ENVIRONMENTAL MANAGEMENT ACCOUNTING NETWORK

9TH ANNUAL CONFERENCE

ENVIRONMENTAL MANAGEMENT ACCOUNTING AND CLEANER PRODUCTION

ABSTRACTS

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Dear Participant,

on behalf of the Austrian Federal Ministry of Transport, Innovation and Technology it is my honour to welcome you to this 9th annual conference of the EMAN Network.

The theme of “Environmental Management Accounting and Cleaner Production” which will be your main focus this year has been an important research area in Austria since the early nineties. At this time the first cleaner production research and case study programmes were developed according to the PREPARE method, which proved so successful, that it is being used by Austrian municipal CP-programmes even today.

Much has happened since the first CP projects were done and environmental management accounting has proved to be a valuable way of arguing and monitoring the investments and costs necessary to make cleaner production a success. The Austrian Federal Ministry of Transport, Innovation and Technology has actively promoted the development of EMA through our national Austrian programme on Technologies for Sustainable Development (at:sd) with it’s sub-programme “Factory of Tomorrow” (“Fabrik der Zukunft”).

“Factory of Tomorrow” is now well under way in taking this important theme one step further towards the issue of sustainable management accounting. Researchers and businesses are being challenged to explore the benefits and challenges of describing sustainable activities in monetary terms.

The ministry is sponsoring this conference as a pre-event to the International Conference on Environmental Management and Innovation, which will be held in Vienna under the auspices of the Austrian EU Presidency immediately afterwards. This is to highlight the importance of EMA and sustainability as drivers of innovation and resource protection, which will ultimately be the among the most important options to secure our economic and physical well-being.

We look forward to receiving the results of your presentations and discussions and taking them into further discussions on Environmental Management and Innovation.

May your debates be fruitful and may you enjoy your stay in Austria.

Hans-Günther Schwarz

Austrian Federal Ministry of Transport,
Innovation and Technology

Introduction

Hans Sünkel, Rector, Graz University of Technology

To carry responsibility implies to integrate consequences of one's actions. More than ever technical scientists bear the consequences for the quality of life of future generations. Especially science always has to keep in mind possible consequences and keep careful interaction with fellow beings and the environment. It must be a central task and concern for Graz University of Technology to further dialogue towards an environmentally friendly, sustainable development.

Emissions, that are detrimental for humans and the environment, and scarce energy resources necessitate worldwide action plans and demand innovative solutions with global outreach. "Zero Emissions Research" –research that aims at producing least possible waste and emissions - is undertaking important endeavours to show realistic solutions for a future worth living in and hence fills the term "sustainability" with life.

In order to meet the challenge of developing further the classic disciplines environmental protection the networking of all involved disciplines is critical. Meetings such as the Environmental Management Accounting Network (EMAN – EU) conference where this year for the first time engineers and economists discuss environmentally friendly measures, are an important step in the right direction, thus making the exchange and development of new strategies possible. Therefore I am delighted that such a distinguished audience with members of different disciplines participates in this international meeting in Graz.

Introduction

Christine **Jasch**
Institute for Environmental Management and Economics (IOEW)

Hans **Schnitzer**
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The ninth annual conference of the Environmental Management Accounting Network - Europe (EMAN-EU) focuses on the links between Environmental Management Accounting, Efficient Material Flow Management and Cleaner Production, especially highlighting win-win situations in joint applications.

The conference is being held on Wednesday 26th and Thursday 27th April 2006 at the Technical University of Graz, Institute for Resource Efficient and Sustainable Systems (RNS). It is organised jointly with the Institute for Environmental Management and Economics, IÖW, Vienna.

The conference also belongs to a series of conferences organised by the Institute for Resource Efficient and Sustainable Systems at Graz University of Technology addressing progress in "Zero Emissions Research and Application". It is aimed at researchers, government authorities and policy-makers and corporate representatives. It seeks and brings together an international and interdisciplinary audience to begin to tackle many of the issues connected with Zero Emissions and sustainable development - to share experiences and to begin to work towards solutions. By building informal partnership and in offering opportunities to share ideas this conference seeks to move this complex debate forward.

The conference theme addresses the issues of how companies and other organisations not only have implemented sustainability tools and concepts but also how this information is incorporated into decisions making and decisions making processes.

The definition of EMA as followed by the United Nations Expert Working Group on EMA and by the Environmental Management Accounting Network (EMAN) distinctively highlights both the physical and monetary sides of EMA. EMA is broadly defined to be the identification, collection, analysis and use of two types of information for internal decision making:

- physical information on the use, flows and destinies of energy, water and materials (including wastes) and
- monetary information on environment-related costs, earnings and savings.

Taking care of the environment has become an enormous preoccupation virtually around the world, and accounting for the environment and related issues are beginning to take on increasing importance. Therefore accountants as well as technicians need to work jointly to minimize – and finally to zeroize – the environmental impact of organisations.

It is important to note that preventive activities such as on-site recycling, cleaner production and environmental management systems play a special role in environmental management. Costs incurred for preventive environmental management activities often not only improve environmental performance, but also bring a financial payback as materials use efficiency raises and waste declines. Accordingly, some projects with preventive environmental benefits are implemented not only to meet environmental goals, but also with efficiency, product quality or other goals in mind.

However, experience shows, that cost accounting technique, information systems and investment appraisal are not well developed and routinely applied in organisations. The currently released International Guidance Document on EMA by the International Federation of Accountants, IFAC, New York, deals with the shortcomings of many accounting systems to adequately monitor physical materials flows and environment-related costs and provides a framework for improved cost assessment.

Environmental issues – along with the related costs, revenues and benefits – are of increasing concern to many countries around the world. But there is a growing consensus that conventional accounting practices simply do not provide adequate information for environmental management purposes. To fill in the gap, the emerging field of Environmental Management Accounting (EMA) has been receiving increasing attention. In the early 1990s, The US Environmental Protection Agency was the first national agency to set up a formal program to promote the adoption of EMA. Since that time, organizations in more than 30 countries have begun promoting and implementing EMA for

many different types of environment-related management initiatives.

In the real world, EMA ranges from simple adjustments to existing accounting systems to more integrated EMA practices that link conventional physical and monetary information systems. But, regardless of structure and format, it is clear that both MA and EMA share many common goals. And it is to be hoped that EMA approaches eventually will support the IFAC proposals in *Management Accounting Concepts* that, in leading-edge MA, "inattention to environmental or social concerns are likely to be judged ineffective," and that "resource use is judged effective if it optimizes value generation over the long run, with due regards to the externalities associated with an organization's activities."

Specific topics addressed in the conference include:

- Tools and experiences for environmental, social and sustainability performance measurement
- Innovations and case studies in management accounting (new methods and procedures)
- Incorporation of environmental, social and sustainability accounting into investment appraisal
- Recent developments of material flow cost accounting
- Surveys and empirical analyses of innovative approaches
- Approaches to zero emissions production and the effects on the companies performance
- Eco-efficiency; key performance indicators and sustainable development
- Zero Emissions technologies and cleaner production
- Process and product design for a sustainable future

We hope that the exchange of experiences among participants will lead to a better understanding between technical and accounting issues and help reduce non sustainable impacts of human activities.

The organizers also want to express their thank to the Austrian Federal Ministry of Transport, Innovation and Technology which substantially supported the event in the framework of its program "Factory of Tomorrow". Within this framework program also several of the projects presented by Austrian researchers are supported.

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BOOK OF ABSTRACTS

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Research on Sustainability Management Accounting – The Austrian Approach

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***Abstract*: Following an early engagement in the development and promotion of cleaner production technologies, Austria has been able to take a prominent role in the research leading to new approaches and standards in environmental and sustainability management accounting. Through a focus on international networking and a strong basis of case study projects within the framework of the national RTD programme "Factory of Tomorrow", sustainability management accounting is on it's way towards becoming a real option for businesses in Austria.**

I. Introduction

The concept of sustainable development requires managerial strategies that also take account of economic, social, and ecological aspects. For this purpose, an organization will need environmental management and environmental accounting systems that provide an integrated perspective of the monetary and material aspects of all environment-relevant activities of the organization. Conventional accounting and cost accounting systems do not yield a comprehensive picture of the performance of or the environmental costs accruing for an enterprise in the fields of health/safety.

Today´s decision makers are rarely able to link environmental data and economic variables and therefore urgently need information on real safety and environmental costs attributable to the activities of an enterprise. The economic value of existing human or environmental resources and assets as well as the economic benefits of a first-rate safety and environmental performance for the enterprise have not yet been sufficiently understood in many organizations and, consequently, have not been integrated in the decision making process. For this reason, existing potentials for greater efficiency are not being sufficiently used.

Since the early 90's the Austrian Ministry of Transport, Innovation and Technology has supported and financed research and development projects in the areas of "Environmental Accounting Systems" and "Integrated Management"; the results of the earlier projects may be considered models for the development of specifications used in tender documents within the scope of the subprogramme "Factory of Tomorrow".

In order to promote the restructuring process towards sustainable development, the Austrian Ministry of Transport, Innovation and Technology (bmvit) initiated, in 1999, the Austrian Research Programme on Technologies for Sustainable Development – at:sd (Impulsprogramm Nachhaltig Wirtschaften) [10], [20]. It has since supported numerous research and development projects as well as demonstration and diffusion measures implemented within the scope of several subprograms, which provide significant innovative impetus for Austria's economy.

The sub-programme "Factory of Tomorrow" (Fabrik der Zukunft) aims to initiate and realize innovative technology development in Austria, which should demonstrate, by means of concrete examples, the feasibility of a sustainable economy. Therefore, the programme focuses especially on projects that, using a comprehensive strategy can be further developed to result in demonstration and model projects or to contribute to such a development. The development of model strategies and case study projects supporting the transition from environmental management toward environmental - and subsequently sustainability - management accounting has been an integral part of the sub-programme.

A great number of successful developments in this field have shown that the objectives of sustainability and the economic success of an enterprise do not contradict each other. Eco-efficiency is an important entrepreneurial concern that also benefits the enterprise and, in the long run, increases its value [17].

II. Austrian Research in EMA

A. *Feasibility of CP Investments*

The first projects dealing with the economic side of Cleaner Production were commissioned in the early nineties in the context of the Austrian PREPARE programme [1]-[6]. The aim was to gauge the financial return which was deemed possible through investing in cleaner production processes rather than in end-of-pipe treatment of waste and emissions [11], [13].

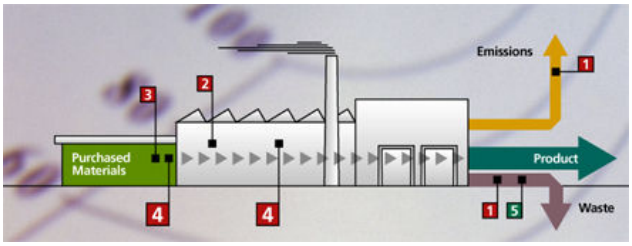

Figure 1: Input-Output-Balance of a Production Plant

More work was done in the mid-nineties to explore the economic success factors of resource-efficiency created through cleaner production and compare the micro-economic effects on a company level with effects on a macro-economic which might contribute to securing Austria's position as a favourable business location [7]-[8], [16].

A focused approach linking environmental management accounting (EMA) and CP input-output analysis was developed beginning 1996 and leading to a workbook, which in 1997 laid out the first principles of how EMA and cleaner production could be addressed and linked together [9].

B. The UN Expert Working Group on EMA

In 1999, the UN Commission for Sustainable Development established a special Environmental Management Accounting (EMA) expert working group which became a milestone in the worldwide development of environmental accounting principles. Following the initial meeting of the UN expert working group on EMA in August 1999 the first projects were designed to create a consistent approach to EMA. Austria has been able to play an active role within the expert group from the very first meeting.

The EWG in turn became a strong driver of research on EMA [17] and sustainability management accounting (SMA) methodology and technology development in Austria.

The EWG on EMA was the starting point for the commissioning of a guidebook on EMA, which was to set a standard in EMA. The Austrian Institute for Environmental Economics and Management (Dr. Christine Jasch), on commission of the bmvit and other partners from the working group drew up a strategy paper describing principles and procedures in environmental and material flow cost accounting. Published in 2001, the paper has subsequently been translated into almost a dozen languages and distributed worldwide by the UN Department of Economic and Social Affairs (UNDESA) [14]-[15]. The principles laid out in the paper were finally included into a voluntary guideline adopted by the International Federations of Accountants in 2005 [22]- [23].

C. EMA within the "Factory of Tomorrow"

EMA and questions of SMA were subsequently adopted as a major theme within the programme "Factory of Tomorrow", which started in late 2000. The years from 2001 onward saw the publication of project results in the field of EMA and SMA ranging from the economic effects of integrated management systems to EMA case studies and the adoption of an SMA approach within an industry cluster [18]- [23].

From 2003 to 2005 the focus of Austrian EMA research projects shifted toward the creation of value and the possible limits of describing sustainability activities in monetary terms.

III. FUTURE WORK AND INTERNATIONAL COOPERATION IN THE "FACTORY OF TOMORROW"

A. New Focus

Future work tendered out within the programme "Factory of Tomorrow" will expand on the results available from the present projects and case studies. An additional focus will be the questions of risk and opportunity costs, which are becoming increasingly established in both banking and investment policies towards sustainability.

B. Trans-National Programme Cooperation

Much of the new work will be tendered out in transnational joint calls within the programme network of the ERA-NET SUSPRISE, where EMA and SMA will be one of several thematic focus areas in the years to come.

SUSPRISE is a coordination action under the 6th Framework Programme of European research and brings together ministries and agencies from 10 different European countries with the aim to coordinate and strengthen cooperation of national research programmes on the "sustainable enterprise".

TABLE I: COUNTRIES & AGENCIES PARTICIPATING IN SUSPRISE

Country	Participant
Austria	bmvit, Austrian Research Promotion Fund - FFG
Belgium	IWT
Denmark	Danish EPA
Germany	BMBF, PTJ (Jülich), PFT-FZK (Karlsruhe)
Finland	Academy of Finland
France	Agence Nationale de Recherche - ANR
Ireland	Irish EPA
Netherlands	MinEZ, MinVrom, SenterNovem
Spain	IHOBE (Basque Country)
Switzerland	Federal Office of Environment – FOEN
UK	DTI

A first pilot call for tenders is currently under way with the participation of Germany and Austria, while a larger joint call, which will include five or more countries will be launched in early 2007.

Figure 2: Examples of Production Technologies

IV. CONCLUSION

Environmental management accounting has taken the first steps to become a trusted reporting format among Austrian businesses, as can be shown by the results of a good number of case studies involving leading companies. Sustainability management accounting has been taken into focus with quite some work ahead within the national RTD programme "Factory of Tomorrow". Bright prospects for trans-national exchange lie in the programme cooperation scheme SUSPRISE. It has to be hoped, that the international coordination role, which has so far been played by UNDESA can be continued.

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The IFAC Guidance document on EMA

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Abstract: **Recognising the increasing importance of environmental issues and the difficulty of managing these issues, the International Federation of Accountants (IFAC), supported by the Division for Sustainable Development of the United Nations Department of Economic and Social Affairs (DSD/UNDESA), has issued new guidance on environmental management accounting (EMA).**

***Keywords*: environmental costs, material flow costs, IFAC, environmental management accounting**

I. INTRODUCTION

Although the guidance is aimed primarily at professional accountants within organisations, it is also of interest to professional accountants and auditors who are becoming more involved in tracking or verifying environment-related information in financial and other reports. It is also targeted at improving the communication between the financial and the technical departments in organisations, as well as the consistency of data management between them.

II. WHAT IS EMA?

Because EMA has no single, universally accepted definition, the guidance document offers two complementary definitions from the International Federation of Accountants (IFAC) and the EMA Expert Working Group of the United Nations Division of Sustainable Development (UNDSD), which highlight the broad types of information typically considered under EMA, as well as some common EMA data analysis techniques and uses.

The definition given by the United Nations Expert Working Group on EMA distinctively highlights both the physical and monetary sides of EMA. According to the UN group, EMA is broadly defined to be the identification, collection, analysis and use of two types of information for internal decision making:

- physical information on the use, flows and destinies of energy, water and materials (including wastes) and
- monetary information on environment-related costs, earnings and savings.

The physical and the monetary accounting side of EMA are developed in more detail. The translation into German as well as an Excel-tool for the assessment of annual environmental costs in German and English is available for download at http://www.ioew.at .The cost categories described in the IFAC guidance document on EMA are:

Environment-related Cost Categories:

1. Materials Costs of Product Outputs

Includes the *purchase costs* of natural resources such as water and other materials that are converted into products, by-products and packaging.

2. Materials Costs of Non-Product Outputs

Includes the *purchase (and sometimes processing) costs* of energy, water and other materials that become Non-Product Output (Waste and Emissions).

3. Waste and Emission Control Costs

Includes costs for: *handling, treatment and disposal* of Waste and Emissions; *remediation and compensation* costs related to environmental damage; and any control-related *regulatory compliance* costs.

4. Prevention and Other Environmental Management Costs

Includes the costs of *preventive environmental management activities* such as cleaner production projects. Also includes costs for *other environmental management activities* such as environmental planning and systems, environmental measurement, environmental communication and any other relevant activities.

5. Research and Development Costs

Includes the costs for *Research and Development* projects related to environmental issues.

6. Less Tangible Costs

Includes *both internal and external* costs related to less tangible issues. Examples include *liability, future regulations, productivity, company image, stakeholder relations and externalities.*

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Environmental Management Accounting Practices in Japanese Manufacturing Sites

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***Abstract*: Most questionnaire-type surveys up till now on environmental management accounting practices have targeted head office environmental departments as a representative of the company. In Japan virtually none has targeted the manufacturing sites where environmental accounting is really carried out. By targeting, in questionnaire form, the sites where environmental accounting is actually developed, this paper attempts to clarify Japanese corporate environmental management accounting practices on the ground. Since head office environmental departments are presumed to have considerable influence on the introduction and performance of environmental accounting at sites, the study also analyses the relationship between manufacturing sites and a head office.**

***Keywords*: environmental management accounting, manufacturing site, head office, Japan**

I. INTRODUCTION

In order to clarify manufacturing sites' environmental management accounting practices, our questionnaire targeted environmental report-publishing firms listed on the First Section of the Tokyo Stock Exchange in four business categories: chemicals, electric appliances, pharmaceuticals, and transport machinery. The questionnaires were sent to both a head office and manufacturing sites mentioned in their environmental reports. The reason we targeted these four categories was that all four are at the forefront of environmental accounting initiatives and it seemed likely that environmental management accounting would be well underway at their sites.

II. SURVEY TARGETS

The survey targeted a total of 136 firms (head offices) in all four categories and 1,148 manufacturing sites which were mentioned in these firms' environmental reports. Questionnaires were sent out to all these head offices and sites and responses were received from 75 head offices (55.1 percent) and 255 sites (19.6 percent). The number of head offices in each industry which responded were: chemicals, 26 (55 questionnaires sent); pharmaceuticals, nine (12 questionnaires sent); electrical appliances, 33 (57 questionnaires sent); transportation machinery, 7 (12 questionnaires sent). The number of sites which responded were: chemicals, 75 (353 questionnaires sent); pharmaceuticals, 13 (55 questionnaires sent); electrical appliances, 157 (667 questionnaires sent); transportation machinery, 10 (73 questionnaires sent).

III. RESULTS

The present study carried out an analysis, based on the results of a questionnaire-type survey, of trends in environmental management accounting at sites in four industries. As a result, the following points were identified.

1) The main purpose of environmental accounting at manufacturing sites is to send data to head offices.
2) Approximately half of the sites used environmental accounting for internal management and environmental accounting was felt to be more useful at these sites than at those which did not use it for internal management.
3)It is useful for head offices to advise manufacturing sites about the introduction of environmental accounting for internal management. At such sites there is an increased awareness of the usefulness of environmental accounting.

IV. CONCLUSION

Environmental management accounting can only be used effectively in corporate management if it is used at manufacturing sites where actual business activity takes place. It has been shown that the important matter is not simply to send data to head offices, but to make use of environmental accounting information internally and for this to happen, advice from head offices is effective. Manufacturing sites which actually use environmental accounting for internal management tend to rate the usefulness of environmental accounting more highly than those sites which do not. This fact suggests the importance of environmental management accounting for Japanese manufacturing sites.

ACKOWLEDGEMENT

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Waste reduction program in Danisco A/S

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***Abstract*: During 2005, Danisco initiated a corporate pilot program "Global Waste Initiative" for testing the adequateness of EMA as tool for production sites. The objective was to apply EMA for identification of reducing the environmental impact from waste and wastewater.**

***Keywords*: Industry, sustainable development, EMA, waste, waste water**

I. INTRODUCTION

Danisco is a global supplier of food ingredients, supplying our customers from more than 70 manufacturing facilities throughout the world. A global program was launched in 2005, focusing on waste and waste water reducing initiatives. Two pilot assessments using EMA were conducted at our manufacturing facilities in Finland and USA. The objective was to identify direct and indirect environment-related costs at each facility, and evaluate the internal use of EMA for identifying initiatives reducing the environmental impact and their related costs.

II. GLOBAL WASTE INITIATIVE

A. Objectives

In order to evaluate the adequateness of EMA for the purpose of identifying waste reducing initiatives, to independent pilot assessments were conducted and evaluated.

The objectives of the assessments were:

- Investigate EMA as a tool for identification of environmental saving initiatives
- Comparison of EMA results versus annual reported environmental costs
- Evaluate EMA as benchmarking tool
  - between production sites
  - for each production site
- Evaluate required resources for EMA assessments

Both EMA assessments were based on [1].

B. Characteristics of pilot sites

Though both facilities are owned by Danisco, they are substantial different regarding regulation, production processes and utility systems.

1) Danisco Sweeteners OY, Kotka, Finland

The facility is located by the seaside on the south coast of Finland. The main product of the facility is Xylitol, used in e.g. chewing gum, toothpaste. The site has a pre-treatment of waste water, and purchases both power and thermal energy from a CHP-plant located next to the facility. The site uses seawater as cooling water. The site has certified ISO9001, ISO14001 management systems.

2) Danisco USA Inc., Kansas, USA

The facility is a stand-alone facility in an industrial area in the area of Kansas City. The main product is emulsifier based on vegetable oils. The site purchases power and natural gas for steam production.

Waste water is processed in a pre-treatment equipment before discharge to a public treatment facility.

The site has certified ISO9001, ISO14001 and OHSAS 18001 management systems.

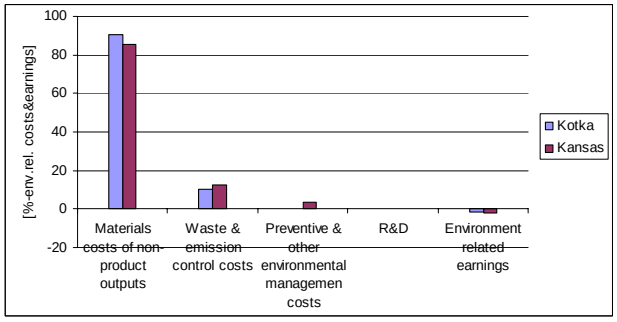

Figure 1: Distribution of environment-related costs in cost categories.

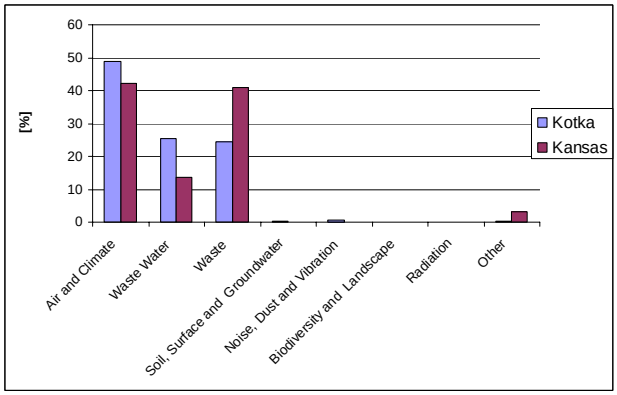

Figure 2: Distribution of environment-related costs in environmental domains.

III. CONCLUSION

The conclusions for the two pilot sites showed several similarities. In both cases, a consistent mass balance could be established covering the fiscal year May '04 – April '05.

As expected, costs of non-products outputs are considerable in both cases, while costs for environmental control are minor. The evaluation indicated EMA as a suitable tool for benchmarking sites, and useful for identifying cost flows through production.

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Developing a Sustainability Accounting framework to inform strategic business decisions: A Case Study from the Chemicals Industry

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I. ABSTRACT

Forum for the Future worked in partnership with a division of a blue-chip chemicals company ("ChemCo"), to develop a framework for sustainable business decision-making.

The Supply Chain Impact Framework was used to produce a six-stage analysis that allowed the assessment of ChemCo's operations and products on key stakeholders and contributed to key strategy setting and innovation processes.

Of most significance to ChemCo were the final two sustainability accounting stages of this work which found that the external environmental benefits of one of their products in use (a refrigerant lubricant) were eight times greater than the external environmental costs produced by the entirety of ChemCo's operations.

