advantage* (Laestadius, 1999). Marshall’s definitions have been criticised to be somewhat vague by Clapham (1922), Knight (1924) and Pigou (1920) since they imply that economic expansion is the result of a working price system (cf. Papandreou, 1997).

Pigou (1920) introduced disturbances in Smith’s price mechanisms as external effects\textsuperscript{6}. He thereby opened up the economic analysis of pollution by distinguishing between private and social (to society as a whole) costs. It followed that environmental policy instruments, such as taxes may correct erroneous price signals and thus limit (or terminate) the polluting activity. The idea was to introduce a tax that would internalise all the costs from external effects on those responsible in creating them. Therefore, the internal costs for the polluter would be equal to the cost of external damage\textsuperscript{7}. This Pigovian tradition has gained a considerable following among economists – neoclassical and others such as Dahmén (1968), Bohm (1997) and Dixon *et al.* (1994) – and led to the design of environmental policy instruments such as the prominent Polluter Pays Principle (PPP) promoted by the OECD since 1972.

This causal view on external effects has, however, been criticised by Coase. Already in his article *The Problem of Social Cost* (1960) Coase argues that Pigou (1912) misunderstood the problem because he neglected the reciprocal nature of externalities and, therefore, also neglected to consider the optimum social cost. The problem is not, argues Coase, about one hurting the other, but to resolve a conflict of how to allocate resources in society. Wealth maximisation under given transactions costs is now central to the law and economics tradition. According to Domeij (2001) the optimal social solution is found when the most severe damage from incompatible allocations is avoided, a result that is well established in case law\textsuperscript{8}.

The analysis in *The Problem of Social Cost* (1960) first takes place in a no transactions cost environment. Coase concludes that when different actions are to be stimulated property rights are even more important than the product itself. He thus suggests that property rights should be treated as any other tradable production factor in economic analysis. Hence, "...It is necessary to know whether the damaging business is liable or not for damage caused since without the establishment of this initial delimitation of rights there can be no market transactions to transfer and recombine them..." (Coase, 1960). Since the article describes the outcomes in a non-transactions-cost environment the conclusion follows that it does not matter who initially owns the rights, the ultimate result will always be the same – a maximised production value – independent of the initial endowment. Coase’s (1960) conclusion that the original endowment is

\textsuperscript{5} Marshall’s ideas (of 1890 and 1919) have later been reformulated by Romer (1986) and Lucas (1988) under the name of New Growth Theory and Marshall is acknowledged by i.e. Schumpeter (1954) as being the first economist attempting to integrate business economics into economics (cf. Eliasson, 2002).

\textsuperscript{6} "No harmful or beneficial effect is external to the World. ... the cost of bringing the effect to bear on the decisions of one or more of the interacting persons is too high to make it worthwhile, ... 'Internalizing' such effects refers to a process, usually a change in property rights, that enables these effects to bear (in greater degree) on all interacting persons." (Demsetz, 1967)

\textsuperscript{7} A very natural and equitable framework that Pigou draws from his example – which uses in his writings (Pigou, 1920) – was a factory that causes pollution related hardships on the nearby residences (mostly inhabited by poor people) surrounding the plant.

\textsuperscript{8} This means that common courts serve as an extension of the market mechanism to areas where markets cannot function due to too high transaction costs. Courts work, hence, as an institution that lowers transactions costs – a transactions enabler.
irrelevant to the outcome in a zero-transactions cost environment led him to conclude that transactions costs can never be zero\textsuperscript{9}. Positive transactions costs explain the existence of firms (cf. Coase, 1937) by lowering the cost of contracts in an internal hierarchical market and the existence of courts (cf. Coase, 1960) establishing contracts in a high transactions cost environment where such relationships would otherwise not be possible\textsuperscript{10}.

Coase's writings (1960; as well as 1937) have revolutionized microeconomic theory, but the necessary understanding took several decades to mature. But, after The Problem of Social Cost externalities such as inefficiencies and market failure began to be viewed as reflecting the existence of transactions costs (cf. Papandreou, 1997). Stigler was influential in using one of Coase's own examples of conflicting resource allocation in his The Theory of Price (Stigler, 1966) to define and exemplify Coase's theory. He illustrates the problem by saying that the right social result would arise if the resources with contestant aims of usage where owned by the same man and then concludes that: "The Coase theorem thus asserts that under perfect competition private and social costs will be equal." This, however, is only possible under zero transactions cost. Later, in his Noble lecture 1991, Coase not only credits Stigler\textsuperscript{11} with defining the Coase theorem, but also explains the importance of an initial endowment of property rights in a positive transactions cost environment\textsuperscript{12}.

Management theory, primarily principal agent theory (Hart and Holmström, 1987; Holmström and Milgrom, 1991) also builds on the relationship between actors and incomplete contracts. The more serious the lack of information and/or the higher uncertainty, on the one hand, the more incomplete contracts and the larger the transactions costs, on the other (Hart, 1993; cf. Tirole, 1999). This observation opens up for the theory of ownership. In this case, presented in this paper, it opens up for the ownership of the environment.

3 Property rights regimes

Defining various types of property rights regimes is an essential issue in the environmental economics literature – from private property down to open access (cf. Turner et al., 1994; cf. Pihl, 1997). Common property and the overuse thereof is not a new problem, neither in reality nor in the literature. Already Aristotle in his Politics II (350 B.C.) criticised the collectivistic childcare ideas of his tutor Plato\textsuperscript{13}: "...property is ill cared for when it"\textsuperscript{14} "owned by all, and just as a child would be poorly nurtured were he to receive no special parental care...". Parental-child (biological or adopted) ties, of course, grow very strong and

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\textsuperscript{9} In his Nobel Prize lecture (1991) Coase saw "the Coase theorem as a stepping stone on the way to an analysis of an economy with positive transaction costs."

\textsuperscript{10} Some critics to Coase's writings claim that the articles of (1937) and (1960) are inconsistent. The reason why is probably psychological. The first article explains the existence of firms in a transactions cost environment and deals only very briefly with the case where no firms are needed. In the second article he describes a case of no transactions cost at a great length where there is no need for firms and only briefly mentions transactions costs. (The law cases in the second article are, of course, under a transactions cost environment.) We can, hence, say that the two articles are indeed coherent and deals with the same problem, transactions costs, but from opposite approaches, of which the later is building on, and enhances the former.

\textsuperscript{11} Who also is a Nobel Prize laureate in Economics (1982) "for his seminal studies of industrial structures, functioning of markets and causes and effects of public regulation."

\textsuperscript{12} "It is obviously desirable that these rights should be assigned to those who can use them most productively and with incentives that lead them to do so and that, to discover (and maintain) such a distribution of rights, the costs of their transference should be low, through clarity in the law and by making the legal requirements for such transfers less onerous." (Coase, 1991)

\textsuperscript{13} The tutor of Plato, Socrates, also got his share in the critique, even though their thoughts greatly influenced the writings of Aristotle.

\textsuperscript{14} The word 'is' is added by me and does not belong to the translation.
perhaps should not be compared with ownership of a piece of land. But there are principal similarities\textsuperscript{15}.

Common property rights regimes are often referred to in environmental literature as \textit{the tragedy of the commons}, an expression first used by Hardin (1968). Different resource regimes are, however, not the sole cause for resource overuse. Problems arising from these various regimes are also closely related to the management of them, or as already Hobbes (1651) puts it: \textit{"And Covenants, without the Sword, are but Words, and of no strength to secure a man at all."} Croci and Pesaro (1998) and Börkey \textit{et al.} (1999), moreover, emphasise the importance of credible sanctions for non-compliance – monitoring actions included – of environmental agreements (cf. Helby, 2002). If both management and the protection of private and state owned resources (from external usage) are non-existent we may face excessive use from external exploration (or even from internal use) even though such ownership regimes are frequently referred to as solutions to resource inefficiencies. This is unfortunately the case in many developing countries. The tragedy of the commons should therefore rather be called \textit{the tragedy of open access} (cf. Turner \textit{et al.}, 1994). Indeed, common property regimes theorists clearly state the importance of adopting rules regarding inclusion-exclusion, obligation, monitoring and sanctioning of participants (cf. Varughese and Orstom, 2001; cf. Agrawal, 2001). Varughese and Orstom (2001) see that the difference among users in common-pool resources pose challenges in overcoming the incentives to free ride and shirk, and Agrawal sees that group size negatively effects the durability of such institutions. Demsetz (1967), on the contrary, argues that property rights will gradually be established if the gains are sufficiently large, outweighing the costs and that wealth maximisation by individuals (according to Demsetz) will lead to the creation of efficient institutions. However, Arrow (1970) and Papandreou (1997) state that individual utility – aggregated private costs – may not necessarily equal total utility or total social costs and this is not the case in Akerlof (1970) where information asymmetries between buyers and sellers, leading to adverse selection, may make efficient markets impossible. As shown in Cerin (2004) car buyers are constantly fed images. The SUV and truck promotions feed consumers images of patriotism, toughness and masculinity, instead of (seemingly unimportant) issues like quality, mileage and usage costs – not to mention environmental degradation. Moreover, despite some surveys indicating considerable environmental consciousness, consumers may be remarkably indifferent to those issues when choosing between other vehicle characteristics i.e. acceleration and torque (cf. Cerin, 2004).

4 The notion of win-win

Porter and van der Linde (1995a; 1995b) introduce the win-win situation as an assumed externality. There is also another possibility. The producer may be operating far below its potential because of regulation or because of bad organising or both, making for large differences between private and group or social returns. We may have a case of faulty incentives instead of lack of knowledge. With the proper use of property rights (Coase, 1960) and information asymmetries (Akerlof, 1970) we can explain the win-win situation as the result of the activation of a positive sum game.

\textsuperscript{15} Also, Adam Smith (1776: Book V) made a similar discussion on the revenue of land and one of his arguments is – due to the probability of negligent, expensive and oppressive management of property under a large proprietor – that: \textit{"The crown lands of Great Britain do not at present afford the fourth part of the rent which could probably be drawn from them if they were the property of private persons. If the crown lands were more extensive, it is probable they would be still worse managed."}
The Porter hypothesis (Porter, 1991; Porter and van der Linde, 1995a; 1995b)\textsuperscript{16}, also known as the Porter-van der Linde thesis (1995a; 1995b)\textsuperscript{17}, states that well designed regulation (in the US) can increase competitiveness and encourage innovation. In practice, however, reputation usually has been associated with decreased competitiveness, deterring innovative activities. According to Porter and van der Linde, this is unfortunate since properly designed policy instruments may, in fact, trigger innovation and increase the outputs from products and services by, for instance, lowering resource use and emissions. They, moreover, state that a too high resource use and too large emissions is a form of environmental waste which also is economic waste. Porter and van der Linde argue that firms have not realised all profitable opportunities since they have not yet been discovered due to deficient (or rather not perfect) management systems (cf. Porter and van der Linde 1995a: 127; 1995b:99), which fits into the views of endogenous economists, i.e. Eliasson (1996). By introducing well designed legislation – that not only informs firms about their services’ present drawbacks – firms’ environmental burdens may be lowered at a small private cost, or even result in a fiscal benefit. With this broader view firms should consider opportunity costs by i.e. substituting unwanted materials and simplifying designs.

