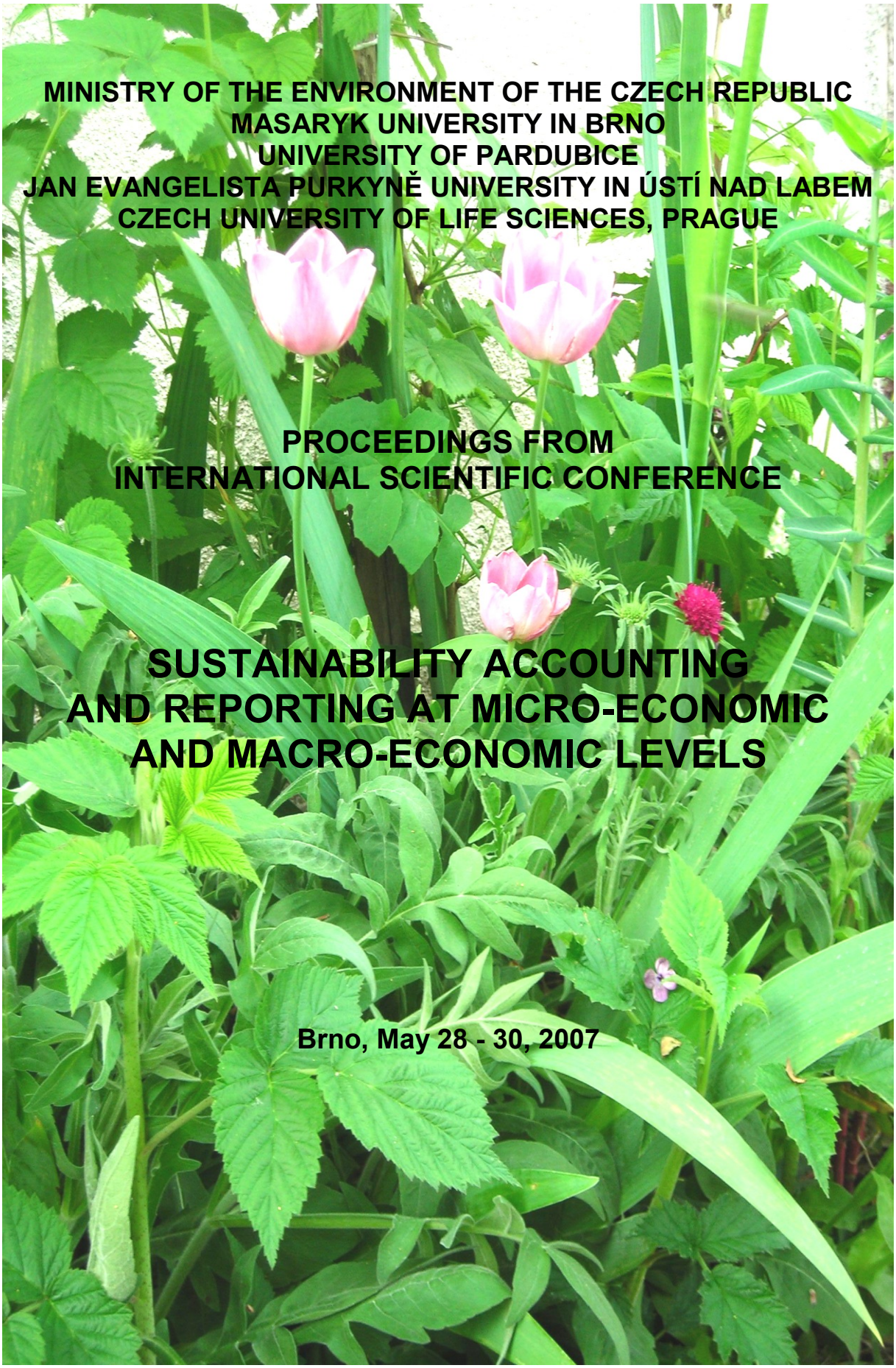


MINISTRY OF THE ENVIRONMENT OF THE CZECH REPUBLIC
MASARYK UNIVERSITY IN BRNO
UNIVERSITY OF PARDUBICE
JAN EVANGELISTA PURKYNĚ UNIVERSITY IN ÚSTÍ NAD LABEM
CZECH UNIVERSITY OF LIFE SCIENCES, PRAGUE

PROCEEDINGS FROM
INTERNATIONAL SCIENTIFIC CONFERENCE

SUSTAINABILITY ACCOUNTING AND REPORTING AT MICRO-ECONOMIC AND MACRO-ECONOMIC LEVELS

Brno, May 28 - 30, 2007

MINISTRY OF THE ENVIRONMENT OF THE CZECH REPUBLIC
MASARYK UNIVERSITY IN BRNO
UNIVERSITY OF PARDUBICE
JAN EVANGELISTA PURKYNĚ UNIVERSITY IN ÚSTÍ NAD LABEM
CZECH UNIVERSITY OF AGRICULTURE PRAGUE

PROCEEDINGS FROM
INTERNATIONAL SCIENTIFIC CONFERENCE

SUSTAINABILITY ACCOUNTING AND REPORTING ON MICRO-ECONOMICAL AND MACRO-ECONOMICAL LEVEL

Brno, May 28 - 30, 2007

MINISTRY OF THE ENVIRONMENT OF THE CZECH REPUBLIC
MASARYK UNIVERSITY IN BRNO
UNIVERSITY OF PARDUBICE
JAN EVANGELISTA PURKYNĚ UNIVERSITY IN ÚSTÍ NAD LABEM
CZECH UNIVERSITY OF AGRICULTURE PRAGUE

PROCEEDINGS FROM
INTERNATIONAL SCIENTIFIC CONFERENCE

SUSTAINABILITY ACCOUNTING AND REPORTING ON MICRO-ECONOMICAL AND MACRO-ECONOMICAL LEVEL

Brno, May 28 – 30, 2007

Reviewers:
Iva Ritschelová – Jan Evangelista Purkyně University in Ústí nad Labem
Miroslav Farský – Jan Evangelista Purkyně University in Ústí nad Labem
Jaroslava Hyršlová – University of Pardubice

Manuscripts were not subject to technical and linguistic corrections.

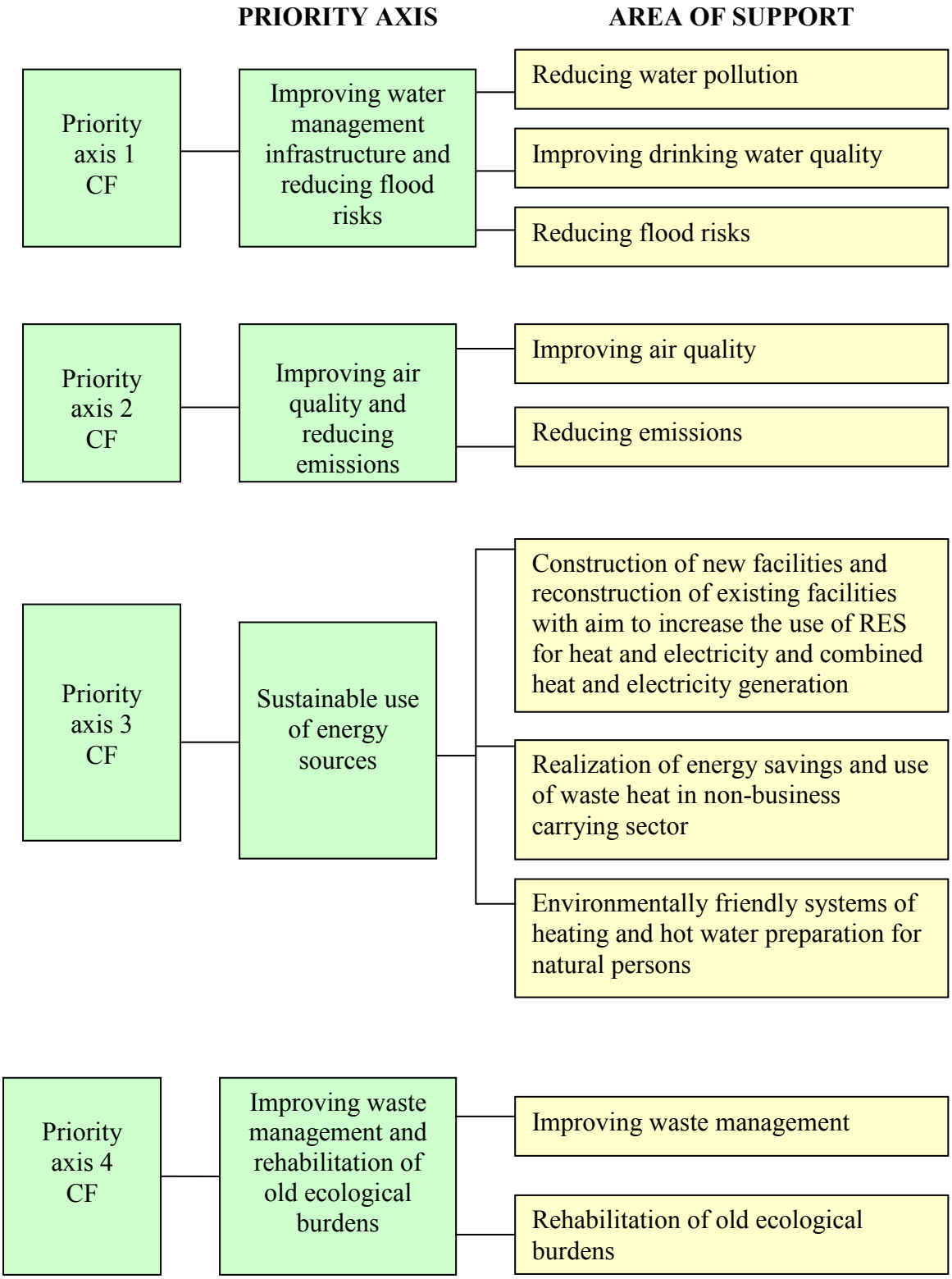
ISBN

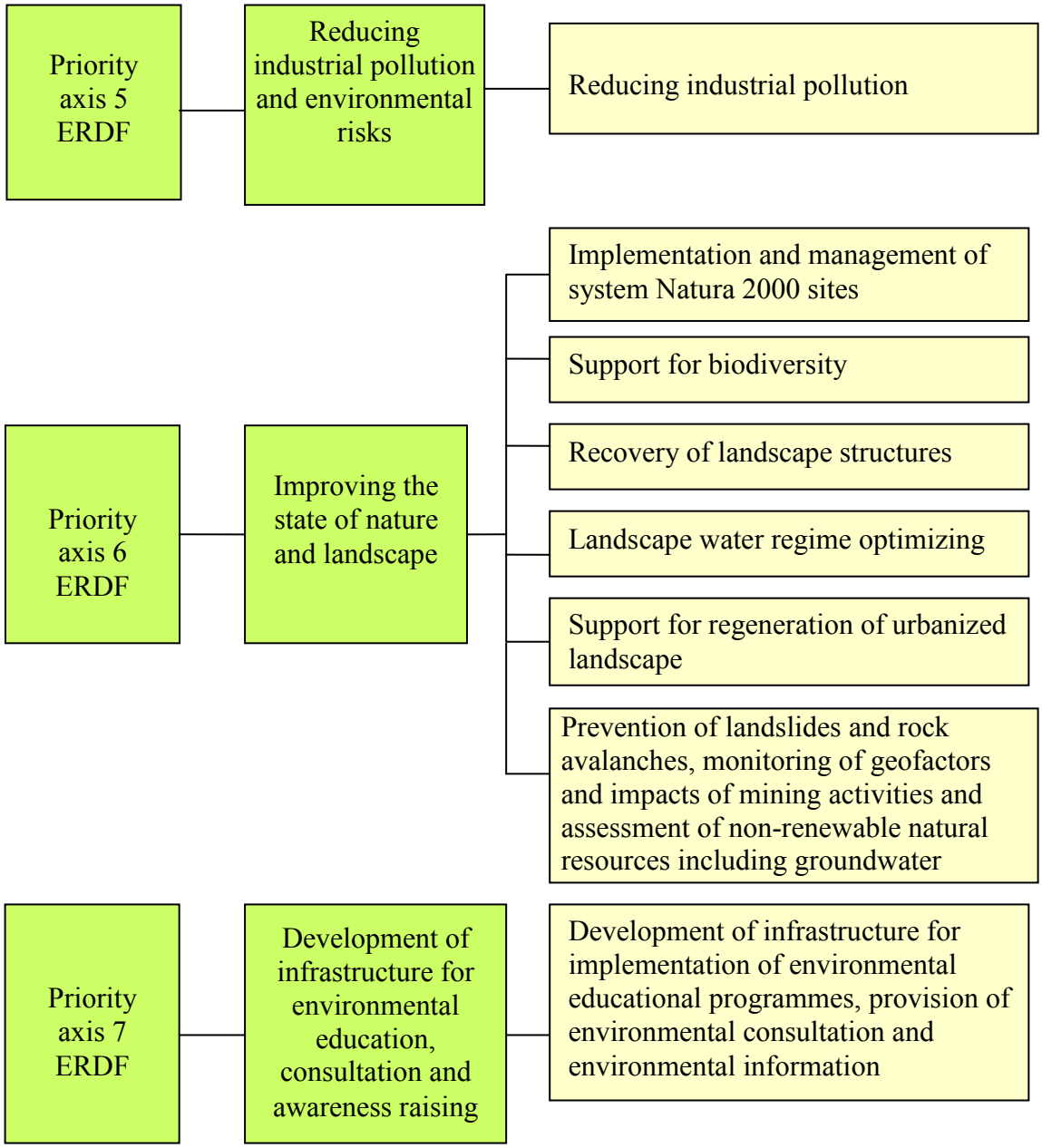
CONTENTS:

FINANCIAL RESOURCES OF EU FUNDS - OPERATIONAL PROGRAMME ENVIRONMENT 2007-2013

Bohumila Andělová

The basic structure of the priority axes under the OP Environment is shown in the following chart.





Introduction

The global objective of the Operational Programme Environment is environmental protection and quality improvement as one of the basic principles of sustainable development. Environmental quality is fundamental to the health of the population, while enhancing the attractiveness of the territory for life, work and investments. The final result of the attractiveness for investments is not only an increase of employment but also of competitive sustainable economic growth in the regions.

Operational Programme Environment develops the priority „Environmental Protection and Quality Improvement“of the priority axis „ The Environment and Accessibility“of the National Development Plan for 2007 – 2013 and priority „The Environment and Accessibility of Transport“of the National Strategic Reference Framework of the Czech Republic for 2007 – 2013 (NSRF). Through the priority „The Environment and Accessibility of Transport“, a strategic NSRF objective „Attractive Environment“is implemented.

PRIORITY AXES AND AREAS OF SUPPORT

Priority Axis 1 – Improving Water Management Infrastructure and Reducing Flood Risks

1.1 Area of Action – Reducing Water Pollution

Supported activities:

1. construction, reconstruction and intensification of waste water treatment plants (WWTPs) in agglomerations over 2 000 PE, including the introduction of arrangements for the removal of total nitrogen and phosphorus (in agglomerations between 2 000 and 10 000 PE including the introduction of arrangements for the removal of total nitrogen and/or phosphorus where water quality conditions in the watercourse require to do so) and WWTP sludge management to reach a level of indicators in the discharged waste waters required by water management authority,
2. construction, reconstruction and intensification of WWTPs or equivalent adequate treatment facilities in agglomerations with a population of up to 2000 PE that are situated in areas requiring special protection (national parks, protected landscape areas, Natura 2000 sites, protection zones of national parks) and in catchment area of Nové Mlýny* hydro engineering structure to reach a level of indicators in the discharged waste waters required by water management authority,
3. construction, reconstruction and extension of sewerage systems in agglomerations with a population of over 2000 PE,
4. extension and reconstruction of sewerage systems in agglomerations with a population of up to 2000 PE that are situated in areas requiring special protection (national parks and protected landscape areas including protection zones, Natura 2000 sites) and in catchment area of Nové Mlýny* hydro engineering structure,
5. technical measures for spot sources of pollution at industrial polluters to reduce the contents of especially hazardous substances in waters,
6. construction and support for systems of complex monitoring, identification and evaluation of the condition, quality and quantity of surface waters and groundwater including equipment for the monitoring systems operators in the investment part; and in non-investment part to cover the selected projects, as the case may be, from the available financial resources under the Technical Assistance,
7. technical and biological measures to reduce eutrophication of surface waters.

