Definition and Measurement of Corporate Ecological Results

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1 Introduction

In view of the many different, existing terms for the environmental performance of companies, the target of this paper is to show the necessity and to present a consistent model for the definition and the measurement of corporate ecological results.[1] The model includes four dimensions of the ecological results and allows on the final stage the assessment of the environmental performance of companies.

2 Necessity of definition and measurement of ecological results

Apart from few exceptions,[2] the term 'ecological results' does not occur very often in literature and corporate practice. The main reasons for this can be seen in two aspects:

- First of all, for the definition and measurement of ecological results it is necessary to develop objective criteria.[3] Already in 1992 the Commission of the European Communities came in its work for the EMAS[4] to the conclusion that for the assessment of corporate environmental performance, objective criteria have to be developed, and objective information has to be disclosed in corporate environmental reports.[5] But exactly this development of objective criteria causes the main problems for companies and external analysts.[6]

  Nevertheless, objective information is necessary so that the public – one of the main target groups of the environmental reports – can assess the environmental performance

[1] According to STAHLMANN, the environmental performance of a company can be measured by its ecological results. If consistent criteria for the measurement of the ecological results are developed, then a consistent measurement of the corporate environmental performance is also possible, compare STAHLMANN, V. (1996), pp. 71.

[2] Compare BAUM, H.-G. / GÜNTHER, E. / WITTMANN, R. (1996), pp. 17; KELLER, B. (1996), p. 141; FREIMANN, J. / METTKE, T. / SCHWEDES, R. (1997), p. 47.

[3] Compare BAUM, H.-G. / GÜNTHER, E. / WITTMANN, R. (1996), p. 17.

[4] EMAS is the abbreviation for "Eco-Management and Audit Scheme" i. e. the COUNCIL REGULATION (EEC) No. 1836/93 of 29 June 1993.

[5] Compare Bundesratsdrucksache (BRDrs.) 222/92, p. 2. ‚Environmental reports' is used here as a generic term for all environmental publications of a company / of a group including the environmental statements in accordance with the COUNCIL REGULATION (EEC) No. 1836/93 of 29 June 1993, Art 2 (h), p. 3, compare for a definition of environmental reports SCHWARZ, E. J. / STEVEN, M. / LETMATHE, P. (1997), p. 473.

[6] Compare for some of the different approaches for measuring ecological results, HALLAY, H. / PFRIEM, R. (1992); BRAUNSCHWEIG, A. / MÜLLER-WENK, R. (1993); STAHLMANN, V. (1994); SCHALTEGGER, S. / STURM, A. (1994).

of companies. Moreover, with the help of objective criteria the environmental performance of different companies could be compared, i. e. that an ecological benchmarking[7] would be possible.

The necessity for definition and measurement also shows in recent empirical studies on the corporate practice of EMAS in Germany.[8] In most of the studies, the companies expressed their dissatisfaction with the response on their environmental reports. There is no or only little demand for the environmental reports on the part of their customers and suppliers, so that marketing effects cannot be seen in great extent yet. Usually, academic institutions ask for the environmental reports.[9] One explanation for this development is that customers and suppliers are simply overtaxed by the extensive and varying information in each environmental report. They are not able to assess and compare the environmental performance of a company on the basis of the given information, as objective, standardised criteria are lacking in the current practice of environmental reporting.[10]

- The second reason why objective information is still not provided is that the ecological results – other than the economic results – do not play a relevant role in corporate decisions.[11] This is proven by several empirical surveys[12] where the empirical figures showed a clear priority of economic targets over ecological ones. As corporate aims of prime importance, 'improving the potential for the annual results', 'maximization of the annual results' and 'securing liquidity' can be identified whereas ecological targets are a means for achieving these economic aims. The empirical results which reflect the minor importance of ecological targets can explain the lack of clear and consistent criteria for measuring ecological results. But the necessity still remains, particularly if meaningful, objective conclusions about the economic and ecological results of corporate eco-orientated[13] measures should be drawn. Moreover with the help of objective criteria companies that are eco-orientated or strive to be eco-orientated have an improved internal basis for information and decision-making and have less difficulties in fulfilling the external demands, e. g. of customers and suppliers. In the long term, if a company is determined to be successful with its eco-orientation and environmental reports, one important prerequisite is to convey credibility to its stakeholders[14] on the basis of objective information.