An example on successful win-win induced regulation under the Montreal Protocol referred to by Porter and van der Linde, involves a change in the cleaning process in the electronics industry. Here both process costs and unwanted CFCs that cause ozone-depletion used in the cleaning process of printed circuit boards are reduced by switching to a semi aqueous cleaning agent (cf. Porter and van der Linde, 1995b).

According to Porter and van der Linde (1995a; 1995b) the USA has a poorly designed environmental regulation that adversely affects US companies’ competitiveness (contrary to Jaffe \textit{et al.}, 1993). Simultaneously, the European (German and Scandinavian) firms enjoy a competitive advantage from cleverly designed and flexible legislation with the long-term goals of the instrument visible\textsuperscript{18}. An example of such policies seeking maximum opportunity for innovation quoted by Porter and van der Linde (1995a) is the development of innovative pulping and bleaching technologies by Scandinavian companies, that do not use chlorine compounds. They claim that this is the effect of Swedish regulatory agencies being more effective than their U.S. counter parts in demanding emission goals with very tight deadlines. Swedish authorities were also ahead of European regulations at the time and made domestic producers anticipate stricter standards in the future. As a consequence, the Scandinavian demand for sophisticated process solutions gave both Swedish paper producers and equipment suppliers (for those paper production processes) a competitive advantage. The Scandinavian pulp and paper industry used this lead to develop innovation offsets going much further than current regulatory demands. This case, originally described by Porter and van der Linde, does not entirely reflect what really happened in the pulp and paper industry in Sweden. In reality, according to Ladberg \textit{et al.} (1992; cf. also Bryntse \textit{et al.}, 1988), Swedish pulp and paper producers refused to go along with any demands to change bleaching compounds, even though Greenpeace during ten years had made the public in Sweden aware of the high amount of organic chlorine in mothers’ milk. Even in the mid 1980’s the large paper producers claimed that it was impossible to competitively bleach without chlorine. These firms where supported by the local and powerful Swedish labour unions fighting for their members’ jobs. For some reasons, during this negotiation process the Swedish EPA chose not to support

\textsuperscript{16} A term used by Ambec and Barla (2002).
\textsuperscript{17} A term used by Palmer \textit{et al.} (1995).
\textsuperscript{18} These German and Scandinavian instruments are according to Porter and van der Linde strict, but also flexible because they take investment cycles of business into account.
chlorine free paper. Miljöförbundet (Environmental Society), however, managed to influence – a number of Swedish Municipalities and thereby – the association of Swedish Municipalities (Komunförbundet) to set up common procurement requirements for paper. Despite what the large players claimed a small Swedish producer, Munkedal, could exclude Chlorine in its bleaching processes – to start with the paper was not entirely chlorine free, but chlorine thrifty. They received orders for copy paper from over 40 municipalities in 1985. This was an important deal for the small player since the municipalities of Komunförbundet bought 1/4 of all copy papers consumed in Sweden. Munkedal could also charge a higher price for their product than others could do for chlorine-bleached paper. The large paper producers (the Goliats – Stora Enso\(^1\), MoDo et cetera) tried to lower their prices on paper in a desperate attempt to protect their market shares against the cheeky small player (David – Munkedal). Munken Panda Copy, as it was labelled in 1987 became a success product to buy even for other customers in society. The ironic aspect of this history is that one year after all the major pulp and paper producers had stressed the impossibility to manufacture paper without using chlorine bleachers, they all had their own non-chlorine bleached papers on the market. So, the conclusion is that Porter and van der Linde’s (1995a) case is erroneous. It is not a case of successful regulation promoting innovation, but the actions of an active and persistent NGO (Non Governmental Organisation) instating the great potential of public procurement (PP).

The above example is not the only case criticising the success stories of Porter and van der Linde. When surveying firms affected by environmental regulation, some being cited by Porter and van der Linde as success cases, Palmer et al. (1995) e.g. found that most of them had, in fact, experienced increased costs. The hypothesis of Porter and van der Linde has been heavily criticised by Palmer et al. (1995\(^2\)), among others i.e. Faucheux and Nicolaï, 1998; and Jaffe et al., 1995) for lack of theoretical foundation\(^2\) (cf. Altman, 2001; and Ambec and Barla, 2002). There is almost always a private cost for firms when complying to become greener, they claim. The Porter and van der Linde argument that managers are systematically ignoring economic opportunities (creating resource waste) is a fundamental challenge to neoclassical theory and among an almost infinite number of legal cases Palmer et al. are not surprised that a few cases have been found where firms have benefited from regulation. The underlying message in the Porter hypothesis, Palmer et al. continue, is that there is no need to worry, since solving environmental diseconomies will not be expensive. On the contrary, Palmer et al. argue, expenditures for environmental protection are costly, but every dime spent may, nevertheless, be well spent from society’s standpoint (cf. Cropper and Oates, 1992; cf. Stewart 1993; Jaffe et al., 1995). Both the costs and benefits for environmental policy should, therefore, be estimated.

There is a well established understanding among business management that a satisfactory behaviour is typical (Simon, 1955; Eliasson, 1976) since the perfect solution is impossible to find (and if it would be retrievable it would be immensely expensive to reach). The interesting question, however, is if firms’ lack of incentives to improve the environmental performance of their offerings is part of their competitive strategy. To create the business incentives to decrease the

\(^1\) Note that at that time Stora was not yet merged with Enso in the 1980’s.

\(^2\) Despite the strong critique from Palmer et al. (1995) they agree with Porter and van der Linde on four points: 1) in favour of incentives based regulation, 2) early estimates of costs for complying with policy is often exaggerated, 3) providing information to customers may trigger innovation and 4) sometimes have these regulations lead to cost saving.

\(^2\) Stavins et al. (2002), argue, that the win-win hypothesis, of Porter and van der Linde, is a case of \textit{partially full glass} enabling researcher to see it as either \textit{mostly full} or \textit{mostly empty}, depending on their chosen perspective.
environmental burdens the role of information asymmetries has to be minimised between producers/design owners and the consumers/end customers. The economic prosperity of an organisation, hence, should to a higher degree coincide with its environmental influence and possibilities to make a change.

Similarly, Faucheux and Nicolaï (1998), argue, that for sustainable development and to avoid firm competition driven technological lock-ins these win-win strategies need to be supported by state intervention. A reason for this need is that actors are not in equal positions, due to information asymmetries, making contracts between actors incomplete which results in difficulties to control for observance of the contract, mainly due to moral hazard and adverse selection. Faucheux and Nicolaï see the key essence for policies (under development and implemented) to bring societal actors together, e.g. firms and their customers with systems of communications.

In order to stimulate innovation Porter and van der Linde (1995b: 111) suggest that the likelihood for innovation in the value chain to occur should be considered. Therefore, the governing principle for regulators should be to regulate as late as possible (or as close as possible to the end consumer [my comment]) in the Value Chain (VC) to allow for more flexibility upstream. Information asymmetries are; however, of key importance if innovation is to be stimulated within the value chain. So, the argument to stimulate innovations as close to the end-consumer as possible focus ought to be placed on transactions costs, asymmetric information and, hence, the capacity of firms to innovate.

It is, moreover, observed that the image of a firm is sometimes more important than the real identity and doings (Wolff, 1986; Cerin, 2002; Brytting, 2002; Rognerud, 2003) which is in accordance with the decoupling concept coined by Meyer and Rowan (1977)22. By allowing for a wider scope of responsibilities – factoring both economic (private) prosperity and (social) environmental effects into the private benefit/cost accounts of one actor – in the way discussed and exemplified by Stigler (1966) – these moral hazards can be reduced. Let us, therefore, take a closer look at the use phase in a value chain and see how a design owner/producer can deal with the development of arising legislation in different markets.

Case I – The premium of branded cars (Volvo)

Volvo is highly concerned about its public image as a producer of safe cars, that do not harm the environment. In the development of legislation for catalytic converters on cars in Sacramento for the Californian market American auto manufacturers declared the demands in producing such cars to be unrealistic. Volvo was then a small player in the Californian market and saw an opportunity to gain market share as well as improving its reputation as a European luxury car maker taking social responsibility. Volvo demonstrated to the regulator in Sacramento that it was possible

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22 In an interesting court case, Kasky vs. Nike, California’s Supreme Court ruled that a company’s public statements (such as letters to the editor and Corporate Social Responsibility Reports – CSR) about its operations must be treated as everyday commercial speech – making deceptive company public statements risky business. The California decision concluded that courts could suppress such public statements and allow monetary awards when they are deemed misleading. Nike says its external communication will be substantially restricted – and they will not publish new CSR reports – due to the ruling. Nike contended, on the contrary, that the US First Amendment, which guarantees freedom of speech, protected the company (Nike, 2002). Nike filed a petition with the U.S. Supreme Court 14th October 2002 (Supreme Court of the United States, 2002). The US Supreme Court, however, dismissed the Nike appeal 26th June 2003 and gave green light to the California ruling (Ethical Corporation, 2003; Nike, 2003). The struggle between activist organisations and business communities supporting Nike will probably continue...
to produce such a cleaning solution23 for the car, especially with Volvo’s Lambda sound technology. The increased costs for producing such a car could Volvo easily pass on to the end consumers by charging more for the higher image of a premium and clean family car it now captured. Volvo apparently found a way to use its environmental image innovatively to charge higher prices (cf. innovative pricing by Jonason, 2001).

In the Swedish market, however, Volvo did not make use of a similar innovative image pricing. On the contrary, later during a similar legislative process in Sweden Volvo took the same position as the American car producers took in California, delaying the converter requirements on cars in Sweden for a few years. Why this inconsistency in approaching the same regulatory process in different markets? Well, in the Californian market, Volvo was a small premium player, being able to pass on the extra costs for catalytic converters to the customer or even earn on extra premium on its new exclusive environmental image. In Sweden Volvo was the dominant player with a share on about one fifth of the total market and could not pass on the costs to a large mass of not so concerned customers. In Sweden Volvo had to compete in segments (mass) with lower prices and the customers prepared to pay extra for a better environment represented a relatively small group compared to Volvo’s existing market share.

Innovations, Palmer et al., argue do not always occur at low costs or give economic benefits in the way described by Porter and van der Linde. Environmental regulation may not benefit all actors regulated, but foremost those who can innovate and the society as a whole if well designed. The largest environmental impacts often occur during use of products that consume energy (active products). However, while the great potential for win-win situations are to be found at the use stage, the incentives for the designer/producer to exploit the opportunities may not exist24. One solution to this dilemma would be for the policy maker to reassign property rights so that a firm’s economic responsibilities coincide with its environmental influence, illustrated in figure 2. Thereby, the benefits of the firm’s information advantage can be explored and be employed in innovative designs, making the economy and environment work hand in hand, and thereby increase the chances to retrieve the win-wins and to reach a step closer to the outcomes discussed in the Porter-van der Linde hypothesis.