These findings helped inform ChemCo's future economic, social and environmental sustainability strategy, whilst the action of conducting the research fostered greater communication and understanding between different sections of the business, developed new data collection and management processes and helped embed sustainable development objectives throughout the organisation.

(This paper has been submitted for the Environment and Business Strategy Special Issue on Sustainability Accounting, edited by Stefan Schaltegger and Roger Burritt.)

Keywords: Sustainability Accounting, Business Strategy, External Costs, Sustainable Development

Health & Safety Management Accounting - a toolkit

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***Abstract*: Health & Safety Management Accounting provides companies and organizations with a tool to prioritize and improve decision making on Health & Safety. The findings of this article are based on the development and testing of a new Excel-based tool for Health & Safety Management Accounting.**

***Keywords*: Health & Safety management accounting**

I. INTRODUCTION

The article will focus on the toolkit for Health & Safety Management Accounting, which has been developed on behalf of the Danish Health & Safety Council by COWI and PricewaterhouseCoopers. The toolkit has been developed in cooperation with five Danish companies from August 2005 - December 2005 and will be tested in 8 Danish companies from January 2006 - April 2006.

II. THE TOOLKIT

The toolkit is based on activity based costing and can be used to quantify the economic impacts of occupational accidents, psychological working environment, heavy lifting and monotonous repetitive work. The method is a further development of the ideas applied on occupational accidents in the Systematic Accident Cost Analysis (SACA) [1] and the Environmental Management Accounting methodology developed and tested in nine Danish companies [2].

The toolkit is comprised of an Excel-based tool for calculation of cost-benefits and investment modelling, and a manual describing the work process and organisational set-up when working with Health & Safety Management Accounting.

The Excel-based tool includes work sheets (check lists) with fixed and variable costs and benefits. The so-called “fixed costs” are defined as the mandatory and voluntary health and safety work which are not directly associated with the health & safety performance of the company as are the variable costs and benefits. Two check-lists on variable cost-benefits are developed for each of the four selected health and safety issues: occupational accidents, psychological working environment, heavy lifting and monotonous repetitive work. The first check list concerns the cost - benefits which are related to the present performance of the company in a given period of time, while the second check list concerns the costs related to specific incidents of work related diseases.

III. COMPANY EXPERIENCES

The toolkit will be tested in 8 Danish companies from January 2006 - April 2006. The companies include both manufacturing and service industries.

The article will describe the test results, and the EMAN 9th annual conference will be the first event where the tool and experiences from the tests will be presented.

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DOES ENVIRONMENTAL ACCOUNTING MAKE BUSINESS SENSE? – A SOUTH AFRICAN PERSPECTIVE

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For an organisation to apply environmental accounting to its fullest extent it must make business sense. Implementing environmental accounting requires resources. Therefore, a business must weigh up the benefits and costs thereof. Environmental accounting comprises four main elements, ie environmental management accounting, environmental financial accounting, environmental reporting and auditing for environmental aspects.

Business does not operate in a vacuum. It is subject to legal requirements and industry practices; it requires resources to produce its products and services; it operates in an environment from which it draws its resources and which may be affected by its activities; and it operates in a community from which it draws its work force and which be impacted by its activities. In order to do all this, business needs a "license to operate", not only from the authorities but from all its stakeholders.

Environmental management accounting focuses on identifying the major environmental cost drivers. This can include raw materials used, environmental resources such as water and energy used, waste that is generated or pollution that is caused. Bi focusing on these cost drivers many of which are often hidden away in overhead costs, business may be able to effect cost savings and result in better product and price decisions.

Environmental financial accounting [EFA] is mainly driven by international accounting standards [IASs]. Some of these have explicit implications for environmental accounting whilst the impact of other standards has to be deduced. Proper EFA results in a better reflection of the financial performance and situation of an organisation, which enhances the quality of decision-making by stakeholders who base their decisions on the financial statements of an organisation.

Environmental reporting has been the subject of extensive development over the past decades. Several stock exchanges have introduced obligatory and/or voluntary systems for environmental reporting. Proper environmental reporting builds confidence of shareholders and all other stakeholders. It offers the opportunity for extensive stakeholder involvement, thereby enhancing transparency and accountability. Reports on corporate governance invariable include sustainability or triple-bottom-line [environmental, social and economic] reporting.

Environmental financial auditing focuses on the environmental aspects in the financial statements. It checks legal compliance, compliance with generally accepted accounting practices as well as compliance with best practices on corporate governance. It should identify possible risk areas that could jeopardise the continued existence of an organisation as an ongoing business.

Sustainable business can only be maintained if resources are used efficiently and sustainably, operations are carried out within the confines of compliance and if the impact of its activities on the social and physical environment is considered in an integrated way. This will ensure that the "license to operate" will remain in place.

This paper will focus on the following issues:

1. The business benefits of implementing environmental management accounting principles.
2. The imperatives for implementing environmental financial accounting.
3. Reasons for proper environmental reporting.
4. The benefits of auditing for environmental aspects in the financial statements.
5. Integrating environmental accounting into sustainable business.

Key words: environmental accounting, environmental reporting, business case, sustainable business

Successful implementation of an environmental management system based on ISO14001 at major Oil Company in Nigeria.

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I. INTRODUCTION

During the period from 1990 onwards, Shell SPDC was struggling with a dropping environmental performance, a poor environmental track record and a controversial reputation. Also the difficult operating environment put pressure on the relation with the local communities. The environmental performance improvement process in SPDC was driven both by the awareness of the local management that the present performance had come to a stage that it started affecting the reputation and the production performance of SPDC and by the vision at Group level. One of the key decisions on Group level that has driven the improvement process in SPDC Nigeria was the clear target that all major production installations of Shell Group had to be ISO14001 certifiable by the end of 2002.

The approach

The Companies of the Royal Dutch/Shell Group operate under a common set of business principles, supported by policies and business controls. One of these is the *Group Health, Safety and Environment (HSE) Policy* on which the *SPDC HSE Policy* is based. This policy requires that all Operating Units have a systematic approach to HSE management. In order to get experience with certification schemes and the external certification of production installations, pilot projects were selected. From this experience, it became clear that ISO14001 certification was possible.

SPDC consisted of 2 divisions East and West, which are both split into 3 (geographical designated) production areas. The area managers for the 6 production areas and the 2 main terminals are the key responsible persons for the production performance and also responsible for the successful implementation and certification of the EMS.

A. Top down or bottom up?

Most implementations of organisational change processes are driven by a top-down approach. Start with the top management, as they are the most influential factor here. They constitute the ultimate bearer of the company culture. Based on the general principles of change management as described in the literature, fundamental changes only have a chance of success provided that the top management is sufficiently visible to clearly convey the new system of values and norms to the organization; that they are highly motivated and enthusiastic sponsors and there is sufficient time (years) is set aside for the changes to occur.

B. Roles and responsibilities

Although the HSE department initiated the implementation process, it was crucial to create ownership in the line organisation. The fact that it could be demonstrated that certified facilities had a better production performance, environmental performance and a better community relation, was not always sufficient to convince production managers. Including ISO certification performance into the Balanced Score Card clearly helped here.

C. Competence

Implementing ISO14001 in a large organisation does require basic skills and experiences. SPDC decided that during the implementation phase dedicated consultants would be allocated/linked to each unit till successful certification had been achieved. Without building up in-house competence there maybe a possibility that the EMS collapses.

D. Cultural aspect

Although ISO14001 is a global standard, the cultural aspects could easily be overseen. Throughout the pilot project we identified that local staff could develop a very high level of ownership for the project. Where possible the communities were engaged in the certification process and during the first certification audits a hospitality visit to the host community was mandatory.

E. Keeping the momentum

In an organization where tremendous efforts were required to get their environmental management system up to international standards, it is clear that will be difficult to maintain this momentum after a successful certification process. New challenges are ahead and as one manager in SPDC stated: "*getting ISO14001 certified is one thing, but keeping it is another thing*"..

F. Role of corporate staff

When the unit of certification increases over time from an initial facility certificate to area certificates and the consultants are gone, the role of the corporate HSE department becomes increasing important. They are the common factor and linking pin to safeguard consistency and comparability in target setting, performance measurement and reporting.

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Sustainable Traffic Management in Companies

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While in the public discussion traffic policy is wellknown as an essential area and even a difficult challenge of sustainable development one important aspect, namely traffic as a management field of companies has been underexposed up to now. So for example you can hardly find specific informations or facts about the transportation activities of firms neither from the economic point of view nor form the ecological perspective. Due to this ignorance in most cases data about the transportation of goods or about the employees´ official mobility are not available. This is remarkable in so far as entrepreneurial traffic management leading to more efficiency in transportation represents both an essential source of cost cutting as well as a considerable potential of environmental release: Approximately 10% of the total costs in industry and even nearly a third of the total costs in commerce are caused by transportation requirements.

Facing that situation presently an empirical study is going to be elaborated at the University of Linz which aims to identify and to analyse the attitudes and interests of companies concerning this management field. In particular this study is focussed on transportation activities caused by material procurement and by the distribution of goods. Finally the objective of this research project is delivering answers to the following questions:

- What are the reasons of companies neglecting questions of transportation?
- How can firms get interested to this subject?
- Which incentives seem to be successful in that context?
- Which are the essential promotion factors of sustainable traffic management in companies?
- Which useful experiences can be drawn from recent pilot projects?

Keywords: sustainable transportation, entrepreneurial traffic Management

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Environmental statements on the internet – from a mere EMAS requirement to an environmental online communication instrument

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***Abstract*: The contribution gives an outline how environmental statements benefit from internet use. When exploiting the media-specific capabilities the internet offers, environmental statements elevate from a mere requirement of the EU eco-management and Audit Scheme to an environmental online communication instrument which provides substantial, updated and target group tailored information, enables interactive communication, and promotes stakeholder dialogue. Without the support of internet technologies and services however, progressing in environmental communication and management becomes quite difficult, as moving away from the orthodox practice of disseminating environmental statements with its standalone nature, print media focus and one size fits all approach seem to be a complex task.**

***Keywords*: Environmental statement; EU eco-management and audit scheme (EMAS); Internet; stakeholder dialogue**

I. INTRODUCTION

In corporate environmental reporting, greater internet use, reports available on the world wide web and movements towards a more balanced reporting approach have become the most noticeable trends since the inception of the field in the late 1980's and early 1990's. These different trends open the window to elevate environmental statements from a mere EMAS requirement to an added value creating environmental online communication tool using the support of the internet and its associated technologies and services [1].

According to a recent contribution to corporate environmental reporting [2], nowadays it is merely a question of how to report on environmental issues, and no longer whether to report at all. Marshall and Brown [3] argue that environmental reporting is becoming part of companies' daily affairs, even entering the business mainstream. Regardless of nationality and differences in country results, this is not just true for environmental pioneers and sector leaders, but also for global players, multinationals and an increasing number of medium-sized companies whose activities either result in high environmental impacts or are suspected of causing them. Examples abound in the pharmaceuticals, chemicals, mining, transport, electronics and automotive sectors [3].

Despite some difficulties and limited succes when using environmental statements [4], within a number of industrial sectors, there is further empirical evidence that environmental reporting today has become of competitive relevance [5] and strategic importance [6].

However, companies realised that the "honeymoon period" [7] in which environmental statements and other reporting instruments received media and public attention just for themselves rather than for what was disclosed is over. Today, the provision of "green glossy brochures" [8], standalone reporting instruments, printed media and a one size fits all approach do not seem to be sufficient any longer; a substantial amount of information and an interactive, target group tailored online communication approach is required [9]. Further, environmental reporting is only successful if the underlying management systems are appropriate and the associated processes are effective and operational. Moreover, the value of reporting depends very much on its underlying information management, particularly on a company's accounting system.

Environmental management accounting is an excellent source as it assess a company's environmental and integrated performance [10]. It addresses environmental aspects in monetary terms, and it measures a company's impact on nature in physical terms [11]. Such a sophisticated management accounting system serves as a solid basis for reliable information. It is particularly needed to provide integrated performance indicators like eco-efficiency, approaching sustainability communication [12; 13].

II. STRUCTURE AND CONTENTS

The contribution is structured into four parts:

(i) First, latest developments in environmental reporting and corporate online communication using the internet are identified.

(ii) Based on current trends stated at the outset, the unique capabilities of using the internet are arranged in a generic classification that are useful for upgrading environmental statements in terms of online communication.

(iii) Following from this incremental classification, a framework for internet-based environmental statements is outlined in a more detailed fashion, described along seven tasks environmental statements are used to fulfil: documentation, information, communication, innovation, relationship, accountability, disclosure.

(iv) In the concluding part internet-specific opportunities and benefits are discussed when EMAS registrated companies are going to improve their current reporting practice, perhaps approaching a balanced (sustainability) online communication system.

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Thermal energy optimization in industrial processes

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***Abstract*: The analysis of industrial energy usage indicates that low temperature processes (20 ≈ 200 °C) are common in nearly all industrial sectors. In principle there is the potential to use solar thermal energy in these lower temperature processes thus reducing the environmental impact from burning fossil fuels.**

Some industrial sectors such as food, chemistry, plastic processing, textile industry, building materials industry and business establishments can be identified as potential sectors for the application of solar energy heat processes. Using the model of an Austrian dairy plant, this research investigates the potential for, and the economic viability of, using solar energy heat processes in industry. When assessing the (economic) feasibility of solar thermal energy the investigation of these industries' energy systems has to focus on an integrated analysis of cooling and heating demands and take into account competing technologies. Amongst these are heat integration, cogeneration, new technologies and heat pumps. Pinch analysis has been used to investigate industrial energy systems and heat integration possibilities and has proved to be a viable tool.

I. INTRODUCTION

The use of solar thermal energy in commercial and industrial applications is currently insignificant compared to the use in swimming pools and the household sector. Most solar applications for industrial processes have been on a relatively small scale and are mostly experimental in nature. Only a few large systems are in use worldwide.

In many industrialized countries, including those with moderate climates, the use of solar energy in thermal plants is a promising CO_2 –free alternative to fossil fuels.

II. POTENTIAL

The investigation was started with an Austrian potential study [1] (PROMISE – production with solar energy) in the framework of the Austrian Reserrach initiative "Fabrik der Zukunft" (Factory of Tomorrow – www.fabrikderzukunft.at) in order to identify the demand for heat in low and medium temperature processes in producing companies that could be covered by solar thermal plants. The results of this potential study were compared with similar studies in other European countries and showed a big potential for the solar thermal application in certain industry sectors. The most promising industries are food and beverage industry, textile industry, chemical industry and production of plastic goods.

III. METHODOLOGY

The methodology used for the energy auditing of industrial plants is a 7 step-procedure. The procedure includes:

1. basic information acquisition for the industrial plant,
2. detailed information acquisition and processing of the data,
3. analysis of the data,
4. elaboration of energy saving proposals,
5. data analysis of the modified system,
6. energetic and economic evaluation and
7. selection of final proposal and detailed design.

Tools have been developed in some of these steps to assist the work of solar experts with little knowledge of process technologies.

IV. CASE STUDY

The potential for using solar thermal energy in an Austrian dairy was examined, which produces different kinds of cheese. All necessary data had been collected to make a first calculation of the overall energy demand of the company. Energy balance calculations were made for the whole plant and, with the detailed knowledge of the energy streams, a pinch analysis was made for the system. Considering the possibilities in this company, a heat exchanger network was proposed as a viable solution. Two different options for the integration of solar thermal energy into this production line were calculated. Finally, a dynamic calculation of profitability was done.

V. CONCLUSION

The use of solar thermal energy for industrial processes is at its inception. There is still a lot of work to do in optimizing implementation and in researching better design methods. First case studies show that the use of solar thermal energy in industrial processes is possible and turns out to be economic in combination with efficiency measures. More applications will be discovered in the near future.

A further extension of solar energy systems for industrial applications depends in large part on the commitment of energy consultants and in-house technicians. This necessitates more consulting and market development.

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Methodology for Changing the Institutional Water Consumption Patterns

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***Abstract*: This paper proposes a methodology for changing the institutional water consumption patterns involving technical improvements, behavioral changes, and economic instruments. Its effectiveness is to be tested in the case study.**

***Keywords*: institution, water, consumption.**

I. INTRODUCTION

The unsustainable world-wide consumption patterns have received a great attention in recent years. According to the Agenda 21 and its chapter 4, global environmental degradation is a result of unsustainable consumption patterns. A shift towards sustainable consumption requires change of lifestyles and different thinking patterns, technology etc.

To our knowledge, not much attention has been paid to the institutional consumption, especially universities as the institutions with the mission of making a worthwhile and significant contribution to sustainable development through research and education. Universities should not only promote sustainable consumption, but also put this concept into their practice.

Our paper proposes the methodology for changing the water consumption patterns at public institutions like universities, in order to make them more sustainable.

II. METHODOLOGY FOR CHANGING THE WATER CONSUMPTION PATTERNS

The methodology involves several steps that could be taken to change the water consumption patterns, including (1) analyzing water consumption practices at universities across the world in order to identify best practices, (2) defining adequate indicators, (3) analyzing institutional water consumption, (4) benchmarking consumption to other comparable institutions, (5) forecasting water consumption based on technical improvements, (6) analyzing consumers needs, values, attitudes, (7) introducing tools for behavioral changes, and (8) analyzing influences of economic instruments.

The main idea of methodology lies in implementation of the three most important components:

A. Technical improvements

Technical improvements could significantly contribute to the reduction of water consumption. Such changes include rainwater collection, toilets with fixed cycle flushing valve, sensors taps, and can reduce the water consumption without user's contributions.

B. Behavioral changes

The long-term consumption changes address the behavioral changes of consumers. The emphasis should be given to changing the patterns, including values, attitudes, lifestyle. Several actions could be taken. For instance, university has a great opportunity of promoting sustainable consumption and awareness rising, in order to achieve better understanding. Special attention should be given to the consumer's information tools, using friendly and efficient monitoring and reporting mechanisms. Also, opportunity should be given to all stakeholders to actively participate in changing reforms.

C. Economic instruments

National or local authorities could put pressure on public institutions to consider the sustainable consumption by economic instruments (polluter pays, user pays, …).

III. CASE STUDY

Department of Chemistry and Chemical Engineering at the University of Maribor, Slovenia is serving as a case-study public institution to test effectiveness of the proposed methodology.

Volume flow-rate of water on a monthly basis between 2000 and 2005 was investigated. Several actions and information tools based on technical improvements, and behavioral changes are to be investigated. Additionally, an influence of economic tools and its relation to the water consumption patterns are to be analyzed and discussed.

IV. CONCLUSIONS

Major changes in technology and behavior, as well as improvement of economic instruments are needed to achieve sustainable water consumption. It is a long-term process, demanding the civil society to take action in order to reverse the unsustainable trends in water consumption. The aims are not only minimizing depletion, reduction pollution, but also achieving the cost savings and better quality of life.

Such sustainable water consumption actions could encourage the sustainable use of other resources and materials, and contribute to the establishment of a sustainable society.

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A Chemical Substitution Study for a Wet Processing Textile Industry in Turkey

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Abstract:

The main environmental concern in the textile industry is about the amount of water discharged and the chemical load it carries. The total quantity of chemicals used in textile mills varies from 10% to over 100% of the weight of the cloth produced. Many chemicals currently used in the textile industry affect the amount and the type of waste produced and their influence the aquatic life of the receiving stream. One of the critical steps in pollution prevention studies is auditing the use of chemicals and making the necessary chemical substitutions. Chemical substitution simply means the replacement and/or reduction of hazardous chemicals in products and processes with less- or non-hazardous ones. This study has been conducted on one of the major textile factories in Turkey with a capacity of 20,000 tons of denim fabric per year. The factory was visited and existing environmental inefficiencies due to the chemical usage was identified. During this site visit Dyeing, Sizing, De-sizing and Finishing processes were determined as the main processes generating pollution due to the chemical usage. In addition to this site visit, alternative chemicals for these processes have been researched in literature. Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques (BAT) for the Textiles Industry was accepted as main reference document. Pollution prevention studies and case studies on wet processing textile sector have also been examined. According to information gathered from the literature search, alternative chemicals which may be used for substitution were identified. Furthermore, cost estimation will also be conducted for possible chemical substitutions to calculate the payback period of the opportunities. Finally, the applicability of the new chemicals will be tested at a pilot scale in the factory to decide whether they are feasible, or not.

***Keywords*:** textile industry, pollution prevention, chemical substitution

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Soluble Silicates in Leather Production

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Abstract: High salt contamination of tannery effluents, caused by dissolved curing salts, is a stringent problem especially in countries with scarce water resources. In an EU – project, the substitution of salt by neutralized alkali silicates was developed. In addition, the impact of Wasserglass – application on auxiliary exhaustion during leather production was studied.

Keywords: Leather production / Salt reduction
Improved auxiliary exhaustion

I. INTRODUCTION

Leather production, i.e. the conversion of raw hides and skins into stable leather, is highly water consuming. While for the removal of most of pollutants from tannery effluents feasible treatment procedures have been developed and implemented, for problems with dissolved neutral salts, mainly NaCl, no feasible procedures are available so far.

In an European funded international R&D – project the substitution of common curing salt (NaCl) by neutralized alkali silicates has been developed. In addition, the impact of alkali silicate application in various tannery processes was studied.

II. CURING

For hides and skins, the application of powdered neutral alkali silicates as well as the penetration of hides and skins with alkali silicate solutions ("Wasserglass"), followed by neutralization, led to strong de-watering and excellent curing (preservation) results.

After re-hydration, the so cured hides and skins could be converted into high-quality leather without significant changes of technology. Soaking liquors (effluents from re-hydration and cleaning) showed a nearly complete salt elimination (> 95 %).

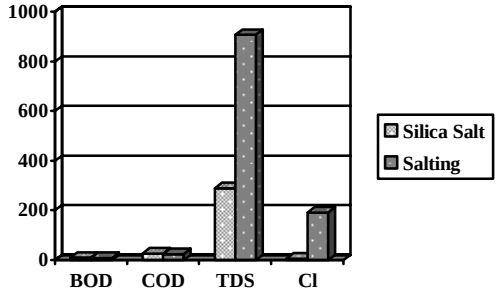

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Figure: Comparison of effluent parameter

III. LEATHER TECHNOLOGY

Wasserglass was applied in various stages of leather production. It could be shown that Wasserglass can substitute lime ($Ca(OH)_2$) completely for unhairing, whereat the resulting pelts (unhaired and opened-up hides and skins) were of better cleanness and could be split with higher accuracy.

An additional Wasserglass – penetration of the pelts with subsequent neutralization (prior to tannage) led to improved exhaustion of subsequently applied auxiliaries. It could be proved that by this measure saving of tannins and dyes up to 20 % are possible without negative impact to the leather quality.

III. IRRIGATION WITH EFFLUENTS

By accident, it was found that silicate – containing liquors showed positive impact on crop yields in comparison with water, when applied for irrigation.

IV. ANALYTICAL INVESTIGATION

By combined NMR and SEM/EDX – analyses, it was tried to find an explanation for the impact of silicate treatment to tannery processes.

V. CONCLUSION

In this R&D – project it could be shown that silicates can be applied in various stages of leather production with positive environmental effects. It can be expected that silicate – application will not increase leather production costs significantly.

Energy Hybrid System for Insulated Settlements in Romania

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***Abstract*: In Romania, about 450000 inhabitants (2% of total population) have no access to electricity, because they live in insulated areas, most of them in Danube Delta and in the Apuseni Mountains. The purpose of this paper is to enhance the possibilities of energy hybrid systems use in order to satisfy their energy demand.**

***Keywords*: hybrid energy system, cogeneration, renewables, insulated areas**

I. INTRODUCTION

UNPD has created the HDI (Human Development Index), a composite index taking into account of several national values (life expectation, education rate, GDP, etc.) which is related to the energy end-use, as may be seen in figure 1 [1]. Until 1000 kgep/inh., it is a strong influence of the energy end-use on the HDI. This value represents the border between the developed Countries end those in transition to this status. The lack of energy could bring serious disturbance of the people's life.

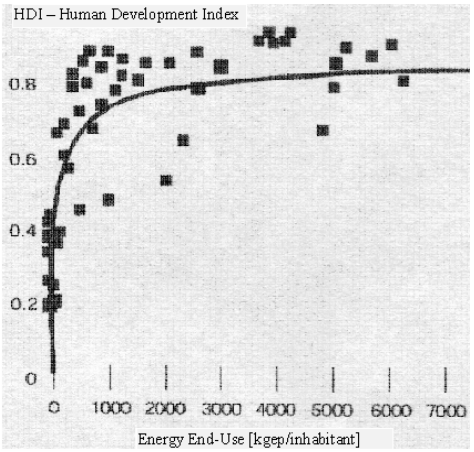

Figure 1: HDI versus energy end-use

II. HYBRID SYSTEM: CHP & RENEWABLES

According to the EU policies [2], the DG (Decentralized Generation) represents a target for all members.