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7 Compare for a concept of ecological benchmarking e. g. SCHNEIDEWIND, U. / DYLLICK, T. (1997).

8 Compare e. g. DYLLICK, T. (1998); SCHWEDT, B. (1998); SEIDEL, E. / WEBER, F. M (1998).

9 Compare AUMÜLLER, C. / JÄGER, T. / SCHWARZ, M. (1998), p. 39; DYLLICK, T. (1998), p. 4.

10 The need für objective criteria shows e. g. in the development of the ISO Standard 14031 ‚Environmental Performance Evaluation (EPE)'.

11 Compare GÜNTHER, E. / STURM, A. (1997), p. 79.

12 Compare e. g. the empirical studies of MEFFERT, H. / KIRCHGEORG, M. (1989) and GÜNTHER, E. (1994).

13 Eco-orientation is the corporate aim to avoid and reduce environmental impacts within all activities of the value circle; it has a strategic character, compare GÜNTHER, E. (1994), p. 76.

14 Compare for the stakeholder approach FREEMAN, R. E. (1984), p. 25; GÜNTHER, E. (1994), pp. 53; GRÖNER, S. / ZAPF, M. (1998), pp. 52.

3 Starting-points for the measurement of ecological results

To answer the question where ecological results can be identified, the following two starting-points can be of use:

a) Ecological results could be on the production side of the companies.
b) Ecological results could also appear through the products' design.

For being classified as 'ecological successful', a company should have ecological results both on the production as well as on the product side i. e. that it tries to reduce its environmental impacts during its production process as well as during the use of the products[15].

The following expositions are primarily concerned with ecological results on the production side.

4 Dimensions of ecological results on the production side

For the definition and measurement of ecological results, four questions leading to the four dimensions of ecological results have to be answered:

1. What do ecological results include?
2. What are the reasons for ecological results?
3. To what extent can ecological results be identified?
4. How can ecological results be assessed?

4.1 First Dimension: Recording of the environmental interventions

The ecological results describe the environmental impacts[16] which result from the environmental interventions of a company; the environmental impacts have to be determined in an external analysis.[17] As a prerequisite for the environmental impacts (and therefore for the ecological results), the environmental interventions, the flows of material and energy, have to be recorded quantitatively within the company and afterwards be assessed regarding their potential environmental impacts.[18] So the focus of the ecological results lies at first on the causes for the environmental impacts, i. e. the environmental interventions.

Each environmental intervention, each flow of material and energy, can be determined regarding its direction and level by a comparison over time. There the actual quantitative values are compared over several periods, and on grounds of this comparison, an 'ecological profit' or an 'ecological loss' can be stated. As the ecological profits or losses include only quantitative figures, the absolute ecological results[19] of the company cannot be deduced yet.

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15 Ecological results on the product side concern e. g. the product's life cycle, its potential for reuse and recycling etc.

16 Compare BRAUNSCHWEIG, A. / MÜLLER-WENK, R. (1993), p. 29; SCHULZ, E. / SCHULZ, W. (1993), p. 47.

17 Compare GÜNTHER, E. (1998).

18 The quantitative recording of the environmental interventions should be taken by an IÖW (Institute for ecological and economic research, Germany) - eco balance sheet with the amendments of WAGNER, compare BÖNING, J. A. (1995), pp. 161.

19 The absolute ecological results refer to only one, single company and contain all relevant environmental impacts of that company.

The terms ‘ecological profit’ and ‘ecological loss’ are defined following the economic terms in external accounting.[20] With the dependence on the economic terms it should be clear that only the ecological results are meant which are caused by companies. So only the interdependences between a company and its surrounding environment[21] are of interest. Moreover the term ‘ecological results’ does not imply any instant evaluation, e. g. like ‘ecological success’; it can either consist of an ecological loss or an ecological profit.
On the next stage, the question arises what kind of corporate measures did lead to an ecological profit or an ecological loss.