The European Commission (2001; 2003) presented a really holistic approach, Green Paper on Integrated Product Policy (IPP). The goal is to propose a strategy to strengthen and re-focus product-related environmental policies to promote the development of a market for ‘greener’ products – and the expression Life-Cycle Thinking is reoccurring. Both focus on extended producer responsibility, environmental product information and the purchasing power of public authorities. The first paper (2001) states that “public authorities should take their responsibility and act as leaders in the process of green management and in changes of consumption towards greener products.” The same paper also relates to legislation initiatives extending responsibilities for producers to the End-of-Life

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23 The introduced a three-way catalytic converter located in the exhaust pipe as an end of piped device. Other devises, in the converter system, are A) the lambda sound that measures emissions right after the engine whose data is then used for improving B) the fuel-air mix, increasing the combustion process. The catalytic converter is hence also a process solution, preventing some emissions from being created.

24 Instead, it may, on the contrary, be cheaper for the firm to use its information advantage to provide the market regarding other product characteristics, alluring the customer of some of the usage costs.
(EOL) phase for electronics and vehicles. In the newer paper (2003) the major foci is the same, but changes are made in extended producer responsibility from EOL foci (on hazardous substances) to also encompass the use phase of Energy-Using-Products (EUP) in order to affect the design process – referring to a forthcoming commission study\textsuperscript{25}. The 2003 paper puts strong emphasis on the increasing variety of products and services available and, thus, calling for a variety of policy instruments.

5 Harmonising economic and environmental opportunities (win-win)

If one seeks efficiency, as in Demsetz’s model (1967) one cannot rely upon individual wealth-maximisers, since their private benefits are not the same as social efficiency (cf. also Arrow, 1970). Akerlof’s (1970) lemons market and Arrow’s (1963) concept of moral hazard indicate that efficient institutions are no guarantee for sustainability. In order to ensure efficiency (Papandreou, 1997), individuals have to be positioned within a specific institutional incentive structure (e.g. markets) that guarantees efficiency. If looking at a value chain, the complete, or partial, the relations between the actors may be characterised by considerable asymmetries in information and power, as discussed by Akerlof (1970) and Habermas (1995), respectively. It may, thus, be cheaper for the design owner to steer product information towards other issues or to present the other side of the coin of the issue dealt with rather than putting considerable resources into product development to delimit environmental impact and possible related costs to other actors in the value chain.

Environmental objectives are best attended to by identifying the circumstances under which the win-win situations arise that Porter and van der Linde (1995a, 1995b) assume, but – importantly – within the responsibility scope of the actor who has the largest potential to use the property rights (opportunities) most efficiently (cf. Coase, 1991). This diminishes the information asymmetry within the Value Chain, i.e. between the design owner/producer and the end consumer/customer. A small actor e.g. an individual person with little resources for gathering information would, on the contrary, end up far below its utility maximisation curve due to high transactions costs and low receiver competence. Public procurement (and also larger corporate customers) may cause similar effect as extended producer responsibility: lower transactions costs sensitivity of buyers (less cost per transferred unit of product) and higher receiver competence, and thus demand on the designer. The power of public procurement is shown in the discussion on the chlorine free paper bleaching process above, but crucial for the entire environmental demand process was the persistent actions by an information bridge – the NGO Greenpeace. There exist numerous information bridges – influencing the consumers in coming to a decision – acting on various altruistic degrees. Such bridges are e.g. NGOs, Green Labels and Consumer Agencies (cf. list by European Commission, 2003) which can to some degree compete with the information flow from design owners – offering their own products. If enforcing environmental public procurement its handbook for public authorities could also serve as an information bridge to other consumers. The highest receiver competence on how to diminish the environmental loads of a service is most likely to occur if the sender and receiver belong to the same organisation (cf. Lee et al., 1999, finding a positive correlation investor size, on the one hand, and, on the other, speed

\textsuperscript{25} Cerin and Karlson (2002) discussed these issues and suggested an extended responsibility for the design owner of Energy Using Products (EUP) as well as a trade in rights to emit, but theoretically funded as well as estimating the greenhouse gases from the services of a multinational company and, if there is a price to emit, the costs associated with those discharges.
of learning and amount of knowledge; cf. Coase, 1991). Therefore, as indicated in figure 1, suggestions for decreasing the environmental burdens and social costs are to create market based related incentives for innovations by A) increasing the area of economic responsibility by extended property rights to cover the actors’ (e.g. a design owner's) areas of environmental influence, by B) enforcing green public procurement making the public authorities to also walk the talk and by C) supporting information bridges to enlighten the consumers (not shown in figure 1).

Figure 1. An indication on the incompatible areas of global warming sources and information/power to make a change among actors of a product/service. (The information that actors have may be of different kinds. E.g. the design owner knows better how to change its design and the authorities what total abatements that are desired.)
First, expand the process to look for new solutions to business problems outside the scope of today’s business revenue delimitations – that is outside the attention span of the firm such as outside its judicial borders – to encompass the scope of where the business’ activities generate the largest environmental impacts (cf. figure 2). Environmental innovations may, thereby, be created for life cycle phases in the value chain where no one is responsible for emissions and/or the actor that in the end actually emits (e.g. a consumer) has an information asymmetric disadvantage (deficient receiver competence).

In the automobile sector the scope of responsibility for designers may be expanded over the use phase to 1) decrease the role of deficient receiver competence of the end consumer\(^\text{26}\) and to 2) create incentives for the designer/producer to achieve economic (private economic benefit) and environmental (social benefit) win-win situations. Situations that otherwise would only have created social benefits at (most likely) private costs for the designer and/or the end consumer – if the seller can pass on expenses (cf. section 5; cf. Cerin and Karlson, 2002).

Relating to figure 2, we assume all economic activities to be associated to some environmental impacts of such character of which the economic agent at least have some bearing. Due to power and information asymmetries in society, however, not all actions by agents can be considered of such character that the agent itself can have enough influence on – power – in order to change it. In the extended property rights policy discussion we focus on cases where economic agents’ scope of environmental influence is considerably larger than its scope of economic responsibility.

The delimitations of environmental and economic scopes in this discussion (Figure 2) are consistent with the reporting scopes in Cerin (2002: Figure 1) arranged according to degree of control. Cerin argues that the scope of environmental disclosures should follow the organisation’s environmental influence

\(^{26}\) The receiver competence and ability to influence the design is smaller if the end consumer is an individual person. If the end consumer is represented by the design owning company – through e.g. extended stewardship or selling the service of one function – the competence and ability to influence will most likely be stronger.
corresponding to the definition in ISO 14001 on environmental aspects (ISO, 1996: clause 4.3.1). In many cases the largest environmental aspects may, in fact, reside outside the judicial boundaries of the organisation and in some cases even cover the entire value chain as shown in *Introducing Value Chain Stewardship* (VCS) (Cerin, 2004).

**Case II – The paint shop**

The paint shop in a car manufacturing plant is a good example of how incentives can be created for simultaneously both improving the (economic) efficiency in the painting unit and decreasing toxic emissions. The plant of the car company bought paint regularly from a paint company. The incentives for the paint company were, therefore, to sell as much paint as possible. It was not in its interest to help the paint shop economise on paint. When, on the other hand, the car company decides to out-source its painting (in the paint shop) to the paint company, the incentives for the paint company are turned around 180 degrees. Instead of having sales volume of paint as a primary goal the paint consumption now becomes a production cost also for the paint company. It will thus try to make the painting as efficient as possible also in terms of saving on paint. The paint company is more likely to succeed with this ambition than the car company because of its competence in the characteristics of its own paint and in how to use it. Thus, the costs for the environmental impacts do now coincide with the core competence of one actor – the core competence of the product designer (cf. Utterback, 1994). Now, not only did the core competence of the paint company coincide with its environmental influence, but with its economic responsibility as well. (See similarities with the suggested expansion of economic responsibility coinciding with environmental impacts in figure 2).

A decision to outsource, as in the above case, may be induced in many ways, such as a new regulation or simply by new competition. If driven by regulation, the policy measure has thus created a win-win situation by forcing the actor to look for new production and service solutions to its new problem. In doing so the actor increases its chances to discover new ways of reducing total costs. The reduction in paint consumption may be large and even compensate for the costs of the new technology. They may even be capable of raising their prices if the new technology has to be used by other car manufacturers and still the total outcome may also even be privately positive for the car companies. A new business economic responsibility structure may suddenly tilt actors into action. By having the incentives and the innovative capacities to create win-win situations coinciding within the same actor, the new structure will enable innovative firms to come up with new solutions to this and other problems as well.

**6 Public generated incentives for sustainability**

Let us assume that some companies offering products that consume energy excessively have put large efforts into minimising the corresponding resource waste, such as energy consumption and emissions of substances causing environmental impacts. They may see potential benefits in doing so and possess

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27 This is a fictive example, but has some similarities to real action taken by car manufacturer Volvo together with the local municipality, putting demands on new products from the paint supplier (cf. Schwartz, 1995).
a knowledge advantage to their customers further down the value chain. Competitors lacking these innovations and leading edge knowledge how to create such services, however, still may possess a knowledge/information advantage compared to end users. These competitors may – from an environmental perspective – instead disturb the market by focusing on other issues such as horsepower and acceleration to deflect attention from high fuel consumption and GHG emissions. In doing so they act as noise traders in the communication of environmental performance information (see Bak *et al.*, 1997; Danthine and Moresi, 1993, on how noise trading increases price variability and reduces welfare).

The full characteristics of the services provided should also include the reduced environmental impact. To be able to charge for the complete product the producer/design owner must be able to, not only inform its customers of all the characteristics of the product, but also convince the customer that he or she should demand all the characteristics of the product, including the reduced environmental impact. Such marketing is transactions costs intensive and if some of the services provided are not supported by property rights – such as GHG emissions – the creation of private economic value in all phases of the value chain is less clear and may not even occur. The resulting social cost, besides being hard to communicate, is shared between all actors of society whereas the private benefit of the actors in the VC is not shared with others in society. Decreased environmental impacts resulting from the adoption of new products and services, however, often cannot be charged for due to weak or the lack of property rights to environmental impacts²⁸. This is the case if the customer does not care. The assignment of appropriate property rights will force the customer to care. Thereby, the designer will also care, as is the case with powerful consumer demands such as public procurement. So, either due to property rights or public procurement this added social value can now be converted into a private value by making the customers aware of, and or by helping them to increase their receiver competence to enjoy it²⁹.