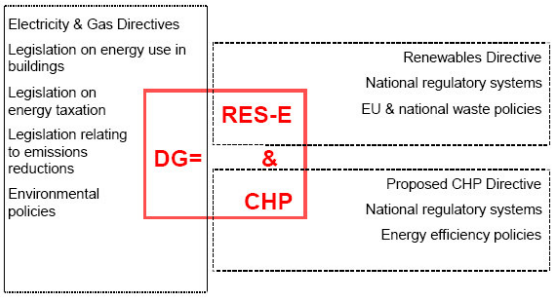

Figure 2: The DG concept

Figure 2 shows the ways of twinning between CHP (Combined Heat and Power) and renewables in the DG concept.

We propose the practical use of this concept as a solution for the lack of energy (especially electricity) of the people living in the insulated areas in our Country.

III. CASE STUDY

An insulated settlement with 30 houses and 100 inhabitants has been considered. For each family, the average energy demand is: P=2,4 kW_{el} and Q=14 kW_{th}. The chosen supplying subsystems are:

A. *CHP subsystem (in operation more than 5000 h/y)*

The CHP subsystem is a gas microturbine (P=80 kW_{el} and Q=420 kW_{th}) with an average effective efficiency η_{ea}=86 % (η_{el}=12,64 %, η_{th}=66,29 %). The requested fuel power is P_F= 572 kW, meaning 228 Nm^3/h of biogas or 514 Nm^3/h gas resulted from biomass gasification. The first option requires the existence of a farm with 420000 chicken/21000 pigs/3900 cows, that means that the area is no more insulated. The other option is based on a gasification reactor needing 16 biomass tones per day.

B. *Renewable subsystem*

This subsystem is composed of:

- 1 wind turbine P=100 kW_{el} (max. 4000 h/y)
- 1 biomass gasification reactor (5000 h/y)
- 30 systems for domestic hot water (4000 h/y)

IV. CONCLUSION

The estimated total investment cost is about 675000 €, representing 22500 €/family. In Romania, the minimal wage is less than 95 €/month. A such investment cost is unaffordable for the interested people.

In the extended paper we will present a detailed economic calculus which will reveal the energy cost (both P and Q), the possible financing sources and a comparative analysis with another CHP option (internal combustion engine)

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Environmental protection expenditure account in European countries

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***Abstract*:**

The objective of making economic growth compatible with the need to safeguard the environment requires the support of a wide range of information such as: knowledge (in physical terms) of the quantity of natural resources available; measurement (in physical terms) of the effects of economic activities on the availability of natural resources and the quality of the environment; knowledge of the scale of the financial flows relating to the environment (expenditure incurred for environmental protection expenditure; expenditure incurred to prevent or repair harmful effects on human life resulting from depletion of natural resources and environmental degradation; the economic burden and the effectiveness of economic instruments like environmental taxes or the application of principles such as "the polluter pays"; etc.). For many of the types of this information there is as yet no current output of statistics available internationally.

SERIEE (*European System for the Collection of Information on the Environment)* is the first accounting instrument developed by Eurostat in response to the requirements of sustainable development. The distinction among the various fields of interest in SERIEE is given by arranging the system into a number of modules. One of the principal fields of interest is the satellite account of expenditure for protection of the environment, known as EPEA (*Environmental Protection Expenditure Account*).

The EPEA in particular is the satellite account of expenditure for protection of the environment: it is therefore configured as an accounting system to record and represent data on the economic activities and monetary transactions of the various institutional sectors of the economy for the purpose of protecting the environment.

The paper presents results of survey conducted in some countries in European Union – Austria, Germany, France, Denmark, The Netherlands and Poland. The EPEA Tables and analysis of environmental protection expenditures account elements: production of environmental services, expenditure and financing for environmental protection are also shown.

Main contest of the paper: 1. Introduction 2. Environmental Protection Expenditure Account (EPEA) 3. Presentation of survey 4. Comparison of EPEA elements in European countries 5. Conclusions.

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The environmental management of green companies as new factor of development for rural areas: the Regional Centre of Competence Benecon as a project for Cilento (Italy)

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***Keywords*: green companies, rural development, Benecon, environmental communication**

This work shows the potential economic sustainable development for rural areas for green companies. We consider green companies as the companies in the touristic, building, services, handcraft, agri – food field for which the production of goods and services could have an environmental impact along the production process from cradle to grave.
These companies,causing of their production, are strongly linked with territory: the competitive growth either companies than territory is linked to the valorisation of environmental quality of companies could be pursued trough methods and tools of environmental management such as the *Chart of Quality* and *Discipline*r, two of the whole system of environmental management we have individuated in the research in the experience of Regional Centre of Competence Benecon. These innovative environmental management tools applied in territorial fragile systems add to the traditional goals of the companies (revenue, new sources of competitive advantage, employment) a new goal dealing with the ecoeffectiveness and, in a long period, the production of ecovalue as new opportunity of business for green companies.
In this work we show the experience of research in Regional Centre of Competence Benecon in which we have individuated a global model of environmental management of green companies localised in a rural area of Italy (Cilento).
This model comprehends new tools such as the mentioned *Chart of Quality* and Discipliner but also a *software* for the evaluation of environmental performance, a system of certification of quality with an environmental brand, the routes of environmental quality or other tools of environmental communication.
This model could be exported in homogeneous territorial contexts and applied when we have green companies and environmental contexts such as rural areas or protected areas to confirm that a green company gives an immaterial value to the natural, environmental and cultural resources in the production process.

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Direct, Indirect, Environmental, Social, Sustainability Costs and Benefits in a Public Private Partnership, Simple Payback Investment Appraisal – A Case Study

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Abstract: **This case study addresses decision analysis and selection of a public private partnership vehicle for creating public value, selection of a discount rate for a decision support system in multiple goal managerial problems and pricing marginal costs of externalities avoided by solar electric power production.** ***Keywords*****: Externalities; discount rates; public value; public private partnerships.**

I. INTRODUCTION

U. S. Department of State management policy regarding energy projects at US diplomatic facilities requires a "business case" investment appraisal demonstrating a simple payback analysis (*ROI in uninflated dollars*) will fully finance a project in ten years or less. Budgets allocating scarce resources compel this business case investment approach. For a project to be approved, management accounting for externalities, environmental, social and sustainability benefits and costs must be quantified in a business case investment appraisal. This case study addresses administrative decision analysis and selection of the discount rate for decision support systems in a multiple-goal managerial problem.

II. BACKGROUND

The simple payback investment appraisal for the PhotoVoltaic (PV) Project at U.S. Mission to the United Nations, Geneva, resulted in the first Building Integrated PhotoVoltaic (BIPV) project implemented at a U.S. diplomatic post. On a sunny day the PhotoVoltaic system installed at the U.S. Mission delivers a peak power of 118 kilo Watts. It is the largest U.S. civilian solar electric project overseas. In this case, the power generated by the system is fed directly into Geneva's electric power grid. The PV array provides enough energy, on a yearly basis, to power 37 average households. The investment appraisal for this project was based on a Public Private Partnership that demonstrated a business case for payback in less than ten years. The outcome of this calculation militated for finance and construction of the PhotoVoltaic Project at the U.S. Mission. This partnership brought together the U.S. Mission and Department of State Overseas Buildings Operations; and a joint venture of Services Industriels de Genèva (SIG), Geneva's electric utility and Service Cantonal de l'Energie (ScanE) of the City and County of Geneva. The case study examines the Utility and Canton pricing marginal costs of externalities avoided by solar electric power production.

III. CONCLUSIONS

In the partnership arrangement, SIG and ScanE provide an accounting for direct and indirect benefits, quantify externalities of electric power production, and assign value for environmental, social and sustainability outputs. This worth is incorporated and accounted for in the Department of State business case investment appraisal in the form of a one-time grant from ScanE and ongoing credits to the US Mission from SIG for PhotoVoltaic power generated. The case study examines public private partnership vehicle for “balanced scorecard” creating public value.

Given uncertainties of future costs and benefits, a simple payback (zero discount rate) calculation is appropriate for management decision analysis in selecting projects. Direct benefits to the US Mission presented in the business case investment appraisal include: net metering revenue payments from SIG for the PhotoVoltaic power generated; a direct grant from ScanE for sustainable design; a reduction in building heat gain, lowering air conditioning electric power; extended building life by protecting concrete façade with solar panels; and a new solar roof providing additional usable space within the Mission.

Public private partnerships provide balanced scorecard integrating value, capacity, and support to provide public value. Indirect benefits to the US Mission included: promoting expanded use of solar and other renewable energy sources; enhancing the appearance of the U.S. Mission Building with bold crystalline blue panels that harvest electrical energy; and providing a unique continuing public diplomacy opportunity that showcase energy technologies. This project demonstrates international cooperation on green energy in a unique, highly visible diplomatic venue, Geneva, which hosts hundreds of international meetings annually.

The US State Department Public Private Partnership with SIG and ScanE makes a significant contribution to the Utility’s and Canton’s goals for promotion of institutional arrangements and the practice of sustainable development. ScanE goals are implemented in close cooperation with SIG through an ambitious green-power rebate tariff for solar electric power fed to the grid.

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An Environmental Accounting Model for a Natural Reserve

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***Keywords*: natural marine reserve, environmental accounting, ecosystem functions, LTFP.**

I. INTRODUCTION

Since 2004 the University of Udine (Italy) and the Italian Association WWF for Nature onlus have collaborated in order to establish an environmental accounting model for the Miramare Natural Marine Reserve (Trieste, Italy) (MNMR). The implementation of the model for the environmental accounting highlighted some evidence. First of all, environmental accounting introduces a scale difficulty. Namea (ISTAT) and Epea (EUROSTAT) models are effective on a macro scale, but are unapplyable to micro scale, for example in the case of natural areas. Property account of natural resources goes beyond the first limit, but introduces the second restriction: the implementation of physical unit measure instead of monetary unit measure. Finally we define the third limit, that is accounting environmental costs but not environmental benefits. Without environmental benefits, environmental accounting system takes into account the effects of the resources consumed but not the resources produced by ecosystems.

II. METHODOLOGY AND RESULTS

Departing from the three limits (scale, unit measure and cost but not benefit) we developed a environmental accounting model that took into account both consumed and produced resources in the MNMR. The model aimed to integrate economic (cost and revenue) with environmental accounting, that reflect not only environmental cost but also "environmental revenue", that is environmental benefit. The difference between costs and benefits, both economic and environmental, assessed the value produced or consumed by the MMR. The model is indicated as "flow budget" (Fig.1) [1]. The study analysed two of the four flows: biosphere-technosphere, which assessed environmental benefits and economic revenue; technosphere-biosphere, which assessed environmental and economic costs. Flows from biosphere to technosphere are the ecosystem functions [2]. Economic valuation of the MNMR ecosystem functions assessed environmental benefits. The technosphere-biosphere template describes how humane activities consume natural resources and reports the monetary valuation. Consumes are derived from the initial environmental review (Emas implemented by MNMR), then converted in CO2 emissions and finally CO2 emissions in monetary unit through carbon tax. Integrating economic and environmental figures in a same framework imposed the reclassification of economic costs and revenues.

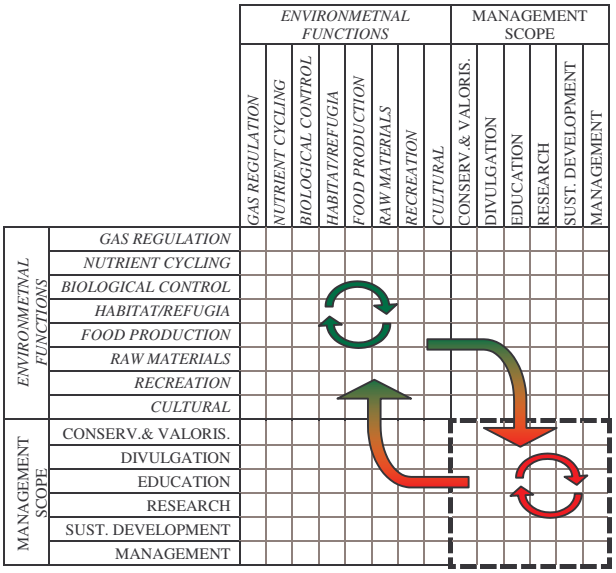

Figure 1: Budget flows

At the micro level (natural areas environmental accountability) human activities are divided in sectors. In particular sectors are labelled with the management scope of the MNMR. In order to reclassify economic cost and revenues we applied the *Long Term Financial Plan* (LTFP) model [3]. Valuing and reclassifying as described, we tried to assess the natural heritage produced or consumed by the MNMR. In this case we assessed that the MNMR produces net benefit estimated in € 498.722,76 per year.

III. CONCLUSION

From a methodological point of view the model seems to give a solution to the three limits (scale, unit measure and cost but not benefit). From an analytical point of view, the MNMR environmental accounting shows net benefits of € 499.000. This means that: natural resources management in MNMR produces heritage and applies sustainable development, conservation and valorisation policies; net benefits covers 68% of the public investments. Finally, we feel that more research should be done in order to investigate the difficulties (assessment procedures not completed and data lacks) connected with the model implementation.

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Measurement and recognition of wildlife in the financial statements of public sector entities: A South African perspective

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Keywords: Accounting, asset, wildlife

Wildlife is an environmental asset. However, the concept of accounting for wildlife in financial statements is questioned, and various arguments have been used not to account for it. For example, fauna moves from place to place which complicates counting, the cost of counting wildlife is expensive, monitoring, measuring and managing of accounting values does not add value and parks manage wildlife for conservation purposes and not to generate profits.

The focus of the international accounting standards is shifting more and more towards fair value accounting. Fair value accounting relies on one of the main principles of accounting, namely estimation. Estimation involves judgements based on the latest available, reliable information. The same degree of estimation must be exercised to account for wildlife, and uncertainties, such as wildlife numbers and values are recognised by the disclosure of their nature and extent and by exercising prudence in the preparation of financial statements.

Financial statements are prepared on an annual basis to indicate the financial position of an entity and to hold management accountable. Financial accountability is the requirement for management to report to the shareholders or government on the deployment of funds and resources entrusted to that party, through independently audited financial statements. Meaningful accountability requires timely, understandable, reliable and relevant financial information. Transparent financial reporting is a prerequisite for a well functioning market economy, and financial accountability is an indispensable management tool, providing essential information for the effective monitoring and controlling of resources. Managing and safeguarding wildlife forms part of this financial accountability.

This paper will focus on the following issues with regard to accounting for wildlife by public sector entities in South Africa:

1. Providing a comparison of the current status of accounting for wildlife
2. An overview of both financial and environmental legislation and its impact on managing assets
3. International accounting standard 41 – Agriculture and its relevance to the recognition of wildlife
4. Counting techniques available to measure wildlife numbers
5. Determining monetary values to use a part of measuring the value of wildlife

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Sustainability Balanced Scorecard for the Alignment of different Actors in the ECOPROFIT Network

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Abstract: **A good balance between collective and individual targets is a central determinant factor for the long term stability of co-operations. In the course of a cooperation collective targets should therefore have an effect "from the collective level back to the individual targets" reflecting themselves in the target systems of the respective network actors [1].**
Thus in the first step of a research project financed by the Austrian Ministry of Innovation and Technology a strategic frame with the Balanced Scorecard on the level of the administration for an existing network (ECOPROFIT Graz), considering all relevant stakeholders, has been developed. Due to this common definition of well-balanced macro-objectives on a municipal level an innovative orientation frame for all the actors of the network has been generated.
In a second step it was examined how the individual targets of the ECOPROFIT companies can contribute to the overall objectives of the municipality. Therefore the management instrument "Balanced Scorecard" was further developed [2] and implemented in seven companies.

Keywords: **Balanced Scorecard, Sustainable Development, Network, ECOPROFIT**

MAIN CONTENTS OF THE PAPER

A policy of sustainability has to focus on the setting of fixed objectives, even though the way for achieving these objectives should be left open to de-centralised actors. Particularly in networks with the aim of a sustainable development the Sustainability Balanced Scorecard on a macro level (e.g. municipality) can have a strong orientation function for the single actors of the network (e.g. companies). With the Sustainability Balanced Scorecard the sustainability strategy of a network becomes transparent and examinable through the "translation" into objectives, measures and indicators.

For the formulation of objectives and indicators by using the SBSC, a method has been developed which today can be seen as an important support tool for the ECOPROFIT network. Thanks to the SBSC-method the participation and active involvement of the top management as well as of the employees during the implementation process of the SBSC has been reached by 100%. The participation of the enterprises' management has again underlined the importance of this tool as to date - in the long years of ECOPROFIT - it has never happened that the managers really make time to participate in the ECOPROFIT network [3]. Seven enterprises (Distillery Franz Bauer, DI Franz Robier construction and building company, Anodising company A. Heuberger GmbH, Gardener Herneth GmbH, Haase GmbH, Ökoservice - Eco-services Company, and Sanatorium Hansa GmbH) have participated in the implementation process showing a big commitment.

Today it can also be stated that the Sustainability Balanced Scorecard is an instrument suited for the development of network related goals in general and especially suited for the controlling of the ECOPROFIT Graz network: An *"ideal and visionary SBSC for the Ecoprofit network has been developed"* (statement by the department of environmental protection). The SBSC of the environmental agency of Graz reflects all interests and central wishes for a visionary strategical development of the ECOPROFIT network. ECOPROFIT basically aims at creating a win-win Situation for companies and the environment through continuous improvement adapting the Cleaner Production approach

A comparison between the collective objectives of the network and the company specific sustainable objectives from the generated Sustainability Balanced Sorecards provided the starting point for a corresponding feedback process. In this feedback process all stakeholders of the ECOPROFIT network were brought together. In the course of a discussion about the relation between municipal and company specific objectives conflicts and complementarities of the objectives have been revealed. Thus the understanding of the wishes of the different actors in the implementation of a sustainable development as well as mutual awareness for problems has been fostered.

Finally a dynamic process both on the level of the local administration as well as on the level of enterprises was initiated through the generated feedback loops. This process will accelerate the continuous adjustment to the requirements of a sustainable development.

The results and implications of the whole process of alignment should be presented in a paper.

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Environmental Efficiency Indicators - Areas of Application

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***Abstract*: Environmental efficiency indicators are a cross of relative and indexed indicators, and they can be used in measuring the environmental efficiency of companies' operations. An example of such indicators is the materials efficiency indicator. Environmental efficiency indicators are a type of Operational Performance Indicators (OPIs), and their advantages become highlighted especially in companies with diversified or ambiguous units of production. The research has been conducted as a case study in Skanska Oy, a Finnish construction company.**

***Keywords*: Environmental efficiency indicators, Environmental indicators, Environmental management.**

I. INTRODUCTION

Literature on environmental indicators presents numerous indicator types for measuring the operational performance of an organization. Oftentimes, a great deal of emphasis is placed on absolute, relative and indexed indicators [1]-[3]. However, these indicator types inadequately convey the environmental performance of a company whose production rate fluctuates over time and is ambiguous to measure in physical units. Construction companies are an example of organizations that often match that description.

The environmental efficiency indicators provide an indicator type that is particularly suitable for such organizations but has received relatively little attention in the literature concerning environmental indicators and environmental management. In environmental efficiency indicators, a theoretical or desirable quantity of an input or an output is divided by the realized quantity of that input or output. Environmental efficiency indicators are expressed in percents (%) with 100 % the best possible value.

This article is a part of an ongoing research project aimed at developing environmental performance indicators for a Finnish construction company Skanska Oy. It is therefore conducted as a case study.

II. DEFICIENCIES IN CONVENTIONAL INDICATORS

The most conventional indicator types in terms of literature coverage are absolute, relative and indexed indicators [1]-[3].

Absolute indicators, also known as direct indicators, concern the absolute quantity of an organization's input or output [1]. The indicator is suitable for assessing the input's or output's environmental load and impact. However, it does not reflect the environmental efficiency of the organization, since the absolute value is tightly linked with the rate of production.

Relative indicators generally reflect the environmental efficiency of an organization [1]. Problems arise, however, when the denominator used in those indicators does not accurately reflect the operations of the organization. This is the case in the construction industry, where the physical inputs and outputs of a construction project may be more affected by the characteristics of the project than by its volume in brm^3 [4].

Indexed indicators are usually applied to benchmark an organization's performance results to a given year or a baseline [1]. Like absolute indicators, they tend to be tightly linked with the rate of production, which makes the assessment of an organization's environmental efficiency problematic.

III. BENEFITS OF EFFICIENCY INDICATORS

Environmental efficiency indicators are a cross of relative and indexed indicators. They share some of the strengths of relative and indexed indicators but, what is more, also rectify some of their inadequacies.

Environmental efficiency indicators are not concerned with the organizations' rate of production. As the environmental efficiency indicators only deal with the actual quantity of an input or an output and a desirable or a theoretical quantity of that input or output, and because they are expressed in percents, they can be effectively utilized in projects of different types and sizes. Furthermore, the indicators' outcome is not automatically affected by fluctuating production rates over time, so they remain comparable from year to year.

IV. CONCLUSION

Environmental efficiency indicators are applicable in virtually any industry. They are especially beneficial in industries where absolute, relative and indexed indicators fail to reflect the environmental efficiency of an organization. An example of such an industry is the construction industry.

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Challenges in Evaluating Eco-Efficiency at SMEs

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***Abstract*: The application of eco-efficiency has centred on integrating environmental and life cycle cost considerations into core business processes. To support this integration, a variety of "eco-efficiency" tools and evaluation models have been developed. The aim of this work was to analyze the differencies between thirteen (13) common concepts and indicators. The research was conducted as a case study among furniture industry in Brazil.**
The use of these concepts as well as indicators in the SMEs was recorded. There exist basical differences between analyzed concepts. SMEs did not use the mentioned concepts, but use some of the suggested indicators.

***Keywords:* Evaluating eco-efficiency, eco-efficiency metrics and indicators, environmental management system, environmental reporting.**

I. INTRODUCTION

World Business Council on Sustainable Development (WBCSD) has since 1992 been developing a framework for measuring eco-efficiency that can be used to measure and report progress towards eco-efficiency in a consistent approach. Companies can measure their eco-efficiency performance because of many different reasons. Tracking and documenting performance and progress, identifying and prioritizing opportunities for improvement, product development, identifying cost savings and other benefits related to eco-efficiency and reporting to stakeholders [1]-[4].
An eco-efficiency indicator is the ratio between an environmental and a financial variable. It measures the environmental performance of an enterprise with respect to its financial performance. The problem with eco-efficiency indicators is that there are no agreed rules or standards for recognition, measurement and disclosure of environmental information either within the same industry or across industries. Most importantly, there are no rules for consolidating environmental information for an enterprise or a group of enterprises so that it can be used together and in line with the enterprise´s financial items [1].

II. METHODOLOGY FOR THE STUDY OF EVALUATING ECO-EFFICIENCY IN SMALL AND MEDIUM SIZED ENTERPRISES

This study aimed at identifying inequalities between thirteen (13) commonly used / described concepts and indicators for evaluating eco-efficiency. Use of these concepts and indicators in small and medium size enterprises (SMEs) was also recorded. Possible reasons for using or avoiding these concepts was also discussed. The information was gathered by interviewing environmental management responsibility personnel of fifteen (15) SMEs and analyzing the questionnaires returned by fifteen (15) SMEs. Questionnaires were sent to fifty seven (57) companies of which 26% answered and returned the questionnaire. Twenty seven (27) interviews and questionnaires alltogether were analyzed. The study was done among furniture industry in South Brazil in 2005.

III. RESULTS

Most of the concepts for evaluating eco-efficiency are based more or less on life cycle assessment (LCA) or the above mentioned WBCSD framework [1]-[4]. Despite this there exist basical differences on the focus of them and in what indicators they include.
None of the case companies (27) used any of the mentioned concepts for evaluating eco-efficiency. Despite this 41 % of the case companies used one or more of the indicators suggested by WBCSD.

IV. CONCLUSION

The development and use of methods, concepts and indicators for evaluating eco-efficiency has limitations and challenges. In small and medium sized firms the understanding of needs and benefits, which can be achieved by using eco-efficiency concepts and indicators, is not clear. Especially for SMEs it is not selfclear which method would be best in their firm and business field. This probably complicates the use of these methods.
The activities of individual companies and the inclusion of upstream and downstream aspects can dramatically alter the information. It is also difficult to find the connection between environmental and economic parameters which have functional value.
This study is a part of a doctoral work on incorporating eco-efficiency in business strategy. The key issue is how SMEs could adopt eco-efficiency practises.

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How to realize the Ecoefficiency-*Potential* of material Goods?

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***Abstract*: A Research-Project on Ecodesign-Products brought some key-findings on ecoefficiency: 1. The concept of ecoefficiency needs to be enlarged, 2. Conventional products also have an inherent potential of ecoeffiency, 3. Logistic-strategies and other product-related services are needed to exploit this potential for both – ecodesigned and conventional designed products. Based on these findings the arising question is, if and how the concept of EEP can be considered within the Environmental Accounting Models and thus will be helpful to develop an Integrated Product Policy of all partners within a Supply Chain Network.**

***Keywords*: Ecodesign, Ecoefficiency-Potential, Integrated Product Policy, Product-Service-Systems**

I. INTRODUCTION

From 1993 until 2001 the ECODESIGN-competition (*ecodesign* understood as *design for environment*) was arranged five times by three Austrian Federal Ministeries. In 2001 the European Commission has published the concept of an Integrated Product Policy as a greenbook to start a discussion process. To profit from the experiences the Federal Ministery of Economics and Labour asked us to evaluate the ECODESIGN-competition and clonclude with advices the concept of Integrated Product Policy. [1]

II. THE METHOD

Out of the 69 winners resp. awarded solutions we choosed six ecodesign-solutions for consumer products to be analysed with regard to the following questions:

- Potential of Ecoefficiency: What is the ecological potential compared to conventional products?
- Realised Ecoefficiency: What has been the ecological effect?