1.2 Area of Action – Drinking Water Quality Improvement

Supported activities:

1. construction, reconstruction and intensification of water treatment plants and drinking water sources supplying agglomerations with a population over 2000 PE,
2. construction, reconstruction and extension of drinking water conduits and distribution systems in agglomerations with a population over 2000 PE,
3. construction, reconstruction and intensification of drinking water treatment plants and sources and construction, reconstruction and extension of drinking water conduits and distribution systems in agglomeration with a population of up to 2000 PE that at the same time are situated in the areas requiring special protection and in catchment area of Nové Mlýny* hydro engineering structure. This activity shall receive priority support as part of complex solution of water supply and waste water sewerage and treatment in these agglomerations.

The condition for implementation of the above mentioned measures in national parks, protected landscape areas, Natura 2000 sites and protection zones of national parks shall be expertise prepared by Agency for Nature Conservation and Landscape Protection of the Czech Republic or by national park administration.

1.3 Area of Action – Reducing Flood Risks

Supported activities:

1. construction, reconstruction and modernization of equipment for the flood prediction and warning service system at national, regional and local levels, investment support for the preparation of maps of flood threats and flood risks with concretized outputs at national and regional levels,
2. implementation of measures to reduce rate of water runoff from river basin areas and eliminate flood discharge rates through supporting construction of polders (dry reservoirs of over 50 000 m^3) and river channels arrangements in built-up municipal areas that are to be carried out in a near-to-natural manner.

Beneficiaries[1] to receive support under the Priority axis 1 are:

- territorial self-governing units and their associations,
- companies with over 50 % of property owned by municipalities and regions,
- organizations established by municipalities and regions,
- administrators of river basin areas, watercourses, water reservoirs,
- administrators and owners of ponds, hydro engineering structures,
- elaborators of plans of measures,
- non-governmental nonprofit-making organizations,
- state organizations and state enterprises,
- operators of flood prediction service system,
- organizational constituents of the state and organizations directly managed by them,
- natural and legal business carrying persons.

Priority Axis 2 – Improving Air Quality and Reducing Emissions

2.1 Area of Action – Improving Air Quality

Supported activities:

The projects are only acceptable if they are included in the relevant air quality improvement programme which has been prepared and adopted in accordance with Act on air protection.

The projects will focus on:

- complex or partial solution consisting, in particular, in:
  - purchase of combustion source with rated thermal capacity of up to 1 MW bearing a label Environmentally Friendly Product or of adequate (low-emission) source, and, at the same time, reduction of energy consumption,
  - extension of the existing medium-pressure supply system following the purchase, including the transition to the combustion of gas fuels for individual sources,
- complex or partial solution in nonprofit-making sector, consisting, in particular, in:
  - purchase of combustion source bearing a label Environmentally Friendly Product, or adequate (low-emission) source
  - reduction of energy consumption,
- complex or partial solution consisting, in particular, in:

- construction of new and extension of central heating supply systems including the interconnection to the existing distribution systems and constructions of exchanger and transfer stations for the purpose of connecting new consumers,
- reducing dustiness from sheet sources:
  - planting and regeneration of insulation greenery separating the residential area from industrial structures or commercial premises or highly frequented transport corridors and delimitated for this purpose in the land-planning documentation.

2.2 Area of Action – Reducing Emissions

Supported activities:
In particular, support shall be received by projects focusing on:

- reconstruction of combustion sources with installed capacity over 5 MW for the purpose of reducing emissions of NOx and particulate matters over the valid standards of the European Communities, except for combustion sources using biomass,
- reconstruction of combustion sources or installation of additional facilities to trap emissions of NOx or particulate matters for non-combustion sources,
- technical measures at the sources leading to the elimination or reduction of emissions of VOC to the air (for example: transition to water-soluble paints, varnishes and adhesives, installation of catalytic or thermo-oxidation units),
- measures at the sources leading to the elimination or reduction of emissions of NH_3 to the air.

Beneficiaries to receive support under the Priority axis 2 are:

- territorial self-governing units and their associations,
- natural persons,
- associations of owners,
- housing cooperatives,
- public benefit corporations,
- legal persons (only for above listed selected activities),
- public research institutions,
- endowments and endowment funds,
- allowance organizations,
- civic associations and churches,
- self-employed persons,
- organizational constituents of the state and organizations directly managed by them.

Priority Axis 3 – Sustainable Use of Energy Sources

3.1 Area of Action – Construction of new facilities and reconstruction of the existing facilities with the aim to increase the use of renewable energy sources for heat generation, electric energy generation and for combined heat and electric energy generation

Supported activities:
Eligible and supported activities include construction and reconstruction of heating plants, power and heating plants (cogeneration) with the use of RES, in particular:

- installation of photo-thermic systems for hot water preparation and heat supply, or for a possibility of added heating,
- installation of photovoltaic systems for electric energy generation,
- installation of heat pumps for heat supply and for hot water preparation,

- installation of biomass boilers and systems using biomass for energy generation, for heat supply and for hot water preparation, possibly in combination with the construction of central fuel production plant including technological line,
- installation of cogeneration units for combined heat and electric energy generation from biomass, landfill gas, biogas, etc.,
- installation of systems for heat supply including hot water preparation, for electric energy supply and combined heat and electric energy generation with the use of geothermal systems,
- installation of wind power plants,
- installation of small hydro-electric power plants.

3.2 Area of Action – Realization of Energy Savings and the Use of Waste Heat

Supported activities:
Eligible and supported activities include:

- thermal insulation systems for buildings,
- doors and windows panes (replacement of windows, etc.),
- elimination of thermal bridges,
- measuring instrumentation and control,
- increase in efficiency of energy systems in the buildings,
- installation of facilities for utilization of waste heat for heat or electric energy generation.

3.3 Area of Action – Environmentally Friendly Systems of Heating and Hot Water Preparation for Natural Persons

Supported activities:
Eligible and supported activities include:

- the installation of renewable energy sources, in particular, for heating and hot water preparation, for example: solar systems, biomass boilers, heat pumps, utilization of waste heat, etc.

Beneficiaries to receive support under the Priority axis 3 are:

- territorial self-governing units and their associations,
- endowments and endowment funds,
- civic associations and churches,
- allowance organizations,
- public benefit corporations,
- organizational constituents of the state and organizations directly managed by them,
- natural persons,
- associations of owners, housing cooperatives,
- nonprofit-making organizations.
- legal persons owned by public subjects

Priority Axis 4 – Improving Waste Management and Rehabilitation of Old Ecological Burdens

4.1 Area of Action – Improving Waste Management

Supported activities:

- construction of integrated waste management systems,
- construction of systems of selective collection of assorted waste,

- construction of waste utilization facilities, particularly waste sorting, processing and recycling facilities,
- construction of waste collection yards and stores,
- construction of hazardous waste management facilities (except for landfilling),
- construction of systems of selective collection of assorted hazardous waste, including hazardous municipal waste and hazardous waste produced by health care facilities,
- reclamation of old landfills, including municipal and other waste,
- elimination of disallowed (illegal) landfills in specially protected areas,
- support for construction of composting plants and biofermentation stations.

4.2 Area of Action – Rehabilitation of Old Ecological Burdens

Supported activities:

- inventory and categorization of the priorities of old ecological burdens at the contaminated sites,
- elaboration of Risk Assessments and Risk Assessment Updates for the sites selected from the material „Regional Lists of Priorities for the Rehabilitation of Old Ecological Burdens – Update 2002, Ministry of the Environment, October 2002“ and its updates from 2004-2006,
- rehabilitation of seriously contaminated sites (industrial objects, military and agricultural areas, brownfields with the occurrence of old ecological burdens) posing threats to the environmental compartments and human health in the cases, where the applicant for support is not a causer of the contamination, or where causer ceased to exist (old ecological burden, or in the case that this obligation is bound to an organizational constituent of the state or to a legal person established by the state for these purposes,
- rehabilitation of old ecological burdens in areas affected by mining of exclusive minerals, including the rehabilitation and reclamation of the premises of abandoned mines and quarries, spoil banks, dumps and sludge settling lagoons and the associated permanent operating costs, in the cases where the applicant for support is not a causer of the contamination or where causer ceased to exist; or in the case that this obligation is bound to an organizational constituent of the state or to a legal person established by the state for these purposes.

Beneficiaries to receive support under the Priority axis 4 are:

- nonprofit-making organizations,
- territorial self-governing units and their associations,
- civic associations,
- business carrying subjects,
- allowance organizations,
- organizational constituents of the state and organizations directly managed by them,
- or legal persons established by the state for these purposes,
- state enterprises.

Priority Axis 5 – Reducing Industrial Pollution And Environmental Risks

5.1 Area of Action – Reducing Industrial Pollution

Supported activities:

- the establishment of infrastructure for institutional background allowing BAT research,
- support for the interconnection of information systems,
- making available to the Internet users of environmental information,

- the creation of user-friendly applications to meet the obligations ensuing from the legislation,
- infrastructure for the REACH programme.

Beneficiaries to receive support under the Priority axis 5 are:

- territorial self-governing units and their associations,
- allowance organizations,
- public research institutions,
- civic associations,
- nonprofit-making organizations
- business carrying subjects,
- state enterprises,
- state organizations,
- administrators of river basin areas and watercourses,
- organizational constituents of the state,
- operators of flood prediction service system.

Priority Axis 6 – Improving The State Of Nature

6.1 Area of Action – Implementation and Management of System Natura 2000 Sites

Supported activities:

Activities eligible to receive support:

- measures relating to implementation of the system Natura 2000 including the monitoring of specially protected areas, selected Natura 2000 sites, and the status of the populations of plant and animal species.

6.2 Area of Action – Support for Biodiversity

Supported activities:

Activities eligible to receive support:

- measures to preserve and increase numerousness of the species, implemented particularly through the conservation of species and ecosystems and through the creation of convenient conditions for their further existence,
- management of the protected areas and evaluation of the management results using the principles of ecosystem approach in *in situ* biodiversity protection,
- measures to prevent and minimize damage to the roads, water management objects, agricultural and forest cultures, fish breeding and bee breeding, caused by heavily and critically endangered specially protected animal species,
- investment measures leading to the improvement of abilities of the ecosystems and species to adapt to the increasing fragmentation of the landscape, to other anthropogenic effects and to the environmental load factors, including the measures relating to care for handicapped animals,
- prevention of importation; regulation and liquidation of the populations of invasive plant and animal species,
- realization of the lasting measures to protect caves and karsts features,
- investment measures aimed at the renovation and build-up of visitor infrastructure in specially protected areas, bird areas, sites of European importance, natural parks and geoparks (including visitor centres).

6.3 Area of Action – Recovery of the Landscape Structures

Supported activities:
Activities eligible to receive support:

- the realization of the measures proposed within the approved complex land shaping and arrangements, focusing on greenery planting in the landscape, and on soil protection,
- the preparation and realization of the features of the territorial systems of ecological stability,
- the establishment and regeneration of the landscape features (the planting and regeneration of hedgerows, alleys, solitary trees, wind-breaks, etc.), stream bank vegetation and historical landscape structures (including field roads and country lanes and treatment of trees in significant alleys), care for monument trees,
- measures aimed at preservation and overall improvement of the natural conditions in the forests in specially protected areas, Natura 2000 sites, in the delimitated regional and inter-regional biocentres of the territorial systems of ecological stability, through the achievement of the species and spatial composition of the stands conforming to the local natural conditions,
- the realization of forest-planting measures of biological character to establish the basic conditions and start up the process of regeneration of the current state of forests in the priority areas of emission threat zones (according to the valid legislation, emission threat zones A through C) in specially protected areas and Natura 2000 sites.

6.4 Area of Action – Optimization of the Landscape Water Regime

Supported activities:
Activities eligible to receive support:

- the realization of measures beneficial to the landscape and ecosystem diversity leading to the improvement of the retention capacity of the landscape, to the protection and regeneration of natural runoff conditions and reduction of threats posed especially by flood events,
- measures to protect against water and wind erosion and to reduce negative effects of surface water runoffs (the establishment or regeneration of balks, infiltration bands and broad-base terraces).

6.5 Area of Action – Support for Regeneration of the Urbanized Landscape

Supported activities:
Activities eligible to receive support:

- individual projects for the establishment and revitalization of significant residential greenery with preference given to the species composition strengthening the diversity of residential biotopes and the relationship of the residents (especially children and youth) to the nature: the support focuses on the individual establishment and regeneration of parks and other persistent non-forest vegetation within the areas delimitated in the territorial planning documentation, of tree alleys and significant groups of trees within the residential areas, cemeteries, town and municipal forest parks, school gardens and composed landscape areas,
- the planting and regeneration of vegetation within the formation of green rings around the residential areas, delimitated in the territorial planning documentation,
- the planting of vegetation showing near-to-natural character at the locations of earlier rehabilitated small (on the lands below 10ha) and economically hardly exploitable brownfields, former military training areas (in the case of not large-scale

afforestation), at the locations of other structures and facilities, burdens or consequences of geological investigation,
- the elimination or securing of buildings, structures and other objects not in use in specially protected areas and in Natura 2000 sites.

6.6 Area of Action – Prevention of landslides and rock avalanches, monitoring of geofactors and impacts of mining and extraction activities, and assessment of non-renewable natural resources including groundwater resources

Supported activities:
Activities eligible to receive support:
- stabilize or remediate landslides and rock massifs which immediately or soon through their negative showings and consequences pose threats to human lives, health and property and also the infrastructure of the settlements; in addition, carry out the monitoring focused on control of the effectiveness of the remedial measures,
- reassess and revaluate the total capacity of groundwater reserves, both in use and not in use, prospect for and install new groundwater sources for drinking water supply,
- geological and hydrogeological works including projects for the purpose of reassessment and revaluation of groundwater reserves utilizable for drinking water supply,
- prospecting, investigation and assessment of the possibilities of controlled artificial groundwater infiltration from the surface waters (watercourses or water reservoirs),
- realization of technical works serving for the provision of other non-renewable natural resources,
- identification of possible negative consequences of mining and extraction activities, proposals and realization of the technical solution which will prevent further threats to the environment in link to the European Parliament and Council Directive 2006/21/EC of 15.3.2006, on mining and extraction waste management, and on change of the Directive 2004/35/EC,
- carrying out of engineering-geological and hydrogeological works in the settlements affected in the past by mining or similar activities, and carrying out of the remedial action.

Beneficiaries to receive support under the Priority axis 6 are:
Areas of action 6.1 and 6.2:
- for the grant scheme: state body with nation-wide competence, whose main activity is nature conservation and landscape protection,
- for individual projects: Agency for Nature Conservation and Landscape Protection of the Czech Republic, national parks administrations.

