Sustainability Assessment in the German Detergent Industry

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Abstract

Since the early years of environmentalism, the detergent industry has been under pressure from NGOs and consumers. This has led to the development of environmentally friendlier products. Meanwhile, the major burdens along the ecological life-cycle of detergents are well known. While the path towards an integrated product policy has been set, further developments towards sustainability are necessary.
In a project conducted by the University of Oldenburg in cooperation with the IKW (Industrieverband Körperpflege und Waschmittel e.V., German Detergent Manufacturers Association) future potentials for sustainable development within this sector in Germany were explored.
This paper will review the project methodology and present some interesting findings. A stakeholder assessment plays the central role of the project. Stakeholder interviews and two workshops provided a basis for discovering the central issues to be tackled by the German detergent industry. Eleven key sustainability assessment fields were identified. Among each field, one to three indicators were selected that describe the current situation and allow exploring future potentials for sustainable development. These indicators and their interrelations were tested and modified according to the specific situation of companies in the German detergent industry. The study gives evidence regarding how this sector can contribute to sustainability by e.g. educating consumers or contributing to sustainability projects.

Introduction

Sustainable development as a concept is often agreed upon as a general objective. A definition given by the Brundland Commission is: “Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (WCED 1987, p. 43). While this definition sets the general tone, it is necessary to develop concepts helping to identify sustainability “hot spots” in certain fields. Even though, various concepts and methods have been presented, it can be observed that they often stay on a rather general level where it is hard to identify specific indicators and potentials for future development. Studies such as Sustainable Netherlands (see Buitenkamp et. al. 1993) or Sustainable Germany (see BUND, Missereor 1996) offer a valid background. The overall assessment of a country yields guidelines on a macro level (country or multi-nation institution), which has to be transformed into objectives on a meso (industrial branch) or a micro level (enterprise) (for the links of these level see: Schneidewind, Seuring 2000). The enterprise level is part of activities, such as the Global Reporting Initiative (GRI) (for more information see: www.globalreporting.org) (See GRI 2000), or specific guidelines such as the report of two German research institutes (IÖW, IMUG 2000). The meso level has hardly been part of research or practical work towards sustainability. (There are few studies on environmental management and change processes in branches: see Dyllick et al. 1994.)
As sustainable development covers two perspectives, a second issue arises. On the one hand, the process towards sustainable development is important. Stakeholders must be involved. As a result of such processes, objectives may be set and indicators identified helping to assess how the overall aim of sustainable development may be advanced. It has to be kept in mind, that these are two issues that can not be separated from each other, to process and goals reached are highly dependent on each other.
The German Detergent Manufacturers Association (Industrievereinigung Körperpflege und Waschmittel, IKW, see www.ikw.org) and the Chair for Production and the Environment at the University of Oldenburg, Germany (www.uni-oldenburg.de/produktion) set up a research project aiming to assess the current situation and future potential towards sustainable development in the German Detergent Industry. The project forms part of the proactive environmental and sustainability strategy of this industrial association.

Background Information on the German Detergent Manufacturers Association (IKW)

The IKW consists of about 350 member companies ranging from large multinational corporations such as Procter and Gamble, Henkel, Lever Fabergé, or Reckitt Benkiser, to a broad range of small and medium sized enterprises. These companies produce and sell a wide range of detergents and other chemicals

that form washing powders, shower gels or dishwashing liquids. From the first days of environmentalism in the mid 60s, this branch has been under pressure from legal acts and non-governmental organisations (NGOs). Problems addressed include “foam mountains” on rivers, euthropication of rivers and lakes, use of non-biodegradable resources, etc. While the industry has reacted to these pressures, it has also taken a proactive role in developing new analytical techniques that helping to identify environmental problems and sometimes even setting an example for other branches within the chemical industry.

Structure of the Paper

Building on this background information, the rest of the paper is organised in three parts. First, the research methodology is described. The single steps carried out to conduct the project are described briefly together with the conceptual basis taken up. One sustainability matrix for each dimension (environmental, economic, social) is presented which provides an overviews of issues within the dimension. Second, the major results of the stakeholder assessment are presented, namely the research fields and the indicators selected therein. Third, some conclusions for future research and implications for future work within the IKW are addressed.