4.2 Second Dimension: Determination of intended and unintended ecological results

According to the Commercial Code in Germany[22] or the codes of business management[23] the annual results of a company can be divided up in order to identify the factors of success for the annual results. The system of splitting up the results which is also possible on the international level[24] can be transferred to the ecological results as well. The aim is to determine the causes that led either to an ecological profit or an ecological loss, and to answer the question if the ecological results can be ascribed to the company. The idea is that an ecological profit which was caused by a simple drop in production and not by measures of eco-orientation cannot be ascribed to the company and is therefore classified as an ‘unintended ecological profit’. In general, as internal cause for an ecological profit there is e. g. the reduction in produced output, the elimination of a line of business, the implementation of environmental regulations or the pursuit of environmental targets. Before an ecological profit or loss is being classified as ‘intended’ or ‘unintended’, it is important to analyse if potential causes relate to the pursuit of ecological targets and are therefore responsible for intended ecological results.
The intended ecological profit means reduced environmental impacts on the basis of achieved environmental targets. On the contrary, the unintended ecological profit describes the coincidentally reduced ecological impact, e. g. by a reduced production output.
The intended ecological loss can either indicate that an environmental target could not be met or that the company had no eco-orientation in the first place. Analogous to the unintended ecological profit, the unintended ecological loss can e. g. arise from an increase in the production output.

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[20] Following the traditional terms in external accounting does not mean that financial / monetary consequences are automatically included in the terms ‘ecological profit’ and ‘ecological loss’. Here only the ecological perspective is relevant.

[21] For the examination of the surrounding environment, only the site of a company is considered following the definition of site in the COUNCIL REGULATION (EEC) No. 1836/93 of 29 June 1993, Art. 2 (k), p. 3. For the consideration of a group, all the ecological results from each related company have to be consolidated. This represents a first-best-solution and should not be followed up here on grounds of practicability. For the definition of site and its delimitation, compare GÜNTHER, E. / SCHILL, O. (1997), pp. 62.

[22] Compare COENENBERG, A. G. (1997), pp. 338.

[23] Compare COENENBERG, A. G. (1997), pp. 337.

[24] Compare REINHART, A. (1998), p. 310.

The differentiation in intended and unintended ecological results requires an analysis of the environmental targets and the degree of meeting these targets.

4.3 Third Dimension: Determination of the environmental efficacy

If a company has set and tried to meet its environmental targets, an assessment of the efficacy[25], i. e. the degree to which these environmental targets were achieved, should be carried out. So it is determined to what extent the intended ecological results coincide with the given environmental target. The environmental target represents the target value whereas the actual value consists of the quantitative figure for each environmental intervention. With the comparison of the target and actual values not only the degree of achievement, the eco-efficacy, is determined, but also the eco-efficiency[26] of the corporate instruments used to meet the environmental targets is examined.[27]

In order to come to a conclusion regarding the quality of the intended ecological results of a company, the determination of the efficacy is not sufficient. Additionally, the target value has to be scrutinized and assessed.

4.4 Fourth Dimension: Assessment of the absolute ecological results

The fourth dimension considers the question which target value should be based for the determination of the ecological results and how this target value can be assessed. The assessment of the target value also means an assessment of the environmental impacts, respectively of the ecological results. Only on this basis, it is possible to come to a meaningful conclusion regarding the quality of the intended ecological results.

So the final stage is now reached where with the help of the environmental interventions from the first dimension a statement regarding the environmental impacts and ecological results can be made.

In general, three levels can be identified for the assessment of the target value; each of them represents a different quality of the ecological results.

1. Critical loads or standards:

On the first level, critical loads fixed in environmental laws and regulations could function as the first quality level. They represent the standards which are required by the government and which should be fulfilled by all companies meeting the criteria for the critical loads. If the critical loads are seen as the first quality level and therefore as target values

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[25] According to WEHRMEYER, the determination of the efficacy means an examination if the achieved changes are the ones which were aimed for, compare WEHRMEYER, W. (1995), p. 4.

[26] For the definition of eco-efficiency compare e. g. SCHALTEGGER, S. / STURM, A. (1995), p. 2.

[27] This can lead e. g. to the review of the corporate environmental management system.

for assessing the environmental impacts, a company will score an intended ecological profit if it meets its environmental targets consisting of the critical loads.[28]
Because of the many problems[29] generally occurring with the theoretical determination and practical implementation of critical loads, the critical loads or standards cannot be in general the first, worthwhile quality level for the ecological results; they rather represent the minimum standard which a company has to meet if it strives for intended ecological results. So the achievement of the critical loads has to be made sure in any case while pursuing environmental targets.