III. THE RESULTS

The main findings of this evaluation-project are:

- Material goods are not ecoefficient per se, but have an *inherent potential of ecoefficiency* (EEP). So not only ecodesign-products but also conventional designed products imply an EEP.
- Ecodesign-solutions have to have a higher EEP over the whole life-cycle than the conventional products.
- Nevertheless, the EEP of ecodesign-solutions is hardly better exploited, especially considering the EEP in the utilization-phase.
- Asked about product-related services to activate ecoefficient behavior of the consumers, the interviewed winners point out, that those services are too expensive considering the existing frameworks. Offered product-related services have rarely been asked by the consumer.

IV. CONSEQUENCES FOR THE CONCEPT OF ENVIRONMENTAL ACCOUNTING

A. *The term of Ecoefficiency*

The term and definitions of *ecoefficiency* turned out not to be sufficient for this project. Ecoefficiency can be understood as a broad comprehensive performance model …[2], without a definite target und thus more a kind of an (abstract) principle [3]. As worked out, products generally can not be ecoefficient per se. Therefore the concept of ecoefficiency has to be enlarged by introducing the term *potential*. The *ecoefficiency-potential* of a solution contains the potential ecological advantages on each stage of the product-life, which can be realized by corresponding product-related services [4].

B. *How to measure the EEP?*

To judge a solution as ecoefficient two EEPs for each stage of the life-cycle have to be accounted:

- the inherent EEP
- the realized EEP

The resulting question is, which kind of services are necessary to realize the inherent EEP and how these can be evaluated and integrated in the concept of environmental accounting.

V. CONCLUSIONS/OUTLOOK

Considering the results of our project there is a need

- to adapt and enlarge an accounting model able to measure the inherent and the realized EEP especially focusing the utilisation-phase of a product.
- to adapt concepts and frameworks in a way that a company benefits from product-related services in a economically way so that for example reuse- and remanufacturing strategies [5] become more competitive.

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Systemic indicators for sustainable development

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***Abstract*:**

The manual "Systemic indicators for sustainable development", developed by the RNS (Institut für ressourcenschonende und nachhaltige Systeme, TU-Graz) and DENKSTATT in cooperation with 6 companies, provides guidance in elaborating customized sustainability indicators linking current interrelations with the environment, corporate strategy and changing framework conditions.

***Keywords*: indicators, monitoring sustainable development, management of sustainable development**

I. INTRODUCTION

Management for sustainable development requires suitable indicators for defining objectives and controlling corporate development. Six leading Austrian companies co-operated in a research project conducted by the RNS (Institut für ressourcenschonende und nachhaltige Systeme, TU-Graz) and DENKSTATT. The resulting manual "Systemic indicators for sustainable development" supports organizations in elaborating custom-made indicators for sustainable development.

II. BACKGROUND

During the last years, the Global Reporting Initiative guidelines have become the main source of reference for sustainability indicators and sustainability reporting. The guidelines provide a list of economic, environmental and social indicators that are considered relevant by typical stakeholders and generally applicable for companies.

The manual developed by RNS and DENKSTATT provides step by step guidance how to elaborate a customized set of indicators. The indicators shall support strategic decision taking processes with relevant information for sustainable development.

III. SIX COMPANIES TESTED THE GUIDELINES

Six Austrian companies from various backgrounds - such as mining, paper, chemical industry, utilities or service providers - participated in the pilot project. The first set of tools and methods was tested with the participating companies. Their practical experience, suggestions for improvement and individual requirements were incorporated into the later versions of the manual.

Different starting positions and particular framework conditions of the participating companies – SMEs and multinational enterprises, producing and service industries - put the manual, tools and methods to a hard test. Three companies started the process of developing sustainability indicators right from the beginning, the others applied the guidelines in order to verify their existing sets of indicators.

IV. RESULTS

The key concept used for deducting indicators is the inter-relation between the organisation and its physical, social and economic environment. Organizations are not isolated, but interrelated with their environment.

The analysis starts with investigating current interrelations and identifying the most important ones in terms of corporate responsibility. Further analysis focuses on future interrelations as a result of corporate objectives and changes in the corporate environment. The systems affected by the implementation of strategic objectives are analysed with a systemic profile.

The major challenge in the analysis is to identify the critical interrelations from the broad range of current and future interrelations and to set priorities.

The second step gives guidance in deducting indicators for the selected interrelations and encourages ideas about cross-cutting indicators. Finally, the selection of indicators undergoes a check with regard to completeness and usability.

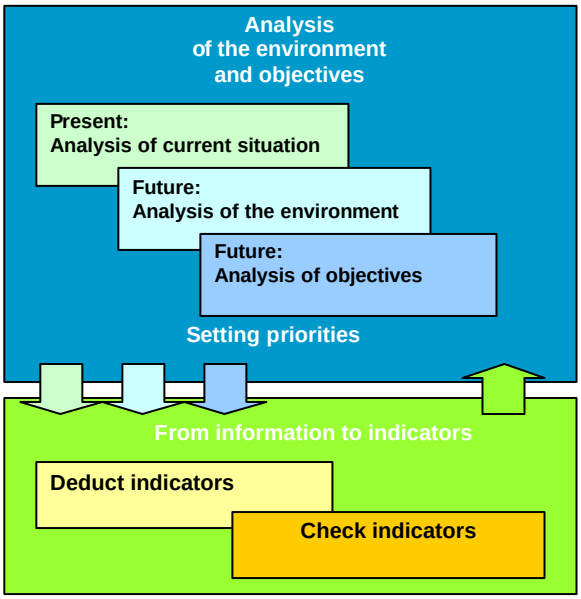

Figure 1: Steps towards a set of sustainability indicators.

Sustainability indicators are not necessarily new indicators. It is the set of indicators rather than individual indicators that allow an assessment of progress towards sustainability.

V. CONCLUSION

The manual encourages a discursive process for the development of sustainability indicators. The participating companies highly valued the comprehensive

approach and the change of perspectives.

Integrating EMA with cleaner production – Conclusions from the UNIDO TEST project

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***Abstract*: The paper demonstrates the results gained in the UNIDO TEST project [1] by simultaneously introducing EMA, cleaner production assessment and EMS in 5 companies of the Danube river basin. The analysis of material and energy flows conducted during the CPA provided the basis for assessing and comparing the performance of the production processes against the norms defined by the technical specifications of the technology in place, and against the norms of BAT or to the theoretical norms. This categorization showed which part of the non-product output costs can be controlled in the short-term, in the medium-term or in the long-term. On the basis of this analysis companies were enabled to take strategic decision such as phasing out of products and planning new investments in environmental technologies on a step-by-step approach. Broadening the scope of EMA, developing the necessary information system within the framework of the EMS, were immediate results of the project.**

***Keywords*: UNIDO TEST project, controlling costs, cleaner production, non-product outputs.**

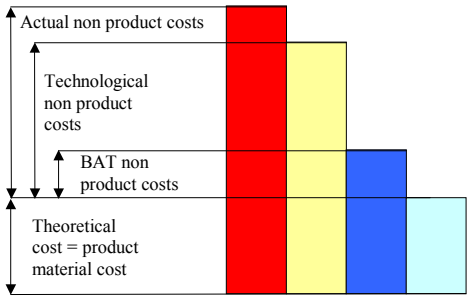
I. INTRODUCTION

The United Nations Industrial Development Organization (UNIDO) has developed a program promoting the Transfer of Environmentally Sound Technologies (TEST) that incorporates the principles of environmental management accounting (EMA). The TEST programme targeted industrial hot spots of five countries of the Danube river basin and was implemented between 2001 and 2004 [1]. The test approach is a methodology designed to simultaneously combine the introduction of several environmental management tools such as EMA, cleaner production assessment and EMS for reaching the sustainable enterprise. The method demonstrates how combining these tools within an integrated framework will result in reaching positive synergies and better results.

II. USE OF EMA FOR CONTROLLING COSTS

The basis for introducing EMA principles in the TEST project is represented by previous works of outstanding researchers in the field. We have used Schaltegger`s and Burritt's[3] concept in allocating environment costs using different allocation keys , the UNDSD methodology[4] developed by C. Jasch for identifying environmental costs as well as the works by M. Bennet and P. James[5], and P2Finance [6] of the TELLUS Institute for analyzing project alternatives.

The first step was the start-up of the cleaner production assessment in order to trace material flows. EMA assigned economic weight to material and energy flows. The usual practice for calculating non-product output costs is to take into consideration the entire value of the material/energy inputs that do not go into the final product. "However, this approach ignores the fact that not all wastes and emissions can be eliminated even when state of the art technology is in use, and thus, companies usually feel that this approach is too penalizing" [2]. In order to promote the use of EMA for managing environmental costs we developed a methodology for classifying environmental costs based on their controllability. Product and non-product output costs, were classified in three categories:



- - Theoretical product costs: are the costs of material and energy inputs in the final product. These costs represent the zero-waste condition and cannot be achieved in reality by any technology.
- - BAT non-product costs: are the costs of material and energy inputs that do go to the final product when the BAT technology is used. These costs are controllable only in the long run, when technological innovation produces more performing BAT.

  - Technological non-product output costs: are the non-product output costs generated when the technology already in place is operated as indicated in the technical manual and correspond to the technical specifications. These costs can be controlled in the medium run, by changing the technology and approaching the BAT.

  - Actual non-product output costs: these are the real non-product costs generated by the technology in place. These costs can be controlled in the short run by better operating the technology in place.

The results of the application of the EMA principles were linked to the results of the CPA and to the EMS. The classification of the non-product output costs as described above was very effective in showing how much companies can save by applying short and/or long-term CP measures. Otherwise EMA principles were practically integrated within the internal cost-accounting system.

Conclusions

The combined application of EMA, CPA and EMS has generated positive outcomes in the piloted enterprises. The use of EMA has positively contributed to enhance the sustainability of the CPA/EMS projects, by increasing awareness of economic implications of environmental aspects and in particular of non-product output costs and by providing solutions for controlling them in the short, medium and long term.

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The phenomenological model of Cleaner Production

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***Keywords*: Cleaner Production, Environmental Management System, Sustainable Development, Environmental Voluntary Agreement.**

I. INTRODUCTION

Cleaner Production has been one of the first NGO environmental programs in Poland, initiated at the UNEP' Seminar in Warsaw in 1989, when the World UNEP'CP Programme was launched.

This new philosophy, started by UNEP at the end of the 80-tes has developed into the "World CP Program".

Poland was the first country to start this program in Central Eastern Europe and an appropriate methodology was developed - in cooperation with UNEP' experts - which was also adapted by other countries.

A 2-phase approach: training for capacity building and design/implementation of pilot projects was the general structure of national CP programs.

Cleaner Production - the "continuous, preventive and integrated strategy" for environmental management systems "CP EMS" has been introduced into the Polish production/service sectors and local governments. For continuity a CP Society was established acting within the Polish Federation of Engineering Societies.

On the basis of this definition a generic dynamic model has been developed and this environmental model has become the outline for a third phase of the Polish CP Program: the dematerialization concept and the CP EVA Scheme – CP Environmental Voluntary Agreements.

It has shown during the first years of the Polish CP Program, that keeping discharges to the environment on levels expected by regulations and standards has been insufficient for the challenges of sustainable development. Industrial experience has also shown, that the "standards' enforcement system" must be replaced more and more by a "negotiation/participation' system". This must be built upon responsible entrepreneurship on the side of the producer and responsible environmental policy created by the local and central authorities aiming at sustainable development. In 1995 an experimental implementation procedure for the introduction of the CP EVA Scheme into production/service companies has been prepared and introduced on pilot basis in chosen companies.

Upon this study the CP EVA has been put into practice. An environmental reporting procedure - on annual basis - has been created and introduced into over 220 companies and local governments. The companies – after 2 years of reporting - are entitled to the inscription into the Polish Register of Cleaner Production and Responsible Entrepreneurship.

A phenomenological analysis of this scheme has enabled the formulation CP Intensity Indices and compare them with environmental intensity formulated on the basis of the Polish Environmental statistics for the whole industry and its branches. This comparison has shown the advantages of the CP approach.

Description of the model, strategy and achieved results shall be presented in the paper.

II. MAIN CONTENTS

1. Introduction
2. The dynamic model of CP and the dematerialization concept
3. Basics of the CP EVA Scheme
4. Phenomenological analysis of the CP EVA Scheme
5. CP Intensity of the Polish Industry

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Addressing CP Paradox and Financing CP/EMA from Savings

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***Abstract*: Cleaner Production (CP) and Environmental Management Accounting (EMA) overlap and lead to better management of material and energy flows. Despite all efforts done in this field the adoption of good CP practice is slow given its potential benefits. The low uptake of CP in cases it offers multiplied benefits is called CP paradox. The paper focuses on analysing this paradox building on experience from industry and on the learning and organisational theory. Particular points are illustrated on empirical data from the EMPRESS project in the Czech Republic. EMPRESS promotes CP through establishing a strong information system based on monitoring and targeting enabling accountability for efficiency of use of material and energy flows as a starting point for introduction of CP within an enterprise. The information system facilitates CP innovations and verifies real effects of CP measures. This verification enables financing introduction of the system and particular measures from savings. There will be presented first experience from piloting of this scheme in the Czech industry. Introduction of CP is financed by a third party and enterprises commit to pay back the costs of services and investments from the verified savings. Experience gained has implications for promotion of effective environmental accounting and CP at the micro and macro levels.**

***Keywords*: Organisational learning, monitoring and targeting, financing from savings.**

I. Introduction

Objective of the paper is to contribute to the discussion on more effective promotion of CP within organisations. Paper is based on broader research ("New Practices for Change of Concepts and Actions in Direction of Sustainable Development within Cleaner Production Programs" - ongoing research at the International Institute for Industrial Environmental Economics at the Lund University and the project "Research on Support of Sustainable Consumption and Production in the Czech Republic" completed for the Czech government in December 2005). Scope of the paper is limited and the paper focuses especially on implications of the research for environmental accounting (both at the macro and at the micro level).

II. CP paradox

There is a gap between the effort of CP initiatives to achieve widespread adoption of CP strategy and its actual uptake. Given the potential benefits of CP this situation is often perceived as a paradox. Initiatives in the field of Environmental Management Accounting (EMA) can be considered to be part of the efforts to address this paradox.

III. Explaining the „CP paradox"

There will be provided summary of theoretical explanation and analysis of the CP paradox showing its implications for particular levels of an enterprise management pyramid.

IV. Analysing empirical experience

The empirical part of the paper refers to the Energy Management Performance Related Energy Savings Scheme (EMPRESS) project and to first results of its practical implementation in the Czech Republic. EMPRESS is a GEF funded project of UNEP, which combines introduction of an effective information system (linking goals, systems and flows which is based on principles of monitoring and targeting (M&T) in order to control not only total costs but also real efficiency) and financing implementation of this system and CP measures in an enterprise from savings through the method of Energy Performance Contracting (EPC).

V. Conclusions

Experience from the EMPRESS project will be utilised for broader discussion and conclusions relevant for promotion of effective environmental accounting and CP at the micro and macro levels.

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Cleaner production in methanol process by optimization of CO_2 recycling using NLP model

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***Abstract*: Countries are trying to reduce their primary energy demand and CO_2 emissions. The concentration of CO_2 in the atmosphere has to be stabilized, requiring a reduction in current emission rates. Opportunities for emission reduction and CO_2 reuse largely depend on the existing plant and energy systems.**

***Keywords*: CO_2 reuse, CO_2 emissions, simultaneous optimization, NLP.**

I. INTRODUCTION

The relationship between energy efficiency and flue gas emission is clear. The higher energy efficiency, the less fuel can be burned and, hence, the smaller the flue gas emission. Two major optimization approaches: pinch analysis [1], and mathematical programming methods [2] can be used to improve energy efficiency through better heat integration and utility savings, and hence reduced flue gas emissions.

II. CO_2 REUSE

CO_2 can be separated from the outlet stream (purge gas) by a membrane or absorption system (absorber and regenerator) and reused as reactant in a reactor system (Fig. 1). Therefore, product yield can be increased and CO_2 emissions reduced, simultaneously. Efficient process modifications can be systematically directed towards reusing CO_2 in processes, to reduce flue-gas emissions. CO_2 emissions can be reduced at source. Simultaneous optimization of the flow rate of CO_2 reuse in a process structure, and its parameters using nonlinear programming (NLP) promises an additional annual profit. The retrofitted process is to be operated within the existing parameters. The separation of CO_2 from mixtures which include other gases, is a process of substantial industrial importance. Process modifications, energy savings, waste-heat minimization, and CO_2 reuse can reduce emissions.

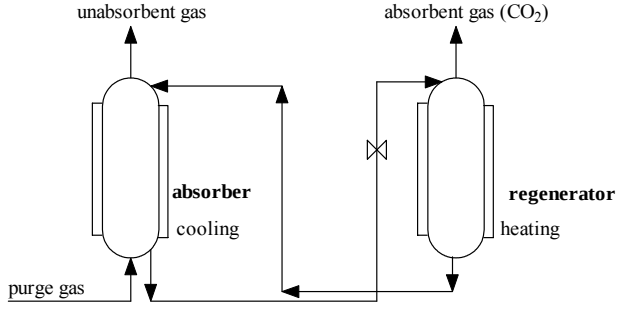

Figure 1: Basic flow sheet for absorption system.

III. CASE STUDY

We have studied a possible reuse of the flow rate of CO_2 from purge gas, reduction of CO_2 emissions using a complex Lurgi process for low-pressure crude methanol production (Fig. 2) extending a simplified flow sheet by using a gas turbine.

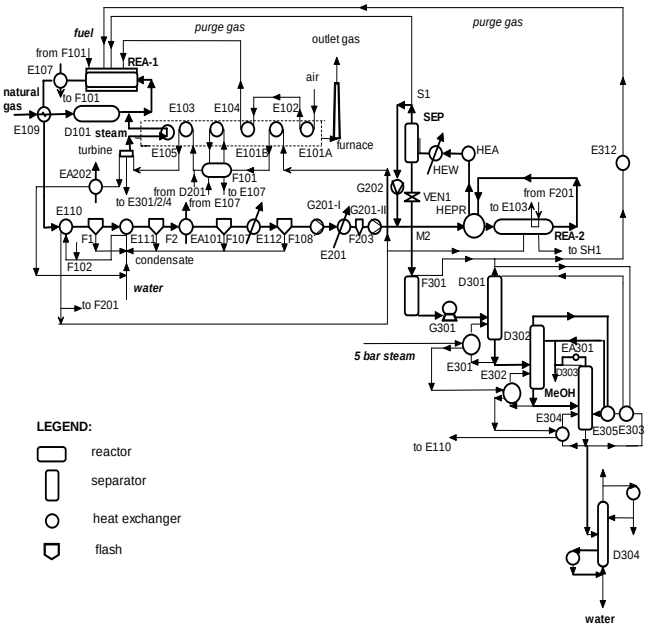

Figure 2: Process flow diagram of a low-pressure Lurgi methanol plant.

IV. CONCLUSION

The higher energy efficiency, the less fuel can be burned and, hence, the smaller the flue gas emission. The open gas turbine too can be included in process. In the methanol process, case study, the CO_2 emission flow rate can be reduced by about 1 000 t/a.

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Application of aragonite shells for the removal of aqueous metals from polluted soils and waste waters

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***Abstract*: The effect of the presence of the divalent metal (Me) ions Zn, Co, Pb, Mg and Ca on the Cd uptake capacity and rate of biogenic aragonite (shells) from aqueous solutions was investigated. Experiments were performed in batch-reactors using mixtures of Me-Cd bearing solutions at a fixed solid/liquid ratio of 8 grams per liter and size fraction of 1-1.5mm. Cadmium concentrations were usually fixed at 0.45 mM whereas the Me concentrations varied (1 - 0.005 mM). The uptake process took place via 3-D nucleation of Me-bearing phases onto the shell surface and microcrystalline otavite precipitation accounted on average for 70% Cd removal after 4 hours. Under the conditions used here, Zn, Co, Mg and Ca and Pb ≤ 0.3 mM do not have a significant effect. At higher concentrations, Pb outcompeted Cd for the concurrently dissolving carbonate ion and thus slowed Cd removal rates significantly. For Mg a slight enhancing effect could be observed while Co was removed much slower. For low Cd concentrations, removal was below 45 % after 4 hours, when decreasing the size fraction to 0.25-0.105 mm it improved to 90 %.**

***Keywords*: heavy metal removal, biogenic carbonates.**

I. INTRODUCTION

Metal elimination from highly concentrated and especially acidic process waters is still a problem in many industrial processes such as those occurring in the galvanization industry. The goals of the present study were: 1) Systematically evaluate the influence of several ions (Ca, Ma, Co, Zn and Pb) in the Cd uptake capacity of aragonite shells under controlled conditions; 2) Assess the effect of shell size fraction and cadmium concentration on the Cd uptake capacity and 3) Determination of uptake/removal rates and mechanism of other divalent metals.

II. MATERIAL AND METHODS

Batch experiments were performed in 250 ml Azlon® beakers kept at 25º by immersing them in a temperature controlled bath. Experiments were started by placing 200 ml of solution with 2 g of solid. The solution inside the reactor was kept in continuous stirring by means of a floating Teflon-covered magnetic stirrer; stirring speed was maintained at 500 – 700 rpm using Heidolph stirring plates. Experimental solutions were continuously bubbled with air equilibrated with the atmospheric carbon dioxide.

All reactive solutions were composed of demonized MilliQ® water and reagent grade $Cd(NO_3)_2$, $NaNO_3$, $Pb(NO_3)_2$, $Ca(NO_3)_2$, $Mg(NO_3)_2$, $Cu(NO_3)_2{\cdot}3H_2O$ and $Zn(NO_3)_2$. Background Ionic strength in all experiments was adjusted to 0.005 M with $NaNO_3$ except for the shell size experiment where KNO_3 was used.

III. RESULTS

Both with respect to total loading and dissolution rate, biogenic shells are superior to ground calcite and ground aragonite mineral grains for metal removal. At close to equilibrium conditions which usually are reached within 24-48 hours with a pH around 8.2 and 5mM NaCl as background electrolyte the predicted solubility of lead, cadmium and zinc in equilibrium with aragonite and the above mentioned solid phases are on the order of 150 ppb, 40 ppb and 400 ppb.

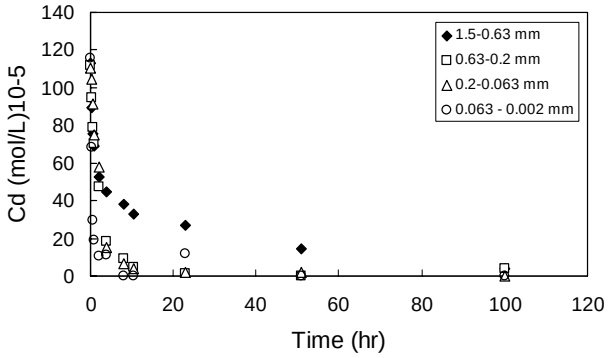

Figure 1: Decrease in cadmium concentration over time using different size fractions : 2-63, 63 to 200, 200 to 630 and 630 to 1500 microns.

IV. CONCLUSION

The above described process is a promising cheap and fast alternative process for eliminating metals from solutions. Further studies are under way to study if the elimination kinetics and efficiency are comparable in process waters containing surface active agents and high iron concentrations. If you have questions please do not hesitate to contact: koehler@TUGraz.at

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Implementing Environmental Management Accounting within Universities

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***Abstract*: The role of management accounting in improving environmental performance through enhanced accountability is attracting increased recognition. Various industries have been included in EMA-based implementation research and related case studies, however service industries have typically failed to be the focus of attention – generally because of the mistaken belief that they generate insignificant environmental impacts. We expand the literature by explicitly considering the implementation of EMA with a service-based sector – specifically we look at the adoption of EMA within a university. We find that there is a general lack of consideration given to environmental costs (and potential cost savings) within a university setting. This lack of consideration is because of the lack of communication between those involved in environmental functions and those involved in accounting functions. Explanations are given in terms of various contingency variables and institutional factors.**

***Keywords*: Environmental management accounting, service sector, theoretical framework, universities**

INTRODUCTION

Universities are microcosms of society and have many of the same environmental consequences and opportunities as do the other industries in the service sector. Despite the growing presence of EMA, a literature review demonstrates that there is limited research about the adoption and implementation of EMA in the service sector. Further, no research was found that relates EMA to the management of environmental impacts within universities.

The paper demonstrates the growing importance of the service sector in the world economy and identifies the major environmental impacts associated with various operations of the sector. Drawing on the limited available service sector related case studies, the potential of extending insights into the management of environmental costs caused by universities is explored.