Stakeholder Assessment

As mentioned, the detergent industry has a long history of environmental involvement. Hence, the previous work of the German Detergent Manufacturers Association had to be taken into account. This allowed insights into the industry and understanding measures previously taken. In earlier years, this was often done in response to demands of environmental pressure groups. Yet in recent years, the industry has taken proactive measures, such as the Code of Environmental Practice (See Claus, Rietmann 1998) and the Washright Campaign (See www.washright.com, last checked 28.02.2002). The Code aims to improve the environmental behaviour of all member companies, while the Washright Campaign uses tools for communication to consumers (websites, TV-spots) to improve their behaviour in using detergents, e.g. washing at lower temperatures or using as little detergent as possible.
During discussions with representatives of the IKW, it became evident that their wish to further contribute to sustainable development could only be reached by involving stakeholders. Hence a project was started to engage stakeholders systematically. The steps carried out during the project can be summarised in ten steps:

No.	Step carried out	People involved
1	Basis definition of the goal of the study	IKW, UOL
2	Review of Previous Work	UOL
3	Developing a First Discussion Paper	UOL, (IKW)
4	First Stakeholder Workshop	UOL, IKW, SH
5	Review and Inclusion of Results of the Stakeholder Workshop	UOL
6	Detailing Research Fields	UOL
7	Development of a First Set of Indicators for Each Research Field	UOL
8	Stakeholder Interviews to Validate Research Fields and Indicators	UOL, SH
9	Second Stakeholder Workshop	UOL, IKW, SH
10	Final Revision of the Assessment Fields and Indicators	UOL

IKW = Representatives of the IKW (German Detergent Manufacturers Association)
UOL = Research team of the University of Oldenburg
SH = Stakeholders (as mentioned above)

Table 1: The single steps of the stakeholder assessment

As can be seen from the sequence of the steps conducted, the stakeholders were involved three times, at the two stakeholder workshops conducted in October 2001 and January 2002 as well as during interviews carried out mainly in December 2001.
Before some results of the project are presented, it is necessary to review the theoretical basis, i.e. the product life-cycle and the stakeholder concept.
Sustainable Development is often said to have three dimensions: an environmental, economic and a social one. For the integration of these three dimensions into one assessment, the product life-cycle concept and the stakeholder concept were chosen. The product life-cycle allows addressing the environmental dimension, while the stakeholder interests represent the economical and the social dimension. These had to be combined with the most important aspects in each field, leading to the three so-called sustainability matrices. These matrices represent a simplified assessment of each dimension.

Conceptual Basis 1: Product Life-Cycle

Within the environmental debate, the product life-cycle forms a discussion centrepiece. The product life-cycle covers all stages from raw material extraction to final disposal or recycling of a certain product. In recent years, various life-cycle assessment studies on detergents have been conducted and well documented, both on a national (German) level (See Grießhammer et al. 1997) and on the European level (See Stalmans et. al. 1995, p. 84-109; Janzen 1995, p. 110-121). The major stages of the product life-cycle of a detergent are:

- Production of the raw materials, e.g. tensides,
- Fomulation of the final detergent,
- Packaging materials,
- Distribrution,
- Use phase,
- Disposal (Waste water treatment).

Environmental Dimension Assessment

The data gathered in the life-cycle assessment shows, that the major environmental burden occurs during the production of raw materials, use phase and disposal. The production of the raw materials uses various renewable and non-renewable materials to create tensides, bleaches, perfumes etc. During the use phase, the detergents are applied, e.g. in a washing machine or dishwasher. Water and energy are needed for the process. Finally, the detergent moves on to the wastewater and is treated. Therefore, a significant chemical oxygen demand (COD) results. In short, these are the major burdens identified in a life-cycle assessment. This data forms the basis for the analysis within the environmental dimension, as displayed in Figure 1.