Area of action 6.3:
For all measures except for measures aimed at preservation and overall improvement of natural conditions in the forests and measures aimed at the realization of forest-planting measures in the priority areas of emission threat zones:
- natural persons,
- legal persons established for non-business carrying purposes, particularly public benefit organizations,
- municipalities,
- regions,
- civic associations,
- associations of municipalities,
- allowance organizations,
- organizational constituents of the state (except for Land Offices),

- state organizations and other entities whose establishment is allowed by the generally binding legal regulations, and whose activities are not business carrying activities pursuant to Commercial Code,
- legal persons entrusted with the management of forests owned by the state,
- administrators of watercourses,
- administrators of river basins areas.

For measures aimed at preservation and overall improvement of natural conditions in the forests and measures aimed at the realization of forest-planting measures in the priority areas of emission threat zones:

- legal persons entrusted with the management of forests owned by the state.

Area of action 6.4:

- natural persons,
- legal persons established for non-business carrying purposes, particularly public benefit organizations,
- municipalities,
- regions,
- civic associations,
- associations of municipalities,
- allowance organizations,
- organizational constituents of the state (except for Land Offices),
- state organizations and other entities whose establishment is allowed by the generally binding legal regulations, and whose activities are not business carrying activities pursuant to Commercial Code,
- administrators of watercourses,
- administrators of river basins areas.

Area of action 6.5:

- legal persons established for non-business carrying purposes, particularly public benefit organizations,
- municipalities,
- regions,
- civic associations,
- associations of municipalities,
- allowance organizations,
- organizational constituents of the state (except for Land Offices),
- state organizations and other entities whose establishment is allowed by the generally binding legal regulations, and whose activities are not business carrying activities pursuant to Commercial Code,
- state firms (legal persons entrusted with the management of forests owned by the state).

Area of action 6.6:

- municipalities,
- regions,
- organizational constituents of the state,
- allowance organizations,
- public research institutions.

Priority Axis 7 – Development of Infrastructure For Environmental Education, Awareness Raising and Consultancy

7.1 Area of Action – Development of Infrastructure for the Implementation of Environmental Education Programmes, the Provision of Environmental Consultancy and Environmental Information

Supported activities:

- reconstruction of the existing objects housing the centres,
- purchase, reconstruction and construction of objects to give rise new education and consultancy centres,
- material and technical equipment of investment character for the objects of education and consultancy centres,
- the creation and releases of professional and specialized materials and aids, for example, films and video materials.

Distribution of financial allocation for the OPE priority axes (in EUR)

Distribution of financial allocation for the OPE priority axes

Priority axis number	Priority axis title	Fund / national co-financing	% of the total allocation	Community contribution
1	Improving water management infrastructure and reducing flood risks	CF/public	40,44%	1 988 552 501
2	Improving air quality and reducing emissions	CF/public	12,89%	634 146 020
3	Sustainable use of energy sources	CF/public	13,68%	672 971 287
4	Improving waste management and rehabilitation of old ecological burdens	CF/public	15,79%	776 505 331
5	Reducing industrial pollution and environmental risks	ERDF/public	1,23%	60 605 709
6	Improving the state of nature and landscape	ERDF/public	12,20%	599 423 825
7	Development of infrastructure for environmental education, awareness raising and consultation	ERDF/public	0,86%	42 452 678
8	Technical assistance CF	CF/public	2,91%	143 209 747
In total			100,00%	4 917 867 098
In total CF			85,72%	4 215 384 886
In total ERDF			14,28%	702 482 212

Source: MoE

Bohumila Andělová
Confederation of Industry of the Czech Republic

INDUSTRIAL ECOLOGY AND REGIONAL DEVELOPMENT: DETECTION AND IMPLEMENTATION OF ECO-INDUSTRIAL SYNERGIES

Benoît Charrière

Abstract:

A key challenge in attaining regional sustainability is to reduce both the direct and the indirect environmental impacts associated with economic and household activity in the region. Material flows like metal, wood, plastics, building materials, and foodstuffs, as well as water and energy flows analysis provide information about the region as an ecosystem. Knowing what these flows are and how they change over time is the main purpose of an industrial ecology approach.

Usually used at a macroeconomic level, these analyses are recently transposed to the regional level, providing useful information to decision makers. During this presentation we would like to focus the role of industrial estates (greenfields, brownfields and running estates), where there is an important concentration of all economic sectors. This concentration creates in one hand huge impacts on the environment, but on the other hand possibilities of synergies, exchange of information and facility sharing.

From metabolism analyses, detection and then implementation of eco-industrial synergies at a local level is a very new approach that we would like to present through concrete examples like in Geneva (CH), Kalundbord (DK) and United Kingdom's national project. It appears clearly, that industrial symbiosis represents for companies complementary solutions with usual EMS.

The URSUS project, leading by the Charles University environment center, is the first czech attempt dealing with regional metabolism analysis (MFA, EFA, urban footprint etc.). Through the Plzen metropolitan area's case study we would like to discuss the regional metabolism approach and the possibility to implement eco-industrial synergies in the Czech context.

Benoît Charrière,
Lausanne University,
Ph.D. student;
Charles University,
Research assistant.

NATIONAL ACTION PLAN FOR PUBLIC GREEN PURCHASING

Emília Boďová, Petra Michalicová

Abstract

Public authorities are major consumers in Europe, spending some 16 % of the EU's gross domestic product (which is a sum equivalent to half the GDP of Germany). By using their purchasing power to opt for goods and services that also respect the environment, they can make an important contribution towards sustainable development. Green purchasing is also about setting an example and influencing the market place. By promoting green procurement, public authorities can provide industry with real incentives for developing green technologies. In some product, works and service sectors, the impact can be particularly significant, as public purchasers command a large share of the market (in computers, energy-efficient buildings, public transport, and so on).

References:

[1] Bouwer M, de Jong K, Jonk M, Berman T, Bersani R, Lusser H, Nissinen A, Parikka K and Szuppinger P: Green Public Procurement in Europe 2005 - Status overview, 2005.

[2] Európska Komisia: Zelené nakupovanie! Príručka environmentálneho verejného obstarávania, Luxemburg, 2005.

[3] Charter M, Evans Ch: Lifting markets – a role for public procurement, http://mail.mtprog.com/CD_Layout/Day_3_23.06.06/1115-1300/ID11_Charter_final.pdf

[4] http://ec.europa.eu/environment/gpp

[5] http://www.sazp.sk

[6] Správa o realizácii programu environmentálneho označovania výrobkov v SR, MŽP SR, SAŽP, december 2006

Ing. Emília Boďová
Vedúca odboru environmentálneho manažérstva
Slovenská agentúra životného prostredia
Pažitná 84, Trnava 917 01
Tel.: +421 33 55 36 613
Fax.: +421 33 5536817
E-mail: emilia.bodova@sazp.sk

Ing. Petra Michalicová
Slovenská agentúra životného prostredia
Pažitná 84, Trnava 917 01
Tel.: +421 33 5907814
Fax.: +421 33 5536817
E-mail: petra.michalicova@sazp.sk

SUSTAINABILITY ACCOUNTING AND REPORTING LINKS BETWEEN GOVERNMENT AGENCIES AND CORPORATIONS IN AUSTRALIAN AQUACULTURE

Roger L. Burritt

Abstract:

Sustainability accounting and reporting are growing in importance. The Australian aquaculture industry provides an example of where sustainability accounting and reporting could be used to help management and stakeholders address social, environmental and economic issues. In this paper, following a brief introduction, the main ecologically sustainable development issues in Australian aquaculture are identified. The notion is then explored of whether environmental management accounting has the potential to bring together the information needs of government departments and corporations involved in the aquaculture industry, as a way to address sustainability issues. It is concluded that guidance provided by the accountancy profession tends to focus on the regular provision of information for decision making, whereas guidance provided by government concentrates on ad hoc information for investment appraisal. The two need to be integrated if systematic movement towards ecologically sustainable development is to be encouraged.

1. Introduction

The concept of sustainability accounting has emerged over a number of years. In the 1990's its foundations were established in environmental accounting and, for decision making purposes at the entity level, in environmental management accounting. In 2001, the United Nations Division for Sustainable Development published a document entitled 'Environmental Management Accounting Procedures and Principles' to help establish a culture of pollution prevention and waste minimisation within industry [1]. A number of academics engaged with Environmental Management Accounting (EMA) framework development in decision making contexts [2] and risk management [3]. Promotion of EMA was taken up for the accountancy profession by the International Federation of Accountants (IFAC) through the production of a similar framework published in an International Guidance Document in 2005 [4]. The expectation of IFAC is that companies, through their accountants, will perceive the self-evident value of EMA and introduce it into their organisations in order to help the environment and society as well as corporate financial bottom lines on the way towards sustainability. The organisations to which the Guidance is addressed include government bodies, as well as companies.

In this paper the possible contribution of EMA to sustainability accounting is considered in the context of ecologically sustainable development (ESD) of the Australian aquaculture industry. The paper briefly provides a background to the aquaculture industry in Section II, while Section III highlights the main issues facing ecologically sustainable development in aquaculture. In Section IV the challenges for sustainability accounting and reporting in aquaculture are explained, with concluding comments, suggesting issues to be addressed, being made in Section V. The Australian aquaculture industry is introduced in the following Section.

2. The Australian Aquaculture Industry

Pillay and Kutty [5] suggest that the word aquaculture has been used in recent decades to denote all forms of culture of aquatic animals and plants (e.g., fish, shellfish, crustacea, aquatic plants, etc.) in fresh, brackish and marine environments. For example, in Australia the

five main aquaculture industries include prawn farming, Southern Bluefin tuna farming, marine salmon farming (Atlantic Salmon and Rainbow Trout), pearl oyster farming and edible oyster farming. These represent over 94% of the total value of aquaculture production in Australia [6]. Australia is said to possess a number of advantages in aquaculture associated with proven culture technologies, favourable production efficiencies, commercial viability and favourable marketing attributes [7].

Government and business are both closely involved in ESD in the Australian aquaculture industry. The Commonwealth of Australia has a federal system of government which includes the Australian Government, State and Territory governments and local government within each State or Territory. Australian Government legislation has provided a major impetus towards the implementation of ecologically sustainable development in aquaculture, in part through s.516 of the *Environmental Protection and Biodiversity Act* 1999 (the EPBC Act), which requires government bodies, such as Departments, to report on their ecologically sustainable development performance. In addition, the EPBC Act requires Government Departments to carry out strategic environmental assessments for Commonwealth managed fisheries and so an assessment and reporting framework has been developed, claimed to be the first in the world that addresses all perceived ESD issues - environmental, social and economic - in aquaculture [8].

South Australia considers itself to be the State within Australia that is leading other States in relation to the pursuit of sustainable aquaculture. It produces about 40% of Australian aquaculture product [14]. South Australia operates in accordance with Australian Government laws, such as the EPBC Act, but has its own constitution and has separate legislation and has introduced a voluntary code of behaviour for the aquaculture industry in the State, implemented through Primary Industry and Resources SA [15]. The State also has other sustainability supporting endeavours which have an impact on aquaculture. First, a Strategic Plan which includes a priority to make South Australia world-renowned for being clean, green and sustainable [17]. Second, an Office of Sustainability which is charged to develop an integrated approach to decision-making and tools and techniques for measuring progress towards ESD as reported in triple bottom line accounts, which can be criticized for not actually addressing the issue of integration of these accounts as is necessary for sustainability accounting [25]. Third, legislation in the form of its *Aquaculture Act 2001,* as administered by EPA South Australia, is designed to regulate and facilitate the development of the South Australian aquaculture industry in an ecologically sustainable manner [16]. In South Australia, the role of local government in sustainability planning and services has been recognized in the provisions of the *Local Government Act 1999.* This was partly motivated by Local Agenda 21 which originated at the United Nations Conference on Environment and Development held in June 1992 and which later developed following the introduction of Local Action 21 at the World Summit on Sustainable Development held in Johannesburg, South Africa in September 2002. In an evolving relationship South Australia has an Office for State/ Local Government relations, located within Primary Industries and Resources SA, and responsible for promoting shared strategic directions and effective working relationships between State and Local Government.

Companies operating the aquaculture industry, including Australian Hiramasa Pty Ltd, Australian Southern Seafood Group, Clean Seas, Coorong Cockles Pty Ltd, Ferguson Australia Pty Ltd, Marmion Group and Soladome Aquaculture, provide a further layer of parties with an interest in the sustainability of aquaculture and, in particular, with the main ESD issues which are examined next.

3. Main ESD Issues

While fish populations in the wild are diminishing, cultured fish populations are increasing, but to a level which can border on the unacceptable for several reasons [9]. First, although many of the fish species cultivated are schooling species and can live in close concentrations, *over-concentration* is one of the issues which animal rights protagonists strongly object to because fish can damage themselves by rubbing against their cages and each other and can become sick and die. Second, raising aquaculture species in concentrated areas can cause *overloading*, which is the presence of too much carbon and nitrogen in the water from fish waste products and fertilizer. These elements lead to a reduction in the dissolved oxygen essential to survival of aquatic plants and animals. Third, when cultured species mix with native species, for example where cultured animals escape into the wild and breed with non-farmed animals, they may transfer diseases to the wild. Fourth, aquaculture development has been associated with the destruction of mangrove forests in some areas, and the accompanying livelihoods of people. Fifth, the inclusion of chemicals in food for specific species of fish and for fish treatment involves drug manufacturers and distributors as well as medicated feed manufacturers in the supply chain. The drugs should be provided at the listed dosages, and when certain disease conditions are present, however *over-provision* of chemicals can occur. Finally, where extensive farming is replaced with intensive aquaculture, the self-sufficiency of local farmers is reduced as they lose their occupations and self-controlled food supplies. These and other social and environmental problems have accompanied growth in the industry which, in turn, has been looking towards information that will help lead to and indicate changes in the direction of ecologically sustainable development performance.

In addition to these social and environmental issues, economic issues are important to the industry. On the positive side: (i) the substitution of farmed for wild fish, the signing by the Australian Government of a free trade agreement with the United States and the lifting of tariffs by the European Union, mean that improved market access and growing market demand for aquaculture products seem assured [10]; (ii) Australia has lower aquaculture production levels in relation to coastal area than other countries in the region. In 1990 Australia produced 0.01 kg of aquaculture production per 1,000 ha of coastal land compared with 1.29 kg for the same area in New Zealand and 33.75 kg in Japan. This low level of production and comparatively low level of coastal water pollution permits a very high health standard of aquaculture products [11] which provides a competitive advantage. However, the industry does face economic problems [12], including: (i) increasing energy costs; (ii) lower-cost aquaculture production from Asia; (iii) increasing demand from Asia for low value seafood supplied in bulk; (iv) increasing power of Australian supermarkets to cut margins on aquaculture products; (v) skilled labour shortages; (vi) the need for product labeling to indicate country of origin; (vii) rising community expectations to have a say in use and management of natural resources and the role of seafood in their health.

In the light of these perceived issues the aquaculture industry is expected to face five strategic sustainability challenges in the next 20 years.

4. Strategic Challenges and Sustainability Accounting and Reporting

The five sustainability challenges referred to above are:

1. Natural resources sustainability – the challenge is to maintain and improve the management and use of aquatic resources to ensure their sustainability. This implies periodic monitoring of management and resource use in physical terms.
2. Resource access and resource allocation – the challenge is to optimize resource access, resource allocation and opportunities for each sector of the fishing industry,

within a rights-based framework. This implies the periodic monitoring of resource stocks and flows in physical terms as well as resource distribution between parties with a right to harvest.

