Nordic Project on Development and Implementation of Environmental Performance Indicators in Industry

Environmental Performance Indicators for Strategic Decision Making

Case report from a.s Norsk Leca
December 2000

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REPORT OVERVIEW

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The scope of the case-project in a.s. Norsk Leca has been defined quite broadly. The activities considered for indicator use along the building material value chain (life cycle), has comprised all activities from raw material extraction to materials recycling after end use in buildings and roads/railways. Based on earlier LCAs, a.s. Norsk Leca's own production facilities were considered to be the actors with the most significant sustainability impacts along the value chain. Both potential local, regional and global environment sustainability effects has been considered in the assessment and a medium term time frame (4-10 years) was selected as suitable for the assessment of strategic sustainability challenges and their strength and direction.

The following four sustainability aspects for company performance were defined:
Energy efficiency – Landscape impacts – Materials efficiency – Climate effects

Budget and strategy planning decisions on the top management level, on product management level, on production management level and on individual factory level were considered as significant for the introduction of sustainability indicators for products and processes.

After strict priority setting, the number of sustainability indicators were narrowed down to the following four:
• Total energy consumption : gross turnover (in kWh/NOK)
• Fossil energy consumption : Total energy consumption (in % based on energy content)
• CO2 emissions : Gross turnover (tons CO2 equiv./NOK)
• Virgin material in block production : Total material in block production (in % on a volume basis)

These indicators are intended for use on a strategic level and will also be transformed into operational indicators for the same sustainability aspects.

Product profile indicators were also developed for strategic product portfolio development discussions. A sustainability matrix was developed for the complete product portfolio, which is intended to be used as a visual and simple tool for portfolio development discussions.</td></tr>
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Project manager	Case project leader
Ole Jørgen Hanssen	Johan Thoresen

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1. Background

In 1996/97, the first preliminary methods for Environmental Performance Evaluation and Indicators (EPE/EPI) in business organizations were developed by Norwegian and Swedish companies. This test phase identified areas for additional work, and gave input to the development of draft ISO standards for EPE and EPIs (ISO 14031).

Based on the preliminary experience gained from this first phase of the EPI development, plans for the Nordic Project for Development and Implementation of Environmental Performance Indicators in Industry (NORDEPE) was developed.

The main aim of the NORDEPE-project was to develop and implement environmental performance indicators as an integrated part of environmental management systems, decision making processes and communication processes in the participating companies, and in the long term to increase eco-effectiveness and competitiveness of Nordic industry.

a.s. Norsk Leca has participated as a case company in the NORDEPE-project, with a special emphasis on EPIs as tools for strategic decisions.
This report documents the results and experience gained from this project.

2. Description of the company

a.s Norsk Leca is one of Norways leading manufacturers of building materials. The company is a part of the Swedish Optiroc Group, the building materials operations of the German Heidelberger Zement Group. a.s Norsk Leca produces light weight aggregates based on natural clay resources. The light weight aggregates are used for geotechnical and insulation purposes, and as a raw material for production of light weight blocks and elements for houses and professional buildings.

a.s Norsk Leca has been manufacturing and marketing Leca products for the Norwegian market since 1954. The number of employees total 300 (pr 2000), with 7 production facilities. The two light weight aggregates plants are located in Borge and Rælingen, while the block and element production units are found in Borge, Lillestrøm, Vestnes, Stjørdal and Tovik.

a.s Norsk Leca has since many years worked on reducing the environmental impacts of both the production processes and the products. A quality and environmental management system according to ISO 9001 and ISO 14001 will be implemented in the company by the end of 2000.

Participation in the NORDEPE- project is motivated by the opportunity to further develop the environmental strategies of the company. Of particular interest are the challenges related to the development of operational indicators also to be used in strategic management decisions.

3. Project Objectives and Organisation

Project objectives

- Define the areas of major environmental concern in a.s. Norsk Leca.
- Define a set of environmental indicators intended for strategic and subsequently for operative decision making within the most important of these areas
- Prepare for indicator testing in practical decision situations.

Project organisation .

The project was divided into two main phases:

- Phase 1 for establishing the strategic sustainability concerns for the company and subsequent development of environmental profile indicators for the various Leca products
- Phase 2 for defining and selecting indicators to describe the development of the company's strategic sustainability concerns. Phase 2 indicators were intended as tools for strategic decisions and subsequently for operational decisions regarding the same sustainability concerns.