Life-Cycle Environmental Burden	Production of Ingredients	Production of Detergent	Packaging	Distribution	Use Phase	Disposal
Energy						
CO_2						
COD						
Waste						
Resources						
Risks						

Black = high relevance, grey = medium relevance, white = low relevance

Figure 1: The environmental sustainability matrix

Conceptual Basis 2: Stakeholder Concept

For the research project presented, the life-cycle assessment reviewed was accompanied by the stakeholder concept, which plays an important role within sustainable development. The term stakeholder covers “those groups who can affect or are affected by a firm’s objective” (Freeman 1984, p. 38). Therefore, the major stakeholders of the Detergent Industry had to be identified. In discussion with members of the IKW board, 20 people were identified, who were seen as being able to represent all relevant stakeholder groups. This included five representatives of IKW member companies, one of the two Chief Executive Officers of the IKW, three members of free research institutes, one representative of the Association of German Housewives, two members of the German Environmental Protection Agency, one representative of the German Ministry for the Environment, four representatives of a German consumer protection organisations, and three researchers from other universities. Not all individuals involved took an equal part during the stakeholder assessment. Some contributed to single steps only. In total, wide ranges of contributions were taken into account, resulting in an overall

representative process. While these people represent the stakeholders for the assessment, certain stakeholder groups had to be identified. After several discussions before and during the first stakeholder workshop, the following groups were taken into account:

- Suppliers, Freight forwarders
- Employees,
- Management of the companies,
- Shareholders,
- Retailers,
- Consumers,
- Authorities,
- Non-Governmental Organisations (NGOs).

This formed one axis of the economic and of the social dimension. Still, the relevant aspects within these dimensions had to be specified so to find out how the stakeholders were affected. This had to be done separately for the two dimensions.

Economic Dimension Assessment

Within the economic dimension, issues raised could be taken from conventional economic thought. Usual goals stated are economic stability, employment, qualitative and quantitative growth, or no inflation. Furthermore, shareholders demand their share and expect responsible management, leading to long-term company growth. This can best be reached by high quality products and continuous innovation, which are both of benefit to the retailers and customers.

These aspects are now assessed in how they affect individual stakeholders. Workers demand employment, shareholders want money and long term growth, customers want high quality products at low prices, just to name the most important issues. Details are presented in Figure 2.

Stakeholders / Economic Aspects		Supplier / Freight For-warders	Company			Retailer	Con-sumers	Authori-ties	NGOs
			Emplo-yees	Manage ment	Share-holder				
Economic Responsibility									
Stability	Qualitative Growth								
	Price Deve-lopment								
	Employment								
Long Term Growth									
Innovation									
Quality									

Black = high relevance, grey = medium relevance, white = low relevance

Figure 2: The economic sustainability matrix

Social Dimension Assessment

Stakeholders form an axis of the social sustainability matrix, too. Again, the major aspect in the social area had to be identified. A first list was put together by the research team and discussed with the IKW representative. The discussion at the first stakeholder workshop was used to establish a set of aspects, covering health, social responsibility, equity, individual contentment, satisfaction of needs, participation and communication, and education.

Stakeholders / Social Aspects	Supplier / Freight For-warders	Company			Retailer	Con-sumers	Authori-ties	NGOs
		Emplo-yees	Manage ment	Share-holder				
Health								
Social Responsibility								
Equity								
Individual Contentment								
Satisfaction of Needs								
Participation/ Communication								
Education								

Black = high relevance, grey = medium relevance, white = low relevance

Figure 3: The social sustainability matrix

Identification of the specific assessment fields

The three sustainability matrices provide an overview of the aspects important for the future potential of a sustainable development in the German detergent industry. While the methodology would be applicable to other areas, it must be emphasises, that the results presented are specific to the German detergent industry as an industrial sector.

The analysis had to be specified to reveal the approximately ten hot factors for a future sustainable development. The black and grey shaded fields of the matrices provide some hints. The issues were selected through a discussion process, allowing no algorithm to transfer the results of the sustainability matrices to the assessment fields.

The assessment field should cover all three dimensions equally. It should also provide the basis for a detailed analysis regarding where suitable indicators can be identified allowing measurement of the present state in the German detergent industry and revealing potential for future optimisation.

Subsequently, the assessment fields and related indicators are briefly presented. Table 2 provides a summary of all assessment fields and indicators. As can be seen, four groups are distinguished. Three assessment fields each are related to the environmental, economic or social dimension. Two assessment fields are subordinated to these dimensions and can be seen as integrated assessments fields (See GRI 2000, p. 4). During the interviews one step was included to validate the relevance of the assessment fields. All stakeholders involved were asked to rate the importance of each assessment field on a scale of 1 to 5. Calculated as a percentage of the highest possible value, the lowest value obtained was 67%. This was seen as a good indication of the high relevance of all assessment fields.