3. Profitable response to rising demand – the challenge is to respond to, and take advantage of, increased demand for seafood and for recreational and customary fishing experiences while enhancing the profitability of the aquaculture industry. This implies periodic monitoring of the physical and monetary flows relating to the demand for aquaculture resources by customers and the ad hoc provision of information in relation to investment decisions as demand is expected to fluctuate.
4. People development – the challenge is to develop people who will help the fishing industry to meet its future needs. This implies ad hoc physical and monetary information is required about the programs to be developed and periodic information about the level of development achieved.
5. Community and consumer support – the challenge is to increase community and consumer support for the benefits of the industry. This implies periodic information is required about the programs to be developed and continuous information about the level of support achieved.

If the sustainability challenges are to be met, and to be shown to be met, companies will need to gather appropriate information and pass it to the government in order to see if policies orientated towards achieving sustainability are achieved, both government and companies in the industry will need to gather and report the appropriate information.

A mapping between EMA components, as represented by the framework developed in Burritt et al. [2] (see Table II) and Burritt [3], has the potential to highlight gaps in the information requirements of agencies and companies in terms of ecologically sustainable development. In addition, it could provide a systematic and pragmatic basis for the ESD-control process in aquaculture [20].

The policy framework introduced by Primary Industries and Resources SA [13] recognises the need for clearly defined sustainability objectives, indicators and performance measures [18] [19]. These are set in context in Figure 1 which shows the flow of relationships between activities towards sustainability as represented in the Standing Committee for Fisheries and Aquaculture's (SCFA's) mapping. Implicit in the Figure is the management decision process, based on appropriate EMA and other information at government agency management levels. This is founded on and framed by *periodic* and *ad hoc* reporting requirements to government, the community, applications for obtaining and maintaining export permits, for regional marine plans, etc..

Reporting has three framing parts to guide management: (i) component trees; (ii) risk assessment and prioritization; and (iii) performance assessment. Component trees identify the issues specific to each component of sustainable development. At the general government agency level these components are ecological wellbeing and human wellbeing, the latter being expressed in social and economic terms. More specific is the management of environmental impacts of and on fishing; contribution to community wellbeing; and ensuring that ecologically sustainable development principles are underpinned by appropriate legal, institutional and economic policy frameworks. Risk assessment and prioritisation is a process which determines which of these components are sufficiently significant to warrant management actions and, hence, a report on performance with justification for assigning low priority or low risk [3]. Finally, pragmatic performance assessment is made at the lowest level of components providing information about the following: operational objective; indicator; performance measure; data requirements; data availability; evaluation; robustness of the

indicator; management response – current and future; actions taken where a gap exists between performance and expectations; and verification.

A start has been made by the South Australian government to address the issue of sustainability information at the level of *ad hoc* project proposals. This is based on the notion of sustainability assessment which consists of a suite of tools, including integrated impact assessment, to enable front end policy integration in decision-making processes of government relating to policy, plans and projects [25]. The tools include means to assess the scope of the impacts of a project proposal, the net efficiency gains from the impacts, and the equity impacts – who gains and loses. Criteria suggested include: economy (business climate, jobs and investment), society (health, safety, regional development, community engagement, cultural heritage, access to public services and equity), and environment (energy, waste management, water, biodiversity, and landscape) all rated as to positive, negative or neutral with high, medium and low scales. In addition a level of confidence on a five point scale allows for relative riskiness of assessment levels to be made apparent. The foundation for developing one form of EMA - ad hoc sustainability investment appraisal - for aquaculture is now available. Guidance provided by IFAC for organisations stands in contrast as the foundation for provision of periodic information about ESD impacts and this raises the issue of whether the two can be brought together to provide information that will promote ESD in South Australian aquaculture (see the possibilities in Table II).

5. Discussion

Based on the framework available to Australian aquaculture the periodic risk based EMA approach appears to fall short for a number of reasons which need to be addressed in a systematic approach to sustainability accounting and reporting: (i) it is critical to recognize the broader social as well as the environmental and economic dimension built into decision making processes associated with the concept of ecologically sustainable development, in order that the total quality of life can be increased [21]. Current interpretations of IFAC based EMA include these social considerations as less tangible costs [22], but these are unlikely to be reported by companies on a voluntary basis and so encouragement from industry associations or the government would be required; (ii) the growing importance of non-financial aspects of an organisation's activities, including risks associated with poor social performance and inattention to the equity of relationships between parties, means that environmental management accounting information may at present provide a too narrow efficiency based representation for organisations moving towards ecologically sustainable development; (iii) the cost of obtaining relevant, high quality information still needs to be compared with the expected benefits for it to be justified by company management, whereas government is in the position to mandate its reporting provisions for accountability purposes; (iv) the lack of integration between different aspects of any organisation's movements towards sustainability means that piecemeal actions remain likely to dominate decision processes with sustainability remaining illusive, unless a systematic framework for sustainability accounting and reporting is adopted [23][24]. The implication is that based on these pragmatic considerations development of a comprehensive foundation for movement towards sustainability accounting and reporting in the South Australian aquaculture industry much work remains to be completed.

References

[1] United Nations Division for Sustainable Development, *Environmental Management Accounting Procedures and Principles*, prepared for the Expert Working Group on "Improving the Role of Government in the Promotion of Environmental Management Accounting" New York, 2001.

[2] Burritt, R., Hahn T. and S. Schaltegger, "Towards a Comprehensive Framework for Environmental Management Accounting. Links Between Business Actors and Environmental Management Accounting Tools," *Australian Accounting Review*, vol. 12 no. 2, pp. 39-50, 2002.

[3] Burritt, R.L., "Environmental risk management and environmental management accounting - developing linkages" chapter in Implementing Environmental Management Accounting: Status and Challenges Rikhardsson, P., Bennett, M., Schaltegger, S. and J.J. Bouma (eds) Kluwer Academic Publishers, Boston/Dordrecht/London pp.123-141 2005.

[4] International Federation of Accountants. *International Guidance Document. Environmental Management Accounting*, International Federation of Accountants, New York, August 2005.

[5] Pillay, T. V. R. and M. N. Kutty. *Aquaculture: Principles and Practices.* 2nd ed. Oxford; Ames, Iowa: Blackwell Pub., 2005, p.3.

[6] Australian Government, *Assessing and Reporting of the Ecologically Sustainable Development of Australian Aquaculture*, Volume I, Main Report, Department of Agriculture Fisheries and Forestry, Canberra, Australia, September 2004, p.iii.

[7] Nel, S. *Aquaculture Product and Industry Development – Making Money from Aquaculture*, Skretting Australasian Aquaculture 2006 Conference, Convention Centre, Adelaide, 27-30 August 2006.

[8] Australian Government, *Assessing and Reporting of the Ecologically Sustainable Development of Australian Aquaculture*, Volume I, Main Report, Department of Agriculture Fisheries and Forestry, Canberra, Australia, September 2004, p.v.

[9] Bartas, J-M. "Aquaculture. An Overview," *Vegetarian Journal*, vol. XVI, nos 3 & 4, 1997.

[10] Nightingale, I, "*A snapshot of economic and employment statistics for aquaculture*" Primary Industries and Resources SA, Government of South Australia, Adelaide, 2006.

[11] CSIRO Marine Research, *Understanding our Oceans. The Facts* Information Sheet, p.1, 2005.

[12] Australian Government, *Companion to the FRDC's Research and Development Plan 2005-10*, The Fisheries Research and Development Corporation, Canberra, Australia, 2005.

[13] Primary Industries and Resources SA, *Aquaculture Resource Management and Ecologically Sustainable Development Policy Report*, PIRSA Aquaculture, Adelaide, 12 August 2004.

[14] Government of South Australia, Primary Industries and Resources SA (PIRSA), *PIRSA Aquaculture* [cited at http://www.pir.sa.gov.au/sector118.shtml , on 17 January 2007].

[15] Government of South Australia, Land Based Aquaculture: Aquaculture Regulation: Aquaculture Act, 2001.

[16] Government of South Australia, *South Australia's Strategic Plan. Creating Opportunity*. Volume 2, Detailed Facts and Figures. Department of Premier and Cabinet, 2004.

[17] Chesson, J., Whitworth, B. and T. Smith, *Reporting on Ecological Sustainable Development: The reporting framework of the Standing Committee on Fisheries and Aquaculture in relation to national and international experience*, Bureau of Rural Science, Canberra, Australia, 2000, pp.100.

[18] Fletcher, W.J., Chesson, J., Sainsbury, K.J., Fisher, M., Hundloe, T., A.D.M. Smith and Whitworth, B., *National Application of Sustainability Indicators for Australian Fisheries.* Final Report FRDC Project 2000/145, Canberra, Australia, 2003, pp.48.

[19] An overview of the eco-control process is provided in Schaltegger, S., Burritt, R. and H. Petersen, *An Introduction to Corporate Environmental Management. Striving for Sustainability*, Greenleaf Publishing, Sheffield, UK, 2003.

[20] Commonwealth of Australia, National Strategy for Ecologically Sustainable Development, Canberra, Australia, December 1992.

[21] International Federation of Accountants. *International Guidance Document. Environmental Management Accounting*, International Federation of Accountants, New York, August 2005, p.17.

[22] Schaltegger, S. and R. Burritt, *Contemporary Environmental Accounting,* Greenleaf Publishers, Sheffield, U.K 2000, p.254.

[23] Schaltegger, S. and R.L. Burritt, 'Corporate Sustainability' chapter in Tietenberg, T. and Folmer, H. (Eds) *The International Yearbook of Environmental and Resource Economics 2005/2006* Edward Elgar Publishing, Northampton, Mass. vol.8, pp.185-222, 2005.

[24] Schaltegger, S., Bennett, M., and R.L. Burritt, 'Sustainability Accounting and Reporting: Development, Linkages and Reflection' in Schaltegger, S., Bennett, M., and Burritt, R.L. (eds) *Sustainability Accounting and Reporting* Springer, Dordrecht, Netherlands, 2006.

[25] Office of Sustainability, Government of South Australia. *Development of Triple Bottom Line Assessment Methodologies*. Report of a South Australian Government Inter-Agency Group, March 2005.

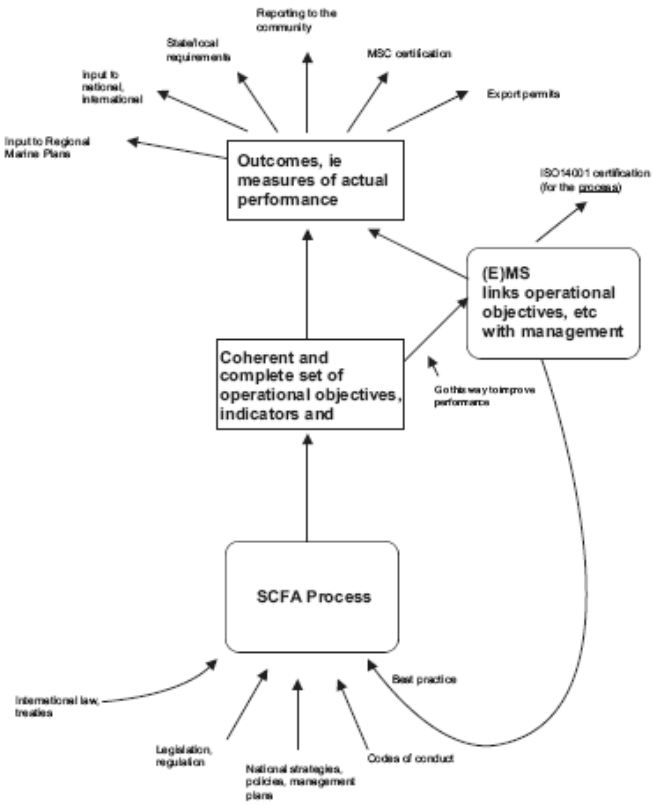
TABLE 1: FIVE SUSTAINABILITY CHALLENGES IN AUSTRALIAN AQUACULTURE

1	NATURAL RESOURCES SUSTAINABILITY
2	RESOURCE ACCESS AND RESOURCE ALLOCATION
3	PROFITABLE RESPONSE TO RISING DEMAND
4	PEOPLE DEVELOPMENT
5	COMMUNITY AND CONSUMER SUPPORT

TABLE II: ENVIRONMENTAL MANAGEMENT ACCOUNTING INFORMATION

		Environmental Management Accounting (EMA)			
		Monetary EMA (MEMA)		Physical EMA (PEMA)	
		Short Term Focus	Long Term Focus	Short Term Focus	Long Term Focus
Past Oriented	Routinely generated information	e.g. environmental cost accounting 1	e.g. environmental induced capital expenditure and revenues 2	e.g. material and energy flow accounting 9	e.g. natural capital impact accounting 10
	Ad hoc information	e.g. ex post assessment of environmental costing decisions 3	e.g. environmental life cycle (and target) costing 4	e.g. ex post assessment of short term environmental impacts 11	e.g. life cycle inventories 12
Future Oriented	Routinely generated information	e.g. monetary environmental operational and capital budgeting 5	e.g. environmental long term financial planning 6	e.g. physical environmental budgeting 13	e.g. long term physical environmental planning 14
	Ad hoc information	e.g. environmental job costing, environmental pricing 7	e.g. monetary environmental investment appraisal 8	e.g. short run environmental impacts 15	e.g. life cycle analysis of specific project 16

FIGURE 1: ROLE OF SCFA PROCESS IN RELATION TO OTHER ACTIVITIES.



Roger L. Burritt
School of Commerce, University of South Australia, City West Campus, Adelaide, SA 5000, Australia;
E-mail: roger.burritt@unisa.edu.au

EXPERIENCE FROM EMPRESS PROJECT IN INDUSTRIAL SITES – INTRODUCING ENERGY AND MATERIAL FLOW MANAGEMENT SYSTEM THROUGH ITS FINANCING FROM SAVINGS

Vladimír Dobeš

Abstract

This presentation describes experience from the EMPRESS project, which piloted implementation of energy and material flow management system in industrial settings and buildings and its financing from savings based on proven environmental accounting method and/or cleaner production tool, Monitoring and Targeting (M&T). Goal of M&T is to improve energy and material efficiency and to reduce non-product outputs (pollution). The project coupled M&T support elements with private sector financing of the costs of energy management system introduction (involving meters and controls, technical assistance, on-site training and software) through an approach often used by Energy Service Companies (ESCOs) and called Energy Performance Contracting (EPC). This combination of "soft" managerial approaches (Monitoring and Targeting technical services) with ESCO-style financing has not been to our knowledge used before and, given the success of the implemented M&T/ESCO contracts, could be considered a break-through in promotion of energy and material flow management system and cleaner production worldwide. This conclusion is relevant also for Environmental Management Accounting (EMA) as M&T fulfils its functions within industrial processes.

The EMPRESS (Energy Management Performance Related Energy Savings Scheme) was a GEF funded project managed by UNEP and BASE and implemented in 2003 – 2007 in the Czech and Slovak Republics with the assistance of ENVIROS. There were implemented 10 no-cure no-pay contracts on introduction of flow management system (with focus on energy management) financed from savings in the Czech Republic leading to guaranteed overall reduction of CO_2 emissions by 21,150 t/year and to guaranteed overall savings 2.28 mio. USD/year. These are practical results of implementation of the newly developed product called M&T/ESCO which was successfully tested in practice and which is available on commercial bases from 4 providers. There are follow up activities amending this newly developed M&T/ESCO scheme to small and medium size enterprises.

This is opening the door for promotion of progressive approaches to industrial sustainability management on a qualitatively new basis which is based on partnership of those who hold the required knowledge and are therefore capable of assuming the technical risks related to desired innovations (M&T/ESCO providers) and those who posses the potential for reduction of environmental risks and for savings (industrial sites).