As a result of responses to the Brundtland Commission in 1987 and especially the Earth Summit in 1992, many universities have started to address environmental issues. An international perspective on initiatives undertaken by universities for managing environmental impacts is discussed and problems and barriers to the adotpion of EMA identified. Our literature review shows that part of the problems and barriers to the adoption of EMA are attributable to a 'communication breakdown' between environmental managers and management accountants. The potential of well designed EMA systems in reducing this breakdown is established.

Although no specific university related EMA case studies are available, a limited number of service sector related studies demonstrate that EMA implementation will improve both the financial and environmental performance of the relevant organisations. In spite of the win-win situation shown, the motivations for and barriers to the adoption and implementation of EMA related tools still remain less considered in the literature. Four potential theories, legitimacy theory, stakeholder theory, institutional theory and contingency theory, are used to provide a theoretical framework to explore the barriers and impediments to EMA adoption within universities. Knowledge of such impediments, together with explicit recognition of the potential benefits to flow from EMA provides a 'way forward' for universities seeking to monitor and control their environmental impacts and related costs.

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Evolution of Material Flow Cost Accounting (MFCA) in Japan

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***Abstract*: Material Flow Cost Accounting (MFCA), which introduced into some Japanese companies, has spread as relevant environmental management accounting in Japan. Some Japanese companies have gotten the good results from MFCA. They achieved the both purposes of environment and economics. Moreover, MFCA has begun to make evolution to new management accounting, whose scope includes Supply Chain and Life-cycle.**

***Keywords*: Cost Accounting, Environmental Management Accounting, Life-cycle, Material Flow, Supply Chain, Sustainable Management.**

I. INTRODUCTION

Since Material Flow Cost Accounting (MFCA) introduced into some Japanese companies in 2000 and 2001, MFCA has spread as relevant environmental management accounting in Japan. The number of MFCA companies is more than 50 until now. Some Japanese companies have gotten the good results, in environment and economics, from MFCA. MFCA can reduce the input of materials and costs. And then, MFCA itself has the power to spread scope to Supply Chain and Life-cycle to get more profit.

II. THE GOOD RESULTS FROM MFCA IN JAPAN

For instance, *CANON Sustainability Report 2005* (p.46) shows the following results under MFCA.

"Material flow cost accounting is being introduced throughout the Canon Group. Canon Chemicals began implementing the system at all its workplaces from 2004 in tandem with workplace-oriented environmental assurance activities. This approach has provided an accurate profile of the materials and funds lost and the processes in which losses occur. Using the information gained, employees working in small groups reduced the levels of generated waste by remarkable margins.

In 2004, the resource efficiency improvement activities developed under the accounting system led to an 1,800-ton reduction in the amount of waste discharge (40% decline), and a savings of about 120 million yen in the amount of materials used (materials purchased) due to a large decrease in waste disposal costs and reductions in the loss. The resulting improvement in capacity utilization rate has also led to higher production, lower capital spending, and other derivative benefits. "

As above, the report says that the quantity of input resources per product unit was reduced, and the cost reduction because of that raised the product yield rate. It is considered that an increase in profit figures was attained as a result, and enhancement of productivity was also achieved.

It is quite clear that MFCA can achieve the purpose of environmental management accounting, both of environmental and economics.

III. MFCA AS NEW MANAGEMENT ACCOUNTING

Compared MFCA with the existing management accounting, MFCA is a tool exceeding the scope of the existing management accounting. The domain of the existing management accounting has so far focused on corporate internal usefulness against external report. In addition, generally the existing management accounting is a decision making support tool to attain an objective of profit maximization within the scope of individual enterprises.

But after MFCA analysis, there are some Kaizen points not in own section, but in other sections, for example, R&D section, Sales section, IT section and so on.

Moreover, we could find the Kaizen points not inside own company, but in suppliers. In this case, the scope of MFCA would spread to suppliers, or Life-cycle.

We make a meeting on the whole company or with Supply chain to realize new profits on the Sustainable management. This can create the new concept of management accounting.

IV. CONCLUSION

MFCA can promote the productivity of physical resources, hidden by the existing management accounting. Some Japanese companies have used MFCA as the tool of environmental management tool, especially focused on increasing profitability. Practically it leads to the environmental protection by promoting the productivity of input resources. And the environmental management on the base of MFCA is introduced not only inside company or company-group, but also on Supply chain.

Some Japanese companies have started to structure Sustainable Management on the base of MFCA.

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Incorporating Environmental Cost Accounting into Cleaner Production Assessment process at SMEs in Vietnam

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ABSTRACT

Environmental Cost Accounting (ECA) is increasingly attracted by the corporate managers as a necessary complement to improve the environmental decision making process within small and medium scale enterprises (SMEs). It is an expansion of good management accounting practices, using a bigger inventory of costs and careful identification of hidden costs. Understanding the environmental cost is the crucial contribution of an Environmental Management Accounting methodology. By identifying and controlling environmental costs, ECA provides the data that managers need to identify cleaner production (CP) opportunities. Often, an ECA analysis is sufficient to encourage SMEs for moving towards CP. In the other hand, a Cleaner Production Assessment (CPA) can also be major data source during the design of an ECA information system, especially in companies that do not have a well-established management accounting system and environmental controlling system in order to provide information on material flows and the costs associated with them, especially the "hidden costs". ***The purpose of this paper*** is to discuss on how cleaner production is related to ECA in the practical condition at the SMEs in Vietnam. The paper will emphasize on the hidden costs behind the different processes/flows at SMEs, and the paper also suggests key steps of ECA to promote cleaner production at SMEs in our country.

Keywords*:* Environmental cost accounting, Cleaner production, hidden cost.

MAIN CONTENTS OF THE PAPER

I. Introduction

II. Development of CP in Vietnam (especially at the SMEs in the chemical industry)

III. ECA methodology and integration of ECA in CP process at the SMEs

IV. Case study for incorporating ECA into CP assessment process at a SME in Vietnam

V. Conclusions

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Implementing Environmental Management Accounting in Argentine Companies

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***Keywords*: environmental management accounting EMA.**

I. ABSTRACT

This paper describes the role of government in promoting and implementing environmental management accounting (EMA) in Argentina.

Environmental Management is a growing part of strategic management in companies, and the significance of environmental issues is growing in Argentine business. As a result of this, EMA is becoming a more necessary tool to run business.

Sustainable future-oriented corporations will be able to prepare information properly with EMA supporting planning, management and control within companies.

The objective of this paper is not only to show economic and ecological advantages of EMA, but also barriers to its take over adoption.

This paper describes and illustrates how this methodology was applied in one of the companies that participated in cleaner production programmes in Argentina.

A possible association between environmental performance and corporate environmental reporting is analysed.

The influence of EMA is also discussed in relation with environmental reporting in general.

The findings revealed that consistence between environmental performance and environmental reporting is quite rare, although future credibility of companies will most likely depend on it.

The results also suggest that government must participate actively by giving incentives and promoting quality corporate information.

It concludes with a number of recommendations, specially concerning the need for standardised indicators and reporting procedures.

This paper provides an overview of current trends and the benefits of implementing EMA, as well as a discussion on how it complements cleaner production programmes.

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Effect of Changing Resource Costs

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Keywords: Energy, water, mining, costs, reporting.

I. INTRODUCTION

Mining by its very nature is financially expensive, environmentally invasive and socially intrusive, yet many countries have successfully managed to convert their mineral endowment into national wealth providing the country with the economic means to address its environmental problems and social aspirations.

South Africa is particularly rich in mineral resources and is one of the leading raw material exporters in the world. The main minerals are gold, diamonds, platinum, chromium, vanadium, manganese, uranium, iron ore and coal.

South Africa on the other hand, is a water scarce country with mining activities in areas with limited water resources. South Africa is one of the countries with the lowest electricity prices, but the ongoing growing use of energy will require South Africa to make significant investment in electricity-generation capacity, which will, inevitably, result in higher electricity prices

Labour, as resource, is a challenge to manage. South Africa, during the last few years, has seen an increase in union demands, some resulting in economically disastrous strikes.

Mining and sustainable development [which includes the resource challenges] are, somewhat counter intuitively, not contradictory terms. Although individual operations are finite, the contribution that mining can make to sustainable development can and does, have profound and long term effects.

II. CHALLENGES FACING THE SOUTH AFRICAN MINNG INDUSTRY

The most fundamental challenges facing the South African mining industry is the productivity of labour and capital and their impact on the cost of mining and extracting minerals. For most minerals, South African producers are 'price takers', as the prices are set on international markets. To remain competitive, particularly with may low-cost emergent world producers, South Africa's mining industry has to focus on productivity and cost trends. Operating margins have to remain, or become competitive to attract investment into the industry, and to sustain existing operations.

To improve the sustainable development of mining companies, management must be informed about the relevant environmentally and socially induced financial impacts on the company as well as the environmental and social impacts added by corporate activities. Accounting is the central economic information management system for most companies. It forms the basis for integrated planning and a core element in most integrated corporate monitoring and control systems. Reporting, in closing the loop, must therefore also include all the challenging issues,.

III. GOLD MINING AS CASE STUDY

Gold mining in South Africa, still hold a special position in the economy with 40% of the world's gold reserves found in the Witwatersrand area. Although the relative importance of gold mining has fluctuated over the last decade with the performance of the gold price, the gold mining industry will continue to play a substantial role in the economy of South Africa.

The development to the technical capacity to mine deep-level gold ore bodies has led to gold mining becoming even more capital intensive. This is because of massive capital required for ventilation, cooling, hoisting, underground tunnelling and surface processing plant. Other reasons are the need to have large numbers of workers operating in the mines and the changing costs of resources.

This paper will address the challenges facing the gold mining industry with regard to energy, water and labour and the relevant costs involved. The role of environmental management accounting as management tool will also be addressed. The paper will also touch on how well [or not] the mines have reported on sustainable development costs.

Cleaner Production & Competitiveness: The Role of Environmental Management Accounting

Md. Abdul Hannan Mia

Abstract

Because of globalization and internationalization process, the business activities, both in home and abroad, have become highly competitive. To keep pace with this competition, firms trying to produce either low cost products or high quality products or both even at the cost of the environment to achieve competitive edge. But they cannot sustain in competition because of global pressure for environmental sustainability. Only environment-friendly products can gain competitive edge. Cleaner production through the practice of Environmental Management Accounting (EMA) enables firms to produce environment-friendly products more efficiently and profitably. Cleaner Production is an approach that ensures minimal environmental costs in production and processing. It refers to the mentality of how products are produced with the minimum environmental impact under the present technological and economic periphery. Increasingly, Cleaner Production is becoming the utmost demand of various stakeholders, such as business customers, local communities, investors and government. It is also very important for the organizations themselves because it increase the operating efficiency, competitiveness and profitability of the entity. Environmental Management Accounting (EMA) is the basis for cleaner production and pollution prevention. It provides the data that managers need to identify cleaner production opportunities. EMA captures the true costs of waste and pollution in current processes, compare them to the true costs of cleaner production alternatives, and make accurate financial decisions using appropriate analysis tools. To ensure cleaner production, a firm has to recognize and understand the environmental cost and also have to find out the way to control and minimize them. In this regards, EMA systems can help environmental managers justify these cleaner production projects, and identify new ways of saving money and improving environmental performance so as to make sustainable financial decisions in competitive business environment.

In a nutshell, the paper aims at providing conceptual framework for cleaner production through EMA practice, the benefits of cleaner production for competitiveness and the role of EMA as a tool for cleaner production in achieving competitiveness of the industrial output in the global market.

Use of Sustainability Ratings by Ethical Fund Managers in Selecting Companies to Include in their Investment Portfolios: the Case of Listed Airline Companies in Australia.

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Keywords: Corporate sustainability ratings, airline industry.

Abstract:
Sustainability ratings are prepared for a number of purposes, including the provision of information to assist investors with the assessment of environmental, social and financial business risk of corporations. A number of ratings agencies provide corporate sustainability information, particularly for ethical investors and for directors examining where their companies are seen to be weak or vulnerable to their own mistakes or to corporate competitors. This paper outlines the notions of sustainability, corporate sustainability and corporate sustainability ratings, before providing information about key aspects of three corporate sustainability ratings systems - the Dow Jones Sustainability Index, FTSE4Good Index and RepuTex Index in the context of listed airline companies in Australia. Conclusions are drawn about the potential of such sustainability ratings in the Australian airline industry.

Assessing the Sustainability of Nuclear Energy with the Ecological Footprint

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***Abstract*: Many different approaches for assessing sustainable development have been introduced in the last years. One of these evaluation methods for the environmental aspects of sustainable development is the ecological footprint, which is defined by the land area which a society uses up to keep its lifestyle. An energy supply system of a socieaty can be called sustainable, if the ecological footprint is considerably smaller than the land area that is actually available for this society. The aim of this paper is to introduce a calculation method for assessing the sustainability of nuclear energy based on the footprint model.**

***Keywords*: Lifecycle assessment, nuclear energy, ecological footprint, sustainable development, risks.**

I. INTRODUCTION

The original footprint model by Rees and Wackernagel includes the aspect of the energy production of a society, but cannot sufficiently assess the effects of fossil or nuclear energy on the environment. Therefore, I modified the calculation method as a tool for energy planning in 2003 [1], but with the aspect of nuclear energy missing. For the calculation of the nuclear energy footprint I proposed a new method togehter with two colleagues in 2005 [2]. This latest improvement of the calculation method includes considerations of environmental and health risks related to the use of nuclear energy throughout the whole lifecycle from uranium mining, transportation and operation to waste disposal. Aim of this article is to introduce this new methodology and to discuss the energy footprint in the light of sustainability principles by verbally weighing arguments.

II. THE FOOTPRINT OF NUCLEAR ENERGY

Energy footprinting follows a quite simple principle: To calculate the footprint of a certain energy source, the amount of used energy is multiplied by the land need index of the specific energy carrier. To find out about the footprint of the whole energy supply of a society, the footprints of the different energy sources are added. The difficulties lie in determining the land need indices for the different energy sources. For renewable primary energy sources it is quite understandable that there is a specific yield of a certain land area that can be transferred into an energy output per unit of area [MJ/m².year] or land need index [m².year/MJ]. Taking other energy sources into account, the calculation methods have to be more sophisticated.

The calculation method for nuclear energy has to deal with a lot of difficulties: First, different environmental and health risks occur during the whole lifecycle of nuclear energy sources. Second, the risks are – according to the production stage – of different, sometimes quite small probabilities, and third, the negative effects are of extremely long duration. Forth, there is a considerable lack of information. Still, it was possible to calculate the footprint of nuclear energy production to be in excess of 22,7 m²year/MJ.

The method for nuclear energy faces several constraints: While the introduced footprint calculation includes land areas that are no longer suitable for housing and food production after a serious nuclear event, it is problematic to quantify environmental and health impacts especially for toxic substances like radionuclides. Radiological consequences will vary due to the type of accident and atmospheric conditions present at the time of accident. Also, there remain significant gaps in our knowledge of the interaction of hazardous material and their effect on our supporting ecosystems.

III. DISCUSSION OF THE NUCLEAR ENERGY FOOTPRINT

The footprint of nuclear energy can be called high in comparison to all other energy sources. Therefore, nuclear power generation must be called very unsustainable.

Furthermore, it shall be discussed whether this judgement withstands a critical discussion in the light of sustainable development. As normative basis for this reflection basic action principles for sustainability are applied that were developed in a discussion paper of the German Federal Ministry for the Environment, Nature Protection and Nuclear Safety [3].

IV. CONCLUSION

It can be concluded, that according to the footprint calculation here introduced the use of nuclear energy cannot be called sustainable. Also verbally weighing arguments in the light of major sustainability principles is not in favour of nuclear energy. Therefore, more environmentally friendly methods of power generation should be considered for future energy supplies.

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Success factors in design and implementation of EMA – Kesko Food Ltd. case study

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***Abstract*: Kesko Food Ltd. is a pioneer in environmental management issues in the trading sector, in Finland and beyond. In the Finnish Environmental Management Accounting (EMA) follow-up research between 1996 and 2005, Kesko Food was found to be the only case company which really has invested in EMA. This paper aims at recognising the factors behind Kesko Food's success.**

***Keywords*: Environmental management accounting, environmental management, success factor, Kesko Food.**

I. INTRODUCTION

This paper considers the success factors in design and implementation of EMA within a company. The consideration is based on four follow-up case studies conducted in large Finnish companies between 1996 and 2005. The results of the case studies were quite surprising: only one of the companies had successfully continued developing its pilot EMA system of 1996, while the other companies had abandoned their systems for being too laborious [1].

The follow-up research divided the concept of EMA in fourteen elements, which were found from the literature, and assessed all case companies according to them. (See Figure 1.) Based on further interviews at the only exemplary company, Kesko Food, this paper aims at recognising the motives and management practices behind successful EMA design and implementation.

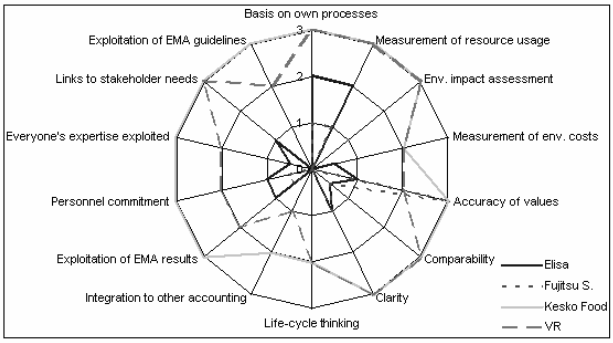

Figure 1: Assessment of EMA in the four Finnish case study companies in 2005. [1]

II. SUCCESS FACTORS

Too laborious, no added value, not really interesting etc. There are many reasons why development of EMA has ceased in an organisation, or the EMA itself entirely abandoned. It cannot be denied that designing and implementing a good EMA system is challenging and requires a lot of work, but as the follow-up research showed, a motivated and persistent organisation can develop an exemplary EMA system. It can also gain real financial benefits through EMA.

Essential for Kesko Food's success in EMA has been the management support and the large number of resources allocated to its EMA activities. The initiator for the pilot EMA project was a well-trusted individual from the company, and corporate management was convinced of the benefits of EMA at an early stage of the project. Consequently, Kesko Food became a top-class company in environmental responsibility and also in marketing this image. The environmental objectives and plans of the corporation have been transparently reported to its stakeholders, and so any retreat from the planned actions has been made difficult or at least embarrassing. Kesko Food has also been anticipating the future needs of EMA, as well as benchmarking suitable guidelines and experiences of other organisations.

Currently the whole Kesko Group is striving to combine value-chain thinking into its corporate responsibility management. Even though the company has already been awarded for its environmental responsibility, it is continuously investing more resources in environmental management and EMA.

III. CONCLUSION

This paper shows that the considered importance of EMA varies a lot between different companies. Some companies invest actively in EMA, while some others avoid putting effort in it as long as possible. Essential factors to be successful in designing and implementing EMA practices within a company are management support, the amount and quality of allocated resources, the motivation of responsible personnel, transparent communication and early realisation of benefits of EMA.

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Evaluating management accounting from a user perspective: a study of the Environmental Accounting System of the Environment Agency in England and Wales

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The Environment Agency in England and Wales (the Agency) has developed its own Environmental Accounting System (EAS) as an extension of its main accounting system, to serve a number of purposes. Initially its primary aims were to support its own Environmental Management System and externally published environmental performance reports, and its use has subsequently been extended to also provide a management accounting tool to support potential users within the Agency. The Agency's ultimate objective is to develop a system not only to support its own management, but to provide a model which will be made available to other entities to adapt and implement in their own organisations.

This paper explains the EAS and reports on research to evaluate its effectiveness as an environmental management accounting innovation, from the perspective of the potential users identified by those responsible for the System. Although the Agency was satisfied that the EAS has fully achieved its primary objectives at a corporate level, this study found that the information which it generated was not yet being used as extensively as anticipated by its internal users to help improve operational performance. This was largely attributable to concern that the information might not be sufficiently reliable for its purpose, and the study identified several opportunities to make improvements in the underlying data collection and accounting processes.

However, both current and potential future users were able to identify several further potential uses for EAS information, and ways in which the EAS could usefully be adapted and developed in order to provide a value-adding management information role. These would imply a change in approach towards using the EAS more strategically, and a broader role for those managing it to promote proactively the use of environmental management accounting by key managers in order to maximise its potential.

Sustainability business cases or low hanging fruit? Environmental Management Accounting applications in South-East Asia

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***Abstract*: Is there a need for companies to worry about environmental issues and sustainability in the absence of public pressure and enforced regulations? Is there a business case for sustainability [1] in South-East Asian companies? This contribution partially answers those questions by reviewing some examples of environmental management accounting case studies in South-East Asia.**

***Keywords*: environmental management accounting, business case for sustainability, eco-efficiency, corporate sustainability, sustainability accounting**

When it comes to environmental and sustainability management, average South-East Asian companies face a very different situation compared to companies in more industrialized countries. The situation can be characterized by failing or arbitrary enforcement of environmental regulations, an absence or powerlessness of public pressure, and rudimentary environmental awareness [2]. The exceptions are large and multinational enterprises supplying environmental- and sustainable-sensitive markets like Japan or Europe.

Whether there is an economic benefit of corporate sustainability measures [3],[4] beyond the irreducible, but rather weak regulations is the crucial question for (corporate) sustainable development in South-East Asia. To put it in other words: Is there a business case of sustainability for South-East Asian companies [1],[5],[6]?

The environmental management accounting (EMA) concept [7],[8],[9],[10] provides tools to answer this question. It meets the integration challenge of corporate sustainable development for the economic and environmental dimension of sustainability [11].

This paper discusses first results of EMA case studies conducted as part of the InWEnt-funded project "Environmental Management Accounting for small and medium-sized enterprises in South-East Asia" [12],[13]. It presents the business case of sustainability for companies from different industries in Indonesia, the Philippines, Thailand, and Vietnam by highlighting their specific EMA decision-making situations.

Many EMA applications in South-East Asia reveal win-win situations which can be achieved by comparably simple measures of cleaner production and eco-efficiency. Rather than characterizing these findings and measures as "low hanging fruit", the paper shows that they are a basic necessity to initialize a learning process to move further towards corporate sustainable development.

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Energy-based LCA. Managing Resources and Information Flows Towards Zero Emissions

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Abstract

Society uses environmental resources directly and indirectly from both renewable energy fluxes and storages of materials and energy that resulted from past biosphere production. The actions of society, its use of resources and the load this resource use places on the biosphere are of great concern. Clearly it is imperative that perspective be gained concerning the interplay of society and environment to help direct planning and policy for the third millennium. In this paper we deal with a systems view of society. The interaction and integration among a system's components, the internal exchange of resources and services, the identification of matter and energy flows to, from and within a system (LCA), the demand for environmental support (energy), and finally the efficiency of resource use for maximum power output and decreased emissions, are discussed and their importance for more sustainable production patterns is highlighted. Accounting expressions for total energy demand, energy savings from waste recycling, energy cost of technology and information needed for integration, waste disposal and damage repair, are provided and a quantitative criterion for the evaluation of benefits from zero-emission patterns is finally discussed.

Keywords: **Zero Emissions, Energy, Life Cycle Assessment.**

Technical Approaches Towards Zero Emissions

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***Abstract*: The work, presented in this paper, was done in a project funded by the Austrian Federal Ministry for Transport, Innovation and Technology under the program line "Factory of Tomorrow".**

Zero Emissions can either be realized in single companies, cluster of companies or in regions. The general meanings are the same in these three variants but there are significant differences at the level of technical implementation. This paper explains these differences based on case studies published in the literature and own work carried out by the authors.

***Keywords*: Zero Emissions, Cleaner Production, Industrial Ecology**

I. INTRODUCTION

When talking about Zero Emissions a big problem is that there is no single definition and everybody is free to interpret it beneficial for his case. So I want to bring our understanding of Zero Emissions to a point:

Mass and energy flows (emissions) that pass the defined system boundary in a Zero Emissions system must neither interfere with ecological nor social requirements.
The defined system boundaries can enclose a single company or a cluster of companies.

We define Zero as "Zero Impact" on the environment instead of analytical or absolute zero. The big advantage is that it is very hard for companies to reduce their amount of waste down to nil but with economically justifiable effort it is possible to reduce emissions to a limit that doesn't harm the environment.

II. METHODS TO ACHIEVE ZERO EMISSIONS

There are three opportunities to alter the existing emissions (waste) within the system that these are allowed to pass the system boundaries and agree to the definition of Zero Emissions.

- Reduction
- Conversion
- Substitution

Via *reduction* the amount of one or more emissions is decreased so that they do not impact the environment anymore. Due to the fact that most end-of-pipe solutions produce an additional waste stream that has to cross the border, process integrated technologies are most favoured for the reduction of emissions. Closing water cycles or energy cascading are common examples that are state-of-the-art nowadays.

Secondly emissions can be transformed inside the system into valuable goods. After this *conversion* the mass stream is not seen as an emission any more and can pass the boundary as a product. The transformation of aluminium-rich waste water treatment sludge into precipitation additives is an example.

Thirdly hurtful substances can be *substituted* within the system with non-dangerous materials. Therefore the stream of the emission crossing the border is running dry. An examples for substituting solutions is the shift from fossil fuel to renewable energy resources, due to the fact of CO_2-neutrality.