The classic example (in literature) of a public good is *The Lighthouse in Economics* (Coase, 1974) in which lighthouse signals benefit all passing ships regardless of their numbers. The difficulty of charging for this public service by excluding ships that do not pay was generally regarded in literature as a rational economic reason for government to supply this collective service³⁰. However, shows that besides being managed by governments over the centuries, lighthouses have also been built and operated profitably by private investors, shipping guilds and public-private partnerships. Thus, the private lighthouse may be run – and so was – by the aid of funds or merely by the support of the right to perform the service and charge for it. Exclusion (of those not prepared to pay) is, however, often associated with considerable social costs (cf. Anderson and Hill, 1975). The trick to make chargeability possible has been to develop an innovative bundling scheme. The economic rationale for how private lighthouses – illustrated in Coase’s (1974) writing – can be presented as a four-step sequence, as I have done below:

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²⁸ For example environmental impacts from product operation or the services surrounding them in the use phase.
²⁹ One example (see Cerin, 2000) would be policy of firms to raise their image (brand) by engaging in costly but privately profitably improvements of their environmental performance.
³⁰ The writers Mill (1965;1848), Sidgwick (1901) and Pigou (1920) held this position according to Coase while Samuelson (1964) argued that private firms (lighthouses) cannot charge for their services.
³¹ Coase (1974) concludes that this difficulty to charge for a public good “does not say that charging is impossible: indeed, it implies the contrary ... which would make private operation of lighthouses possible.”
Private Lighthouse Scheme (Coase’s *The Lighthouse in Economics* in brief)

(A) Lighthouses provide a service (social value)
(B) that is difficult to charge for (weak public support – property rights/procurement)
(C) but by bundling the product with the use of the port (private economic value)
(D) the bundled product can be charged for through the harbour fee (chargeability).

Placing this systematisation of the lighthouse example in a broader environmental and social context a policy can be designed to use property rights to transform environmental impacts into a tradable production factor. This Sustainability Incentives Scheme (SIS) runs as follows: 1) By providing decreased environmental impacts as an accessory to the product a positive social value is created which 2) by defining (if possible) rights or providing by public procurement (temporary monopolistic segmentation) and 3) an economic value follows (either via the buyers' benefits or public procurement pressure) 4) which then is chargeable, bundled with the product. The four elements of the Sustainability Incentives (SI) are structured below:

**Sustainability Incentives Scheme (SIS)**

1. Provide **social value** (e.g. avoiding environmental impact)
2. Strengthen **weak public support** (e.g. property rights/public procurement)
3. Create **private economic value** (e.g. product lowering environmental costs)
4. Enable **chargeability** (e.g. charge for the internalised functionality of product bundle)

Item 2 is the great obstacle for many actors in the SI scheme, shown above. In many cases there is a need for support from superior institutions to overcome uncertainties and conflicting aims. If the support in step 2 is strong in defining property rights and the enforcement thereof, or by supporting environmental public procurement, the need for product bundling will be lower. Institutions that own the information surplus – regarding society's need to abate e.g. GHG emissions as well as need for transportation and communication in a wider perspective – and have a social optimum as first and foremost objective are the ones most likely to steer the regulated actors towards the social optimum. Even though all actors of society together constitute the society, the personal self interest combined with a personal short term perspective often calls for a regulatory institution\(^\text{32}\) to make economic interests and environmental impacts coincide in the long term (compare with the utility costs of Arrow, 1970). Short term competitiveness and long term climate issues are both intangible dimensions that are difficult to coordinate by commercial incentives without significant support (cf. Arnold, 2000).

7 Concluding Discussion

Environmental concerns and policies to get the better of these issues have often been associated with excessive product costs. In the mid 1990's writers such as Porter and van der Linde have claimed the opposite. According to them regulators merely need to serve as enlighteners, making firms realise that environmental waste is economic waste which the corporate managers just have failed to see. They support their argumentation on successful legislative cases leading to corporate win-wins. Palmer *et al.* (1995) and this paper have indicated that some of those cases are faulty which may lead to erroneous conclusions. By applying the Coase theorem, bringing transactions costs and property rights to fore, this

\(^{32}\) However, of which the short-term perspectives of politicians, unfortunately, affect many.
paper argue that strong public support is necessary to create private incentives for exploring significant economic and environmental win-win innovations.

The economic prosperity of an organisation, hence, should to a higher degree coincide with its environmental influence from its offerings which may be achieved either by A) extended producer responsibilities or B) environmental public procurement. Together with publicly supported C) information bridges the size of the information asymmetries among actors can be lowered further. Thereby, the environmental influence caused by firms can be made reciprocal to its financial outcome, contrary to small sized customers’ abilities to influence them in such direction, if the customers care at all. As indicated in this paper, private customers in general seldom care or have access to suitable information that allows them to make a choice based on their environmental concerns. The final conclusion is that we cannot expect companies to act altruistic for the sake of nature if the win-wins will not reside within their own financial outcome, especially if the consumers do not promote such characteristics. We consumers may, thus, have a greater influence as citizens by acting environmentally in elections setting pressure on politicians to make emissions a production factor and employ the power of public procurement to work for a better environment.

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or


Paper XI

Introducing Value Chain Stewardship
(VCS)

International Environmental Agreements: Politics, Law and Economics.
Forthcoming.

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Abstract
Now, after a decade of international negotiations to limit greenhouse gas (GHG) emissions, there is a sufficient number of countries that are ratifying the Kyoto agreement. However, even with this positive development there is a formidable challenge since, according to the World Resource Institute (WRI, 2004), “For the most part, developed nations have failed to attain the non-binding emission reductions they committed to in the original climate treaty” from 1992. Ensuring adherence to the reductions stated in the treaty by these nations may become an immense managerial task not to mention the enforcement of sanctions. Instead of national emission targets the approach of this paper is to focus on trade within selected industry sectors – i.e. housing and transport – that are responsible for most of the world's GHG emissions. This paper shows that the vehicle manufacturers – the design owners – may use its information advantages to influence its customers' focus to other aspects of the vehicle as opposed to costs during use. Expanding the environmental responsibility of the design owners to coincide with the area of environmental impacts will convert emissions cost into a production cost. It is indicated in this paper that when applying the estimated costs for GHG emissions to the vehicle user, strong enough incentives are not given to drive technological change, but if the responsibility is allocated to the design owner the very same additional costs will be an incentive for the designer to use its information advantage to innovate away from those emissions rendering technologies. A Value Chain Stewardship (VCS) is, thus, established.

Keywords
Property rights, transaction costs, asymmetric information, product stewardship, design owner, value chain stewardship.

JEL classification
D23; K32; K33; L15; L22; L91; Q21; Q28
1 Introduction
The last five years of negotiations on delimitations on greenhouse gas emissions (GHG) within the UN Framework Convention on Climate Change (UNFCCC) and the increased emissions during the same time period (for GHG emission trends cf. CAIT, 2003) have demonstrated the immense difficulties in going from debating to actually abating the GHG emissions. To break the current stalemate, alternative solutions are suggested that place less focus on national entities. As a beginning, attempts to delimit national allowances to emit GHGs will face difficulties in achieving worldwide agreement and may be followed by immense difficulties of implementing, managing and enforcing the settlement which is well illustrated in the WBCSD Newsletter: Energy & Climate News (WBCSD, 2004).

To achieve the maximum benefits from trade in allowances on emission rights most nations of the world have to be included in the agreement, especially if considering the rapid economic growth in several major developing countries and the dramatically increasing numbers of vehicles (cf. WRI, 2004). Controlling more than 150 nations, however, may be an impossible managerial task with sensitive aspects of "who should be controlled by whom". The enforcement of sanctions on nations responsible for transgressions is likely to be a delicate matter as well. These facts, if not dealt with properly, could lead to a diminishing trust in the trade of allowances instrument, which will lead to increased costs for trade, due to the lack of confidence among actors.

Let us turn our focus on firms, considering the fact that about half of the world’s 100 largest entities, financially, are corporations and that most of them reside within OECD countries (Anderson and Cavanagh, 2000). The value chains (VC) of many industries are dominated by a limited number of multinational firms and the phase where the shape of the rest of the VC is controlled is the design phase. A legitimate thought therefore is: why focus on emission target agreements at the national level – between countries – and then establish firm level trade of intra and inter national character when we can focus directly on trade between firms, within each industry? The nations hosting these firms will, of course, be involved, but the number of nations will now be smaller and those who get involved will be so only partly.

To increase the efficiency of trade in emissions rights this paper introduces a solution focusing on trade within selected industry sectors. In fact, a few sectors are responsible for the majority of the world’s GHG emissions. By identifying these sectors and their key players the responsibility for emissions can be defined (and the rights to acquire emission permits). Hence, also the actors that have the largest potential to reduce emissions can be identified. This is exemplified with extended stewardship, e.g. requiring property rights to GHG emissions over the entire value chain of a product’s life, that in an extreme case can be allocated to one single actor. Such policy instruments may be applied to very specific, and defined, product groups and industries. If the aim is to reduce GHG emissions by giving win-win incentives to innovate (cf. Cerin and Karlson, 2002), one way could be to focus on the products and services of those industries that have the most significant

1 The European Commission (2001) discusses how to implement a product stewardship to the producer/importer that covers the end of life treatment (EoLT), hence, on emissions to land and water – not on GHG emissions. The form of product stewardship suggested here, covering the entire value chain, I call value chain stewardship (VCS).
contributions to global warming. Such as the transportation and building industries, that represents approximately 1/5 and 1/3 of the world’s GHG emissions, respectively.

In a no transactions cost environment initial endowment is of no interest for the outcome, but rights to the resource must be established (Coase, 1960). When Stigler (1966) defined the Coase theorem, under no transactions costs, he did so by making analogies to having conflicting resource aims under the same owner. He, hence, shifted ownership and responsibility to make transactions costs (almost) zero. Coase (1991) explained the necessity of giving the rights (to resources) to those who can use them most productively in order to keep transactions costs down and to increase the overall efficiency. By introducing the concept of asymmetric information (developed by Akerlof, 1970). Cerin (2004) and Cerin and Karlson (2002) illustrate the differences of power in the value chains, often making the end consumers short on information and, thus, power. In many cases the largest knowledge and possibilities to change the provided services and the associated value chain is located in the design (and/or final production) phase. Cerin (2004) continues to describe the asymmetric differences of different types of end consumers. The private consumers have the smallest possibilities to make changes upstream in the VC while corporate customers (varying e.g. depending on size) and especially public procurement have much larger consumer power, sometimes being able to dominate the entire market and, hence, supply.

Cerin (2004) suggests that the design firm will take a larger responsibility for the efficiency of the end product if the company is responsible for its operation. Then the environmental waste produced during use will be seen as a production cost (for supplied services) to be minimised. In a well-defined industry, hence, the area of company economic performance will coincide with the scope of company responsibility for environmental influences (Cerin, 2004). This is in line with the environmental management scope defined in clause 4.3.1 in the management standard ISO 14001 (1996), but so often neglected when implementing the EMS (cf. NV, 2003). If these delimitations are made to coincide incentives to innovate better solutions for society have been established.

Section two in this paper describes the Kyoto protocol agreement regulating GHG emissions. Thereafter the extreme situation is studied where the design companies are made responsible for GHG emissions arising from the entire VC of the automotive/transportation sector. This VC approach for trading in these emissions is dealt with in the third section.