Ing. Vladimír Dobeš, M.Sc.
Director of the Czech Energy Management Centre EMPRESS
Na Rovnosti 1, 130 00 Praha 3
Tel.: 284 007 481; Mobil: 603 178 642; Fax: 284 861 245
E-mail: office@empress.cz

EMA AND EXTERNALITIES

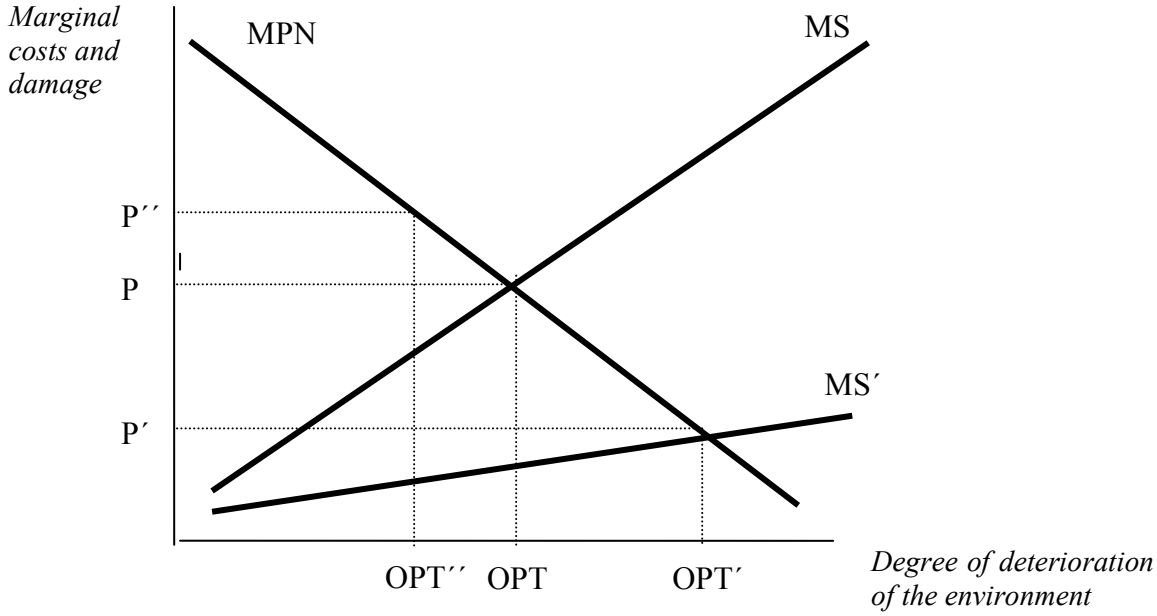
Miroslav Hájek, Karel Pulkrab

Study of the microeconomic aspects of environmental protection is important from the point of view of both the conduct of individual entities and their impact on the environment and also from the standpoint of governments and regulatory instruments leading to minimization of the impact of human activity on the environment. Dealing with these issues is closely related to the aspect of externalities (Heyne, 1991), as externalities lead to market failure, because the rules do not reflect social marginal costs and benefits. This leads to a greater degree of detriment to the environment and lower marginal costs of entities that do not take generated externalities into account (Graph 1).

Externalities are mainly known for their negative extra-market effects, i.e. they reduce production or benefits from a general point of view and lead to higher costs that are not compensated by the entity that created them. They are generated primarily under the following conditions (Štěpánek, 1997):

1. unusually large volume of production
2. in production and consumption when the environment is excessively burdened
3. the prices of products are too low and particularly do not reflect social costs related to production
4. there are no realistic market incentives for introduction of environmentally sounder technologies.

Graph 1 Cost optimization for protection of the environment at a company and social level



MS´ .... marginal private damage.
MS .... marginal social damage.
MPN .... marginal preventative costs.
OPT´ .... economically optimal environmental quality taking into account private damage.
OPT .... economically optimal environmental quality taking into account social damage.

External costs can be partially compensated in monetary form (compensation for damage) or, for example, through lower value of the property that causes the external effects and in a number of other ways. Positive externalities are frequently overlooked; here, there is an

increase in the production or benefit of entities affected by the externality without them paying for this advantage.
A government is expected to consistently monitor the occurrence of externalities and correct their effects in society, i.e. it is expected that it will suppress the occurrence of negative externalities and support positive externalities, as this is one of the causes of market failure that is difficult to combat without governmental intervention.

Environmental management accounting as part of instruments and approaches

State policy in the area of the environment encompasses various kinds of instruments and approaches, which must be selected in relation to the targets of environmental policy and their characteristics. The degree of risk and time are amongst the most important factors. Depending on the character of the issues involved, "hard" and "soft' instruments can be selected, i.e. from prohibition, through taxes and charges and tradable permits to environmental labeling and company management.
Environmental management systems and especially environmental management accounting constitute a voluntary approach (instrument) that is not required according to the valid laws but, on the other hand, may contribute to environmentally sound conduct. It is advantageous that these are voluntary measures and are thus not accompanied by sanctions for failure to introduce them or for erroneous implementation. They also have the advantage that quite large scope is provided for adaptation to specific conditions (these are flexible mechanisms) and thus greater effectiveness should be achieved in the implementation of specific measures.
From the standpoint of the State, the voluntary nature of introduction is a disadvantage, because this entails uncertainty in this approach as to whether a reduction in environmental impact will be achieved at all and, if so, when. Consequently, voluntary methods are sometimes combined with other instruments, e.g. environmental taxes with voluntary agreements for energy-intensive industry.
Voluntary application is also subsequently important from the standpoint of performance of analyses with inclusion of externalities as, if externalities are not included in the environmental accounting, this accounting will not reflect all the aspects of environmental protection and management decisions need not be correct from the standpoint of society as a whole.

Approach of public entities

Environmental management accounting can be employed for both the private and public sectors. The methodology for introducing environmental management accounting is basically the same for both sectors and also for other applications (various levels of management, for product life-cycle assessment, etc.). From this point of view, it is apparent that the method can be established in general and can be used by anyone, where minor modifications can be made from the standpoint of the specificity of particular entities.
The most complete assessment of costs and benefits can probably be expected in the public sector, which should be concerned to take into account all aspects, including the effect of externalities. Information obtained from environmental management accounting, supplemented by the value of externalities, can be used, e.g., for cost-benefit analysis.
Cost-benefit analysis consists of the following steps: project definition or variant approaches, establishment of economically important and physical impacts, including use of the methodology of environmental management accounting, and discounting (Hanley 1993).
Project definition consists in delimitation of the area covered by the project, including e.g. specification of the population affected by the project.

Identification of the impacts of the project (positive and negative) may include establishment of net impacts concerning only the given locality or may encompass transfer from or to some other locality.
An important part of the analysis consists in identification of significant economic impacts, which are the subject of analysis of the relevant and physical impacts of implementation of the project.
Monetary evaluation of important effects is important. The basic unit of the cost-benefit method is money. In prediction of its amount, increased attention must be paid to prices. The effect on prices caused by imperfect competition, governmental interventions or the absence of a market must be taken into account.
One of the most important elements of analysis consists in discounting of the cost-benefit flow. An important contribution following from cost-benefit analysis is the aspect of time (Pearce, 1993). This analysis also allows for calculation of benefits for the environment in the long term and an economically comprehensive picture of implementation of the measures can thus be obtained. The long-term effects that are an important feature of investments for environmental protection can thus be assessed, for example, for forest management, which has a very long production cycle.
Use of the net present value method is important from the viewpoint of temporal distribution of the compared costs (which are usually greatest at the beginning of the period of implementation) and expected yields that are likely to be obtained even in the long term, i.e. 10, 20 or more years. This is also connected with the accuracy of calculations. In the initial years of implementation, the values of costs and benefits will be relatively accurate while, at the end of the evaluated period, these will be mere estimates. The net present value represents the difference between the current value of expected benefits and the current value of costs including the costs of acquisition of investments and operational costs.

$$NPV = \sum_{n=1}^{N} B_n \frac{1}{(1+r)^n} - \sum_{n=1}^{N} C_n \frac{1}{(1+r)^n}$$

The success of practical application of cost-benefit analysis depends on resolving the most important aspects connected with this analysis:

1. valuation of non-market goods (nature, landscape),
2. the complexity of the ecosystem (aspect of accuracy of prediction of future trends in the ecosystem),
3. the manner of determining the discount rate.

Consideration should be taken of whether the analysis can actually be used in practice. It might only contribute to increased bureaucracy without the desired effect.
Environmental management accounting can be employed as a source of information for cost-benefit analysis and as basic information for decision-making in the public sector. Here the methodology does not present any difficulties, in contrast to calculation of the negative and positive externalities. There is currently no uniform methodology and thus specific information on the monetary value can usually not be compared. From the standpoint of the actual accounting, it is necessary to differentiate between items belonging in the internal accounts and the costs and benefits for society as a whole (outside of the internal accounting). From this standpoint, it is difficult to employ a similar approach in the private sector.

Approaches to taking into account externalities in the private sector

In general, it can be stated that externalities that are not evaluated by the market are not included in internal calculations of economic activities (Hyršlová, Vaněček 2003).

Consequently, externalities are not included in company costs and revenues and are thus not taken into consideration in decision-making in the private sector.
If companies were to take into consideration externalities in their decision-making, it would be in the interest of the State to choose instruments leading to internalization of these externalities, i.e. introduce a system of instruments that would include costs and benefits for society as a whole in corporate costs and benefits. This cannot be based on complete internalization of externalities, but rather on optimization or specific targets following from environmental policy and reflecting the requirements of society as a whole in relation to externalities.
From a theoretical standpoint, the optimal level of internalization of externalities should be found. For negative externalities, for example, environmental impacts are compared with the level of preventative costs (Graph 1). The effect of social costs on reducing the level of environmental detriment (OPT′ → OPT) and on increasing costs to a level corresponding to the economically optimal environmental detriment is then apparent (P′ → P).
In practice, the optimal level of pollution is based most frequently on risk analysis and determination of limits for emitted pollution. Subsequently, instruments are adopted, leading to achieving of the set limits. If administrative instruments are involved, the company must adopt measures so that it does not exceed the limits and the costs of these measures are reflected in environmental costs. When economic instruments are employed, company conduct is affected so that the set limits are attained through fees and taxes or other instruments. However, this depends on the proper rates for fees and taxes. Economic instruments are most effective and provide scope for flexibility in the company in adopting measures to protect the environment. The use of environmental management accounting promotes this positive role of economic instruments and also emphasizes the level of internalization of negative externalities.
It thus follows that negative externalities are taken into account in the framework of common methods of environmental management accounting. However, this depends on the level of the environmental policy and related policies and the instruments employed to implement them. For example, the rates of taxes and fees should correspond to their incentive function and should be regularly updated in relation to the level of inflation; if a long-term substantial reduction in emissions (e.g. greenhouse gases) is required, the rates of taxes and fees should be known for a longer period of time so that the affected entities can gradually adapt and reduce emissions.
If negative externalities are internalized through economic instruments, they are monitored through environmental management accounting. This is similarly true of positive externalities, which are entered under environmental revenues as subsidies, or under taxes and fees if various kinds of exemptions are involved.
However, difficulties tend to be encountered rather in conduct beyond the framework of the set rules and legislation and, at the theoretical level, the expenditure of greater costs for prevention (P′′) than corresponds to the optimal environmental detriment (Graph 1). For example, this is true of the use of environmentally friendly products and services.
However, there are other points of view of internalization of externalities that companies can perform themselves without endangering economic results (Schaltegger, Wagner 2006)

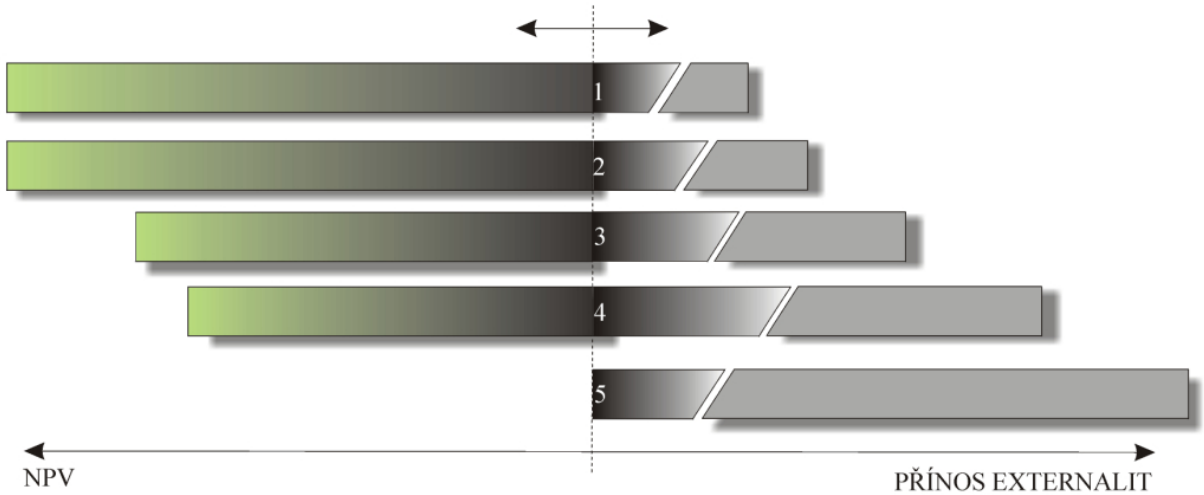
1. technical innovations usually provide substantial benefits, not only for the competitiveness and economics of the company, but also for reducing the environmental impact of production,
2. the ideas of management,
3. influencing customers to increase consumption of environmentally friendly goods and services.

There are a number of methods that lead to environmentally better conduct beyond the framework of the legislation. Mostly, these consist in analysis in the framework of a decision-making process, based on information obtained from environmental management accounting and not concerned with modifying methods of reporting environmental costs and revenues.
Some methods are relatively simple and, fundamentally, need not employ a complex method for evaluating externalities. For example, these include the methods of simple amelioration and the principle of equivalent marginal costs.

The method of simple amelioration

Nonmonetary expression of values can be employed when the method of simple amelioration is used in the decision-making process. For example, in comparing tree felling methods in forest management, the benefits and practical potential for use can be documented (Klemperer 1996). This method was employed to compare clear-cutting, shelterwood cutting, transition to stands of various ages, including stands without felling (1 to 5). In relation to the potential for monetary valuation of the function of a forest, the net present value (NPV) is compared on the left-hand side of Graph 2, with the nonmonetary valuation on the right-hand side. It can be assumed that the monetary function of a forest would be based on information from an environmental management accounting system. The nonmonetary function of a forest can be based on comparison of the condition of the forest, soil, erosion, number of animals, etc., where a relatively simple point valuation can be employed. However, there is also a relatively simple point valuation that could be used for this method (Vyskot 2003). Where some functions can be expressed in monetary terms, then the net present values are included in the calculation.

Graph 2 Comparison of monetary and nonmonetary inputs of five tree felling methods in forest management.