In phase 1, the project was organised with a steering group comprising managers representing production, sales/marketing, product development and quality-/environmental management. Group members were:

Oddvar Hyrve	-	a.s. Norsk Leca
Ole Krokstrand	-	a.s. Norsk Leca
Kjell Håkon Helgesen	-	a.s. Norsk Leca
Arne Monsen	-	a.s. Norsk Leca

The project group comprised personnel with production-, sales-, product- and environmental expertise. Group members were:

Kjartan Wehn	-	a.s. Norsk Leca
Kjell Ove Amundsgård	-	a.s. Norsk Leca
Knut Vaage	-	a.s. Norsk Leca
Jørgen Jacobsen	-	a.s. Norsk Leca
Stefan Jacobsen	-	Norsk Byggforskningsinstitutt
Ole Jørgen Hanssen	-	Stiftelsen Østfoldforskning
Johan Thoresen	-	Stiftelsen Østfoldforskning

Anne Rønning - Stiftelsen Østfoldforskning
Carl Henrik Borchsenius - Stiftelsen Østfoldforskning

In phase 2, Kjell Håkon Helgesen from a.s. Norsk Leca functioned as a steering group, while the project group members were:

Knut Vaage - a.s. Norsk Leca
Kjartan Wehn - a.s. Norsk Leca
Johan Thoresen - Stiftelsen Østfoldforskning

4. Project Methodology

The general principles for selection and implementation of indicators used in the case project are in accordance with ISO 14031 "Environmental Performance Evaluation" and the methodology developed in the NORDEPE methodology[1]descriptions developed in the project. A brief outline of the methodology is given in fig. 4.1:

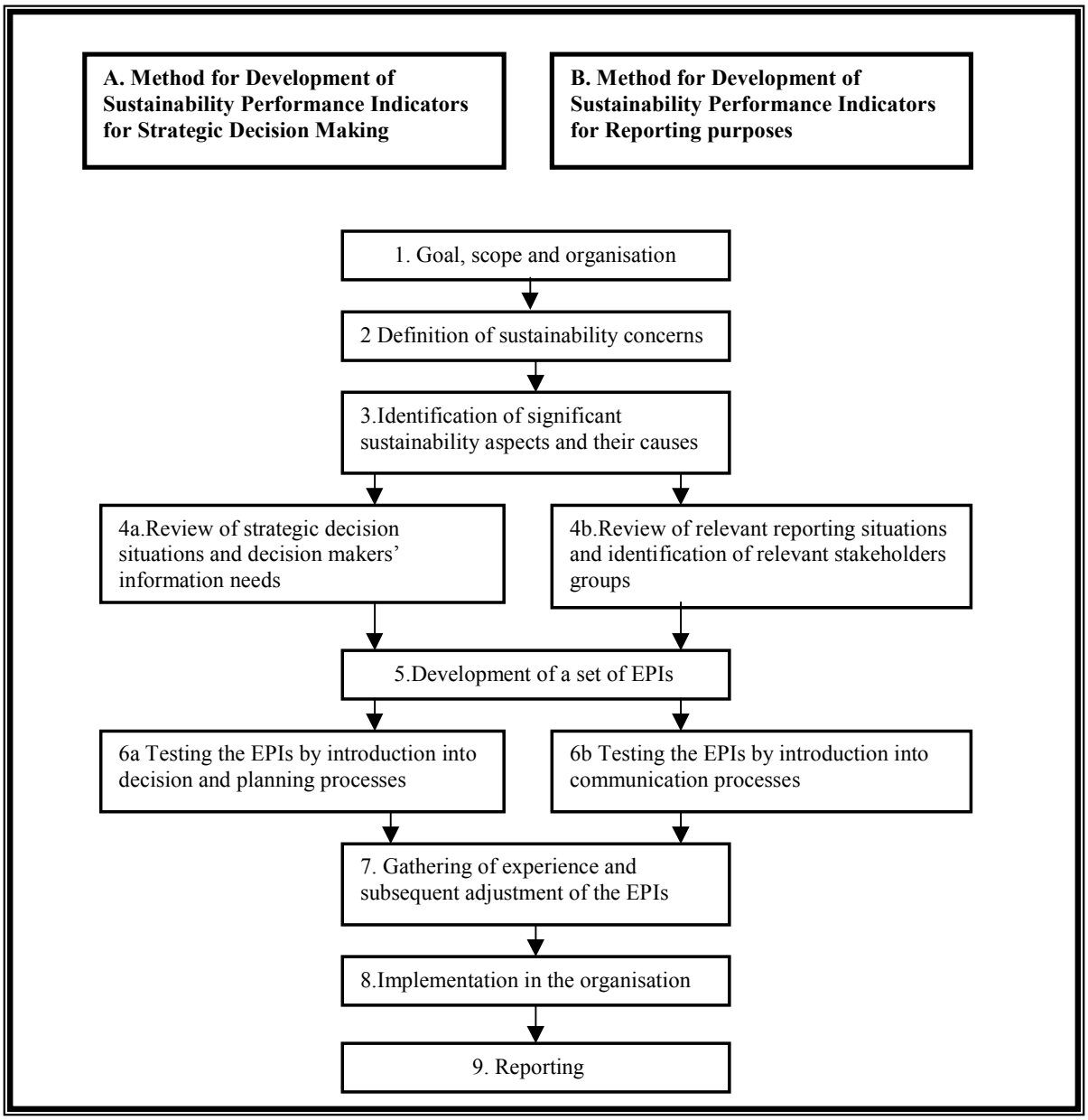

Fig. 4.1 General methodology for the development of Environmental Performance Indicators for strategic decision making (A.) and reporting purposes (B.)

The subordinate methodologies used in steps 2., 3. and 5. strategic decision indicators (shown on the left hand side of fig. 4.1) have been the following:

- Definition of sustainability concerns (step 2.)
  The listing of categories and sub-categories of impacts for potential sustainability indicators in Annex 1 of the NORDEPE methodology report was chosen as a basis for this definition.

- Identification of significant sustainability aspects and their causes (step 3.)
  Selection of key environmental aspects to be represented by indicators was based on the forecasting scenario technique - see Appendix 4 of the methodology report.

- Development of a set of EPIs (step 5.)
  Priority setting for sustainability indicators was carried out according to Appendix 7 of the methodology report.
  Sustainable profile indicators for strategically important products were defined according to Appendix 8 of the methodology report.

5. Results and discussion

The sub-chapters below all refer to the methodological steps presented in fig. 4.1.

5.1 Goal, scope and organization

The goal of the project and its organization has been defined in chapter 3 above. The scope in different areas has been defined as follows:

Boundary line. The value chain activities to be considered for indicator use comprise all activities from raw materials extraction to materials recycling after end use.
Major value chain or lifecycle actors. Based upon earlier LCAs for some major products, Norsk Leca's own production facilitites were considered to be the major sustainable actor along this chain.
Localisation of environmental impacts. Both local, regional and global environmental effects were considered.

Time frame for indicator use. A medium term timeframe (4-10 years) was chosen use.

5.2/5.3 Definition of sustainability concerns and identification of significant sustainability aspects and their causes

The listing of categories and sub-categories (methodology report - Annex 1) of impacts for potential sustainability indicators and the forecasting scenario technique (methodology report - Appendix 4) were chosen as selection tools for the definition of sustainability concerns and aspects.

Energy efficiency - landscape impacts - materials efficiency - climate effects
were defined as the company's most important sustainability aspects.

5.4 Review of strategic decision situations and decision makers' information needs

The review carried out by the project group gave the following answer:
The budget and strategy planning processes on the management group level, on the product management level, on production management level and on individual factory level were considered relevant for using new indicators on a strategic and subsequently on an operational level for the same aspects.
Since there exists an environmental co-ordination group within the Optiroc Group (the mother corporation), this group must be strongly involved in the selection of indicators and proposals for where the indicators can serve an optimum sustainable

purpose. The responsibility for testing and fully implementing the indicators must on the other hand be a line-management responsibility.