The scope of the paper centers on the identification of the assessment fields and indicators. Still, some hints on the measurements carried out to fill the indicators are included. In some cases, the measurements conducted and values obtained will be included in the discussion.

Sustainability Assessment Fields and Related Indicators

Integrated Assessment Fields

The two integrated assessment fields have been identified as being able to describe the overall commitment of the German detergent industry towards sustainability.

1. Sustainability in the German Detergent Industry

This fields sounds tautological to the whole study, yet the two indications identified are best gathered under this heading. The indicator effectiveness of educational consumer advertisements is an important indicator, as the consumers play a central role in detergent use. With their behaviour they decide whether the needed quantity and quality of detergents are used or whether overuse occurs, leading to a higher total resource consumption. In contrast, the second indicator fulfilment of voluntary commitments directly

addresses the companies of the industrial sector and the IKW as their association. The IKW has signed more than 25 voluntary commitments within the last two decades (See BDI 2001). All of these voluntary commitments have been fulfilled completely and on time, indication commitment of the IKW and its member companies towards environmental and consumer protection. The second integrated assessment field continues this argument.

2. Sustainability Reporting of IKW Member Companies

As mentioned before, sustainability reporting of companies has gained considerable momentum in recent years (see e.g. GRI 2000). Various companies have published such reports already, e.g. Henkel, Düsseldorf (see Henkel 2000). These reports address issues beyond the scope of corporate environmental reports. Still, the indicator looking at the companies of the IKW that publish such a report will be distorted by the size of the firms. Usually, small and medium sized enterprises (SMEs) find it more difficult to deal with such issues than large multinationals. Hence, a second indicator compliance with the Global Compact completes this assessment field. The Global Compact covers topics in human rights, labour and environment. It was announced at the World Economic Forum, Davos, on 31 January 1999, by UN Secretary-General Annan (for more information see www.umglobalcompact.org, see United Nations 2001). Both indicators ensure, that companies comply with regulations and international standards.

Assessment Fields	Related Indicators
Integrated Assessment Fields	
Sustainability in the German detergent industry	• Effectiveness of educational consumer advertisement • Fulfilment of voluntarily commitments
Sustainability reporting of IKW member companies	• Number of companies publishing a sustainability report • Compliance with Global Compact
Environmental Assessment Fields	•
Reduction of pollutants to the aquatic environment	• Rate of persistent ingredients per kg laundry
Reduction of laundry temperature / energy	• Energy demand per kg laundry
Protection of resources	• Use of detergent per kg laundry
Economic Assessment Fields	•
Ability to innovate	• Time for implementing innovations as a reaction to consumer demands and environmental problems • Innovations during a set time period
Price development	• Price of detergent in relation to cost of living • Average return on investment in the detergent industry
Washing as value pertinent of fabric life	• Average number of washings during a textile's lifetime
Social Assessment Fields	•
Ease of household tasks	• Time needed per kg laundry
Role allocation in laundry	• Percentage of men who do laundry
Health / hygiene as a result of laundry	• Number of job-related diseases over time • Number of health-based medical conditions over time • Wash temperature corresponding to constant standards of hygiene

Table 2: The Assessment Fields and the Related Indicators

Environmental Assessment Fields

The environmental assessment fields address the major environmental burden indicated by the life-cycle assessment studies conducted. The reduction of pollutants to the aquatic environment, measured in the rate of persistent ingredients per kg laundry and reduction of the wash temperature and energy consumption of the washing cycle, measured by the energy demand per kg laundry show this directly. Again, two major actors and their behaviour are evident. The consumers decide how they wash, while

industry provides the detergents. Hence, the third assessment field, the protection of resources in general and its indicator are rather straightforward.
Still, one major issue arises. The use of detergents in the laundry cycle is highly dependent on the washing machines used and on the apparel treated. Both are manufactured and sold by other industries. Future potentials for a sustainable development might only be reached, if companies cooperate beyond traditional industrial sectors. This issue will be taken up again in the concluding section, where some optimisation potential are highlighted.