2. A-, B-, C- environmental targets:

The second level includes specific environmental targets of the company which should be of higher ecological quality than the critical loads.[30] Especially the environmental targets set by companies participating in EMAS could be meant: According to EMAS these corporate targets should guarantee a continuous improvement in the environmental performance of the companies[31], achieved by higher standards than the ones fixed in environmental laws and regulations.
To be an appropriate level for the assessment of environmental impacts, the corporate environmental targets have to be orientated towards the ecological problem areas of an industry (or a company). Which problem areas are real ones, should be determined by an industrial expert in agreement with the companies. For the assessment, first the main relevant production processes have to be identified by the companies and the expert of the industry. Then the relevant flows of material and energy should be ascribed to the respective production processes[32], so that the production process with the highest ecological relevance can be determined. This process should be classified as the A-environmental target i. e. that the pursuit of this target has priority in comparison to other environmental targets. Usually A-, B- and C- environmental targets are distinguished,[33] but primarily the A-target should be based for assessing the environmental impacts. With the help of this distinction and assessment, a statement about the quality of the absolute ecological results is possible. It is important to examine and determine industrial targets, so that a comparison among the companies in the sense of an ecological benchmarking can also be carried out.

3. New Standards in Environmental Policy:

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[28] Most of the assessment methods are orientated towards the critical loads, compare e. g. HALLAY, H. / PFRIEM, R. (1992); BRAUNSCHWEIG, A. / MÜLLER-WENK, R. (1993); SCHALTEGGER, S. / STURM, A. (1994).

[29] Compare UMWELTBUNDESAMT (UBA) (Hrsg.) (1993), p. iii and pp. 1; BÖNING, J. A. (1995), pp. 221; SCHALTEGGER, S. / STURM, A. (1994), pp. 113 and pp. 127.

[30] The three quality levels are to be seen as subsequent stages each including the one before.

[31] Compare COUNCIL REGULATION (EEC) No 1836/93 of 29 June 1993, Art 3 (e).

[32] This procedure is similar to the one using eco-balances sheets for production processes of a company.

[33] Compare for a differentiation of A-, B- and C- environmental targets e. g. HALLAY, H. / PFRIEM, R. (1992), pp. 122. In contrast to this definition the focus here lies on the specific industrial ecological problem areas.

The final and highest level for the assessment of environmental impacts should be represented by a new standard in environmental policy, e. g. the concept of sustainable development.[34] For the implementation on the corporate level and integration in environmental targets, the general model of sustainable development has to be put in concrete terms.[35]

The following diagram shows an overview of the four dimensions of ecological results:

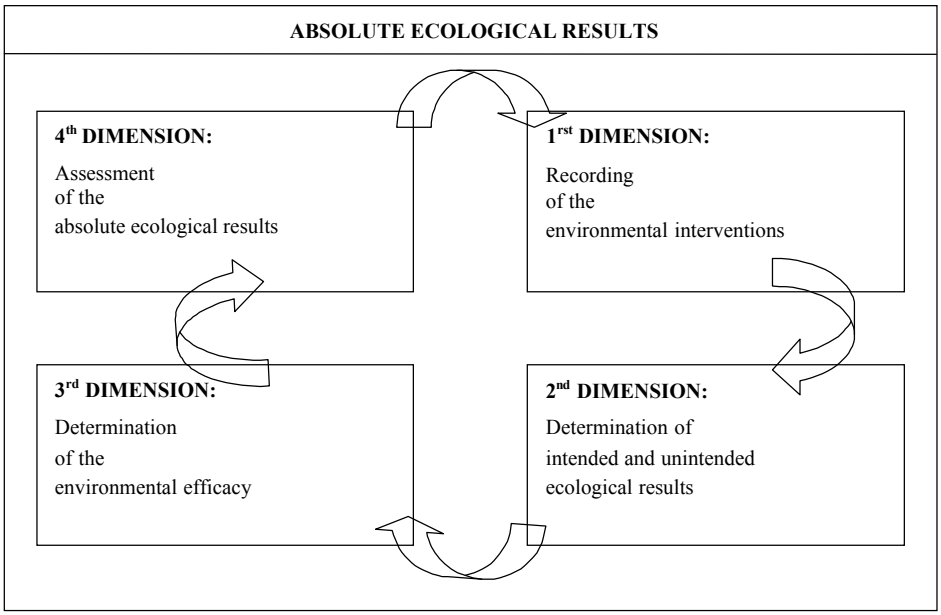

Diagram: Dimensions of ecological results

The following expositions were merely concentrating on the absolute ecological results, but as mentioned before, the relative ecological results can also be determined by comparing companies of one industry in an ecological benchmarking.