Different methods can be allocated to these three different approaches, like Cleaner Production, Upsizing, Green Chemistry, Recycling, Reusing, Industrial Ecology and many more, and they have a different occurrence in single companies, clusters or regions. Upsizing can be much easier in a system of companies than in a single company, because e.g. heavy metals containing concentrates can be handed over to a partner firm that is specialised on treatment of such fluids and recycles the heavy metals via electrolytic processes. On the other hand it is much easier for single companies to substitute toxic chemicals with non-toxic ones, because probably not two companies will use the same processes chemicals.

III. OUTLOOK

The differences in the implementation of single or combined used methods will be described in this paper. It will be shown that are connections between the methods and norms can be found to quick check the different methods for the possibility of implementation.

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Bioconversion of low grade meat to high grade proteins

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Abstract: **Poultry slaughterhouses generate residual streams, composed of low quality meat and meat that is not suitable for consumption. An innovative enzymatic process has been developed, that transforms the meat in high grade proteins, high grade poultry fat and a small fraction mostly consisting of bones. This results in an economical valuable bioconversion and upgrade of a low-added value by-product.**

Keywords: protein, enzyme, upgrading,

I. INTRODUCTION

Verbinnen/Lintor is a Belgian poultry processing company that manages the entire chain from chicken to high grade products, low grade products and rendering of the waste products.
To prevent decay of the low-grade products, they are transported frozen which has a high cost and high health risk if the cold chain is broken.

Enzymatic processes make it possible to biotransform organic compounds as proteins to higher added-value compounds as e.g. amino acids [1],[2]. The choice of the enzymes and the selection of the process conditions are critical to ensure high conversion rates and an end-product with the right nutritional composition and flavor.
The research described within this article, developed and assessed the enzymatic conversion process to the European standards.

II. RESEARCH

To assess the technological feasibility of the enzymatic process tests were performed on a lab scale reactor. Also the different handling steps on the reaction product (enzyme deactivation, separation, concentration,…) were evaluated.
Furthermore the process was monitored on protein quality, type of amino acids, bacteriological quality, quality of poultry fat.

III. RESULTS

The tests showed that the enzymatic hydrolysis of the protein to amino acids was efficient. A conversion efficiency of protein to soluble amino acids of up to 99 % was obtained.
The separation of the watery protein solution, the oil/fat fraction and the solid fraction from the enzymatic end-product was difficult. By applying different decantation techniques a good separation was obtained between the three phases.

As shown in table I the bacterial count diminished by log 4-5. The residual bacterial count was 0 – 1 cfu/gram. 35 % of the amino acids are essential amino acids which makes it a valuable end product.

TABLE I: HYGIENIC QUALITY

Product	Bacterial count (cfu/g)		
	22 °C	30 °C	37 °C
Raw meat	1,9E+5	1,9E+5	2,4E+4
Liquid amino acids	0,0E+0	0,0E+0	1,0E+0

In contrast to the raw protein this product can be dried easily to 90 % dry solids and stored for long periods of time without decay.
The recovered fat from the process was 99 % pure fat and consisted mostly of unsaturated fatty acids, suitable as a raw material for the food industry.
The solid fraction consists of bones and undissolved organic matter. This product can be further processed to bone meal for animal feed.

IV. CONCLUSION

By applying an innovative enzymatic process low grade poultry meat is transformed in a high grade protein product, pure poultry fat and bone meal. These products are more hygienic, have a longer storage life and create a higher added-value.
This process results in a better use of the available resources by producing less low grade products and less waste. The company is presently preparing the construction of the full-scale installation.

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Zero Emission in Textile Industries

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***Abstract*: Industrial textile production often still offers high potential for integrated optimization methods. The combined approach of using technical analyses calculations and environmental accounting has been proved an efficient technique for identifying weaknesses and saving potentials. The results of such analyses in Austrian textile companies are discussed.**

***Keywords*: textile industry, energy efficiency, material efficiency, zero emission**

I. INTRODUCTION

Many industry branches are faced with the challenges of reducing production costs while maintaining product quality at the same time to keep up with the competitive market. European textile industry in particular is facing market challenges from other continents with emerging industrial strength. Additionally the environmental challenge to be met in Europe increases as the environmental understanding rises due to better awareness building and stronger regulations in the past years.

II. METHOD

Analyzing methods that take a detailed look at the production site and that identify weaknesses and strengths in terms of energy-, mass- and cost calculations are necessary more than ever not only to compete in the market but as well to follow the guidelines of sustainable production in environmental and social aspects. Such methods can point out the areas in which integrated optimization techniques can be implemented in the production. Integrating the idea of Zero Emission, the results can help to understand the possibilities to create an energy autarky and environmental sound textile production.

III. RESULTS

The analyses methods and the results of optimization for textile companies in Austria are presented. Focus is drawn on the use of the combined method of technical and economical calculations for identifying crucial optimization points in production. The further steps in calculating detailed savings in production costs for energy and water efficiency measures are additionally discussed. Potential energy savings just by improving the existing system are calculated to up to 155.000 Euro/year in one company. Water treatment and its efficiency as well show great potential but prove to require detailed assessment and chemical engineering. Based on these outcomes the future technical potential for creating a “Zero Emission Textile Plant” are analyzed and prospect to upcoming challenges is given.

IV. CONCLUSION

The combination of the economic and technical calculation shows that high optimization potential is possible in Austrian textile industries. However, a detailed analysis considering especially the energy (the large amount of off gas heat) and water household (the difficult water chemistry) still pose challenges to be met to create a Zero Emission textile plant.

Implementation of Zero Emissions in an Electro Polishing Process

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***Abstract*: This abstract presents a concept for gathering, cross-checking data and information of an electro polishing process. The collected data will enable us to optimize the process and are the basis for further measures to approach Zero Emissions. In addition the implementation for Zero Emission Techniques in consisting management systems will be discussed later on in the presentation.**

***Keywords*: Zero Emissions, Electro Polishing, Implementation, Process Water Treatment**

I. INTRODUCTION

During the electro polishing processes various acids, bases and other process chemicals are used. The resulting waste water is very harmful to the environment and has to be cleaned in appropriate treatment plants and discharged in compliance with to stringent discharge regulations. Waste water treatment causes high costs (e. g. for process chemicals, personnel, transport, discharge, landfilling of sludge). The Zero Emissions Concept aims at minimizing these costs by reducing the consumption of water, chemicals and energy. We will demonstrate that it is possible to run such a process and make a step forward to approach Zero Emissions [1].

II. THE PROCESS

Figure 1 shows a simplified flow chart of the existing electro polishing plant (in semi-automatic mode) for polishing exhaust pipes made of stainless steel (1.4301).

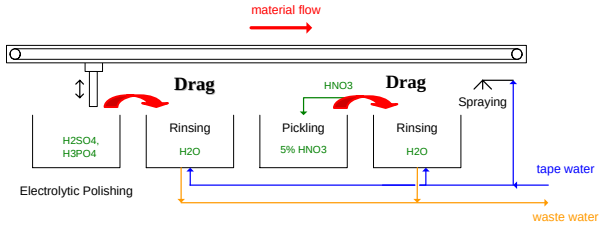

Figure 1: Electro Polishing Process

The drag out of the electrolyte caused by pulling the frame and work pieces through the process contaminates the rinsing baths with residuals of acids and metal predominately with H_2SO_4, H_3PO_4, HNO_3, Fe, Ni, and Mo. In the present case the contaminated rinsing water is treated in the local neutralisation treatment plant and is discharged afterwards. The electro polishing process is one of the bottlenecks in the company and water and chemical consumption are high.

III. THE MEASUREMENT

The regeneration of rinsing baths was the criterion for the sequence of measurements, the collection of data and the accurate determination of the current state of the electro polishing process (Figure 2).

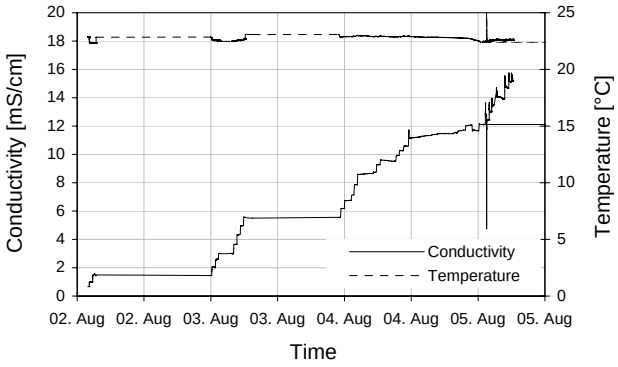

Figure 2: Electro Polishing Process

The collected data, measurements and results of a developed software tool for reducing water consumption are the basis to approach Zero Emissions

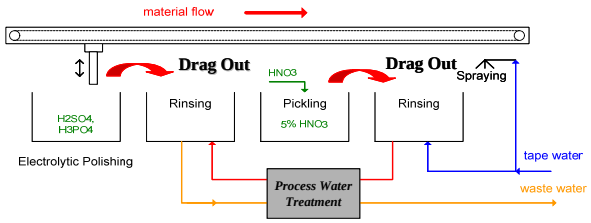

Figure 3: Possible measures to reduce water and chemical consumption.

First screenings have shown a feasible reduction of water consumption about more than 50%. A possible replacement of the consisting end of pipe technology for waste water treatment with other more efficient separation technologies will deliver further minimisation of water and chemical consumption as well as internal and external closed loops, recycling and external use (Figure 3).

IV. CONCLUSION

The presentation shows the current situation of an electro polishing plant and gives some answers and possible measures how to approach Zero Emissions in a metal working company. It gives a short outlook for a concept to implement Zero Emissions Techniques and points out some difficulties.

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Integration of Small and Medium Sized Biomass Conversion Processes into Profitable Decentralized Biorefineries with Zero Emissions Based on Optimisation of Mass- and Heat-Exchange Cycles

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***Abstract*: The necessary renaissance of biomass as feedstock, which has to be applied in sustainable way went along with several developments in engineering, which might be strengthen the paradigm change: The change from the economy of scale to the economy of numbers based on simple and robust process designs, the application of biocatalysts and flexible fermentation processes based on controlling ecological equilibria, and the integration of biomass conversion processes within networks of small and medium sized bio refineries.**

Our work is concerned with two topics: (1) we are looking for the portfolios of components built in robust fermentation processes under different nutristatic and chemostatic conditions and develop processes to extract them carefully with non-toxic and cheap chemicals. We will present some new results to demonstrate this new kind of technical application of fermentation processes. (2) Based on commercial process simulation tools we simulate biomass conversion processes and integrate several of them in heat and mass exchange networks in order to gain sustainability. Sensitivity analysis allows to identify and assess cost traps in order to evaluate future developments or alternatives. We can demonstrate that those tools give rather realistic results, so that we apply these tools to evaluate these instruments for regional bio refinery developments.

When is next time
Lessons from the explosion at the plant of CNPC

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***Abstract*: On November 13, 2005,an explosion occurred at a petrochemical plant of Jilin Petrochemical Co, killing five people and forcing the evacuation of tens of thousands of others, two years after a well blast at another site killed 243 people and poisoned more than 10,000. At first, the damage seemed to be constrained to the local area. However, when on Nov 23, Harbin's water supply was force to be halted for four days ,the truth revealed itself. The explosion has spilled benzene, a cancer-causing substance into the Songhua River, causing serious ecological damage to the environment. Though the Chinese petroleum giant has promised to prevent a repeat of the accident, people still doubt when is next time. The article try to explore the phenomenon of the explosion and the underlying reasons, hoping to learn form this accident and suggest some stringent measures to be taken by the government and the company.**

***Keywords*: water pollution , environmental risk analysis ,**

I. INTRODUCTION

The November explosion occurred at a plant of Jilin. Petrochemical, a subsidiary of Petrochina. After the explosion, Petrochina, the parent company tried to cover up the fact of pollution, saying that an environmental survey at the site of the blast showed that air quality complied with the ``relevant standard''. The truth was not known until Nov 23, when water supply of Harbin, the downstream capital city of Helongjiang Province, was forced to be halted for four days. Before that, another city in Jilin province has already been faced with the problem of water pollution. Why explosion occurred on a equipment that was only 15 months old? Why a second accident for Petrochina? The answer lies in the lack of sense of social responsibility of the company. In this article, the author tries to explore the possible reasons underlying the accident.

Firstly,the author tries to determine the damages from the accident: Political harm(Harm to the image of the company and the government, relationship with Russia),Physical harm in the near run and in the long run(great effort to contain damage),possible lawsuit ahead. The company is faced with huge environmental liability, yet the stock market made little response.

Then the author explores some phenomenon with the explosion: 1)Rapid growth of economic, great thirst for basic material, uprising oil price in the international market, making the Petroleum industry the most profitable one. Contribution by Petrochina has made the government unable to say no to this company. 2) The company is a state controlled company, having close relationship with the government makes it possible to cover facts. 3) Huge supply of foreign investment is attracted by Chinese emerging market, so the stock market makes little response to the accident. 4) The subsidiary has been faced with financial pressures for several years, the parent is seeking privatization of this subsidiary. The subsidiary has cost saving incentives, paying little attention to proper employee training and safety.

II. LESSONS TO BE LEARNED

The economic growth, measured by GDP is quite misleading.People will not be aware of the environmental liability until it is too late.

Enforcement of environment law should be carried out on Listed companies ,especially the state controlled companies.The government should trade between the private cost of the listed companies and the social cost of the society.

The secretiveness culture of the government and the company will harm the rights of the people and does no good to the society as a whole.

Using financial measures to evaluate the performance of state own companies will encourage the company to be profit driven.

III. MEASURES TO BE TAKEN

The government should modified the national system to measure the real benefit of the society.

In addition to the environment appraisal required by the government for each project, a environment risk appraisal system should be taken

Fully disclosure system will be needed.

Corporate Environmental governance shall be encouraged.

IV. CONCLUSION

Unless the government takes some measures to force the profit seeking companies to be responsible for the environment and society, people will not ensured of their well being.

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http://www.emasconference2006.at/index.php?page=grz_start&conf=grz

Initiatives for sustainable company development: integrated evaluation of environmental costs

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Abstract: **The managers of industrial companies which accepted sustainability as one of main business goals clearly believe that environmentalism has something to offer business, and hopefully the main impetus for sustainable development in the future will probably come from business. There are other significant developments too:**

- **many consumers are prepared to pay more for environmentally responsible products;**
- **the emergence of ethical investment funds has thrown the spotlight onto corporate environmental performance;**
- **companies are changing their views and measures when responding to external pressure from consumers and environmentalists.**

Since environmental problems caused by industrial production are due to so-called external effects, corrective policy measures are needed to reduce or eliminate such effects. The response of industry to such policies has in almost all cases a technological nature. Hence industrial technology and its continuous innovative change (which is directly related with economics), if properly shaped by market and policy incentives, makes an important contribution to solving the environmental sustainability problem.

Presently, financial institutions and other sources of private sector funding follow a well defined due diligence process when evaluating loan and investment proposals, consisting of verifying the technical, financial and legal aspects of the project, evaluating the creditworthiness of the borrower, and assessing the different risks involved. Therefore, an attempt to demonstrate how to initiate and facilitate sustainable development of a company by developing a system for integrated assessment of environmental costs, and by persuading public and private financial institutions and the industrial community to adopt these instruments was made in this paper.

Keywords: **sustainable industrial development, environmental costs, environmental management accounting**

I. INTRODUCTION

The key aspects of the long, knowledge-intensive process of integrating the environment with the rapid economic development are the following [5]:

- understanding the environment and the processes that affect it by identifying the sources of environmental degradation, its consequences, and the costs of reducing it, as the foundation for effective policy;
- developing indicators of environmental performance that policy-makers at the local, regional and national level can use;
- using environmental information to improve both public regulation and private decision-making;
- managing environmental knowledge by building the capacity to gather and disseminate knowledge, improving private sector environmental management and broadening public policy models to include environmental variables.

However, it should stressed that in many cases when the management of a firm is willing to invest in pollution prevention measures, for example, Cleaner Production (CP), the implementation of CP investment proposal can still be hindered by the lack of financial resources or too much investment is still being directed towards environmentally unfriendly technologies, even where commercially available environmentally friendly and renewable technologies are technically feasible and financially attractive. In other words, clean technologies have to overcome a series of financial and non-financial barriers: as usual, loan officers in financial institutions have little practical experience in evaluating applications that have an environmentally friendly technology component. They do not always understand in full the economic and environmental advantages of investments in such innovations and sometimes regard them as being too risky on the basis of outdated or incorrect information concerning their technical and financial performance. Because banks and other lending institutions fail to support CP projects, environmentally friendly technologies are penetrating the market at the rates slower than are socially desirable [6].

On the other hand, financing mechanisms for special targets of any kind, including CP investments by industry, are only appropriate within an evolutionary framework. If they are presented too early, the targets are not motivated and often unable to consider them, because they lack the right skills. Even though special financing may offer incentives, these are usually not enough to overcome confusion as to CP and reluctance to present environmental information to outsiders. Targets are ready for CP financing only after they have understood the real reasons for their problems, have a solid analysis of all environment-related costs, and are given an opportunity to make significant changes over time.

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An Application of Environmental Management Accounting Information in Investment Appraisal – an Empirical Examination in the Australian Oil and Gas Industry

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Abstract.

An experiment is used in this paper to investigate two important factors associated with environmental investment decision-making by managers: the regulatory climate in which the firm operates (contrasting a command and control regulatory climate with a voluntary self-regulatory climate) and the nature of environmental information used as a decision aid (contrasting environmental management accounting with conventional management accounting information). Based on a 2 x 2 experimental design the paper considers environmental investment decision-making by different types of managers working in the Australian offshore petroleum industry, an environmentally sensitive, highly capital intensive industry in Australia. This paper provides initial empirical evidence on the role of environmental management accounting information in environmental investment decisionmaking by managers, in comparison with the use of conventional management accounting, under two different regulatory circumstances. The empirical evidence indicates that environmental accounting information has a more significant influence on the incorporation of environmental considerations in investment decisions, than the type of regulatory regime.

Keywords.

Environmental Management Accounting; Investment Appraisal; Empirical Study; Oil and Gas Industry.

Environmental and other sustainability performance indicators – Some key features of recent UN, GRI and UK proposals and the assurance implications

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ABSTRACT:

Use of financial performance indicators in managing and monitoring business is widely, if not uniformly, established. Such information assists comparisons as well as the identification of trends. In recent years, there have been steps to devise indicators that measure sustainability performance, particularly in the environmental area but also covering economic and social performance, including labour practices, human rights, society and product responsibility.

The paper identifies some key features of thinking by the United Nations Conference on Trade and Development, "A Manual for Preparers and Users of Eco-efficiency Indicators" (2004) and ongoing work on "Comparability of Existing Indicators on Corporate Responsibility". The UN approach is compared with that of the Global Reporting Initiative (GRI) in an exposure draft of the third generation of its Sustainability Reporting Guidelines (G3) issued in January 2006 and the voluntary guidelines "Environmental Key Performance Indicators – Reporting Guidelines for UK Businesses" (2006).

After summarising the advantages of using indicators to manage sustainability performance and the attendant limitations, the paper examines the extent to which these proposals are based on a conceptual framework, the range of impacts addressed and the detailed guidance provided as regards definition and compilation of the performance indicators. Reference is made to the need for credibility and the implications for providing independent assurance on the information.

Key features of environmental indicators are discussed within the following potential impact groups:

- **Emissions to air and contribution to global warming**
- **Water use and discharge**
- **Waste and emissions to land**
- **Materials use and recycling**
- **Energy use**
- **Biodiversity**
- **Environmental protection expenditure**
- **Impacts of products and services**

Performance indicators and the related criteria used for managing environmental impacts and for benchmarking enterprises are of increasing concern. Accountants in business have a major role to play in environmental performance measurement and interpretation of the information. The need for credibility raises challenges for the assurance function, due to the widely differing nature of indicators involved, the lack of consensus on their definition and presentation, as well as the absence of adequate controls over collecting the information.

These instructions give you guidelines for preparing abstracts for the EMAN Conference 2006. Use this document as a template if you are using Microsoft *Word* 6.0 or later. Otherwise, use this document as an instruction set. Define all symbols used in the abstract. Do not cite references in the abstract text

Product-Specific Environmental Information and Environmental Management Accounting

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***Abstract*: Relevant, available and un-biased environmental information is a necessity for any attempt to improve environmental performance of production or products, and for customers to make solid purchasing decisions. The PhD project "Towards Integrated Environmental Information Systems" investigates the preconditions for generating such information. One area of interest is to investigate how the concept of Environmental Management Accounting supports the generation of product related environmental information.**

***Keywords*: Environmental Information, Environmental Management, Environmental Information Systems, Environmental Management Accounting**

I. INTRODUCTION

There are obvious reasons for a company to manage environmental information about its production, products and services; simply for reducing business risk and finding the opportunities to maximise profit. This is achieved by adjusting production, products and services to the new rules set by authorities, nature and also the market and society. However, there are several known problems to environmental information management in companies. Ambiguous information, high time and cost consumption, low organisational memory, low availability and a poor product information flow are some of the problems that can be found [1-4].

The PhD project "Towards Integrated Environmental Information Systems" aims to contribute to increased knowledge about preconditions, problems and possibilities for environmental information systems in the industry, with a focus on life-cycle information.

II. METHOD

A literature review and one pilot field study at a flooring company have been completed so far, and more field studies are planned. One of the research questions for the completed field study was:

How is environmental information managed? Is it by simple routines, highly automated IT systems or other means?

III. PILOT STUDY CONCLUSIONS

The results from the study concluded that environmental information is only partly integrated in the studied company's IT systems. However, time, cost, quality and availability problems with environmental company related information were not identified. For product related information, the situation was however different. Product information was not updated when improvements were made in the production process, and contained average raw material data instead of data collected directly from the suppliers. The quality of product information could hence be questioned, and sales people also witness of a product information format that is hard to understand.

One possible explanation to this difference in quality and availability between site-specific and product-specific environmental information is that site-specific information is audited by both a certification body and the municipality, while the product information is not audited at all.

IV. FURTHER FIELD STUDIES

Further field studies will be undertaken in the project. Companies will be chosen with regard to complexity of products, size of company, level of internationalisation, degree of outsourcing, degree of regulation, relation strength in the product chain/web, position in product chain and environmental relevance.

V. ENVIRONMENTAL MANAGEMENT ACCOUNTING AND PRODUCT INFORMATION

One special area of interest is to investigate how the increasingly popular concept of environmental management accounting supports the generation of relevant, un-biased and available environmental product information. Is there a too strong focus on company related environmental information, or could the advances in company-specific environmental information constitute a benefit also for product information?

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Fostering Sustainability by Linking it with the Innovation Method TRIZ (Theory of Inventive Problem Solving) – Project Experiences

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***Abstract*: Project experience in linking sustainability, innovation management and the innovation method TRIZ (Theory of Inventive Problem Solving): Training and consulting models**

***Keywords*: Sustainability, Cleaner Production, Creativity, Innovation Toolbox**

In several projects in the last three years the Industrial Liaison Department of the University of Leoben, STENUM Ltd. and JOINTS - Joanneum Research together with Fraunhofer GmbH (Aachen, Germany), Creax (Yper, Belgium) and other partners have developed

1. A training course for sustainable development and the problem solving tool TRIZ (SUPPORT)
2. A consulting concept for the implementation of cleaner production measures through TRIZ-Tools and (PREPARE+)
3. A Tool-Box as a reference book for product development including Sustainable Development (INNOTOOL).

In these projects the main emphasis was the linking of the philosophy of a sustainable development and the theory of a systemic and a creative way of problem solving according to state of the art innovation management theory and using best practice problem solving techniques.

The training course SUPPORT was developed with 4 other European project partners as a Leonardo da Vinci project. SUPPORT consists of the following 7 modules:

1. Introduction module: Innovation & Sustainable Development
2. Cleaner Production Aspects for Products und Processes
3. TRIZ- Tools for Problem Analysis (Function Analysis, Ideal Final Result)
4. TRIZ- Tools for Idea Generation I (Innovative Principals, Contradictions)
5. TRIZ- Tools for Idea Generation II (evolution lines)
6. Evaluation Tools
7. Project Management.

Working materials like background papers, training presentations, videos and exercises for the respective modules are available. In 2004, the training course was tested with several companies in Austria, Estonia and Italy. In the context of a Leonardo Valorization Project, the course was presented in 5 other European countries. It will be launched as a regular course in Italy and Austria early in 2006.

In the Factory of the Future project "SUMMIT/ PREPARE PLUS", the existing cleaner production consulting approach of PREPARE was extended by introducing TRIZ-Tools for problem definition and idea generation (www.prepare.at). This approach now is used regularly by STENUM. The corresponding materials are available on the internet.

In "SME´s INNOTOOL", a toolbox for SMEs was developed, which serves as a reference book for product development (problem definition, idea generation and idea evaluation). Also in this project, predominately TRIZ-tools are used.