Economic Assessment Fields

The ability to innovate is central for all companies wanting to stay in the market long term. This assessment field contains the aspects of long-term company growth, both in a quantitative and qualitative manner. This can be measured by two indicators. The time for implementing innovations as a reaction to consumer demands links the companies directly to the consumers. The time for reaction to environmental problems shows how well companies are prepared to react to them. While the industrial sector might look rather stable and less innovative at first glance, there have been various major innovations in recent years, such as compacted powders. Tabs are used for dishwashers, where all three components, shiner, decalcifier and detergent have been formed into one piece allowing easy consumer application.
The second economic assessment field chosen was price development, as this forms the direct link between producers and customers. Yet, price development must be seen in relation to the cost of living, as only this offers a suitable measurement. The second indicator in this field addresses the companies again, as it takes the average return on investment in the detergent industry into account. Combined, the two indicators represent a dynamic perspective that closely relates to economic stability.
The third assessment field has a strong connection to the textile and apparel industry. Washing helps maintaining fabrics. Therefore, the average number of washings during a textile's lifetime was chosen as a representative.

Social Assessment Fields

The social assessment fields mainly relate to the consumers and employees. The ease of household tasks can be measured by the time needed per kg laundry. Gender issues are addressed in the second assessment field, i.e. role allocation in laundry. The related indicator is the percentage of men who do laundry. Both indicators provide evidence regarding how people's life patterns change over time.
The last assessment field is health and hygiene as a result of laundry. Three indicators were identified: The number of job-related diseases over time, the number of health-based medical conditions over time, and wash temperature corresponding to constant standards of hygiene. The contribution of modern washing and cleaning techniques to health and hygiene are evident and help improve everyday life.

Potentials for Sustainable Development in the German Detergent Industry

The data collection to fill the identified indicators is still in progress, so only some hints for specific measures have been given. Still, the process of the project allowed identification of three major topics for a future path towards sustainable development in the German detergent industry.

Environmental Quantum Leap

The industrial sector, both at a German and international level, implemented various steps to improve the environmental performance of products and production facilities. Consequently, it is hard to improve this with further marginal innovations. Major improvements in the environmental dimension might only be reached by radical innovations such as washing with cold water, without detergents or other chemicals, e.g. by applying ultrasound. This might lead to the use of fewer resources and allow a greater fraction of the world population to wash their clothes with advanced technology without threatening regional and global eco-systems.

Cooperation with Consumers

The issues presented offer evidence that consumers play a central role in future developments. They must be integrated into the activities of each industrial sector, as only the existence of consumer needs guarantees the long term existence and growth of companies. Still, companies can drive demand patterns and influence them with their marketing power. The Washright Campaign is one example where, on a European scale, all detergent manufacturers use advertisement channels (TV, internet) to provide information to consumers. This should enable consumers to change or improve their behaviour in doing laundry, so that less energy, water and detergents are needed.
Major improvements might be reached, if the laundry process is further improved. Washing machines might be equipped to help users apply the correct washing programme and dosage . Machines might be able to measure how dirty clothes are and apply the detergent automatically. These ideas guide the way to the third topic.

Extended Strategies for Cooperation with Other Industries

The detergent industry is highly dependent on two other sectors: the apparel and fashion industry and the "white goods" or household appliance industry. Washing machines or dishwashers are developed and sold by this industry. Hence, energy and water consumption, central to environmental performance, or the time needed for a washing cycle, an important element of the social dimension, are predetermined by this industry. The detergent industry's influence has on the processes after basic investment in such a household appliance is rather marginal. In both cases, better cooperation across traditional supply chains are needed. The household appliance industry and the detergent industry would have the chance to develop improved equipment allowing easier, faster, and cheaper washing cycles leading to an improved sustainability performance.

Cooperation with the fashion industry might lead to new fibres and textiles needing less care or can be cleaned at lower temperatures.

Still, the trade-offs that might arise from such optimisations have to be taken into account. Such cross-industry developments might tie companies together, making them (economically) dependent on each other. Their products might only be used jointly, limiting the customers' freedom of choice and might therefore have a negative impact on sustainability.

Conclusions

The project and its findings presented in this paper were driven by a pragmatic approach to identify potentials for a sustainable development in the German detergent industry. Previous work seemed either too broad or specific to be applied in the study. During early discussions with members of the board of the IKW, it became evident that a meaningful outcome can only be reached by involving stakeholders. Hence, this played a central part in the project. Consequently, the results of the project are reached through discussion and revision. The steps carried out in this stakeholder assessment are not fixed, but have to be set appropriate to the situation analysed. This questions the methodological approach chosen, yet looking at the complexity of aspects covered, no other approach seemed suitable.