5 Conclusion

The paper presents a model for assessing the environmental impacts of a company, with four dimensions of ecological results. The fourth dimension suggests to assess the environmental impacts by an A-environmental target based on the most relevant ecological problem area of a specific industry. On grounds of this model not only the assessment of the absolute ecological results of a company is possible, but also the determination of its relative ecological results.

The research project is not finished yet. Especially for the ecological results on the product side a consistent definition and measurement has to be developed as well whereas the model for the ecological results on the production side will be verified by empirical case studies in the field of mechanical engineering.

REFERENCES

[34] Compare SCHMIDHEINY, S. (1992); MINSCH, J. (1993).
[35] One example is the COSY-concept, compare SCHNEIDEWIND, U. / HUMMEL, J. / BELZ, F. (1997).

Books and articles

AUMÜLLER, C. / JÄGER, T. / SCHWARZ, M. (1998): Ökologische Innovation oder bürokratische Deformation? Erfahrungen eines mittelständischen Unternehmens mit der EG-Öko-Audit-Verordnung, in: UmweltWirtschaftsForum (uwf), volume 6, number 1, 1998, pp. 37 – 40.

BAUM, H.-G., GÜNTHER, E., WITTMANN, R. (1996): Ökonomischer Erfolg, Ökologieorientierung und ökologischer Erfolg, in: UmweltWirtschaftsForum (uwf), volume 4, number 2, 1996, pp. 14 – 18.

BÖNING, J. A. (1995): Methoden betrieblicher Ökobilanzierung, 2nd edition, Marburg 1995.

BRAUNSCHWEIG, A. / MÜLLER-WENK, R. (1993): Ökobilanzen für Unternehmungen – eine Wegleitung für die Praxis, Bern 1993.

BUNDESRATSDRUCKSACHE (BRDrs.) 222/92 vom 26.03.1992: Vorschlag einer Verordnung (EWG) des Rates, die die freiwillige Beteiligung gewerblicher Unternehmen an einem gemeinschaftlichen Öko-Audit-System ermöglicht, Bonn 1992.

COENENBERG, A. G. (1997): Jahresabschluß und Jahresabschlußanalyse. Grundfragen der Bilanzierung nach betriebswirtschaftlichen, handelsrechtlichen, steuerrechtlichen und internationalen Grundsätzen, 16th edition, Landsberg/ Lech 1997.

DYLLICK, T. (1998): Umweltmanagement auf dem Prüfstand, in: UmweltWirtschaftsForum (uwf), volume 6, number 1, 1998, pp. 3 – 5.

EEC (THE COUNCIL OF THE EUROPEAN COMMUNITIES) (1993): Council Regulation (EEC) No. 1836/93 of 29 June 1993 Allowing Voluntary Participation by Companies in the Industrial Sector in a Community Eco-Management and Audit Scheme, in: Official Journal of the European Communities, No. L 168, pp. 1 – 18.

FREEMAN, R. E. (1984): Strategic Management: A Stakeholder Approach, Marsfield Massachusetts 1984.

FREIMANN, J. / METTKE, T. / SCHWEDES, R. (1997): Erfolgsdimension des Umweltmanagements. Erfolgsdimensionen und deren Niederschlag in Umweltinformationssysteme, in: UmweltWirtschaftsForum (uwf), volume 5, number 3, 1997, pp. 46 – 50.

GRÖNER, S. / ZAPF, M. (1998): Unternehmen, Stakeholder und Umweltschutz. Einfluß, Strategien und Gründe für eine umweltorientierte strategische Betrachtung von Stakeholdern aus Unternehmenssicht, in: UmweltWirtschaftsForum (uwf), volume 6, number 1, 1998, pp. 52 – 57.

GÜNTHER, E. (1994): Ökologieorientiertes Controlling. Konzeption eines Systems zur ökologieorientierten Steuerung und empirischen Validierung, München 1994.

GÜNTHER, E. / STURM, A. (1997): Ökologieorientierung und ökologischer Erfolg, in: Wissenschaftliche Zeitschrift der Technischen Universität Dresden, volume 46, number 6, 1997, pp. 77 – 80.

GÜNTHER, E. / SCHILL, O. (1997): Wahl der Systemgrenze für die betriebliche Ökobilanzierung entsprechend den Anforderungen der EG-Öko-Audit-Verordnung, in: Wissenschaftliche Zeitschrift der Technischen Universität Dresden, volume 46, number 6, 1997, pp. 60 – 63.