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2 Transports in the world constitute 22% of carbon emissions from energy use (OECD, 1997; IPCC, 1996a, 1996b; 1997; 2000). The transportation sectors share in the US is 31% of USA’s total CO2-eq. emissions (US-EPA, 2002). The carbon emissions from this sector – world wide – is, moreover, the fastest growing one with a 2.4 percent average annual increase compared to a 1 percent increase per year for the whole world as of 1990-95 (Price et al., 1998).

3 Interesting to note here is that Adam Smith extensively discusses property rights in his The Wealth of Nations: (1776) e.g. in Books III, IV and V as a prerequisite for an efficient market economy but also for liberty and equality.

4 Despite considerable European taxes on petrol (affecting the end consumer), they have failed to stimulate the development of innovative alternatives to the gasoline engine, but rather created social impacts on poor rural areas where alternatives to the motor vehicle are few (Black, 2000). Currently and despite the taxes, (originating from a lower level) the European automobile ownership growth rate is increasing far faster than the North American one.

5 Cerin (2002) shows that environmental marketing to stakeholders (in e.g. corporate environmental reports) to steer away attention from those environmental aspects that the company regards sensitive or costly to improve is not an uncommon practice. This diversion marketing strategy is, however, not likely to be profitable for the firm when it has to carry the usage costs itself.
The fifth section discusses how to make the consumer pay for their GHG emissions. Then, in section six, the VC economy of hydrogen fuel cell cars is compared to gasoline cars under trade and the restrictions estimated by OECD to achieve the Kyoto goal. The immense system consequences from the introduction of different kinds of hydrogen engines are studied in the seventh section. The impacts on technology development from technological paths chosen are shown in section eight. The ninth section discusses the obstacle to implement new institutions. The results are summarised in section ten.

2 The Kyoto protocol regulating greenhouse gases

The Kyoto Protocol of 1997, a continuation on the 1992 UN Framework Convention on Climate Change (UNFCCC) ratified by 167 nations, is the first international attempt to place legally binding abatement targets on greenhouse gas (GHG) emissions, however, constrained to only cover emissions from developed countries. The GHGs addressed in the agreement are primarily CO₂ and an additional five, CH₄, N₂O, HFCs, PFCs, and SF₆. These industrialised nations should by 2005 demonstrate their progress towards achieving their respective targets. Globally that is a 5% emission reduction of GHGs compared to the levels of 1990 to be reached in the commitment period as of 2008-2012. In order for the agreement to be enforced ratification by a minimum of 55 nations, accounting for 55 percent of the global GHG emissions in 1990, is required (UNFCCC, 1998).

Even though the new treaty brings fruition to the good intentions of the 1992 agreement, developed nations have in general failed the non-binding, but committed abatement targets of GHG emissions. The Kyoto Protocol does not set any binding limits on the emissions from developing nations, nor does it establish a mechanism or timetable for these countries to take on such limits voluntarily. It however, introduces opportunities for emission reduction projects in developing countries funded by developed countries, which then will get the credits for the reductions in return under the Clean Development Mechanism (CDM).⁶

The practicability of achieving the specified reductions (5 percent from 1990 levels) is according to WRI (2004) a formidable test to many industrialised countries since, GHG emissions in most of these nations have risen considerably since 1990 and prognoses indicate a continued growth without any major changes in energy consumption patterns and in the mix of fuels used for energy generation. To prevent other countries from leaving the agreement, forests and agriculture have been accepted as GHG sinks⁷, relieving the industry from some of the reductions that had earlier been negotiated. Despite these exemptions (taken by 178 nations as of July 23, 2001 in Bonn) which considerably soften the initial abatement targets, the new agreement could become a milestone in the direction towards – but nowhere close to – achieving sustainability.

In these negotiations the problems associated with the issue of control are central. Such as, how shall the national emissions be measured and verified, and how shall transgression of (or failure to achieve) emission targets be managed? There are several nations to

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⁶ The Kyoto Protocol includes three tools for increasing the cost efficiency in attaining the overall abatement goal. The three so called Flexible Mechanisms are 1) International Emissions Trading (IEM) and the two project based ones 2) Joint Implementation (JI) and 3) Clean Development Mechanism (CDM) (cf. SOU, 2003).

⁷ In the GHG Protocol Initiative (2001) – by World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) – these sinks are seen as a separate sector, but hopefully with reverse net signs on GHG emissions.
control; especially if trading or quantified national abatement targets shall include the 140
developing countries – of which the extent of corruption varies and a few may even be
of a dubious nature. There is, hence, an underlying risk for immense monitoring and
management costs for the proposed agreement, leading to lowered efficiency in achieving
the proposed targets (cf. Cerin and Karlson, 2002). Moreover, if the gap in national pol-
icy ambitions between countries is too large there is also a risk that firms – in their search
for profitability – may find a need to migrate\(^8\) their, CO\(_2\) generating operations to regions
with lower environmental demands. This phenomenon, fleeing to lower cost regulation
areas, was termed as the *bathroom soap syndrome* by Laestadius (1980).

In its GREEN model OECD has estimated the price required on carbon emissions to
achieve the abatement reduction targets suggested by the Kyoto protocol (without any
trade) to USD 100 – 300 per tonne carbon emission (the average [USD 200/tonne C]
corresponds to [USD 54/tonne CO\(_2\)])\(^9\). If trade with the rights to emit GHG between
nations is permitted the abatement costs will drop considerably and reduce the corre-
sponding income loss by lowering the average marginal abatement costs, which varies
among firms, industries and countries (OECD, 1999). OECD and the latest GHG
agreement also suggested trading between countries. There are also great differences in
GHG abatement costs among the OECD countries. The carbon dioxide content per
TWh in Swedish energy supply is only one third of the average in the industrialised
world, mainly due to Swedish electricity being almost exclusively produced by nuclear
and hydroelectric plants.

The few coal plants that do exist have at great expense already installed highly advanced
emissions abatement equipment. As a consequence, however, the abatement costs in
Sweden are 5 times the European average reduction price according to Edin (1999), re-
sources which can be better allocated to create larger improvements elsewhere. As Adam
Smith put it in a critique of Mercantilistic ideas – characterised by populationism, fiscal-
ism and protectionism\(^10\) – in the fourth book in his *Wealth of Nations* (1776: Book IV: Capt. II):

> *It is the maxim of every prudent master of a family, never to attempt to make at home what
it will cost him more to make than to buy...What is prudence in the conduct of every private
family, can scarce be folly in that of a great kingdom. If a foreign country can supply us
with a commodity cheaper than we ourselves can make it, better buy it of them with some
part of the produce of our own industry, employed in a way in which we have some advan-
tage.***

One line of critique is that pollution abatement using emission rights trading will reallo-
cate future abatements to those actors that accomplish them most efficiently, which in
many cases are the plants and countries that currently have low degrees of abatement
technology. As a consequence, the incentives for – in this case – nations with high reduc-
tion costs to go further in delimiting their own emissions will be low. This will initially
slow spearhead technological development and make radical innovations less frequent in

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\(^8\) This phenomenon can be achieved by outsourcing.
\(^9\) However, now when the US, the world largest emitter of GHG by far, has chosen not to participate the
estimated price is more likely to be USD 20/tonne CO\(_2\) (ECONytt, 2003).
\(^10\) Adam Smith’s ideas should be viewed as a critique on Merchantilism, a system e.g. due to Marquis de
Mirabeau’s *Rural Philosophy* (1763). Smith, moreover, created and used the concept of a mercantile system for
polemic purposes, as a straw man to knock out.
the near future. These misgivings are reflected in both general-equilibrium based papers (cf. Bahn, 2001) and the industrial dynamics literature (cf. Faucheux et al., 1998).

There is also an equity-based critique against trade in emission rights. Is it fair to allow rich countries and strong firms the ability to buy themselves free from reducing their own emissions? The amount that each country should be allowed to emit should rather correspond to the number of citizens than on financial strength or the grandfathering principle. Not often mentioned in this line of critique, besides the overall cost effectiveness in obtaining emission reductions, is that wealthier countries and firms will in fact transfer capital and also know-how to other places on the world.

3 Trading in product life cycle emissions – a value chain approach

With the emission-contributions and reduction-opportunities from various industry sectors in mind, as well as the large number of countries to manage in a global GHG abatement policy program, a value chain stewardship (VCS) approach will be innovative – beneficial to management and innovative activities. Cerin (2000) and Cerin and Karlson (2002) demonstrate the potential positive financial consequences of being responsible for such product life cycle (PLC) emissions, shown, using the CO₂ emissions costs estimated by the OECD (1999). This is done by making one actor in the value chain responsible for the carbon dioxide emissions of the entire PLC and by making the total amount that an industry (over the entire VC) may emit strictly limited. The firm would then treat emission rights for offered products as a production cost, on an equal footing with other factors of production i.e. labour and resources.

Coase’s (1937) article shows that both the existence and the size of firms are determined by the intersection between hierarchy and markets where the internal and external costs for transactions are equal. A firm will continue to exist and grow as long as the internal costs for coordinating activities are lower than the costs for transacting them in the open market¹¹. Since it is usually very costly bordering on the impossible to come even close to the situation of full information (Stigler, 1966; Williamson, 1985; North, 1987), institutions are needed to support market transactions¹², working as information bridges. As a matter of fact, positive transactions costs constitute the lion part of production costs in economic life (statistical evidence is provided by Eliasson, 1984; 1996).

The concept of an exogenous relationship between actors within a value chain environment is dealt with by Porter (1985; 1990), who is well known outside the academic community. According to Porter (1990) the value chain serves as a tool for understanding the sources of cost advantage. However, due to an information asymmetry in service productivity value chain actors do not have equal opportunities and abilities to use these emission rights effectively. In fact, Akerlof (1970) demonstrates that markets need not to be efficient. On the contrary, Akerlof shows that sustainable markets may very well be inefficient, driving out products of good quality – the markets for lemons. Larger actors may

¹¹ See the correlations with Adam Smith’s description on Free trade and the burden of America (Smith, 1776): By means of glasses, hotbeds, and hotwalls, very good grapes can be raised in Scotland, and very good wine too can be made of them at about thirty times the expense for which at least equally good can be bought from foreign countries. Would it be a reasonable law to prohibit the importation of all foreign wines, merely to encourage the making of claret and burgundy in Scotland?