Moreover, many aspects and tools of sustainable development, of technology transfer and the generation of an innovation-friendly environment are involved. On the basis of some examples, the results of these projects will be presented (experiences from the trainings, experiences from stimulating solutions and processes in companies and concrete results in companies) and supported by videos. The results show

- that this novel approach broadens the spectrum of concrete measures which were identified
- that this approach can be the basis for structured, focused, effective innovation management providing a structurized conceptual framework and tools to generate a wealth of ideas for improvement
- that this approach identifies not only problems (as material flow analysis, energy analysis, environmental accounting, etc.) but systematically elaborates the ideal final result for products and processes in terms of a sustainable development, characterizes the innovation potential using 35 lines of evolution and identifies steps for improvement.

Innovative Concepts towards Sustainable Plant Protection

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***Abstract*:**
Chemical plant protection measures are economically useful, but entail ecological disadvantages. These are exposure during application, ingestion of pesticide residues by consumers, entry into the environment, and effects on non-target organisms. Therefore it is intended to reduce the risks by improving the pesticide application. Implementing plant protection as a service may make it more sustainable in terms of eco-efficiency.

***Keywords*: plant protection, eco-efficiency, service, sustainable use of pesticides.**

I. INTRODUCTION

Because of suspected risks to human health and the environment, the EU claims that concrete measures must be introduced to achieve a more sustainable use of pesticides. The Inter-University Research Centre and the Institute of Innovation and Environmental Management are undertaking several research projects to determine if plant protection measures can be created as service systems and whether they would include an eco-efficient benefit. In brief, eco-efficient service systems aim at reduced resource consumption, preserving benefit to the client.

II. PRACTICE OF PLANT PROTECTION SERVICES (INNOVAZID)

Focussing on Styrian farming, the project INNOVAZID surveyed how plant protection services are implemented [1]. Farmers in agriculture, wine- and fruit growing were surveyed, along with consultants and representatives of the farmer association.

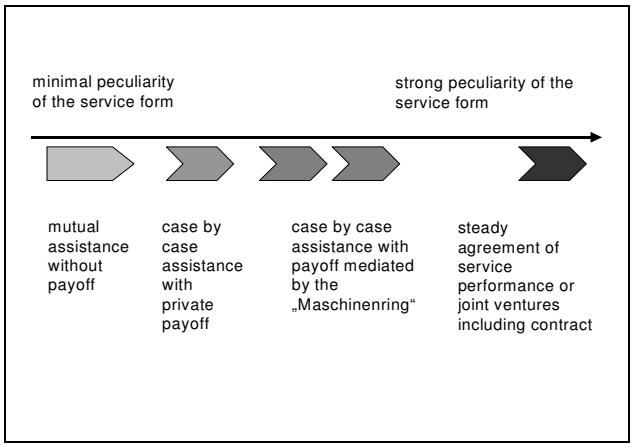

Figure 1: Characteristics of plant protection services as a result of INNOVAZID

III. IMPLEMENTING PLANT PROTECTION SERVICE IN STYRIAN WINEGROWING (SER-VINO)

In the project SER-VINO, farmers in the Styrian winegrowing areas were surveyed on how they perform plant protection and on whether they are willing to assign to a contractor the task of protecting their crops with pesticides [2]. Model calculations and case studies are being undertaken and will be provided to the target group to demonstrate the economic benefit. Field trials in small areas are also being undertaken; these are managed by the consulting service of the Styrian Chamber of Agriculture and a regional winegrowing farm.

IV. DEVELOPING A CONCEPT FOR A PLANT PROTECTION SERVICE (SERPLANT- PRO)

When developing the plant protection service, core questions such as insurance, assurance of quality and contract design have to be solved, since quality and safety are prerequisites when establishing pioneer applications. In the project SERPLANT-PRO – sponsored by the Austrian Program on Technologies for Sustainable Development – the participants aim to analyze and demonstrate how the service system “plant protection” can be implemented, to identify barriers, and to determine which stakeholders are interested in the concept. The provincial focus of INNOVAZID is also being broadened to include the whole of Austria. Key research questions are: Who are the important stakeholders, including promoters and opponents? How can information channels be designed? How can issues of liability and insurance be resolved? Who can be pioneers?

V. CONCLUSIONS

Plant protection is performed as a service to farmers, but often it is often regarded as mutual aid. That is, clients retain their own machinery and the suppliers are not able to earn a significant income from this service. Despite this, a few examples were found where this service could be characterized as a regular or long-running cooperation. Projects are now being undertaken to investigate the prerequisites for such a service being strengthened on a broader basis and becoming more eco-efficient.

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Chemical management services: safeguarding environmental outcomes

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Every year hundred of new chemicals are being developed and introduced to the market. The life cycle impacts of these chemicals on our health and the environment are not always known. Therefore, reducing the amount and volume of chemicals in use can be seen as one of the options for reducing associated environmental impacts. Chemical management services (CMS) has been seen by environmental experts as a business strategy that may allow reduction of volume of chemicals sold, while keeping the suppliers profits from chemicals use up. In practice, CMS are based on a strategic, long-term contract, according to which the supplier of chemical management services accepts the responsibility for managing chemicals and strives to reduce the associated costs and risks. The goal of this paper is to investigate whether CMS always lead to reduction of associated costs and risks by improving environmental profile of managing chemicals and how the environmental improvements can be safeguarded by CMS customers and providers. The paper will draw on experiences with implementing CMS in automotive companies in Europe and on interviews with European CMS providers.

New approach to environmentally oriented product development in the pulp and paper industry

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***Abstract*: This paper presents a new procedure developed for environmentally oriented product development, especially for paper and board products. The procedure combines principles of ecodesign and customer oriented product development. It aims to transform qualitative expert information to an explicit form suitable for industrial decision-making.**

***Keywords*: Paper industry, product development, ecodesign.**

I. INTRODUCTION

Life cycle approaches have become increasingly important in environmental management and in the European environmental policy [1] in the recent decades. In the field of product development various approaches, such as *design for environment* (DFE), *ecodesign* or *environmentally oriented product design*, include also life cycle thinking. These approaches aim usually at efficient material use; minimized energy consumption; improved recyclability; optimized product life time; and minimized use of environmentally harmful substances [2]. From the paper industry's point of view, many of these approaches are unfeasible because they are developed for parcelled goods. As paper and board are bulk products, which are used as raw materials for other goods, they cannot be developed without affecting the production process. Therefore, an objective of an ecodesign approach should be to define the effects of planned product development actions on the emissions from the production process. For this purpose a new procedure was developed. This paper presents the developed procedure and results from a case study.

II. NEW APPROACH TO PRODUCT DEVELOPMENT IN PAPER AND BOARD INDUSTRY

The developed procedure [3] combines principles of ecodesign and customer oriented product design. A key principle in the development of the procedure was to find instruments to transform qualitative expert information to an explicit numeric form which can be utilized in industrial decision-making. The product development procedure consists of four stages that are described in the following.

A. Definition of the customer requirements

The first stage of the procedure is to collect customer requirements. This is done in a structured workshop with the customers or end users of the product, such as brand owners and retailers. The workshop produces a list of desired product properties and prioritizes them.

B. Specification of product properties to be improved

In the second stage the customer's qualitative voice is transformed to quantitative form using the QFD (*Quality Function Deployment*) method [4]. In this stage, the product properties that respond to the customer needs are defined, and the unit operations of the production process affecting the critical product properties are specified.

C. Definition of development actions and their consequences

The third stage of the product development procedure is to define the environmental burden caused by the planned development actions. The method here is *Life Cycle Inventory* (balance) calculation. The case study concentrated on energy and raw material consumption and air emissions, and the calculations were based on KCL EcoData [5].

D. Assessment of the results in decision-making

The effects of the product development actions can be compared using two optional functional units. In other words, the changes are calculated either per ton of board or per constant number of packages. These two approaches lead to different results, which can be seen in figure 1.

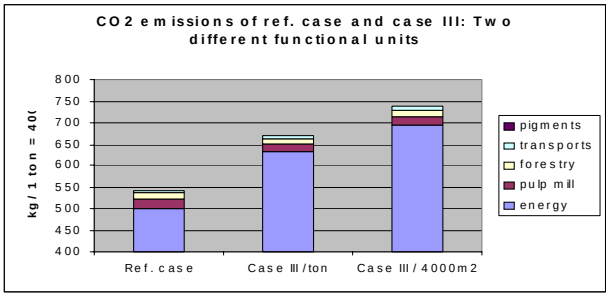

Figure 1: CO2 emissions compared with two different functional units.

III. CONCLUSION

A new approach for environmentally oriented product development of paper and board products was needed because the development of the product presumes changes in the production process. The former ecodesign approaches do not cover such applications. The procedure was developed in a case study on paperboard packaging but due to its generic nature, it can be applied also to other paper products. An advantage of the procedure is that it integrates competence from the different parts of the supply chain. It also provides explicit information for decision-making by transforming the qualitative customer information to a more feasible numeric form.

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Sustainability Monitoring for the Coffee Supply Chain

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***Abstract*: To support sustainable development in the global coffee supply chain a monitoring process is proposed to manage this challenge.**

***Keywords*: Sustainability, Monitoring, Resource Dependent System, Coffee Supply Chain**

I. INTRODUCTION

When we talk about sustainability today, it is due to the fact that the actors (e.g. in the coffee business) discovered that the resources they rely on are not necessarily available in sufficient quantity [1]. Thus, a sustainable coffee supply chain is a resource dependent system that maintains its material and immaterial resource base by constantly investing in the reproduction of its indispensable resources.

II. PROBLEM STATEMENT

The economic rationality of sustainability opposes the prevailing economic rationality of efficiency. To consider both rationalities in decision making the contradiction between efficiency and sustainability needs to be managed. Our approach for handling this contradiction is based on monitoring decision making processes in the coffee supply chain. We take coffee, the most traded growing commodity worldwide, for showing how to solve social, ecological and economical problems in resource dependent systems.

III. THEORETICAL FRAMEWORK

The resource perspective is used in management literature because enterprises noticed that resources (e.g. human resources, natural resources etc.) which are elementary for achieving organisational aims became absolutely scarce [2].

As long as this scarcity wasn't observable, it was possible for enterprises to concentrate on the efficient utilization of their obtained resources. The understanding of an enterprise as a value creating system needs to be extended with the concept of an enterprise as a resource dependent system [3].

The implications of both economic rationalities (the rationality of efficiency and the rationality of sustainability) should be found in different concepts of economical success. Enterprises must do both at the same time: succeed on the market and preserve their own economical, ecological and social resource base. To manage this challenge one promising approach is to structure the process of achieving one's aims in sequences. To realize a balance of aims the decision process needs to be monitored [4].

IV. CONCEPT OF A MONITORING PROCESS

With a monitoring process decisions of the coffee supply chain can be made visible. It is not only necessary to consider the different dimensions of sustainability (i.m. ecological, economical and social dimensions) but also the system stabilizing impacts [5]. These are distinguished by saluto genetically impacts (strengthen the ability of problem solving) and patho genetically impacts (reducing negative effects) [6].

The monitoring process has to be initiated and legitimized by a diverse network that represents as many actors as possible of the coffee business (e.g. NGOs, industry, farmers). The constitution of a council is thus required for managing the monitoring process. With the license to operate the whole net this council is able to give an overview of the sustainable development of the coffee business [7].

V. CONCLUSION

We present an approach to handle the contradiction between the two different economic rationalities by monitoring the balance of ecological, economical and social aims. In the full paper we will consolidate our theoretical framework with regard to system theory and a discourse to managing contradictions. Furthermore we demonstrate the need for a new understanding and working of NGOs (e.g. concerning their license to operate). Finally we will present an exemplary monitoring process for the coffee supply chain.

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Stochastic models of air pollutants spreading as the method of emission amount management allowing elimination of high pollution concentrations in ecosystems

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Abstract: **The problem of air pollution is the main problem of industrial regions such as Silesian province in Poland. The paper presents the methods of forecasting the concentrations of air pollutants in base of the data collected from monitoring stations. These forecasting models take into consideration many random variables, including also the influence of pollution being transported from neighbor regions.**

***Keywords*: air pollution, regressive models, adaptive models, pollution forecasting.**

I. INTRODUCTION

Poland is the country, which southern region is particularly exposed on harmful effects of heavy industry activity. Mainly Silesian Province as highly urbanized region, which is basin of industry, where many mines, power plants and mineral processing plants are localized is the region of high pollution. Currently, system of automatic monitoring stations is localized in whole area of the country, from which 16 is localized in Silesian Province [1].

The harmful influence of air pollutants of peoples health condition was proved [2]-[3]. The data collected from these stations make possible to construct statistical models allowing prevention against high pollution concentrations levels. This paper shows the possibility of their application.

II. MAIN CONTENTS

The paper includes many variants of statistical modeling based on SO_2 concentration. Practically, there are two ways of pollution spreading mathematical modeling. The first one is one basing on convection and diffusion phenomena equations, emission sources characteristics, temperature gradient, wind, surface characteristics etc. The second one base on connection of mean pollution concentrations with weather conditions from the researched area in certain period of time (so-called stochastic models) [4]-[5]. Authors concentrated on regressive modeling. First one is model based on parabolic character of SO_2 pollution dependence on temperature and wind velocity.

$$SO_2(t) = aSO_2(t-1) + b(T-T_0)^2 + c(v-v_0)^2 + d \qquad (1)$$

Second one takes into consideration the aspect of autocorrelation of concentrations [5]. But the best solution for modeling such phenomenon as air pollution is adaptive modeling. The methodology of this kind of models is the basic technique of neural networks. Generally, it is assumed that atmosphere forecasting model is in form:

$$\hat{y} = f(\mathbf{X},\mathbf{C}) = \sum_{j=1}^{k} c_j \varphi_j(\mathbf{X}) \qquad (2)$$

If we apply the new set of data, the coefficients C will also change. So the new data adapt to the already existing model [6]. The authors proposed this kind of solution for the Silesian cities Bytom and Katowice.

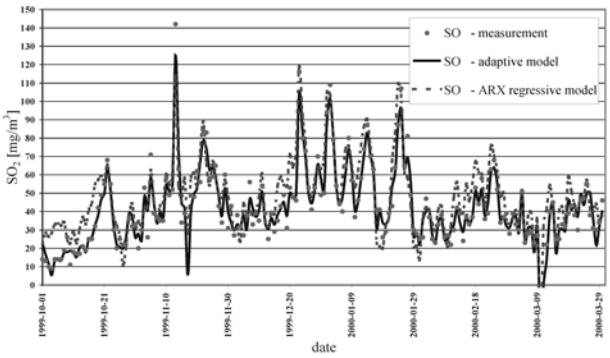

Figure 1: Regressive and adaptive model curves for Katowice

III. CONCLUSION

This approach to models may allow to interpret their coefficients and models itself in context of pollution transportation or searching for a method (rules) of pollution spreading in highly urbanized areas.

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Energy Savings: Persuasion, Performance and Persistence

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Abstract: **In this study, architects, the sponsoring utility and the energy simulation specialist joined together to evaluate the persistence of energy savings through a Design Assistance Program. The primary question was, "when decisions are made with the help of rigorous analysis in a whole building design process, do the savings persist, or do several years of operation alter the performance of the integrated systems in the building?" To arrive at the answer, three projects—a college library, a municipal transportation facility, and a hospital—are used as case studies.**

Keywords: **Case-Study Verification, Installation, Monitoring**

I. INTRODUCTION

To define a method for comparison, design simulation and metered performance data were analyzed for specific energy-saving strategies. This paper provides a background overview of the basis of selection of the three projects, the energy design assistance methods employed, the savings expectations, and the decisions made throughout the process. For each case, design characteristics, modeling assumptions, selected strategies and actual metered performance are outlined.

In this evaluation, with three case studies, we find evidence of appropriate levels of energy conservation, but not of the absolute values predicted. In each, the discrepancies between modeling assumptions and final operating procedures are identified, evaluated and rectified. The paper illustrates that while owners are saving energy, they are not always consistently getting the full savings potential for what they install.

The paper concludes with a reexamination of the overall process and suggests improvements and changes. It evaluates the uncertainty of savings of individual technologies related to utility incentives.

II. DIFFERENTIATING INFLUENCES

The building design and construction market is a highly differentiated and fragmented marketplace that is both heavily regulated and burdened by social customs. Its complexities are easily underestimated, making performance outcomes and expectations difficult to influence and manage. Four common approaches to exerting influence in an effort to transform markets are: code enforcement; teaching "advanced" practices though workshops; promoting efficient components through rebates and; Energy Design Assistance (EDA). The influence exerted and expectations set by each approach vary, as does the ability to verify their efficacy and manage end user satisfaction. The EDA process sets a higher expectation of performance and verification than other options.

III. RESULTS

The team identified eight possible projects based on a range of criteria including age, building type, market segment and interest of the building owner. Three projects were chosen for an extended energy performance verification and validation study. In order to qualify, each project needed to have been completed and operated for at least one year, be new construction, and have clearly identifiable energy metering. We identified two owners whose perceptions of their building performance were not completely satisfactory based on their expectations. The best candidates were a hospital, a transit facility, a public/private venture office building, and a college library.

All projects incorporated strategies selected through the EDA process. As expected, not all implemented them fully or operated the building as expressed during the design process. The library did not require an adjusted or as-built model to rectify differences. Predicted and actual savings have remained close the 1998 estimates. The worst kWh prediction in six years was 3%.

For the transit facility, an as-built model was required to account for some design and operating changes. Once completed, it predicted savings performance in peak kW and gas consumption within 10% and 4% respectively.

For the hospital facility, where the owner was least satisfied, an as-built model was also required. There were more extensive adjustments to the model in this case. Once completed, the predicted savings performance in peak kW and kWh consumption were within 3% and 5% respectively.

Ultimately each project showed a persistent savings due to the energy conservation measures they selected as part of the EDA process, although it became clear that for some projects the savings results were not at all clear to the owners because they had been obscured by other decisions and activities.

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The work presented here is original. There are no external bibliographical sources. Elements of this work have been presented within the following contexts:

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[2] "Performance Persistence," presented at the International Energy Program Evaluation Conference, August 18, 2005, New York, NY
[3] The Energy Assets[SM] Program and The Minnesota Design Community: Trends in Co-Evolution," presented at the European Council for an Energy Efficient Economy (ECEEE), June 2001, Mandelieu, France

Efficiency Engineering – Requirements for Tools from Industrial Practice

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***Abstract*: The presentation provides insight into industrial practice of effciency engineering. It'll show tools that are used successfully to improve the effciency of production systems, but also what type of hurdles are observed, that hinder that promising measures are put into practice finally.**

***Keywords*: Efficiency Engineering, Eco-Effciency, Material Flow Management, Organisational Learning.**

I. Introduction

Environmental Management Accounting helps to discover which activities of an enterprise contribute most to consumption of resources, which cause the most costs and environmental impacts and also helps to keep track of changes. This can be a starting point for efficiency engineering. Improvements in complex production systems are found and put into practice by innovative and creative process engineers. What kind of information and tools do engineers use to find improvement potentials of production systems, how do they communicate their finding to the rest of the company and how are changes put into practice?

II. Drivers for Efficieny Engineering

Environmental legislation, rising prices for energy and raw materials provide the basic motivation for all activities related to process improvements. Instruments like Enviromental Management Accounting or Material and Energy Flow Analysis provide systematic approaches to handle the complexity of production systems. Environmental, economic and social indicators are used for documentation, decsion-making support, but also for internal controlling.

III. Efficiency Engineering in Practice

Companies from a variety of industrial sectors with complex production systems create from the challenges brought by rising costs for ressources and strict environmental legislations copetitive advantages by effciency engineering. From an organisational point of view efficiency engineering is carried out as an internal service from a group of experts who have the experience and the knowledge to create a comprehensive solution.

The expertise required for efficiency engineering includes methodological know-how, communication skills and a comprehensive understanding of the production system of the specific enterprise or the respective industrial sector. Methodological know-how refers as well to know-how about accounting approaches, as to modelling approaches. Additionally the handling of modeling tools to create a model of the production system is required. One important use of such tools is their application for scenario analysis of alternative technology options and measures. Another relevant function is to create visualizations of production systems including the discovered improvement potentials. Material- and Energy Flows are visualized as well as costs.

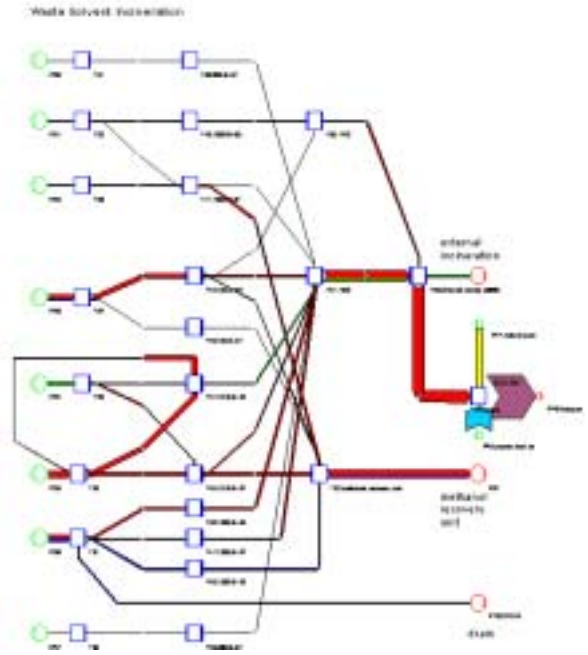

Figure: Visualization as Sankey-Diagram by Ciba® Expert Services

Not all solutions found through efficiency engineering are technological innovations; often a change of behavior of the staff, a different handling of a certain production step is required.

IV. Training for Change

Both types of innovations, technological or organisational innovations and changes require training of the involved staff. Especially with non-technology innovations like changes in behavior, efficiency engineering solutions often face the hurdle that the "old" behavior is very persistent. Certainly this also depends of the company cultural, but how to create a climate of change to put innovations in to practice on all levels of the company. Key factors are transparency of decision-making processes and know-how transfer at least on a rough level by the efficiency engineering experts. Tools and training concepts to support this know-how tranfer are currently developed.

Environmental Accounting at the Corporate-Level

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Abstract: **The paper focuses on selected problems of environmental accounting at the corporate-level. As a key term, environmental cost is identified. There are many barriers to take into account environmental costs and evaluate environmental benefits. (it is quite difficult to identified EC and..) Contemporary results of the research in this area in the Czech Republic and abroad are discussed. The role of companies, especially small medium/sized enterprises (SME), in sustainable development and their informational support is mentioned.**

***Keywords*: environmental accounting, environmental management system, external costs, environmental information**

I. INTRODUCTION

Historically first studies of environmental/ecological accounting began with corporate level approaches in 70's years of the last century (Müller-Wenk, Ullmann, later Schaltegger and many others). The development of research activities was encouraged by requirements of newly implemented systems EMS/EMAS and in connection with regulation of IPPC and TRI information systems in the last years.

II. ONE PAGE ABSTRACT

The concept of sustainable development creates a new space and possibilities for entrepreneurship. New legal measurements from the government regulate activities of companies not to get environment worse and determinate certain framework for long-term prosperity. On the other side, strategy of sustainable development creates important opportunity to increase competitiveness by respecting the environmental protection as one of the strategy aims and enforcing principles of sustainable development to all activities of the company.

The green entrepreneurship develops many tools for management decisions making. [Bleischwitz, R; Hennicke P, p. 120] differentiate these tools according to the types of focus (analytical tools, tools for action, tools for communication) and areas of focus (green entrepreneurship/ environment, efficient entrepreneurship/economic and environment and responsible entrepreneurship/social, environmental and economic).

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Life-Cycle Based Sustainability Assessment of Products

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Key-words: Sustainability, Life Cycle Assessment (LCA), Life Cycle Costing (LCC), Social Life Cycle Assessment (SLCA), Products, SETAC

Sustainability - a term originating from silviculture, which was adopted by UNEP as the main political goal for the future development of humankind - is also the ultimate aim of product development. It comprises three components: environment, economy and social aspects which have to be properly assessed and balanced if a new product is to be designed or an existing one is to be improved. The responsibility of the researchers involved in the assessment is to provide appropriate and reliable instruments. For the environmental part there is already an internationally standardized tool: Life Cycle Assessment (LCA). Life Cycle Costing (LCC) is the logical counterpart of LCA for the economic assessment. LCC surpasses the purely economic cost calculation by taking into account hidden costs and potentially external costs over the life cycle of the product. It is a very important point that different life-cycle based methods used for sustainability assessment (or life cycle management (LCM)) use the same system boundaries. This is not trivial, since in economy the "life cycle" of a product is often defined in a different way compared to LCA. The social aspects of sustainability have not yet been adequately described in terms of sustainable life cycle management.

Finally, once the methods for economic and social assessment will be developed, the most promising ones should be standardized by ISO. As in the case of LCA, it is planned to “pre-standardize” LCC by SETAC in the form of a code of practice. “Social Life Cycle Assessment” (SLCA) is still a research topic, but first results are beginning to emerge. The working environment is likely to be an important item in SLCA of products (including services).