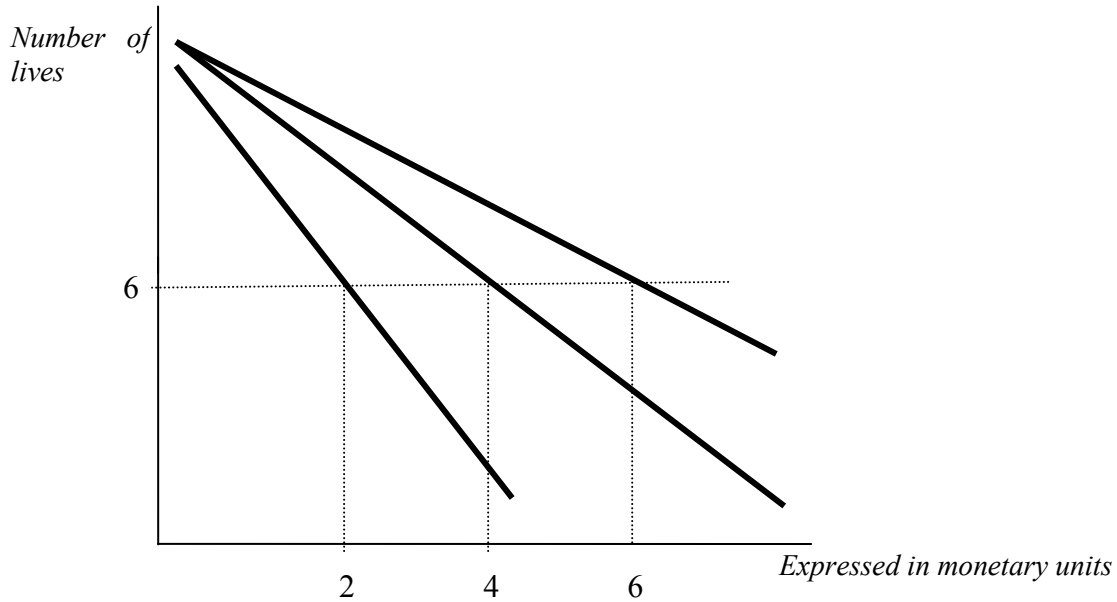
The specific decision-making occurs through comparing the net present value with the benefit of externalities. The first and second columns of the graph contain the same net present value and a substantial greater benefit of externalities in the second column. Thus, the activity that is expressed in the second column should be chosen.
Another example is given in columns three and four, where the net present value is lower in column four, but the benefit of externalities is much higher in this column. In this case, it is possible to select the variant given in column four because, in case of sale of a forest, both the value of the wood and the nonmarket values (appearance of the landscape, recreational value, etc.) are taken into consideration. Of course, if a decision were to be made without consideration of possible future sale, the forest owner would choose the third variant.
The simple amelioration method can also be used according to the existing methods for introduction of environmental management accounting (Hyršlová, Vaněček 2003) where the

part “Environmentally important inputs and outputs” contains comparison of the amount of wastes, emissions, etc., according to the individual variants entering the decision-making process.

The principle of equivalent marginal costs

This principle is better applicable in the public sector. It is based on achieving qualitative expression of the benefit or positive externalities while expending the costs that are available for various measures. Specifically, for example, this could refer to the reduction in the death rate on highways if lights are installed at cross-roads, by-passes are built and highways are widened (Klemperer 1996). An example is the reduction in the risk of death by five lives in a case where 12 monetary units are available for the above measures (Graph 3).

Graph 3 Optimal allocation of a nonmarket output



A number of examples are known from theory where it is not necessary to valuate externalities in decision-making. In combination with the use of environmental management accounting, the aspect of positive and negative externalities can be resolved, where it is not necessary to employ monetary expression of these externalities in order to optimize their extent.

Conclusion

When considering the effect of externalities on the decision-making process, it is necessary to base considerations on environmental management accounting, where externalities corresponding to the targets of the environmental policy or those corresponding to the relevant environmental protection legislation are included. The basic difference lies in the approach to the decision-making process in the public and private sectors. While the private sector is based primarily on products and services, whose value can be expressed in monetary terms, the public sector also takes nonmonetary values into consideration. Consequently, special attention should be devoted to decision-making processes in the private sector, so that maximum use is made of knowledge of externalities.

Acknowledgements

This work was supported by the Grant Agency of the Czech Republic under project No. 402/06/1100.

References:

1. Heyne, P.: Ekonomický styl myšlení. Vysoká škola ekonomická v Praze, Praha, 1991, 509 s.
2. Hyršlová, J., Vaněček, V.: Manažerské účetnictví pro potřeby environmentálního řízení. Ministerstvo životního prostředí, Praha 2003.
3. Klemperer, W.D.: Forest Resource Economics and Finance. McGraw-Hill, Inc., New York, N.Y. 1996.
4. Metodický pokyn pro zavedení environmentálního manažerského účetnictví. Ministerstvo životního prostředí, Praha 2003.
5. Pearce, D.W., Warford, J.J.: World without End. Oxford University Press, Washington, D.C., 1993.
6. Schaltegger. S., Wagner, M.: Managing the Business Case for Sustainability. The Integration of Social, Environmental and Economic Performance. Greenleaf, Sheffield 2006.
7. Štěpánek, Z.: Ekonomické souvislosti ochrany životního prostředí. Zpravodaj MŽP 1/1997.
8. Vyskot, I. et al.: Quantification and Evaluation of Forest Functions on the Example of the Czech Republic. Ministry of Environment of the Czech Republic, Prague 2003.

Doc. Ing. Miroslav Hájek, Ph.D.,
MŽP ČR,
Vršovická 65, 100 10 Praha 10,
tel.: 267 122 084, fax: 267 126 084,
e-mail: Hajek_Miroslav@env.cz

Prof. Ing. Karel Pulkrab, CSc.,
FLE, ČZU, Praha,
Kamýcká 1176, 165 21 Praha 6 – Suchdol,
tel.: 220 920 319, fax.: 234 381 860,
e-mail: pulkrab@fle.czu.cz

GREEN PUBLIC PROCUREMENT IN THE CZECH REPUBLIC AND ITS AMOUNT IN THE YEAR 2005

Daniel Hájek

Public authorities are major consumers in Europe, spending some 16 % of the EU's gross domestic product (which is a sum equivalent to half the GDP of Germany). By using their purchasing power to opt for goods and services that also respect the environment, they can make an important contribution towards sustainable development. Green public procurement covers areas such as the purchase of energy-efficient computers and buildings, office equipment made of environmentally sustainable timber, recyclable paper, electric cars, environment-friendly public transport, organic food in canteens, electricity stemming from renewable energy sources, and air conditioning systems complying with state of the art environmental solutions. Green purchasing is also about setting an example and influencing the market place. By promoting green procurement, public authorities can provide industry with real incentives for developing green technologies. In some product, works and service sectors, the impact can be particularly significant, as public purchasers command a large share of the market (in computers, energy-efficient buildings, public transport, and so on).

Legislative in the Czech Republic:

- **Act of law 137/2006 – law for public procurement**
  Two main regulations which are contained
  - Central authority for procurement
    - Easy controllable
    - Economics benefit
  - The possibility of establishing of environmental criteria as one of criteria in procurement contract
    - That the provider has to have some environmental management system or that the product has to fulfill some environmental criteria
- **Government Resolution 720/2000 – about prioritizing of green products**
  - Recommends federal ministries and other bodies of state administration to consider environmental criteria in tenders
  - Central purchasing in line with this recommendation

Amount of the Green Public Procurement in the year 2005

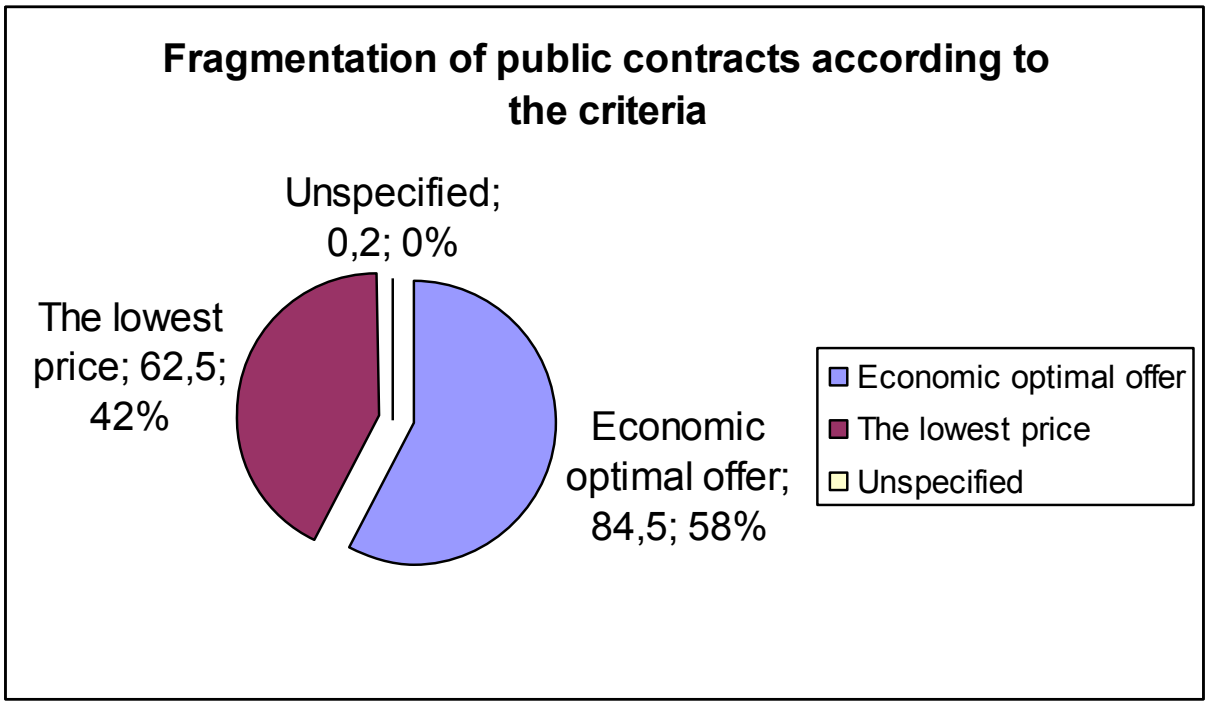
Table 1: Total amount of Public Procurement and its basic fragmentation (year 2005)

Kinds of public contracts	**Price (in milliards CZK)**	**No. of public contracts**
Construction works	101,5	4 397
Supplies	40	1 619
Services	42,5	1 226
Total*	**184**	**7 242**

Table 2: Fragmentation of public contracts according to the criteria (year 2005)

Criteria of public contract	Price without V.A.T. (in milliards CZK)	No. of public contracts
Economic optimal offer	84,5	3 589
The lowest price	62,5	2 654
Unspecified	0,2	15
Total*	**147,2**	**6 258**

Graph 1: Fragmentation of public contracts according to the criteria (year 2005)

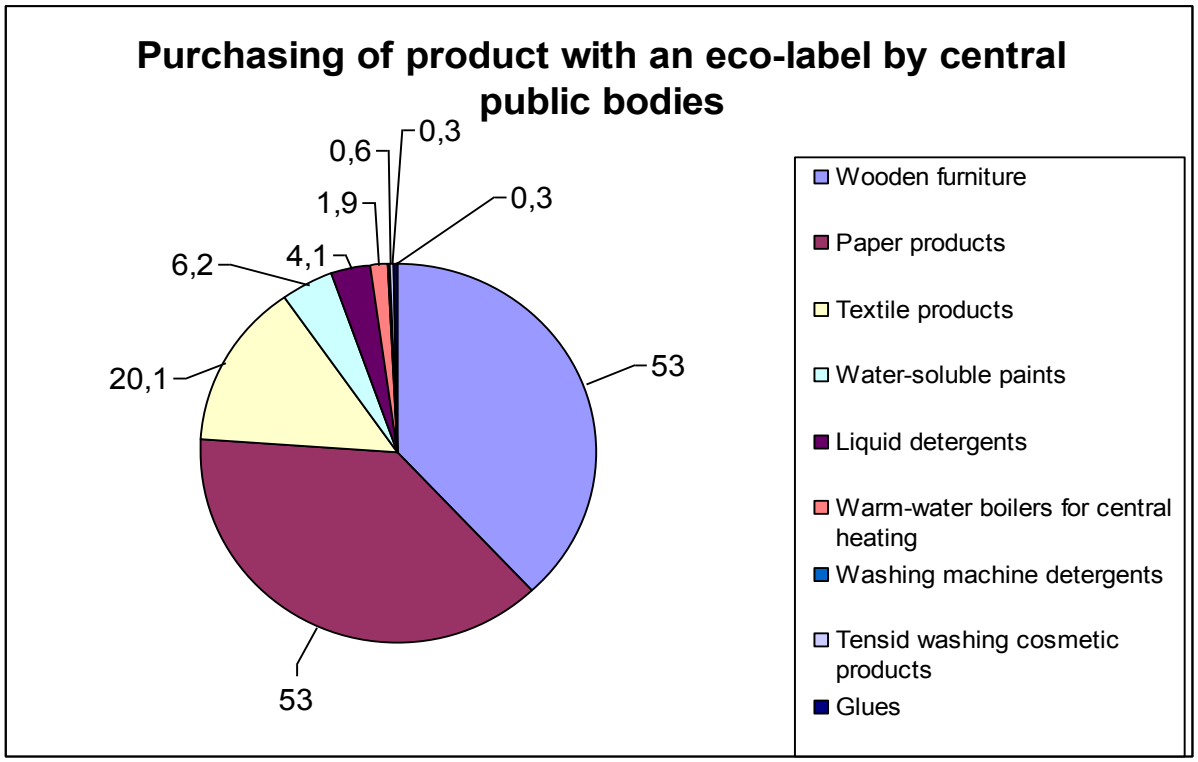


*difference is represented by special public contracts which are not taken into account in the second table

Table 3: Purchasing of product with an eco-label by central public bodies (year 2005)

Product group*	Price
Wooden furniture	53mil. CZK
Paper products (graph paper, hygienic paper, paper bags, wrappers)	53mil. CZK
Textile products	20,1mil. CZK
Water-soluble paints	6,2mil. CZK
Liquid detergents	4,1mil. CZK
Warm-water boilers for central heating	1,9mil. CZK
Washing machine detergents	0,6mil. CZK
Tensid washing cosmetic products	0,3mil. CZK
Glues	0,3mil. CZK
Total	**139,5mil. CZK**

Graph 2: Purchasing of product with an eco-label (year 2005)

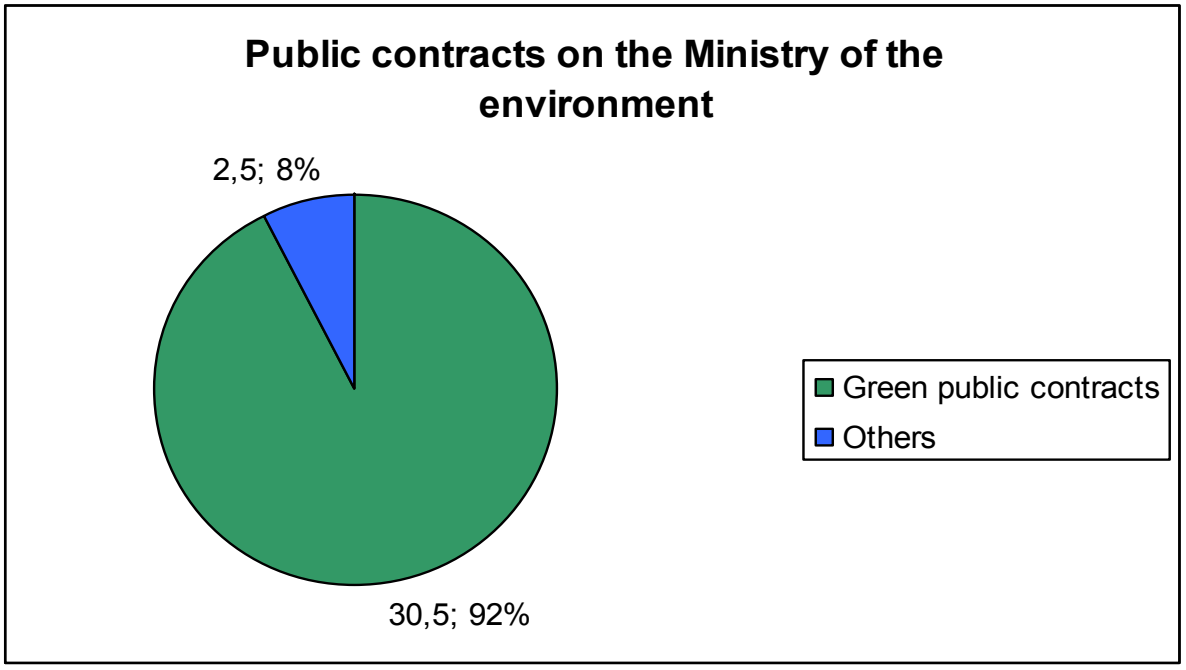


* In average it represents 79% of all products which were bought in certain category.