5.5 Development of a set of EPIs

Priority setting for sustainability indicators was carried out according to the methodology report - Appendix 7 for the selected aspects energy efficiency, landscape impacts, materials efficiency and climate effects.
Project group discussions based on cause/effect-trees for all these four aspects started out with a set of 17 different types of indicators. It was concluded that the final set of indicators must be few to be accepted by the potential users and should therefore cover only the most important areas for sustainable performance. In this context, landscape impacts were discarded as a 1. priority aspect for indicator use.
Examples of the cause/effect tree for energy efficiency analysed in a lifecycle perspective and decriptions of potential indicators and users are given below:

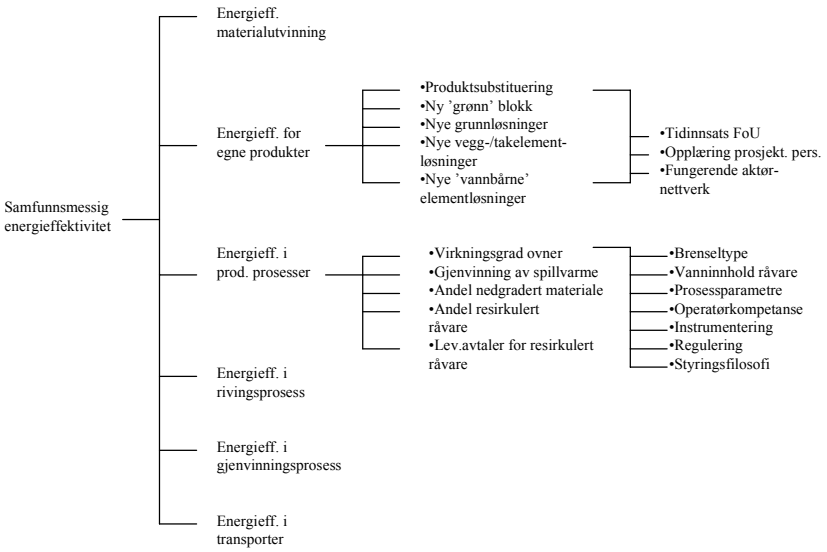

Fig. 5.1 Example of cause/effect tree

STRATEGISKE MILJØINDIKATORER FOR AS NORSK LECA -
B. for å forbedre energieffektiviteten gjennom livsløpet for Leca produkter

Indikator	Hensikt med indikatoren	Relevant for	Mulige bruks-situasjoner	Mulige brukere
Energiforbruk pr. omsetningskrone *kWh/NOK*	Samleindikator for styring og oppfølging av beslutninger i forbindelse med produktportefølje, produktutforming, prosesser, teknologi og råvarebruk, slik at energibehovet pr. omsetningskrone stadig søkes redusert. Omsetningstallene skal være indeksregulert i hht. et valgt referanseår. Indikatoren kan benyttes til "benchmarking" mellom bransjer, produktområder og fabrikker. Indikatoren er definert som - *Sum av all energibruk (elkraft, fossilt brensel, biobrensel etc.) i kWh : samlet omsetning i NOK indeksert i hht. referanseåret.*	Konsern totalt Pr. fabrikk	Strategiplan -legging/ oppfølging	1 toppledelse 2 markedsledelse 3 produktutvikling 4 fabrikkledelse 5 innkjøpsledelse

Fig. 5.2 Example of mapping of indicators and their potential users

Indicator priority discussions ended up with the following proposed set of indicators:

Total energy consumption : Gross turnover (kWh/NOK)

Fossil energy consumption : Total energy consumption
(% based on energy content)

CO2 emissions : Gross turnover (tons CO2 equiv./NOK)

Virgin material in block production : Total material used in block production
(% on a volume basis)

These indicators are intended for use on a strategic level, but will also be translated into operational indicators for the same aspects. For such operational indicators to be used in the production sector, a volume basis rather than a NOK basis will be chosen.

Sustainable profile indicators for strategically important products. Life cycle based environmental profiles for products may be of great value for strategic portfolio development discussions. Product profile indicators were developed for all product segments in a.s. Norsk Leca according to the procedures given in the methodology report - Appendix 7.
The position of the different product segments were then entered into a matrix according to their position along the horizontal environmental profile axis and expected market potential along the vertical axis. The size of the circles representing each product segment in the matrix defines its current sales volume. The matrix shown below presents the principles of such a presentation. But the actual numbers are – for secrecy reasons – not the real ones.