An Example for Sustainable Removal of Ammonia From Anaerobically Digested Cheese Whey

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***Abstract*: The removal of NH_4-N by struvite precipitation from the supernatant of the anaerobic digester decomposing cheese whey was studied under varying concentrations of NH_4-N and PO_4-P. The results indicated 68% removal was possible.**

***Keywords*: nitrogen, struvite, precipitation, cheese whey.**

I. INTRODUCTION

Struvite precipitation is a recognized problem in anaerobic digesters. Struvite deposits predominately occur at locations where CO_2 is stripped from the solution with a corresponding increase in pH [1,2]. On the other hand, the process can be turned to be beneficial, because struvite has a composition of $MgNH_4PO_4.6H_2O$, which can be used as a valuable commercial fertilizer in agriculture [3,4]. For example, if the removal of dissolved N and P via struvite precipitation is achieved in the digesters, the quality of the anaerobic sludge can be increased in addition to the resolution of the struvite deposition problem observed.

II. PURPOSE

This study is composed of the evaluation and discussion of the preliminary results on N and P removal in the effluent of an anaerobic digester decomposing cheese whey by struvite formation. The purpose of the research is to investigate and determine the conditions to form struvite in the supernatant of the anaerobic digester.

II. EXPERIMENTAL

The composition (COD, SS, VSS, TS, NH_4-N, PO_4-P, Mg^{2+}, pH) of the supernatant from the anaerobic digester is determined and initial Mg:N:P molar ratio is reported as 1.0:33.7:1.4. Since the concentrations of Mg^{2+} and PO_4-P were inadequate to form struvite in the system, different concentrations of Mg^{2+} and PO_4-P were added into batch reactors to test the struvite formation. The struvite precipitation was confirmed by measuring the decrease in NH_4-Nand PO_4-P concentrations after the equilibrium was established in the reactors.

III. RESULTS

The experimental results of this study indicated that (1) the struvite precipitation can successively be used to remove NH_4^+-N from the anaerobically treated cheese whey, (2) NH_4^+-N removal was highest (%68) when the Mg:N:P molar ratio was 1:1:2, and (3) the percent NH_4^+-N removal increased from 44 to 68% by increasing the initial pH from 7 to 10 for the Mg:N:P molar ratio of 1:1:1. This indicated that if initial pH control was adopted for the Mg:N:P molar ratio of 1:1:2, NH_4^+ removals more than 68% would be achieved with struvite formation as a product.

IV. CONCLUSIONS

There are different studies indicating that a controlled struvite precipitation can be used to treat the wastewaters containing high levels of nutrients [5,6,7]. The potential of struvite precipitation during the anaerobic digestion of cheese whey was investigated in this study to remove NH_4^+-N and promising removal efficiencies were observed experimentally confirming the results in the published literature.

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OVERVIEW OF THE ROMANIAN RENEWABLES ENERGY USE

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***Abstract*: This paper realises an overview of the renewables energy potential and use in Romania. Authors are professors at University Politehnica of Bucharest, Energy Faculty, involved in the field of clean energy production. All kind of sources are investigated for giving a complete picture of the present situation: solar, geothermal, biomass, wind, small hydro.**

***Keywords*: renewables use and potential**

The use of renewables is the right answer against the Climate Changes. Every country intents to increase the use of renewables, but there are still many step to do forward in this field. As a transition country, Romania has started an official programm to developpe more the green energy production.

This paper presents an overview of the Romanian realised projects, but also a presentation of the potential to be exploited. Incentives and fences on the green electricity market are described, with considerations about the impact of renewables on the classic sources (coal, natural gas, etc).

Romania has an important amount of wood waste to be convert in energy. Small and local projects are already realised, but the first big plant (steam turbine) is in construction phase. An interesting analyse will be presented, as a result of a research project.

Wind turbines are also presented, but big projects are still available for potential investors. Short comparasion with Bulgarian situation will draw a road map to be consulted in this field.

Geothermal is already intensively used in Romania, not for electricity but for heat production. Few projects will be presented and economics are discused.

Small hydro potential is still unexploited enough. How much cost to produce green energy from water in Romania and what an investor can do for making money are questions with answers in the article.

The presented information will be uselful for the EMAN 2006 participants for having an image of bussines potential in renewable field in Romania. Once our country accepted in EU structure, these projects could be realised and the benefits could be shared.

The authors are professors at University Politehnica of Bucharest, Energy Faculty, in the renewables use for energy field. They have participated as consultants to many green energy investments in Romania and they have a good experience for implementing energy projects.

Designing and Monitoring a Zero-Energy-Building

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Abstract: **The Science House at the Science Museum of Minnesota is an example of habitable, cold climate architecture that is also a net zero energy building. The team used comparative analysis to resolve design conflicts at the intersections of functionality, aesthetics and performance. We began by significantly reducing annual energy consumption starting with expectations of use and architectural form. Ultimately, renewable generation was added. Two years of continuous monitoring demonstrates the resulting building—using passive solar design, daylighting, ground source heat pumps and photovoltaic (PV) panels as the major design strategies—has more than met its goals.**

Keywords: **Zero Energy, Verification, Monitoring**

I. INTRODUCTION

The challenge of the Science House at the Science Museum of Minnesota was to create habitable, cold climate architecture that would result in a zero net energy building. The defining question became “how much building and power generation can we build within a fixed budget?” This question changed the nature of the design process.

The paper documents the design process, predicted energy use and actual monitored performance. It shows the extent of load reduction achieved with passive solar design. A challenge for getting to "real zero" is the difference between expected performance and actual building performance; this paper illustrates how measured data is used to trace these differences to unexpected equipment performance, heat pump behavior and off-line PV panels.

II. GOALS AND PROCESS

The process outlined below was used to help determine how to design the building to achieve the desired zero net energy results for the Science House.

- Serve as a dynamic working model for energy efficiency and renewable energy for 50,000 annual visitors to the Science Park
- Serve as a beacon for the Science Museum’s environmental initiatives
- Serve as an interpretive centre for environmental programming
- Serve as headquarters in a landscape that inspires imagination, teaches Earth-systems science, and connects people to their natural and built environments
- Demonstrate integration of building design concepts with state-of-the-art energy efficiency and renewable energy features.

The first task became assessing the potential for energy conservation by addressing programmed areas, interpretive programming activities and technologies, and comfort and control expectations. Next was an assessment of generation technologies including photovoltaic, wind, micro turbines and fuel cells.

III. FINDINGS

Regular and incremental comparative analysis related to energy and environmental performance was required to maintain the overall goals for a net zero energy building in the face of design and aesthetic interests.

Though all of the products and technologies specified are readily available, “off-the-shelf” items, design specifications and/or the expectation of tradesmen who bid the job led to more construction coordination than expected for a project of this size.

Assumptions regarding occupancy and building use during the design phase often differ from their actual use; this makes operating a building for net zero energy an additional challenge above and beyond designing one.

IV. RESULTS

Overall, the actual building is exceeding the design team’s goals, using on average of 59 kWh/m2 annually and generating 80 kWh/m2 to exceed even the net zero energy goals.

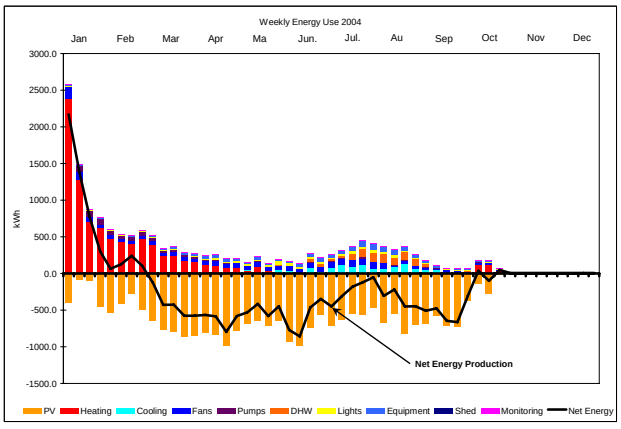

Figure 1: Monthly Energy Production/ Consumption.

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The work presented here is original. There are no external bibliographical sources. Elements of this work have been presented within the following contexts:

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[2] "The Little House that Science Built: Energy Modeling and Design Strategies for Science House," Specifics, Winter 2004

[3] Jason Steinbock, et. al. ECEEE 2005 “Getting to Zero: Experiences of designing and monitoring a zero-energy-building: The Science House in Minnesota”

Examining Trading Areas and Sites of Biomass District Heating Systems as a Tool for Municipal Energy Planning

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***Abstract*: Especially in a country like Austria where forests cover almost 50% of the countries surface, an enormous resource stock for energy production is available under sustainable conditions. An efficient and environmentally friendly technology to utilize this CO_2-neutral energy source is biomass district heating. The aim of this article is to introduce a user-friendly method to check the feasibility of biomass district heating systems in municipalities by using a Geographic Information System.**

***Keywords*: biomass district heating, municipal energy planning, local energy demand, heating plant sites.**

I. INTRODUCTION

One of the most efficient methods to mitigate negative environmental effects of energy supplies is the use of renewable energy sources like forest biomass. In Austria the potentials of renewable energies are quite high, applying a balanced energy mix between different renewable energy carriers combined with energy saving measures, a renewable energy supply would be achievable [1]. To promote the dissemination of biomass district heating or combined biomass heat and power systems, we propose a methodology to check the feasibility of biomass district heating systems in municipalities by using a Geographic Information System (GIS).

II. METHODOLOGY

The methodology aims at showing those areas that can be provided with energy from a subsidized biomass district heating system. Furthermore, those locations are defined that are most suitable for the construction of a district heating plant. The method consists of three steps:

1. Identifying the energy demand in residential and commercial areas.
2. Determining the district heating grid.
3. Proposing alternatives for a site of the heating plant.

III. CASE STUDY ST. GEORGEN AM WALDE

The applicability of the method is demonstrated on the municipality of St. Georgen am Walde. This village is located in Upper Austria, north of the Danube about 50 km away from the Provincial Capital Linz. It is a typical rural municipality with an extent of 53.56 square kilometers and about 2,250 inhabitants.

From the calculation of the energy demand for households and companies results that if all buildings were connected to the district heating grid, a total energy demand of about 5,300 MWh per year would have to be supplied by the biomass district heating system. The total nominal capacity of the buildings would amount to 3.5 MW.

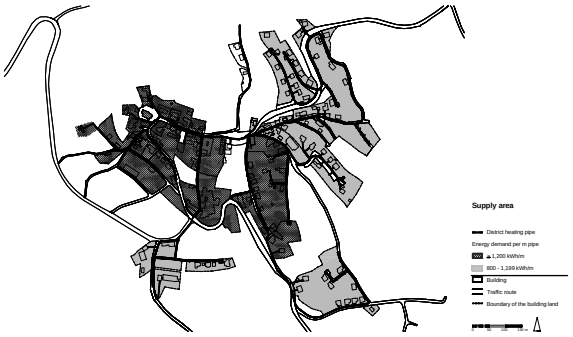

Figure 1: District heating grid and supply areas in St. Georgen am Walde. [2]

As shown in Figure 1, the supply areas and the heating grid could be located. Furthermore, two alternative sites are proposed as result of the method. In the following, the applicability of the method, the strenghts and weaknesses are discussed.

IV. CONCLUSION

Biomass district heating systems are an important tool to improve the environmental performance of municipal energy supplies. Although the technology is fully developed and subsidies are granted for building such systems, the potentials are still not fully tapped and the spreading of such systems especially with combined heat and power production should be much wider disseminated.

The introduced method is suitable for supporting decisions in municipal energy planning processes that aim at increasing the supply with renewable energy. The proposed method guarantees that with relatively low efforts the feasibility of biomass district heating systems can be surveyed efficiently. Therefore, this method can serve as a tool to promote the dissemination of these environmentally friendly energy supply systems.

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Environmental Performance Evaluation of Textile Wet Processing Sector in Turkey

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Abstract

By now the prominence of sustainable development is recognized by almost all developing countries. Today, traditional pollution control strategies are being replaced by the preventative approaches. Environmental performance evaluation is an important tool to determine the potential cleaner production opportunities. Appropriate Environmental Performance Indicators (EPI) are key elements to review, monitor and evaluate environmental performance. They are developed to promote Cleaner Technologies and improve environmental and economical performance. Turkey is among the candidate countries of European Union and currently in accessing process. During the accessing process Turkey has to adopt EU directives, form an environmentally sound approach and a new environmental policy to reduce environmental impacts at the source. However there is lack of information on the Environmental Performance concept and the tools used to evaluate environmental performance in Turkey. Therefore, this research has been undertaken to develop and apply the sector specific EPIs to be able to determine the current environmental performance level of textile sector in Turkey.

To this purpose, site visits were conducted and the necessary data were collected. After evaluating the enterprises based on the common processes, the potential EPIs were defined. Then the most representative EPIs were selected by considering the common processes of four enterprises with different sizes. By considering these EPIs the environmental performance of these four enterprises were evaluated. As a result of this study, environmental performance data for textile sector was obtained. The outcomes of this study could form as a base to identify areas of improvement and setting targets in textile sector to improve the environmental performance in Turkey.

Keywords: Environmental Performance; Environmental Indicator; Cleaner Technologies

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The economic aspects of Zero Emissions Processes

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Abstract:
Environmental accounting is an important tool for supporting the application of cleaner technologies. The new approaches in preventative environmental protection are Zero Emission Technologies and Production Systems (ZETS) that aim at the prevention of wastes and emissions rather than seeking to minimize them.
ZETS will only be successful if they are economic, since one cannot expect legislation in that direction in the next years. ZETS will only be economic if they add new aspects to environmental accounting through the complete elimination of cost categories.
The paper deals with this aspects and from a theoretical point of view based on real projects in Austria within the research program "Factory of the Future".

***Keywords*: Zero Emissions, factory of the future, environmental accounting, zeroizing**

I. INTRODUCTION

A short look back to the last two decades of environmental protection shows that the approach of applying end of pipe technologies reduced air and water pollution significantly. But this approach was expensive and has lead to an increased use of materials and energy.

In the early nineties, the approach shifted towards preventative solutions (Cleaner Production, Waste Minimization, Eco-Efficiency, Integrated Pollutions Prevention and Control/IPPC,…). With this approach, emissions should rather be prevented than treated. Mainly large companies could report success stories, but there are also many successful projects in SMEs. Now also WIN-WIN situation could be found, where costs and emissions could reduced at the same time.

In order to proceed further from environmental protection to sustainable development, a completely new approach has to be chosen. Not "doing things better", but "doing better things" has to become the guideline. So will an improved situation regarding traffic not be achieved through better cars, but through a new approach to meet the needs for mobility of people, goods and information.

Seen from the systems theory point of view, a shift has to be done from the

- level of repair (e.g. installation of a catalyst at the end-of-the-exhaust pipe) through
- optimization on the sub-systems level (eco-efficiency = design of a 3-liter car) and through
- optimization on the system's level (redesign of transport systems) to
- optimization on the meta-system's level (questioning he need for mobility)

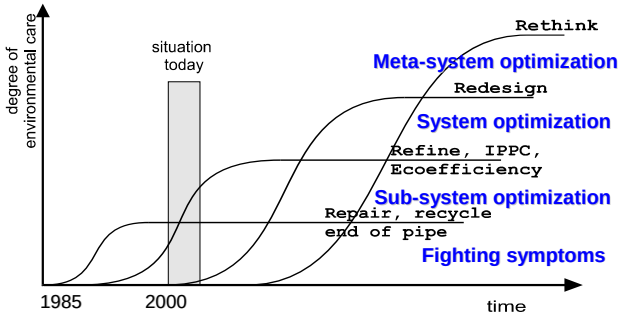

Figure 1: A redesign of services is needed to obtain a further development towards sustainability.

Zero Emissions Techniques and Systems are not the result of a continuous improvement of integrated pollution prevention.

ZETS

- are innovative new technologies and systems in which all inputs
  - are used in the final product or
  - are converted into value-added inputs to other processes.
- have the potential to simultaneously:
  - meet expanding material and energy demand
  - solve critical environmental problems
- address energy safety and security issues; and
- reduce the costs of sustainable development

ZERO is used in different meanings by different authors. Depending on the aim of a project and the target group, many definitions can be found.

The total avoidance of environmental technologies has a number of influences to the accounting system. While waste minimization reduces the costs according to the percentage of reduction, approaching ZERO gives a sudden change due to the complete elimination of costs for infrastructure. Closing water cycles completely not only saves costs for water but more than that, the investments for the connection to the drainage system is zeroized. It is like with minimum energy houses, where while adding more insulation a reduction of investment costs is achieved in that moment, when the installation of a chimney, a boiler and an oil tank is not necessary any more.

Since a ZETS solution is always linked to the socio-economic system, the approaches have to be evaluated in relation to the specific socio-economic environment. There is no ZETS system that can be transferred from one situation to any other – only the principle is of general value.

Corporate Sustainability Accounting: Catchphrase or Decision Support?

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Abstract: "Sustainability accounting" and related terms (such as "sustainability management accounting" and "sustainability financial accounting") are being used with greater frequently at academic conferences and in corporate practice. This raises the question of the relationship between accounting and sustainability and the role of accounting for sustainability, as well as what could be understood by sustainability accounting.

This contribution reviews the literature on the corporation and sustainability accounting and distinguishes between different views when dealing with this topic. In addition, different approaches towards the further development of sustainability accounting are discussed.

Keywords: sustainability accounting, environmental management accounting, corporate sustainability

"Sustainability accounting" has become a term used with greater frequency at academic conferences and in corporate practice.[1,2,3] However, review of the literature reveals a blurred picture of what is covered by this and related terms, such as "sustainability management accounting" and "sustainability financial accounting". Few definitions of sustainability accounting exist, even in papers which include the term in their titles. Also, in the context of discussions about the related notion of sustainability reporting, sustainability accounting has, in the main, not been conceptualized. At best a vague description can be found of what is expected from sustainability accounting. In most cases sustainability accounting is just used as another term for environmental accounting or environmental reporting. Although a framework for environmental management accounting (EMA) exists [4], and although EMA is part of sustainability accounting no conceptual framwork for sustainability accounting has been proposed, so far.

This picture raises a number of questions such as:

- What is implictly understood by the notion of sustainability accounting in the literature and in corporate practice? Is the term and the attention it gains the basis for a philosophical debate about capitalism and world philosophies in general? Is it part of the processes of and attempts to realize a sustainable economy and society and thus seen as a logical consequence of corporate challenges which management should address?
- What could be understood by sustainability accounting in the light of movements towards corporate sustainability and what is the goal of establishing sustainability accounting systems?
- What paths for and approaches to the development of a corporate sustainability accounting system make sense from the perspective of management?

This paper focuses on the role of sustainability accounting as an approach to help support management improve corporate sustainability and responsibility. After the examination of two fundamental views, related to the philosophical debate and the management approach, the paper discusses the role of sustainability accounting in corporate responsibility and reasons for its introduction. The paper then deals with interpretations and paths of sustainability accounting from a management perspective. The final part of the paper discusses the need for a pragmatic goal driven path to sustainability accounting and highlights two different ways of following this path.

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KPMG International Survey of Corporate Responsibility Reporting 2005

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I. INTRODUCTION

When KPMG published its first global survey in 1993, we did not expect that in less than a decade the number of top companies in industrialized countries producing these kinds of reports would almost triple. Neither did we expect that corporate environmental reporting would be the 'icebreaker' for a much wider form of corporate responsibility (CR) reporting in the form of sustainability, triple bottom line or corporate social responsibility (CSR) reports. Reporting aimed at communicating with stakeholders, not only on environmental performance, but also in an integrated manner on environmental, social and economic performance, to be transparent and accountable. We could not envisage that in countries and in industry sectors lagging behind during the past few years, a tremendous effort would be made to catch up with these developments, sometimes even overtaking the vanguard. Looking back now to the beginning of the nineties, these facts are both striking and exciting.

The KPMG International Survey of Corporate Responsibility Reporting 2005, conducted by the University of Amsterdam and KPMG Global Sustainability Services, has been the most comprehensive survey of its kind since its initiation in 1993. This triennial survey analyzes trends in CR reporting of the world's largest corporations, including the top 250 companies of the Fortune 500 (Global 250, G250) and top 100 companies in 16 countries (National 100, N100). With its vast coverage of 1600+ companies the survey provides a truly global picture of reporting trends over the last ten years.

2. MAJOR SURVEY FINDINGS

• CR reporting has been steadily rising since 1993 and it has increased substantially in the past three years.
In 2005, 52 percent of G250 and 33 percent of N100 companies issued separate CR reports, compared with 45 percent and 23 percent, respectively, in 2002. If we include annual financial reports with CR information, these percentages are even higher: 64 percent (G250) and 41 percent (N100).

• A dramatic change has been in the type of CR reporting which has changed from purely environmental reporting up until 1999 to sustainability (social, environmental and economic) reporting which has now become mainstream among G250 companies (68 percent) and fast becoming so among N100 companies (48 percent).

• Although the majority of N100 companies (80 percent) in most countries still issue separate CR reports, there has been an increase in the number of companies publishing CR information as part of their annual reports. At national level, the top two countries in terms of separate CR reporting are Japan (80 percent) and the UK (71 percent). Reporting has increased considerably over the last three years in most of the 16 countries in the survey, with the highest increases seen in Italy, Spain, Canada and France.

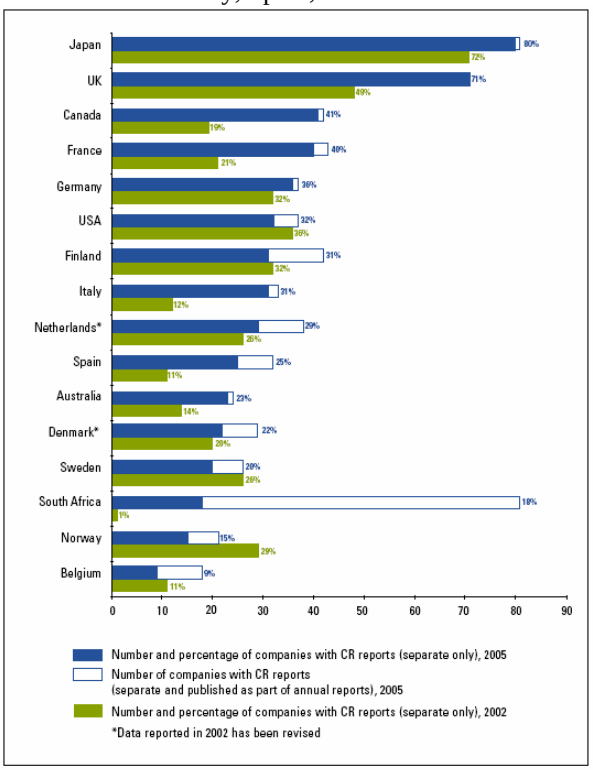

Figure 3: Corporate responsibility (CR) reporting trend by country, Top 100 in 16 countries (2002, 2005)

• The typical industrial sectors with relatively high environmental impact continue to lead in reporting. At the global level (G250), more than 80 percent companies are reporting in electronics & computers, utilities, automotive and oil & gas sectors, whereas at the national level (N100), over 50 percent of companies are reporting in the utilities, mining, chemicals & synthetics, oil & gas, oil & gas and forestry, paper & pulp sectors. Most remarkable is the financial sector which shows more than a two-fold increase in reporting since 2002.
The survey includes a detailed analysis of the reports from the G250 companies which is focused on why companies are committed to corporate responsibility and what influences the content of reports. These results are summarized below:

• Business drivers for CR are diverse, both economic (74 percent) and ethical (53 percent). The top 3 reported economic drivers are innovation & learning, employee motivation and risk management & reduction with about 50 percent companies reporting these as motivating factors.

• Almost two-thirds of CR reports include a section on corporate governance, although most reports lack specifics on how CR is structured and information on how governance policies are implemented within the organization.
• The survey analyzed how companies select the issues discussed in the reports and whether the users of the report are systematically consulted during the process. The survey revealed that report content is most commonly decided based on GRI guidelines (40 percent) with only a fifth (21 percent) mentioning stakeholder consultation. About a third of the companies (32 percent) invite stakeholder feedback on the report.
• Stakeholder dialogue was mentioned in almost 40 percent of reports with dialogue focused more on CR policies rather than reporting. Compared with environmental issues, coverage of social and economic issues and topics is far more superficial.
• Social topics are discussed by almost two-thirds of the companies, generally, in one or more of four areas: core labor standards, working conditions, community involvement and philanthropy. While the majority of companies express their commitment to these issues, reporting performance remains sketchy, possibly due to the lack of clear social indicators.
• Economic issues are discussed by the minority of companies. Although 61 percent of reports include financial information such as profits, only 25 percent discuss the economic impacts of their business from a broader, sustainability perspective.
• Reporting on the supply chain is now common. Supplier issues are mentioned in a vast majority (80 percent) of reports, albeit without specifics, as companies are increasingly being asked to extend their responsibility down the supply chain.
• The survey analyzed reports for one of the most pressing environmental issues of today, climate change, which was addressed in about 85 percent of reports. Independent assurance1 remains a valuable part of reporting. In 2005 the number of reports with an assurance statement increased to 30 percent (G250) and 33 percent (N100) from 29 percent and 27 percent, respectively, in 2002. Major accountancy firms continue to dominate the CR assurance market with close to 60 percent of the statements.

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