Through stakeholder involvement, the major aspects for a sustainable development in the German detergent industry were identified as presented in the assessment fields and related indicators. The issues raised in these fields provide a chance for both a look back on achievements reached in recent years as well as a chance to discover potentials for future optimisation towards a sustainable development in the German detergent industry, which was among the core objectives of this study.

References

BDI (Bundesverband der Deutschen Industrie) (ed.) (2001): Freiwillige Vereinbarungen und Selbstverpflichtungen (Voluntarily Commitments), Berlin.

Buitenkamp, M. et. al. (ed.) (1993): Sustainable Netherlands – Action Plan, Friends of the Earth Netherlands, Amsterdam.

BUND (Bund für Umwelt und Naturschutz Deutschland); Missereor (ed.) (1996): Zukunftsfähiges Deutschland – ein Beitrag zu einer global nachhaltigen Entwicklung (Sustainable Germany – A contribution to a global sustainable development), Basel.

Claus, F.; Rietmann, S. (1998): Der Code Umweltgerechtes Handeln – Ergebnisse des Verbraucherworkshops des Industrieverbandes Körperpflege und Waschmittel e.V. (IKW), Dortmund.

Dyllick, T.; Belz, F. ; Hugenschmidt, H.; Koller, F.; Laubscher, R.; Paulus, J.; Sahlberg, M.; Schneidewind, U. (1994): Ökologischer Wandel in Schweizer Branchen (Environmental Change in Swiss Sectors), Bern.

Freeman, R.E. (1984): Strategic Management – A Stakeholder Approach, Boston 1984.

GRI (Global Reporting Initiative) (ed.) (2000): Sustainability Reporting Guidelines on Economic, Environmental, and Social Reporting, Boston. (See www.globalreporting.org).

Grießhammer, R.; Bunke, D.; Gensch, C. (1997): Produktlinienanalyse Waschen und Waschmittel, (Product line assessment washing), Umweltbundesamt, Berlin 1997.

Henkel KGaA (ed.) (2000): Sicherheit, Gesundheit, Umwelt – Auf dem Weg zu Nachhaltigkeit, Nachhaltigkeitsbericht Henkel 2000 (Safety, Health, Environment – On the path to sustainability, Sustainability Report Henkel 2000), Düsseldorf.
Download available at www.henkel.com/sustainability).

IÖW; IMUG (Institut für ökologische Wirtschaftsforschung; Institut für Markt - Umwelt – Gesellschaft) (ed.) (2000): Schritte zur Nachhaltigkeitsberichterstattung (Steps towards sustainability reporting), Diskussionspapier IÖW 50/00, Berlin.

Janzen, D. C. (1995): Methodology of the European Life-Cycle Inventory for Detergent Surfactants Production, in: Tenside, Surfactants, Detergents, Vol. 32, No. 2 (1995), p. 110-121.

Kanning, H.; Müller, M. (2001):Bedeutung des Nachhaltigkeitsleitbildes für das betriebliche Management (The relevance of the concept Sustainable Development for management); in: Baumast, A..; Pape, J. (ed.): Betriebliches Umweltmanagement: Theoretische Grundlagen, Praxisbeispiele, (Corporate Environmental Management – Theoretical Basis and Practical Examples), Stuttgart, p. 13-27.

Schneidewind, U., Seuring, S. (2000): Glanz und Elend der Stoffstrom-Ökonomie – Grenzen und Chancen der Analyse und Regulierung aus ökonomischer Sicht (Splendour and Squalor of substance orientated environmental regulation – Limits and Opportunities from an economic perspective), in: Führ, M. (ed.): Stoffstromsteuerung durch Produktregulierung – Rechtliche, ökonomische und politische Fragen (Substance Chain Control by Product Regulation), Baden-Baden, p. 161-173

Stalmans, M. et. al. (1995): European Life-Cycle Inventory for Detergent Surfactants Production, in: Tenside, Surfactants, Detergents, Vol. 32, No. 2 (1995), p. 84-109.

United Nations (ed.) (2001): The Global Compact – Corporate Leadership in the World Economy, New York. (See www.unglobalcompact.org).

WCED (World Commission on Environment and Development) (ed.) (1987): Our Common Future, Oxford.