GÜNTHER, E. (1998): Bewertung ökologiebedingter Konsequenzen, in: Möller, H. P. / Schmidt, F. (Hrsg.): Rechnungswesen als Instrument für Führungsentscheidungen, Stuttgart 1998, pp. 231 – 259.

HALLAY, H. / PFRIEM, R. (1992): Öko-Controlling. Umweltschutz in mittelständischen Unternehmen, Frankfurt a. M., New York 1992, pp. 148 – 157.

KELLER, B. (1996): Unternehmensexterne ökologische Berichterstattung. Entwicklung einer Konzeption mit Ansatzpunkten zur Prüfung, München 1996.

MEFFERT, H. / KIRCHGEORG, M. (1989): Umweltschutz als Unternehmensziel, Arbeitspapier Nr. 50 der Wissenschaftlichen Gesellschaft für Marketing und Unternehmensführung e.V., Münster 1989.

MINSCH, J. (1993): Nachhaltige Entwicklung: Idee – Kernpostulate. Ein ökologisch-ökonomisches Referenzsystem für eine Politik des ökologischen Strukturwandels in der Schweiz, IWÖ-Diskussionsbeitrag Nr. 14, St. Gallen 1993.

REINHART, A. (1998): Die Auswirkungen der Rechnungslegung nach International Accounting Standards auf die erfolgswirtschaftliche Abschlußanalyse von deutschen Jahresabschlüssen, Frankfurt am Main, Berlin, Bern u.a. 1998.

SCHALTEGGER, S. / STURM, A. (1994): Ökologieorientierte Entscheidungen in Unternehmen, Bern u. a. 1994.

SCHALTEGGER, S. / STURM, A. (1995): Öko-Effizienz durch Öko-Controlling? Zur praktischen Umsetzung von EMAS und ISO 14'001, Stuttgart u. a. 1995.

SCHMIDHEINY, S. (1992): Kurswechsel. Globale unternehmerische Perspektiven für Entwicklung und Umwelt, München 1992.

SCHNEIDEWIND, U. / DYLLICK, T. (1997): Ökologisches Benchmarking, in: Die Betriebswirtschaft, volume 57, number 4, 1997, pp. 569 – 572.

SCHNEIDEWIND, U. / HUMMEL, J. / BELZ, F. (1997): Instrumente zur Umsetzung von COSY (Company oriented Sustainability) in Unternehmen und Branchen, in: UmweltWirtschaftsForum (uwf), volume 5, number 2, 1997, pp. 36 – 44.

SCHULZ, E. / SCHULZ, W. (1993): Umweltcontrolling in der Praxis, München 1993.

SCHWARZ, E. J. / STEVEN, M. / LETMATHE, P. (1997): Methoden der Umweltberichterstattung, in: Zeitschrift für Betriebswirtschaft, volume 67, number 4, 1997, pp. 471 – 498.

SCHWEDT, B. (1998): Evaluierung von Umweltmanagementsystemen. Überblick über ein Forschungsvorhaben und erste Ergebnisse, in: UmweltWirtschaftsForum (uwf), 6. Jg., Heft 1, 1998, S. 12 – 15.

SEIDEL, E. / WEBER, F. M. (1998): Die EMAS-Praxis in Deutschland. Ergebnisse einer kritischen Bestandsaufnahme, in: UmweltWirtschaftsForum (uwf), volume 6, number 1, 1998, pp. 22 – 27.

STAHLMANN, V. (1994): Zur Bewertung von ökologischen Wirkungen des Unternehmens, in: UmweltWirtschaftsForum (uwf), volume 2, number 7, 1994, pp. 7 – 17.

STAHLMANN, V. (1996): Öko-Effizienz und Öko-Effektivität. Läßt sich der Umweltfortschritt eines Unternehmens messen?, in: UmweltWirtschaftsForum (uwf), volume 4, number 4, 1996, pp. 70 – 76.

UMWELTBUNDESAMT (UBA) (Hrsg.) (1993): Internationaler Vergleich von Verfahren zur Festlegung von Umweltstandards, UBA-Berichte 3/93, Berlin 1993.

WEHRMEYER, W. (1995): Measuring Environmental Business Performance. A Comprehensive Guide, Cheltenham 1995.