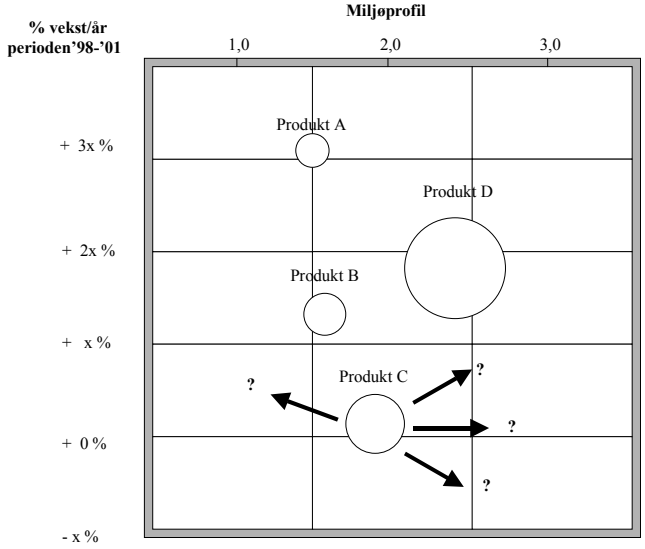

Fig. 5.3 Product positioning in an environmental profile and market value frame for strategic portfolio decisions.

The position of the product along the horizontal axis (1 : poor environmental profile and 3 : excellent profile) is actually an aggregated indicator for product performance across important environmental aspects and across all life cycle phases. The matrix makes it easier to visualize possible strategic directions for environmental profile and/or future sales development for the different products in the company portfolio.

5.6a Testing the EPIs by introduction into decision and planning processes

Creating interest and understanding between key personnel within the organization is a necessary preparation for the testing of selected indicators. The project group has chosen an introduction path starting with production management in AS Norsk Leca, and finally ending up with the management group in AS Norsk Leca.

A recent take over of the mother company by a German corporation (the Heidelberger Zement Group) and subsequent organizational changes have delayed indicator testing, experience gathering and final implementation (steps 6., 7. and 8.)
Indicators representing company performance for the selected environmental aspects therefore will be tested first on an operational level, before the necessary management decisions can be taken to introduce them on a strategic level.

5.7 Gathering of experience and subsequent adjustment of the EPIs

This phase will take place after the ending of the current international introduction and testing of environmental performance indicators within companies belonging to the Swedish Optiroc Group.

5.8 Implementation in the organization

This phase is at the moment under development within companies belonging to the Swedish Optiroc Group.

6. Conclusions

The introduction, development and implementation of EPIs requires a build-up of environmental knowledge and understanding within companies over time. It may be a slow process since key environmental personnel – often the first personnel category to invest time and interest in EPI introduction - often do not have the necessary mandate to speed up company-internal processes.
A cross-functional project group with close top management contacts is ideal for this build-up of knowledge, understanding and for the development of relevant EPIs and procedures for their introduction and use in the organization. Project group members should be carefully selected according to their competence, interest and access to top management.

The number of indicators should be kept low in the introduction phase, to prevent de-motivation of potential users. Use of a small set of essential indicators during an introductory period of time may create understanding of their importance and possibly produce the need for a broader coverage of indicators. It may also be wise to start the EPI introduction with operational indicators describing the most environmentally important areas for the company, before indicators are introduced as tools for strategic planning and decision situations.

Top management support is vital for success of EPI introduction efforts in planning and decision processes. This is especially valid for the introduction of EPIs for strategic decision purposes, both regarding changes of product portfolio environmental profiles and environmental performance of manufacturing and transport facilities. One important task for the environmental manager is to introduce EPI concepts to top management in a fashion where sustainable development and the monitoring of this for the company is strongly linked to future profitability of

systematic EPI implementation for strategic and operational decisions. A bottom-up approach is normally needed before top management takes sufficient interest in environmental issues to formulate demands and support for systematic EPI implementation and use by functional managers and their departments.

Ideally, indicators should describe the performance of both manufacturing- and transport processes as well as environmental performance of company products through their life cycle. To avoid sub-optimum product solutions, the understanding of the functional role of the product through its life cycle is essential. This requires an understanding of the system of which the product is a part. Product design or product specifications should ideally be based on this kind of knowledge. Environmental product profiles should be optimized on this basis through the use of product profile EPIs with a systems and life cycle perspective.

> Example:
> One of the major functional requirements put on building materials in the Nordic countries is to insulate dwellings against cold outside temperatures. Energy requirement and climate gas problems from the user phase of dwellings have proved to be much more important in a life cycle perspective than other activities, e.g. manufacturing or transportation of building materials, building-site activities etc.
> For the building material manufacturer, the environmental optimum viewed in a life cycle perspective may therefore be to increase the insulation capacity of his product, even if this
>
> means an increase of materials- and energy requirement and increase of emissions from his manufacturing facilities. In a societal perspective, the subsequent reduction of energy consumption from the dwelling is much more important than the reduced environmental performance from the manufacturing facilities. The systematic use of product profile EPIs to support product portfolio and product development decisions should – if possible - take account of this knowledge.