¹² Also papers using Neoclassical theory, assuming transactions in markets to be costless and that all actors are fully informed in the sense of being able to allocate themselves in static equilibrium, have indicated that institutions do matter in the idolised world as well (cf. Gerlagh and Keyzer, 2001).
take advantage of their power and information advantage. This article will show that vehicles are to a large extent sold by images – such as liberty and masculinity – and badge marketing, making the customer less inclined to consider issues like price, quality, mileage and environmental performance. It is hard for the small consumer to screen the information (cf. Stiglitz, 1975) that is signalled from the large car manufacturers (cf. Spence, 1973). In this situation actors cannot aim for being fully informed. To be satisfied they must resort to simplistic decision models (Simon, 1955). Who should then be made responsible for these emission rights? Following Coase’s Nobel Prize Lecture (1991) such rights – a Value Chain Stewardship (VCS) – shall be assigned to those who can use them most productively. Accepting the existence of positive transactions costs means accepting the critical role of the property rights institution, and that the outcome of a transaction will be dependent on the initial endowment of properties. Stigler (1966) compared the no transaction cost environment with a case where one owner had a resource with conflicting aims of usage. He concluded that “the Coase Theorem thus asserts that under perfect competition private and social costs will be equal.” In a transactions cost environment, on the other hand, it was stated in the 1991 Nobel Prize Lecture (Coase, 1991) that: “It is obviously desirable that these rights should be assigned to those who can use them most productively and with incentives that lead them to do so and that, to discover (and maintain) such a distribution of rights, the costs of their transference should be low, through clarity in the law and by making the legal requirements for such transfers less onerous.”

The theoretical body of Global Value Chains (GVC) uses the concept of a lead firm, managing the actors within the chain. Another central concept is governance (cf. Gereffi et al., 2004; cf. Humphrey and Schmitz, 2001). According to Dolan and Humphrey (2000) small sub-contractors in the horticulture industry are marginalized, not fitting into the new sourcing strategies of the lead firms. This marginalization of smaller contractors is also indicated to be the case in the automobile components sector according to Barnes and Kaplinsky (2000). A vast number of researchers indicate an immense upgrading power managed by lead firms through the role they play in their chains enforcing radical changes (e.g. Gereffi, 1999). A common way to structure these chains is the producer and buyer driven chains. As shown by Gereffi, more complex products and systems often reside within Producer-driven chains where the core competence (of the leading firms) of the value chains is R&D and design. This is e.g. the case in the car, computer, aircraft, telecommunications, home appliances and consumer electronics industries. Design and marketing competence is seen as critical in industries producing simpler products such as textile, furniture, paper and food. These chains are called Buyer-driven chains. Kaplinsky (2000) sees the ability to govern a VC as an intangible competence used by the lead firms – i.e. R&D, design, branding and marketing – which have considerable impacts on the distribution of gains. A new core competence in public policies is to create upgrading activities within the chain to decrease unwanted societal cost. The chain, hence, becomes Policy-driven.

Branding and chain management seem to go together which also is in line with the discussions of inefficient markets, briefly dealt with previously in this section. As a matter of fact, the concepts of transaction costs and power asymmetries are very prominent in the forthcoming article on GVCs by Gereffi et al. (2004). In most value chains of complex products the most efficient solution may, thus, be to assign one actor – the design owner of the end product – the ownership of all GHG emissions from the product’s entire life (cf. Stigler, 1966), since the design owner has the largest knowledge about the product parameters. The design owner, thus, has the largest potential to lower emissions during use, to choose suppliers and technologies upstream, and to implement radical changes to
its provided service. By giving the VCS to the design owner, emissions from all life cycle stages will become a production cost for the design owner and consequently the incentive to lower emissions will directly coincide with the enlarged delimitations of the economic prosperity.

4 The prevailing trend in today’s automobile market – do consumers care at all?

By enforcing emissions as an auto-feature, the extra cost for lowered emissions during use will be more visible to the customer/end-consumer in the price tag when purchasing the car/sport utility vehicle (SUV)/truck/etc. In spite of the great potential for environmental and economic win-wins (cf. Cerin and Karlson, 2002) for firms, shown in the green and competitive literature in the mid-1990’s, the trend seems to be the opposite. As of today, in North America, trucks and SUVs constitute half of car sales (and Europeans fancy high-performing vehicles to a higher degree than the Americans). Vehicle fuel economy in the US is at a 21-year low\textsuperscript{13}, and still declining (US-EPA, 2001; cf. ASE, 2002) mainly due to, on average; 22\% heavier, 84\% stronger and 27\% faster acceleration compared to 1980.

Obviously, many consumers are prepared to pay about 50\% more for fuel-thirsty vehicles than for economy class cars (see fuel cost in Figure 2) – that is roughly speaking $30,000-40,000 (SUV) respectively $15,000-20,000 (standard) in purchase prices\textsuperscript{14}. Using the average US gas price today USD 0.29/litre\textsuperscript{15} and the Kyoto CO\textsubscript{2} emission costs USD 0.16/litre and multiply these with 200,000 kilometres (representing the distance driven during use) equals USD 12,900 and USD 6,100 for SUVs and economy class cars, respectively. Despite numerous green studies showing the potential value of nature and the great possibilities to charge extra for services protecting the environment consumers are rarely prepared to pay extra for goods and services with superior environmental performance. The probability that the consumer will opt for the green characteristics is even smaller if the customer has to give up something else, for instance high acceleration vs. low emissions\textsuperscript{16}.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure1.png}
\caption{Feeding the consumer with the image of patriotism and masculinity}
\end{figure}

\textsuperscript{13} The 21-year period as of 1980 – 2001. Fuel consumption, did prior to this, decrease during the oil crises in the 1970s from a very high initial fuel per distance consumption level.
\textsuperscript{14} For more information, browse to \url{http://www.carprices.com/} and \url{http://www.cars.com}.
\textsuperscript{15} For more information, browse to \url{http://www.gaspricewatch.com}.
\textsuperscript{16} A recent survey (since Dec. 12 2001) on Sweden’s largest news site on the Internet, \url{www.aftonbladet.se}, indicates that when choosing among six alternatives when purchasing a car environmental performance is the least likely to consider (2\%). The voters prioritise price, performance and safety the most. And Sweden is often referred to as a market with high environmental demands.
The market for SUVs and trucks has been associated with large profit margins – compared to production costs and to standardised cars – during the 1990s in a branch which has and still is exposed to significant competitive price pressure, resulting in mergers among producers. This fact of prosperity forces almost all automakers to join in with their own overweight vehicles. The premium car makers Lincoln and Cadillac\(^\text{17}\) are now both making their own full-size pickups (and SUVs) – a car type formerly reserved for ‘rednecks’. Porsche, long known for ultimate high performing vehicles, can no longer stand aside watching this prosperous segment develop and has, therefore, made its product portfolio more diverse, introducing the SUV Cayenne in 2003\(^\text{18}\). The same goes for most European and East Asian car manufacturers. The question is, for how long can this segment retain its high profit margins, but obviously automotive manufacturers are feeding consumers with images of something extra to support margins, such as masculinity, wilderness or nationalism\(^\text{19}\). An example on this is the “liberty” Jeep presented at the Detroit Auto Show, January 2002 (see figure 1). The vehicle alludes to the cruel and cowardly attack on WTC and Pentagon September 11, 2001 by Muslim extremists. The consumer is provided with the image of a strong and independent nation (fighting back) that ‘produces its own goods’, but the high fuel consumption of the vehicle appears to contradict that image. That is, liberating the nation from its dependency on foreign oil.

5 Making consumers pay the automobile emissions

Dumping CO\(_2\) emissions into nature does not yet carry any price tag, since there is no responsible owner of nature. Can a sustainable owner be created that can exercise property rights to nature and charge a price? A voluntary approach would be to include emissions data as part of the product specialisation, and hope that car buyers will go for low emission vehicles\(^\text{20}\). It is shown in the catalytic converter case (for Volvo in California) that this is workable if the producer can build a positive environmental image around its vehicles that appeals to well-to-do-customers, who are willing to pay\(^\text{21}\). This strategy, however, is not likely to be workable if it forces the environmental customers to give up comfort, safety and acceleration. This will be the case if the costs for attending to emissions are high and customers’ willingness to pay for environmental performance is low. Then the incentives for producers to innovate will be lacking. This negative outcome will also occur if the producer finds other strategies to address environmental issues that are less costly to attend to or identifies other product characteristics, such as acceleration, as more effective than informing on serious environmental issues. The car owner might not even be aware of the pollution characteristics of the car he or she buys. So, the car manufacturer might be able to build an environmentally friendly image of its products, without outperforming its competitors’ vehicle environmental performance. The automobile designer (producer), however, knows its products’ characteristics – and often also of how

\(^{17}\) For more information on available types of vehicles go to http://www.cars.com.

\(^{18}\) For more information on the Porsche Cayenne and its sibling the Volkswagen Touareg go to, VWvortex NEWS: http://www.vwvortex.com/news/, a news site that encompasses the automobile brands of the Volkswagen Group.

\(^{19}\) Slogans used in this segment are “Tough American-built” (used by Ford in the US) and “Real men don’t eat sushi” (used by Chevrolet in Sweden) instead of focusing on other factors such as quality and mileage economy.

\(^{20}\) Some auto manufacturers are currently doing this transfer of emissions data and home appliance producers are similarly informing their consumers on energy consumption. Despite these labelling initiatives buyers’ choices are not significantly benefiting good environmental performance alternatives.

\(^{21}\) Even if such a customer group is identified it is unlikely to be spread to the lion part of the market’s customers. This is shown in the very same catalytic case but for Volvo in Sweden as well as presented in the Aftonbladet Web poll shown in the footnote above regarding the car customers’ preferences.
to improve corresponding designs as well – and could be made to act if responsibility was allocated to him. Government could therefore, exercise its property rights to nature, by exacting limitations on, or a charge for pollution that would shift demand to more environmentally friendly vehicles. It is, therefore, of interest to know how large the change would have to be to make environmentally clean vehicles price competitive. The correct calculation would be to estimate the charge that would keep emissions at a desired level.

We will now see 1) the CO₂ emission limitation or charge needed to make fuel cell vehicles competitive choices (section 6) and 2) how the new BMW dual hydrogen and gasoline engine may radically change the theoretical case in introducing hydrogen powered cars and energy supply (section 7). Using the carbon emission cost estimated by the OECD to achieve the Kyoto goal, will fuel cell vehicles (FCV) be more competitive in a carbon emission market for a VCS covering the transport sector? Let us compare the hydrogen FCV (fuelled with direct hydrogen converted by local steam methane reformers) with gasoline internal combustion vehicles (ICV) which are identical in other respects. This is illustrated by comparing the hydrogen FCV to the corresponding gasoline ICV, but also by using the expensive, heavy and thirsty SUV (fuelled with petrol) when considering both the purchase price and the costs to drive.

6 Comparing the economy of a HFC with a GIC powered vehicle

The purchase price for the conventional 5-passenger gasoline internal combustion vehicle (GICV) is USD 18,000 (Thomas et al., 1998; Thomas et al., 2000). The corresponding vehicle purchase price for a 5-passenger hydrogen fuel cell vehicle (HFCV) is USD 20,00022 according to these authors’ assessments of an initial mass production of FCVs. The price for the gasoline SUV begins at USD 30,000 (cf. http://www.carprices.com/).