Table 4: Public contracts on the Ministry of the Environment

Kinds of public contracts	**Price**
Green public contracts	30,5mil. CZK
Others	2,5mil. CZK
Total	**33mil. CZK**

Graph 3: Public contracts on the Ministry of the Environment (year 2005)



Future:

Ministry of the Environment will focus on enhancement of an awareness of the GPP and utilisation of environmental criteria in public contracts.

Daniel Hájek
Ministry of the Environment

KEY INDICATORS OF ENVIRONMENTAL PERFORMANCE AND THEIR ASSESMENT

Jiří Hřebíček, Pavel Růžička

Introduction

The *Environmental Performance* (EP) of an organisation is defined as results of an organisation's management of its environmental aspects. In the context of environmental management systems these results can be measured against the organization's *environmental policy* (i.e. overall intentions and direction of an organization related to its environmental performance as formally expressed by top management), *environmental objectives* (overall environmental goals, consistent with the environmental policy, that an organization sets itself to achieve) and *environmental targets* (i.e. detailed performance requirements, applicable to the whole organization or parts thereof, that arise from the environmental objectives and that need to be set and met in order to achieve those objectives), and other environmental performance requirements.

Environmental performance evaluation (EPE) is the subject of international standard ČSN EN ISO 14031 *Environmental management — Environmental performance evaluation — Guidelines* (further ISO 14031). EPE is defined as follows: *Process to facilitate management decisions regarding an organisation's environmental performance by selecting indicators, collecting and analysing data, assessing information against environmental performance criteria, reporting and communicating, and periodic review and improvement process*

The standard ISO 14031describes two general categories of indicators for EPE: *Environmental Performance Indicators* (EPIs); and *Environmental Condition Indicators* (ECIs).

There are two types of EPIs:

- *Management performance indicators* (MPIs) provide information about management efforts to influence the environmental performance of the organisation's operations.
- *Operational performance indicators* (OPIs) provide information about the environmental performance of the organisation's operations.

Indicators ECIs provide information about the condition of the environment. This information may help an organisation to better understand the impact or potential impact of its environmental aspects, and thus assists in the planning and implementation of EPE. The decisions and actions of an organisation's management are closely related to the performance of its operations.

Environmental performance criterion is described by ISO 14031 as an *organisation's environmental objective, target, or other intended level of environmental performance set by its management*.

Hřebíček and Pitner (1998) proposed information system ISEPE, which may evaluate organization's environmental performance against its environmental policy, objectives, targets and other environmental performance criteria. An organization without environmental management system may use EPE and information system ISEPE to assist in identifying its environmental aspects[2], determining which aspects are treated as significant, setting criteria

[2] i. e. in ISO 14031: element of an organisation's activities, products or services that can interact with the environment. A significant environmental! aspect is an environmental aspect which has or can have a significant environmental impact.

for its environmental performance, and evaluating its environmental performance against these criteria, (Hřebíček 1997).
The Figure 1 provides an outline of the EPE process, as the known Deming's *"PLAN – DO – CHECK – ACT"* management model.

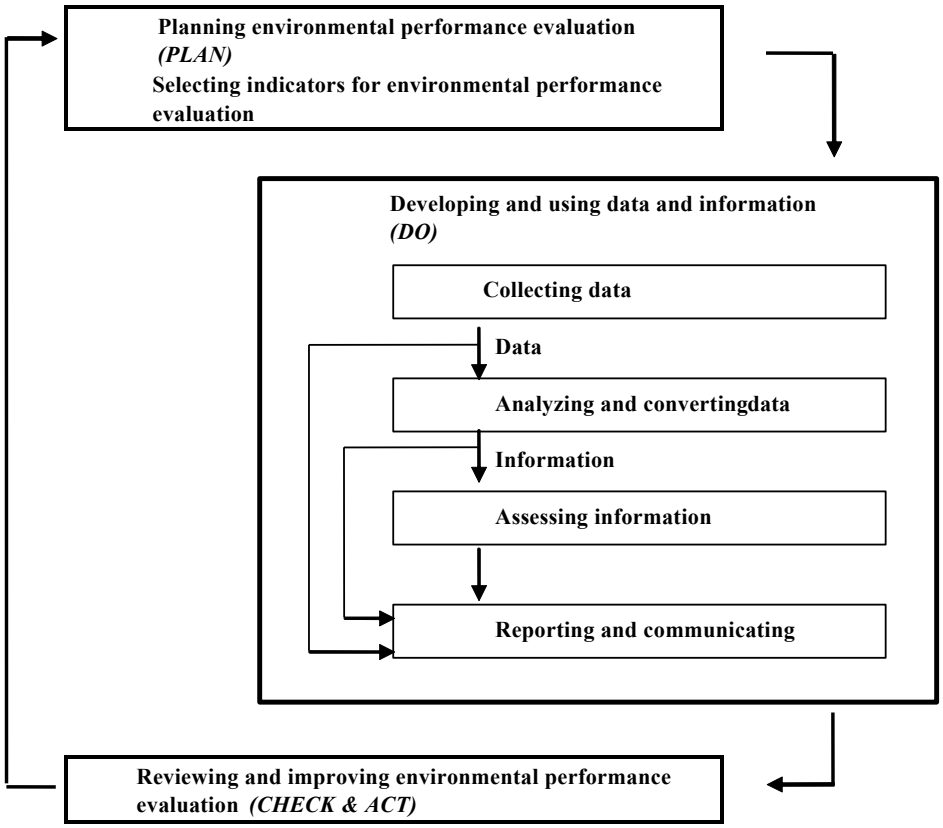


Figure 1 - Process of EPE

The process EPE defined in ISO 14031 is too general including methods how to choose appropriate EPI and ECI and set environmental performance criteria.
Therefore, we present several approaches for selecting key environmental performance indicators in the paper.

1. Selecting key indicators with respect to Recommendation 2003/532/EC

In Annex I of Commission Recommendation 2003/532/EC, on guidance for the implementation of Regulation (EC) No 761/2001 of the European Parlament and of the Council allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) concerning the selection and use of environmental performance indicator, is the guidance on the selection and use of environmental performance indicators for the purpose of producing the EMAS environmental statement of organisation. However this guidance is too general. Its major categories OPIs, MPIs, and ECIs as well as most subcategories correspond directly to relevant indicator categories used in ISO 14031. However the subcategories products supporting the organisation's operation, transport,

employee involvement, administration and planning, purchasing and investments and health and safety are specific for EMAS.
Basic principles of development of environmental indicator systems (Hřebíček, Pitner 1998) and Commission Recommendation 2003/532/EC are:

- *comparability*: indicators should enable a comparison and show changes in the environmental performance,
- *balance between problematic (bad) and prospective (good) areas,*
- *continuity*: indicators should be based on the same criteria and should be taken over comparable time sections or units,
- *timeliness*: indicators should be updated frequently enough to allow action to be taken,
- *clarity*: indicators should be clear and understandable.

Further in Recommendation 2003/532/EC is highlighted, that organisations should select indicators which enhance their management. Indicators which do not contribute to the management of the organisation will ultimately not be incorporated in day-to-day management and hence will have little effect in improving environmental performance. In short, only those key performance indicators could be chosen which enable the employees and management to perform their tasks better. The Recommendation 2003/532/EC consider following criteria in the selection of appropriate key performance indicators:

a) *Indicators should give an accurate appraisal of the organisation's performance.*
It is important that the organisation can have a correct assessment of its environmental performance. The indicators should represent environmental performance as accurately as possible, providing a balanced illustration of environmental aspects and impacts[3].
In addition to absolute values of environmental impacts, measurement units may also address the environmental impact per unit of product or service, per turnover, gross sales or gross value added (*eco-efficiency* indicators) or the environmental impact per employee.

b) *Indicators should be understandable and unambiguous.*
For reasons of both credibility and management control it is important that indicators should be clear and understandable to the user and correspond to the users' information requirements. Indicators should be coherent and concentrate on essential data. For reporting purposes data is often aggregated or normalised. Whilst this may allow for a succinct presentation it is important that the end result is easily understood. For instance reporting against an internal index for in-house recycling may not be understandable if the method for generation of that index is not explained in simple terms.
Normalising data against a base year may allow for year on year comparison but may not reflect all aspects of environmental performance.

c) *Indicators should allow for year on year comparison.*
This aspect ensures that it is easy to follow the development of EP of an organisation. The importance of the correct selection of indicators at the beginning of the reporting process can be demonstrated in the requirement for year on year comparison.

d) *Indicators should allow for comparison with sector, national or regional benchmarks*
One of the essential requirements for comparison of indicators is that they are generated the same way. The organisation should take care to apply the '*common standard*' when creating their indicators. Organisations should ensure that they are aware of these

[3] i.e. in ISO 14031: any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

benchmarks and that if reporting against these aspects then the indicators they choose should allow for direct comparison with these benchmarks.

e) *Indicators should allow for comparison with regulatory requirements.*
For both internal management and external credibility, organisations should be able to demonstrate how they are performing in relation to regulatory requirements. Where regulatory requirements exist for the environmental aspect to be reported, organisations should include these requirements in the same table or graphical representation as the performance.

Before deciding on the key indicator to be used for tracking an environmental aspect an organisation should ask itself the following questions:

a) Can the data represent the environmental impact of the organisation?
b) Can the indicators enable the quantification of environmental targets?
c) Does the data support the management process of the organisation?
d) Is the data understandable without complicated explanation?
e) Will data in this format be usable year on year?
f) Are any existing legal limits for this aspect incorporated?
g) Can the data be compared with relevant benchmarks for this aspect?

Creating environmental information can be expensive and time consuming. Environmental performance indicators should therefore be cost-effective and appropriate to the size and type of organisation and its needs and priorities. They should address primarily those environmental impacts that are most significant and which the company can influence by its operations, management, activities, products and services. They should also be sensitive enough to reflect significant changes in environmental impacts. In addition, organisations should make the optimum use of the environmental information they collect. To this end the indicators should fulfil the dual purpose of assisting the management of the organisation and providing information to stakeholders. Depending on an organisation's capabilities and resources, the use of environmental performance indicators may initially be limited to those aspects considered most relevant, with the initial scope being gradually widened over time.

2. Further approaches for selecting key environmental performance indicators

2.1. United Nations approach

At the United Nations Conference on Trade and Development was published "*A Manual for Preparers and Users of Eco-efficiency Indicators*" (2004). This UN Manual sets out a range of eco-efficiency indicators, defined as the ratio between an environmental and a financial variable, i.e. indicators are ratios composed of an environmental item divided by a financial item. Eco-efficiency is therefore increased by reducing the environmental impact while increasing the value of an enterprise (Schaltegger/Sturm 1989). Accounting principles in the UN Manual are based on the document "*IASB Framework for the Preparation and Presentation of Financial Statements"*, particularly the characteristics: *understandability, relevance, reliability* and *comparability*. For each of the eco-efficiency indicators, the accounting policy adopted is disclosed.

2.2. Global Reporting Initiative (GRI) approach

GRI G3 Guidelines (http://www.globalreporting.org/ReportingFramework/) are the third and the last generation of GRI Guidelines. They were published in 2006 and they are results of several years' development and improving Guidelines from 2002.

Figure 2. GR3 Reporting Framework

These guidelines are divided into several parts; each of them is devoted to certain aspect of GRI reports. G3 defines requested content of reports, framework of information and their quality. Guidelines prescribes part of report (Strategy and analysis, Organisation profile, Report parameters, Governance) and contain the list of performance indicators in three area covering corporate reporting and such can be observed and implicated in the GRI report. There are: *Economic Indicators, Social Indicators* and *Environmental Indicators*.
The Economic Indicators illustrate: Flow of capital among different stakeholders; and Main economic impacts of the organization throughout society. The Social Indicators illustrate: Employment; Labor/Management Relations; Occupational Health and Safety; Training and Education; and Diversity and Equal Opportunity. The Environmental Indicators concern an organization's impacts on living and non-living natural systems, including ecosystems, land, air, and water. They cover following areas: Materials; Energy; Water; Biodiversity; Emissions, Effluents, and Waste; Products and Services; Compliance and Transport.

2.3. The UK Reporting Guidelines approach

The UK Reporting Guidelines[4] (2006) „*Environmental Reporting Guidelines – Key Performance Indicators (KPIs)*" help companies address their most significant environmental impacts, identify environmental risks relating to company performance, and report on these in a way that meets the needs of their shareholders and other stakeholders. Reference is made to the GRI G3 framework as well as the Guidelines on Environmental Management Accounting issued by the International Federation of Accountants and the Corporate Accounting and Reporting Standard (http://www.iasplus.com/ifac/ifac.htm) issued by the World Business Council for Sustainable Development and the World Resources Institute (http://www.wri.org/). The UK Guidelines identify three general reporting principles: *transparency* (including the definition of boundaries and explanation of processes to manage risk), *accountability* (including stakeholder engagement and third party assurance) and *credibility* (including the use of an EMS and policy for supply chain management).

[4] http://www.defra.gov.uk/environment/business/envrp/guidelines.htm

3 Key features of environmental performance indicators

There is substantial variation between the different proposals as regards the range of environmental performance indicators advocated and the environmental impacts covered. In this paper, it is convenient to discuss the way in which indicators address:

- ***Emissions to air and contribution to global warming***

  The GRI G3 Guidelines have four indicators that concern emissions to air and contribution to global warming:
  EN 17 Greenhouse gas emissions
  EN 19 Other significant air emissions by weight
  EN 23 Other relevant greenhouse gas emissions
  The UK Guidelines include five indicators that concern emissions to air and contribution to global warming:
  KPI 1 Greenhouse gases
  KPI 2 Acid rain and smog precursors
  KPI 3 Dust and particles
  KPI 5 Volatile organic compounds
  KPI 6 Metal emissions to air

- ***Water use and discharge***

  The GRI G3 Guidelines include indicators:
  EN 9 Total water withdrawal by source
  EN 10 Water sources and related habitats significantly affected by withdrawal of water
  EN 11 Percentage and total volume of water recycled and reused
  EN 21 Total water discharge and quality
  EN 25 Water sources and related habitats significantly affected by discharges of water and runoff
  The UK Guidelines deal separately with water abstractions and emissions to water:
  KPI 14 Water abstraction
  KPI 7 Nutrients and organic pollutants
  KPI 8 Metal emissions to water

- ***Waste and emissions to land***

  The GRI G3 Guidelines include indicators:
  EN 20 Total amount of waste by type and destination
  EN 22 Total number and volume of significant spills
  EN 24 Weight of transported, imported, or exported waste deemed hazardous

  The UK Guidelines include:
  KPI 9 Pesticides and fertilisers
  KPI 10 Metal emissions to land
  KPI 11 Acids and organic pollutant emissions to land
  KPI 12 Waste (Recycling, recovery and landfill)
  KPI 13 Radioactive waste

- ***Materials, use of resources and recycling***

  The GRI G3 Guidelines include:
  EN 1 Weight of materials used
  EN 2 Percentage of materials used that are recycled
  EN 27 Percentage of products sold that is reclaimed at the end of the product's useful life by product category

The UK Guidelines cover the use of resources:
KPI 15 Natural gas
KPI 16 Oil
KPI 17 Metals
KPI 18 Coal
KPI 19 Minerals
KPI 20 Aggregates
KPI 21 Forestry
KPI 22 Agricultural produce

- ***Energy use***

  The GRI G3 Guidelines include:
  EN 3 Direct energy consumption broken down by primary energy source
  EN 4 Indirect energy consumption broken down by primary energy source
  EN 5 Percentage of total energy consumption met by renewable sources
  EN 6 Total energy saved due to conservation and efficiency improvements
  EN 7 Initiatives to provide energy-efficient products and services
  EN 8 Initiatives to reduce indirect energy consumption

- ***Biodiversity***

  The GRI G3 Guidelines include:
  EN 12 Location and size of land owned, leased or managed in, or adjacent to, protected areas
  EN 13 Description of significant impacts of activities on protected areas
  EN 14 Areas of habitats protected or restored
  EN 15 Programmes for managing impacts on biodiversity
  EN 16 Number of IUCN Red List species with habitats in areas affected by operations, broken down by level of extinction risk

- ***Environmental protection expenditure***

  The GRI G3 Guidelines incorporate single indicator EN 30 requiring total environmental protection expenditure by type, within the categories:
  - Waste disposal, emission treatment and remediation costs
  - Prevention and environmental management costs.