The present judgement in a.s. Norsk Leca is that this type of indicator is important for corporate environmental challenges, but the organization is not quite ready for the introduction of such indicators yet.

Organisational changes – e.g. caused by takeovers - may introduce turbulence, unrest and possible changes of focus in an organization for a period of time. Preferably, the introduction of new concepts – like EPIs for strategic and operational decision making – should wait until the organization once more reaches a point of balance.

Annex 1: Participation and reporting in the project

Case companies:

Companies	Sector	Contact person
Tetra Pak S-22100 Lund	Packaging production	Lars Lundahl
AstraZeneca AB S-15185 Södertelje	Pharmaceutical production	Helena Uddholm Birgitta Thorsin
Akzo Nobel S-44485 Stenungsund	Chemical production	Bertil Norberg Klas Hallberg
M. Peterson & Søn N-1501 Moss	Pulp and paper production	Per Arne Syrrist Ellen Hilde Grøm
Sydkraft SE-20509 Malmö	Energy production	Rolf Henriksson Maria Sunér
Norsk Leca N-0614 Oslo	Construction materials	Knut Vaage
FORTUM Power and Heat Fin-00048 Fortum, VANTAA	Energy production	Pekka Järvinen Hannu Härkönen
UPM-Kummene FIN-00101 Helsinki	Pulp and paper production	Kari Ebeling Nina Norjama
Norcem N-3950 Brevik	Cement production	Erik Stoltenberg Hansson
Cementa AB S-620 30 Slite	Cement production	Gunnel Pott

Following companies:

Companies	Branch	Contact person

STORA ENSO Group FIN-00101 Helsinki	Forest industry	Anneli Suotsalo
Lännen Tehtaat Oy FIN- 27821 ISO-Vimma	Food Production & Engineering	Juhani Hvitfelt
METSO Corp FIN 00101 Helsinki	Forestry	Pirjo Kaivos
Elkem N-0303 Oslo	Ferroalloys and silicon metal	Inger Johanne Eikeland
Statsbygg (N), N-0032 Oslo	Real estate	Zdena Cervenka Stein Rognlien
ESAB SE-40277 Göteborg	Welding and cutting equipment	Stefan Larsson
Volvo Personvagnar SE-40508 Göteborg	Car manufacturing	Agneta Wendel
Perstorp SE-28480 Perstorp	Chemical production	Henrik K. Ny

Participating institutions:

Institute	Participating councellors	Addresses
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Technical Research Centre of Finland, VTT	Rabbe Thun Virve Tulenheimo	***P.O.Box. 1403, FIN- 02044 VTT, Espoo*** Phone: +358 9 456 5450 Fax: +358 9 456 7043
Centre for Environmental Assessment of Product and Material Systems (CPM)	Bo von Bahr Bengt Steen	Chalmers University of Technology, Kapellgången 5, S-412 96 Göteborg Phone: +46 317722177 Fax: +46 317722172
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Associated Partners:

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IIIEE Lund University	Yoke Mun Chan, Joscelyne M. Shaw, Narine Sargsyan, Anastasia O'Rourke Jaakko Kuisma	Lund University P.O.Box 196 S-22100 LUND, Sweden Phone:+46 46 222 0200 Fax: +46 46 222 0210

Participating SME-companies within the transport sector:

Participating transport companies:

Company	Contact person
Jørgensen Transport AS	Ivar Jørgensen
Sørum Transport AS	Harry Nilsen
Haukebøe Transport AS	Elling Haukebøe
Kristian Gerhard Jebsen Skipsrederi AS	Haktor Øvrevik

Annex 2: Reports from the project

Main report from the Nordic project for development and implementation of Environmental Performance Indicators in Industry.
Johan Thoresen & Elin Økstad & Ole Jørgen Hanssen, Østfold Research Foundation. Norway, Bo von Bahr & Bengt Steen, CPM, Chalmers University of Technology, Sweden; Elin Eriksson & Petra Bäckman, Chalmers Industriteknik, Sweden,
Rabbe Thun & Virve Thulenheimo, VTT Industrial Environmental Economics, Finland
Kristian Løkkegaard, Ernst&Young, Danmark