There are obviously large uncertainties in estimating the incremental vehicle costs for FCVs compared to GICV. When reviewing the literature the reader should, moreover, also observe that there are different prices/costs that are dealt with in the articles which are not always obvious at a first glance. These prices/costs may be grouped into three categories and text in italics is my denomination of them;

1) manufacturing costs – additional costs for production (Hörmandinger and Lucas, 1997),
2) retail costs – additional costs also for R&D, capital, marketing etc (cf. Ogden et al., 2001; cf. Ogden et al., 2004; both referring to calculations by Delucchi, 2000) – and
3) purchase prices – the actual price facing the consumer which is heavily influenced by automaker and dealer incentives and rebates (cf. Black, 2000).

In this study the most interesting for the realisation of FCVs is the difficult to estimate purchase price. Manufacturers appear at times to be willing to internally subsidise the cost of some vehicles. Toyota for example has claimed to substantially subsidise their gasoline hybrid vehicle when sold in Japan (Black, 2000)23.

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22 The estimated purchase price for the HFVCV used in this example on USD 20 000 ranges from just over USD 19 000 to just under 20 000 in Thomas et al. (1998) and Thomas et al. (2000).
23 This is, of course, far from a general approach. In Sweden, for instance, the Toyota gasoline hybrid is not subsidised to a similar extent and is, hence, not really affordable to the common man (cf. www.miljofordon.se). The vehicle consumer price competes with premium vehicles that are much larger in size and offers several luxury attributes as well. Ford, on the other hand, introduced their Ford Focus
The mark-up price for HFCE compared to ICE is difficult to estimate and various assessments range between less than USD 2,000 to USD 2,500 (cf. Ogden et al., 2001; Ogden et al., 2004; Thomas et al., 1998; Thomas et al., 2000). The incremental costs for methanol and gasoline FCEs are even higher (cf. Dunn, 2002; Thomas et al., 1998; Thomas et al., 2000). The important price difference here is not only the one between the standard gasoline ICV and the HFCV, but the one between the HFCV and the so appreciated SUVs in the West, equipped with considerable premiums both concerning (high) purchase price (exceeding USD 12,000) and (low) fuel economy. In other words: peoples’ perceptions of what is worth striving for determine what is competitive pricing or not and perhaps not utility per se.

Figure 2 shows that the purchase price of a fuel cell vehicle is not price competitive with today’s environmental considerations of car buyers, since the standard vehicle – GICV – is about USD 2,000 cheaper than the corresponding fuel cell vehicle. Consumers’ preferences, however, make the – USD 12,000 more expensive than the conventional family car – SUV preference-competitive, by providing the extra utility of carrying around one extra tonne of steel at a surplus gas cost of USD 3,500 when driving a distance of 200,000 km. By applying a USD 200 introduction price per tonne carbon emission (a rough average cost in the OECD GREEN model, see OECD 1999) – a tonne CO₂ emission would cost USD 54 – and add these carbon costs to the emissions from the entire value chain of the car to the purchase price, the FCV alternative becomes price competitive to the standard ICV. The methane-based hydrogen, delivered by trucks or pipelines and locally transformed from methane to hydrogen, is a technological bridge (cf. Conte et al., 2001) which may be used, short term, until the technological and economic obstacles for adopting zero emitting technologies have been removed. We see (in figure 2) that the fuel cost is somewhat lower for hydrogen than for gasoline (cf. Thomas et al., 2000), even though hydrogen is taxed ‘extra’ (not on equivalent energy bases) to com-

Flexifuel car (running on either gasoline or ethanol) in Sweden with a somewhat lower price than the corresponding ICE Focus (this is not the case 2004, but the mark-up price is still small) and the company also offers discount on the vehicle insurance (cf. www.ford.se).

An interesting evidence of differences in perceptions is how different the SUV is perceived in the West versus China. Larsson (2004) has in his interviews regarding one of the world’s largest vehicle manufacturers seen that one large dilemma for them is that the Chinese SUV segment has not been increasing as other Chinese car segments has. This is an important obstacle for the corporation to overcome since A) it is everywhere in the world the very dominant player in that segment and B) the segment is a very prosperous one too. Instead the Luxury Sedans with plenty of legroom for backseat passengers is more appealing to wealthy Chinese – a car model less resembling vehicles of the militia. The Volkswagen Passat e.g. is popular in China, commonly attributed with shaded windows and extra legroom in the back.

That is USD 54/tonne CO₂ emission, since carbon constitutes 27% of the total carbon dioxide weight.

These carbon emissions, from various life cycle stages of IC and FC vehicles, are retrieved by using data from Albrecht (2000; 2001), Thomas et al. (1998), Thomas et al. (2000). For instance CO₂ emissions that are used ranges between; in production from 2 to 3 tonnes, during use from 0,075 kg/km to 0.75 kg/km and in end-of-life treatment the carbon emissions are considered negligible to the outcome of this study.

Better technologies (when concerning GHG emissions) would today be nuclear power with near zero emission of CO₂. Due to the risks connected to nuclear power an even better solution, when the technology eventually becomes mature, may be to produce this energy by solar cells. Common to these two ways of producing energy is their delivery systems which are energy generation transformed into electricity, distributed and then (at decentralised refuelling stations) to transform the energy into hydrogen power via electrolysis (cf. Ogden et al., 1999; Dunn, 2002). These processes are, however, inefficient using only a small part of the energy originally extracted. A close to optimal solution in the future may be onsite solar cells, using technology that splits water into oxygen and hydrogen without having to transfer energy back and forth to electricity (Gustafsson, 2001). If going to the long-term solution the carbon dioxide cost in figure 2 would drop to almost zero, but the cost of vehicles and fuel would rise.
pensate for its much higher efficiency\textsuperscript{28} (than gasoline) so that the tax per driven kilometre will be the same. The resulting cost for fully taxed hydrogen is 0.26 USD/litre per gasoline equivalent. The price used here has been rounded off to 1 USD/litre per gas equivalent. The corresponding gas price used is 0.29 USD/litre (cf. http://www.gaspricewatch.com/). It is interesting to note (in figure 2) that the initial price for carbon emissions – estimated by OECD (1999) – makes hydrogen FCVs price competitive to standard gasoline ICVs, enabling the introduction of such technology even on the US \textit{low taxed} gas market. This is in fact, necessary when customers are not prepared to pay anything extra for the environment. However, as pointed out above and perhaps peculiar to some, the willingness to pay extra for vehicles with extra weight, horsepower and emissions is quite considerable.

![Figure 2. Comparing cost of hydrogen FCV and gasoline ICV (standard and SUV) under a Kyoto emission-goal based VCS CO2 permit instrument for vehicles.](image)

### 7 Comparing the HICE design of BMW with the HFCE

Using the concepts by Hughes (1992), the \textit{salient} in this technology system development is the hydrogen powered engine while the \textit{reverse salient} is the energy supply infrastructure to vehicles, which has to be solved if the technical change shall take place. The term \textit{critical problem} – coined by Hughes – for the reverse salient could both be to solve the supply structure and to change vehicles dependencies on fuel type. The hydrogen internal combustion engine (HICE) created by BMW is almost as efficient as the hydrogen fuel cell engine (HFCE) developed today in terms of carbon emissions. Mazda has recently tested a somewhat similar solution to the fuel problem that is based on another type combustion engine\textsuperscript{29}. The BMW and Mazda engines, however, have a great advantage: they may


\textsuperscript{29} Both cars use HICE, both based on old combustion techniques. Mazda’s engine, however, is not based on the common pistons equipped otto-engine as BMW’s engine is, but on the rotating triangle used in
serve as technological bridges for introducing hydrogen vehicles. The enormous costs associated with introducing infrastructure for hydrogen supply is one major obstacle that has to be dealt with. This infrastructure introduction will make the costs that now are delaying the introduction of 3G-mobile systems appear like minuscule. The introduction of HFCV will require nation-wide (or more likely multination-wide) installation of hydrogen stations prior to the sale of hydrogen vehicles. In order to gain revenues in the short term, there is, however, a need to have an existing fleet of hydrogen cars on the roads as soon as possible. The dual design of e.g. the BMW hydrogen combustion car, based on BMW 750L, may contribute to achieving this objective. It can be driven on both hydrogen and gasoline. If – when introducing hydrogen powered vehicles – hydrogen stations are strategically placed in densely populated areas the vehicles can be driven on hydrogen in these areas and driven on petrol in the less densely populated areas. Thereafter, hydrogen stations can be introduced at a rate relative to the increase rate of hydrogen cars on the roads. Such a course of events may cause a dominant design scenario, creating a technological lock-in\(^{30}\) and path dependence (cf. Arthur, 1990) into HICE powered cars. The combustion engines will, in this scenario, gain a research lead that creates efficiency and production cost advantages over the HFVE. This could become the case since the HICE (used by BMW) is almost as efficient as the HFCE today. The development will be determined by policy approaches taken by nations and regions together with the price competitiveness of firms’ innovations that will be offered under the new rules.

**Sustainability estimations – considering impacts on competitiveness**

Since the introduction of Dow Jones Sustainability Index, managed by SAM Indexes, the index has been criticised for not considering quantitative environmental performance data of the reviewed companies’ offerings. Cerin and Dobers (2001) questioned the validity of the criteria and assessment of components – e.g. the selection of BMW as the sustainability leader in its group. Yet, BMW produces cars with considerable fuel consumption and performances, stimulating excessive driving and thereby even more severe emissions and number of traffic related deaths. Now, SAM together with WRI has made a serious attempt to estimate the impact from GHG emission restrictions on the competitiveness of the ten largest vehicle manufacturers in the world (SAM and WRI, 2003).

One useful measure e.g. is the carbon insensitivity of the profits from their product portfolios. Despite the notable attempt there is still potential for improvements. SAM and WRI identified three technologies as key resources for future competitive advantage; diesel, hybrid and fuel cell. The grave error here is not to take the immense differences in likeliness of realisation – as discussed in this paper the great obstructions in creating an infrastructure for hydrogen supply. BMW’s dependency on carbon in their profits is identified, but the error – by SAM and WRI – is not recognising the potentials of BMW’s hydrogen internal combustion engine (HICE). The HICE can become a technological bridge in a transition to hydrogen fuel vehicles and even, due to potentials to create path dependence and the potential to become a dominant design even though the fuel cell engine today is somewhat more efficient.

wankel-engines. The two engines in the applications discussed here can be seen as similar solutions to vast infrastructural problems with hydrogen.

\(^{30}\) Technological lock-in is one possible outcome when policies are only determined by competition, contradicting social optimums set – i.e. goals for sustainability (Faucheux and Nicolai, 1988).
Accordingly, contrary to the SAM and WRI assessment of BMW’s hydrogen technology, it might have larger possibilities to initially become realised than the fuel cell based technology.

The technology used by BMW (and to some extent for other hydrogen engine technologies as well) requires large and heavy cars in order to fit the engine-fuel system into the car with the acceptable space left for transporting people and goods. Further development is, thus, needed, especially if one considers the large number of people in the late-comer economies – of e.g. China and India – that soon will be put on wheels. Important to note in the bi-fuel car scenario is that a policy system putting all the incentives on the designer/producer may neglect some implications on the consumer/driver behaviour. But when the hydrogen-equivalent is price competitive to gasoline – 0.26 USD/litre compared to 0.29 USD/litre – as this paper argues, the consumers’ ability to freely choose fuel form time to time does not pose a problem. If one follows the arguments of this paper, the fuel alternative we would like to steer consumers towards must be price competitive or close to it if the obstacles to change fuel is small or none. The policy makers must create financial benefits to the consumer to stay with desired fuel. That can be achieved e.g. either with a tax on gasoline31 (which under normal uni-fuelled vehicles only delimits car usage very marginally but with considerable social impacts on the poor segments on society (cf. Black, 2000) or with reduced parking costs if being able to show that the car is regularly being fuelled with alternative fuels to a certain extent (as in Gothenburg, cf. SPI, 2003).

8 Reinforcement of old technologies and technological path dependence

Some estimates indicate that the transformation of gasoline to hydrogen driven vehicles should be looked upon in the long-term perspective, realised within the vague time span 10-30 years from 2004 (ViBilägare, 2004; Lissen et al., 2003; Personal Communication, 2003; Ogden et al., 2004). Volkswagen plans to have FCV in larger quantities available earliest by 2020, while Toyota plans to have 50,000 FCV out on the Japanese market by 2010 and my personal communication with the CEO of one of the words most profitable vehicle manufacturers suggest HFCV to become realised by 2025-2030 at earliest. The CEO (Personal communication, 2003), and Volkswagen (ViBilägare, 2004) and Lissen et al. (2003) believe synthetic fuels to be the short-term solution. Volkswagen and Shell have developed SunDiesel which is a liquidised biogas and is, hence, carbon neutral. The CEO emphasised the potentials with the vast gas fields in Western Siberia, an area as large as France and Spain combined, to be a future usable resource by merging short gas molecules into a synthetic diesel. This new opportunity could, hence, pro-long the decency on fossil fuel for some additional 30 years.

There is always a risk that the best technologies fails to bud because self-reinforcement processes embodied in chosen technological bridges lock development onto the wrong trajectories (path dependences, indicated by Marshall, 1890, and further developed by Arthur, 1990; 1994 and by Kaijser et al., 1991). Common examples of self-enforcement (of old and) inferior technologies are VHS locking out Beta and MS Windows locking out Macintosh. Hydrogen fuel cells present us with a similar lock-in problem (Dunn, 2002) such as choosing deficient energy supply infrastructures. We may see a continuous decrease in allowed GHGs emissions demanded by the policy instrument (i.e. by the Kyoto protocol

31 However, if choosing both a tax on carbon content in fuel and delimiting rights to emit carbon over the vehicle VC, the result may be a case of double taxation.
and possibly further on) simultaneously with an expected increase in physical activities – e.g. transports (Ogden, 2000). Absence of a GHG instrument may lead to a 30-40% increase in GHG emissions over the next 20 years. Transportation may constitute 95% of that increase (cf. Dunn, 2002). These challenges might create immense incentives to take us out of major lock-ins into deficient technologies. The tradable permits market – being VCS-based – makes the VC emissions a production cost for the design owner/producer and thereby establishing a foundation for innovations creating spillovers and an expanding set of new opportunities (Eliasson, 1996).

Moreover, Requate (1998) argues, the introduction of new technologies under a tax instrument welfare program may go down. This scenario is less likely in the case with permits. One reason is that under a tax instrument the innovative firm serves the whole market through its cost advantage, while it will be more optimal for the conventional firms and the innovative firm to share new technologies in the market – such as under a trade policy.

9 Obstacles to implementation of new policies

Even if a tough policy instrument, such as bubbles for trading life cycle GHG emission rights, may be very efficient in theory it may, nevertheless, be difficult to implement. The important issue regarding barriers to policy implementation, which determines whether actual progress is at all possible, is only briefly dealt with in this paper. In his article on inducing bubble markets (of environmental control technology) by legislation Dobers (1996) identifies three actors influencing the creation of emerging environmental markets: pressure groups, suppliers and customers. His life cycle description on emission markets, however, calls for more research on the pre-existence of markets. Especially, the task of changing institutions – rather than implementing new ones – is difficult (Papandreou, 1997). These obstacles of implementing changes to institutions were recognised already by Machiavelli (1513):

… there is no more delicate matter to take in hand, nor more dangerous to conduct, nor more doubtful in its success, than to set up as a leader in the introduction of changes. For he who innovates will have for his enemies all those who are well off under the existing order of things, and only lukewarm supporters in those who might be better off under the new.

(Machiavelli, 1513)

This opposition is partly due to the opponents’ fear – legitimate or not – and the uncertainties of those wanting real proofs. Strannegård (2000) identifies politicians as chiefly being reactive to change. People know what they have, but not what they will get. One method to overcome the barriers to introduce new trade policy instruments is to adopt the grandfathering principle. Porter and van der Linde (1995) discuss the importance of minimising uncertainties (that is the transition cost) by employing phase in periods in regulation adjusted to industry cycles as well as having comparative advantages and innovations in mind. The dynamic interaction between regulated firms and regulators is also described by Faucheux et al. (1998) as a strategic game where potential winners and losers try to affect the evolving instrument.

32 My comment: The phrase the existing order of things is in some translations translated as the old institutions.
OECD (1999) illustrates the difficulty of introducing a system of tradable permits and concludes that the costs of implementation are lower if the grandfathering allocation principle is adopted. Since no trade exists initially and if an egalitarian rule is the basis for the initial allocation of permits, considerable amounts of tradable permits have to be traded immediately at the introduction of the new instrument. This large trade would then take place in an early phase of the instrument’s life cycle when the uncertainties are highest and, thus, also the transactions cost. Considerable allocation by trading is, however, essential for allowing entry and exit of new and old companies and technologies. Without such possibilities, the innovative force of the policy instrument is considerably lower and static – protecting old society structures from change (the four mechanisms of growth, Eliasson, 1996; the entrepreneur, Schumpeter, 1911; the innovative entry, Smith, 1776; see further the emission bubble discussion in Cerin and Eliasson, 2002).

To avoid heavy initial and costly trade the grandfathering allocation principle should be used (initially) (cf. OECD, 1999) when establishing of an emission bubble for the VCS of a sector’s services. Instead of having annual rights being based on this grandfathering principle, in a longer perspective, a gradual transition should be made towards annual rights increasingly being allocated on primary trade. Also, by making costs for entry and exit of traders low, a different and more efficient allocation will soon be established.

10 Concluding discussion

Despite the alarming signals on society’s green house gas contributions into our life-supporting milieu international multilateral agreements to reduce emissions seem far away. If focusing on the industries primarily and the lead firms’ value chains, this paper has identified benefits that are worthy of further investigation and debate. That is, by pinpointing sectors with the largest green house gas emissions (i.e. housing (1/3) and transports (1/5), of the world’s total emissions). Economic-environmental win-win incentives can be created in those sectors that have the largest potentials to innovate and create new solutions. By expanding the environmental responsibility to design owners – in this paper the vehicle manufacturers – to coincide with the area of environmental impacts, emissions cost will be converted into a production cost for offered services. Incentives for environmental improvements are, hence, created for those (the design owners) that have the largest possibility to innovate new designs. Even the very considerable European taxes on petrol have failed to stimulate the development of innovative alternatives to the gasoline engine. However, considerably smaller additional costs for carbon emissions when added to the US car and gasoline prices have been shown to be large enough to stimulate such innovation in the value chain when applied to the right actor.

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Appendix

Displaying the Front Pages of Papers I – II

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Where is corporate social responsibility actually heading?

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Abstract: A discrepancy is indicated between the emergence of environmentalism and the sustainability agenda, and accomplished environmental improvements. Despite the increasing number of success stories, environmental and social progress is not keeping up to the same advancement pace. The enormous information asymmetries among actors in society and the dangerous circularity of rating and selection of firms may well obstruct the changing of the State of the World. Sustainability indexes may lead to investments in twice as much greenhouse gas emissions per turnover which is probably the opposite of what the environmental conscious individual investors have in mind. Thus, actions that diminish the need for image building are suggested. The scope of corporate environmental and social responsibility should be extended to better coincide with the actor who has the largest potentials to make a change, including governmental bodies by strengthened environmental and social public procurement – that is to Walk the Talk themselves.

Keywords: corporate social responsibility; hijacking environmentalism; information asymmetries; sustainability indexes; environmental image building.


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SUSTAINABILITY HIJACKED BY THE SOCIOLOGICAL WALL OF SELF-EVIDENCE

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The nowadays commonly applied structuring of sociological theories – the four-fielder of Burrell and Morgan (1979) – in the environmental and sustainability agenda may, unfortunately, serve as a platform for the advocators of leaving business alone to realize win–win solutions by itself – that is obstructing change by encouraging business as usual. The reason for this hijacking of environmentalism is a dichotomization of regulation and radical change along an axis describing the nature of society. By instead focusing on power along the society continuum, the tool describing sociological theory enables policy thought that promotes a societal change towards increased sustainability. Copyright © 2003 John Wiley & Sons, Ltd and ERP Environment.

INTRODUCTION

When dealing with how firms and society handle, and ought to handle, environmental issues, finding a common theoretical worldview is not easy. There is no theoretical environmental paradigm explaining how man shall economize on nature and its sustainable resources. Environmental research dealing with these issues often leans on either the socio-theoretical trajectories of business administration or economics, sometimes bridged to natural sciences on conditioning the state of the natural milieu. These complicating circumstances, especially since the areas of business administration or economics are extensive and contradictory within themselves, lead to considering the need for a theory on the whole (cf. Silverman, 1997). I attempt, however, to show the essence of a

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1 Since environmental management is a young discipline it relates closely to the traditional management trajectory (Dobers et al., 2001). Dobers et al. (2001) also noticed that management research is a multi-faceted and fragmented field in itself. Environmental management, containing management, is moreover multidisciplinary and heterogeneous. I would say the same goes for economics and environmental economics.
SWEDISH ENVIRONMENTAL PROTECTION AGENCY
Environmental Strategies in Industry – Turning Business Incentives into Sustainability
Environmental Strategies in Industry

Turning Business Incentives into Sustainability

In this report some of the concepts, tools and instruments that firms are using to respond to the global challenge of sustainable development are being reviewed. The review is made with a critical eye and the many barriers and limitations in the use of corporate environmental management tools are revealed. By widening the scope involving a larger group of actors and stakeholders in the development and application of corporate environmental management tools and policy instruments this book contributes to more holistic theoretical development in its field.

“This work is a timely and needed contribution to the theory and practice of corporate environmental strategies, supported by relevant case studies and practical examples. I recommend this report to all those interested in sustainable development, corporate social responsibility, cleaner production and environmental policy.”

Research Professor Dr. Jouni Korhonen, Editor-in-Chief, Progress in Industrial Ecology, Inderscience Publishers.