METHODOLOGY REPORTS

Statistical Properties of Emission Data in the Nordic Cement Industry
Bo von Bahr, CPM, Chalmers University of Technology, Sweden; Ole Jørgen Hanssen & Mie Vold, Østfold Research Foundation, Norway, Gunnel Pott, Cementa AB, Sweden and Erik Stoltenberg-Hansson, NORCEM, Norway

Environmental Supply Chain indicators for the transport sector. Methodological approach and examples.
Lars von Krogh, Ole Jørgen Hanssen, Elin Økstad: Østfold Research Foundation, Norway

Performance Indicators for External Reporting and Green Rating
Virve Tulenheimo, VTT Industrial Environmental Economics, Finland; Petra Bäckman, Chalmers Industriteknik, Sweden and Elin Ökstad, Østfold Research Foundation, Norway

Methodological Approach for Development of Indicators for Strategic Decision-making in Industrial Companies
Johan Thoresen, Østfold Research Foundation, Norway; Elin Eriksson, Chalmers Industriteknik, Sweden and Rabbe Thun, VTT Industrial Environmental Economics, Finland

Methodology Approach for Selection of significant sustainability aspects
Bengt Steen, CPM, Sweden

CASE STUDIES

Akzo Nobel AB
Development of a Process and a Measurement System to Achieve Continuous Reduction of the Ecological Effects of Operations and
Products at Akzo Nobel Surface Chemistry
Klas Hallberg, Akzo Nobel; Elin Eriksson, & Ulf Östermark, CIT, Sweden
Akzo Nobel AB

CEMENTA AB and NORCEM
Environmental performance indicators for external and internal communication
Case report from Cementa and Norcem
Mie Vold & Ole Jørgen Hanssen, Østfold Research Foundation, Norway, Gunnel Pott, Cementa, Sweden; Erik Stoltenberg-Hansson, Norcem, Norway; Bo von Bahr, CPM, Sweden

FORTUM Power and Heat Oy
Backcasting for Sustainable Strategies in the Energy Sector
Jaakko Kuisma, IIIEE, Lund University, Sweden; Virve Tulenheimo & Rabbe Thun, VTT Industrial Environmental Economics, Finland and Pekka Järvinen, FORTUM Power & Heat Oy, Finland

M. Peterson & Son
Environmental performance indicators for communication in the local community.
Elin Økstad, Østfold Research Foundation, Ellen Hilde Grøm, Peterson Linerboard, Norway

a.s. Norsk Leca
Environmental Performance Indicators for Strategic Decicion making
Johan Thoresen, Østfold Research Foundation, Knut Vaage, as Norsk Leca

SYDKRAFT AB
Development and Testing a System for Benchmarking of Environmental Management Performance
Yoke Mun Chan, IIIEE, Lund University, Sweden; Rabbe Thun, VTT, Finland and Maria Sunér, Sydkraft, Sweden

Identification of Internal Indicators for Sustainable Corporate Decision-Making - A feasibility study for the establishment of business-related travel
Joscelyne M. Shaw, IIIEE, Lund University, Sweden; Rabbe Thun & Virve Tulenheimo, VTT Industrial Environmental Economics, Finland and Maria Sunér, Sydkraft, Sweden

Sustainable Development and Corporate Reporting: Selecting Indicators from Stakeholder Dialogue
Narine Sargsyan, Lund University, Sweden; Rabbe Thun & Virve Tulenheimo, VTT Industrial Environmental Economics, Finland and Maria Sunér, Sydkraft, Sweden

Corporate Environmental Assessment and Strategic Acquisitions
Anastasia O'Rourke, IIIEE, Lund University, Sweden; Rabbe Thun & Virve Tulenheimo, VTT Industrial Environmental Economics, Finland and Maria Sunér, Sydkraft, Sweden

Tetra Pak AB
Identification of Strategic Environmental Performance Indicators
Lars Lundahl, Tetra Pak; Elin Eriksson & Ulf Östermark, CIT, Sweden

UPM-Kymmene Oyj
Indicators for Sustainable Strategies based on Backcasting the Future
Rabbe Thun & Virve Tulenheimo, VTT Industrial Environmental Economics, Finland; Kari Harjunen & Ari Tiihonen, PricewaterhouseCoopers, Finland and Kari Ebeling & Nina Norjama, UPM-Kymmene Oyj, Finland