  Expenditure on fines for non-compliance with environmental regulations is addressed under EN 28.

- ***Impacts of products, services and transport***

  The GRI G3 Guidelines include:
  EN 26 Initiatives to manage the environmental impacts of products and services and extent of impact reduction.

Above indicators need to be defined with sufficient precision to ensure that preparers and users have a uniform understanding as to the information included, its limitations and context. This should embrace completeness and reliability, neutrality, and clarity. There should be relatively little scope for individual judgement in deciding what information to report or omit. Definitions and measurement methods need to be sufficiently precise to avoid uncertainty and to ensure that different organisations in similar circumstances do not present significantly different data. The degree of flexibility should be minimal so as to reduce the scope for bias or manipulation of a performance indicator. An explicit statement defining each indicator and

the basis of compilation is important in meeting these criteria, whether the indicator is used internally or published externally.

References

1. Department for Environment, Food and Rural Affairs/ Trucost (2006) *Environmental Key Performance Indicators – Reporting Guidelines for UK Business* (DEFRA, London, 2006)
2. Global Reporting Initiative (2006) *Sustainability Reporting Guidelines* (Global Reporting Initiative, Amsterdam, 2006)
3. Hřebíček, J. (1997) Environmentální indikátory a hodnocení environmentálního profilu v informačním systému EMS. Životné prostredie,.5: 242-245
4. Hřebíček, J., Pitner, T. (1998) Analysis of information systems for environmental performance evaluation. *Acta Universitatis Mendelianae Bruenesis*, Brno: MZLU Brno, XLVI, 45-56. .
5. International Organization for Standardization (1999) *Environmental Management – Environmental Performance Evaluation-Guidelines*, ISO 14031 (1999)
6. United Nations Conference on Trade and Development (UNCTAD) (2004), *A Manual for the Preparers and Users of Eco-efficiency Indicators* (UNCTAD, Geneva, 2004)

Jiří Hřebíček, Prof., RNDr., CSc.
Centre of Biostatistics and Analyses, Masaryk University Brno, hrebicek@cba.muni.cz,
Kamenice 126/3, 625 00 Brno
Pavel Růžička Ing.
Ministry of the Environment, Czech Republic

SOCIAL ASPECTS OF SUSTAINABLE DEVELOPMENT AND A CORPORATION

Jaroslava Hyršlová, Marie Bednaříková

Introduction

The concept of sustainable development in the present world constitutes an alternative model for the development of society in relation to industrial economies. Prior to the emergence of the concept of sustainable development, society did not reflect on the natural environmental and social limits to economic development. Economic growth was generally considered to be a measure of increasing well-being and successful social development in general. However, especially since the 1980's, attention has been focused, especially in the developed countries, on "sustainability" and the qualitative aspect of development.

Sustainable development cannot be imagined, not only without environmental equilibrium, but also without balance in the social and economic spheres. This means that preconditions must be created for long-term economic prosperity and the overall quality of life, including social, cultural and spiritual quality. Consequently, economic development, the environment and the social sphere cannot be perceived separately. The concept of sustainable development emphasizes harmonic and balanced development of these three dimensions. Sustainable development is understood as a complex set of strategies that employs economic means and technologies to satisfy human needs, material, cultural and spiritual, while fully respecting environmental limits; in order for this to be possible on a global scale in the contemporary world, it is necessary to redefine its social-political institutions and processes at a local, regional and global level [7].

Social needs consist not only in food, clothing, heat and shelter, but also in basic human values, such as love, friendship, respect and openness between human beings, social recognition and, of course, also a certain material standard appropriate to the particular culture. The social dimension of sustainable development encompasses the need for a dignified life and development of the human personality, health, education, social recognition, justice, cohesion and development of culture. This can be achieved by functioning families, municipalities, civic society and public institutions. In the framework of the human material standard, it is also necessary that people be capable, after careful consideration, of truly giving up everything that is superfluous, that they don't really require – this is aware humility. The fact that people do something actively of their own volition, that they suppress their bad qualities and develop the good, constitutes the only development that is sustainable: development of quality, the quality of life and the quality of human beings themselves [7].

This article is concerned with social aspects of sustainable development and their introduction into corporate practice. Emphasis is first placed on perception of the concept of sustainable development and its social aspects in corporate practice. The social aspects of sustainable development at the company level constitute a very broad topic. Consciousness of the importance of active work with human resources, leading to full utilization of their potential for the company plays an important role. This work also encompasses care for the working environment, employee safety and protection of their health at work. This article is concerned with this aspect.

1. Is Corporate Practice Aware of the Social Aspects of Sustainable Development?

The answer to this question follows from an extensive study performed in the middle of 2005 by the Czech Environmental Management Centre and the Czech Environmental Information Agency[5]. Part of this study determined how corporate practice perceives the concept of sustainable development. A written survey was employed to determine primary information. 1265 organizations were addressed. At the time of the survey, these companies had introduced an environmental management system (EMS). 222 companies (i.e. 17.5%) returned a completed questionnaire. It followed from the survey that (see Fig. 1):

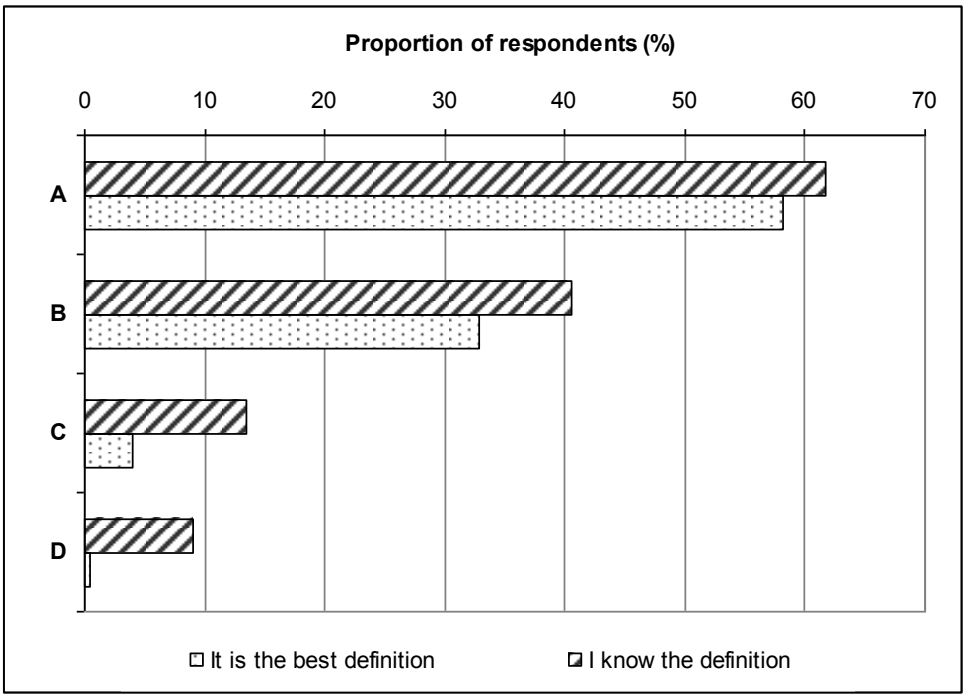


Fig. 1 Perception of sustainable development; n = 222

- In corporate practice, the best-known definition of sustainable development was development that satisfied the needs of the present generation without endangering the ability of future generations to satisfy their needs (definition A) – 62% of respondents. 129 respondents (i.e. 58%) considered that this definition best characterized sustainable development.
- 40% of respondents are aware of the definition of sustainable development based on equilibrium amongst the three pillars (definition B). 33% of respondents stated that this definition best characterized sustainable development. As the size of the corporation increased, the percentage of respondents that favoured the concept of sustainable development based on equilibrium amongst the three pillars increased.
- Only 13% of respondents were aware of the concept of sustainable development as the ability of human beings to provide for development of knowledge and ethical potential so that global challenges or dangers could be overcome (definition C). 4% of respondents considered that this definition best characterized sustainable development.
- Only 9% of respondents agreed with the statement that sustainable development at the corporate level was achieved through corporate success – i.e. achieving a profit (definition D). This opinion was held primarily by the representatives of small companies.

[5] Research was realized within the project No. VaV–1C/4/13/04 **Application of Environmental Accounting on Micro- and Macro-economic Level.** The project was supported by the Ministry of the Environment of the Czech Republic. The author of this paper (J. Hyršlová) was a member of project team.

Only the representative of 1 company (the representative of a large corporation in the processing industry) considered that this definition best characterized sustainable development.

More than half the respondents (58%) considered the best definition of sustainable development to be development that satisfied the needs of the present generation without endangering the ability of future generations to satisfy their needs. This definition placed great emphasis primarily on a sound approach to the environment. In the context of this perception of sustainable development, 65% of respondents were of the opinion that existing corporations met the conditions of sustainability – the economic development of the company was achieved in relation to a sound approach to the environment.

A third of the respondents (33%) stated that sustainable development was best characterized by a definition based on the three pillars; thus, these respondents are also aware of the social aspects of sustainable development. 78% of them stated that, in their opinion, current business operations fulfill not only economic and environmental targets, but also social targets.

4% of respondents perceive sustainable development as the ability of mankind to provide for development of knowledge and ethical potential that enables meeting global challenges (dangers). 89% of them were of the opinion that current business operations were a product and source of knowledge potential.

On the basis of the survey, it can thus be stated that corporate practice perceives sustainable development primarily in the context of a sound approach to the environment; a small part of the corporate environment connects sustainable development with the need for equilibrium amongst the three basic pillars: economic, environmental and social.

2 The Social Pillar of Sustainable Development and Corporation

It is apparent from the above text that the need for sustainable development is not the result only of economic and environmental limits, but also of social limits. This fact follows from the Strategy of Sustainable Development in CR, whose strategic and individual targets are formulated so as to maximally reduce the disequilibrium in mutual relations between the economic, environmental and social pillars of sustainability. For a corporation, this thus corresponds to functioning in relation to the triple bottom-line, where the company concentrates on all three pillars of sustainable development – i.e., not only on the economic and environmental, but also on the social pillar. Corporate Social Responsibility (CSR) is a trend that emphasizes the social aspects of sustainable development. Socially responsible corporations act so as to take into account the requirements of their external and internal environment, to contribute to sustainable development, to be transparent and generally to assist in overall improving the state of society in the framework and beyond the framework of their commercial sphere [9].

The inner potential of the company, which is subsequently reflected in its competitiveness, plays an important role in sustainable development; this consists in the ability to survive in a competitive environment in the market and simultaneously to affect the environmental and social impacts on the surroundings [9]. It is apparent that, if a corporation wishes to achieve high competitiveness, it must know and define its corporate values, primarily the human dimension of management [8]. The human aspect of management, similar to development of human capital, is one of the manifestations of CSR in the social sphere. Further manifestations of CSR in the social sphere include [9]:

- corporate philanthropy,
- dialogue with stakeholders,
- employee health and safety,
- compliance with working standards, prohibition of child labour,

- balance between the working and personal lives of employees (work-life balance),
- equal opportunities (for women and men and for other disadvantaged groups in general),
- diversity at the workplace (ethic minorities, handicapped and elderly people),
- provision for requalification of dismissed employees for their further employment,
- certainty of employment,
- human rights.

It is necessary that each employee becomes an "ambassador" for his company. The key postulates for achieving this state of affairs are [8]:

- people at work must be capable of exercising their free will in seeking new opportunities;
- employees must attempt to support development of their company through cooperation with others,
- unilateral force from above must not be exerted on employees,
- it is necessary to develop a dialogue on what to do and how, to provide people with the opportunity to express their opinions,
- a certain ethical level must be required in performing jobs.

In order to understand the social aspects of sustainable development, it is necessary that the corporation be aware of the importance of human resources for its present and future success. Companies operate in an environment that is very dynamic, demanding and confusing. Most corporations must exert maximum efforts to be successful, not only in the near future, but also so that they are capable of ensuring success in the long term. The people in the company and their potential form the basis for this success. In this connection, an important role is played by the aspect of occupational safety and health protection, which constitutes a necessary (but not sufficient) condition for exploitation of this potential.

2.1 The Importance of Active Work with Human Resources for the Corporation

Awareness of the importance and irreplaceability of human resources is an essential precondition for corporate success. Human motivation, enthusiasm, skill, ability, experience and knowledge constitute the greatest wealth of a corporation. Management and the development of human potential determine the success or lack of success of a company in the corporate environment [1]. It is mainly human beings and the results of their efforts to date that predetermine the present and particularly the future growth or failure of a company.

Human resources can be perceived as the sole and unique, live and enlivening, dynamic and dynamizing force of a corporation. Human potential constitutes an enormous range of knowledge, abilities, predictable and unexpected reactions and means of perception and behaviour, etc. Human resources and their positive and negative abilities, that are manifested in the corporate environment, are an irreplaceable constructive (but potentially also destructive) source of new values and new knowledge.

The aspect of management and development of human resources is one of the chief spheres of management of a successful corporation. This supplements and synthesizes the other areas of corporate management and provides the necessary accent of dynamic and increasing effectiveness. It allows senior officers and employees to consistently create newer and better products that are expected by customers. More responsible and creative work of individuals and groups in the corporation leads to achieving a strong position in the market and gaining strategic competitive advantage. This consists in a qualitative increase in motivation and the related increase in the level of knowledge, skills, experience and competence of people in the company [2].

The approach, form of communication, management style, time and efforts of senior employees and personnel professionals are reflected in the motivation and complex performance of employees [5]. In order for this to be positive, the system of management and development of human resources in the company must function as well as possible. In accordance with the corporate vision, mission, objectives, philosophy and culture, it is necessary to create an environment with high responsibility of every individual and all groups. It is necessary to plan an environment for creation and implementation of the necessary changes in corporate activities and, simultaneously, it is necessary to provide sufficient scope for a sense of self-realization, satisfaction and a certain independence of the qualified professionals in the company.

The basic precondition for care for human resources in the company consists in increasing the motivation of all the employees of the company. Only a highly motivated worker can identify with the objectives of the company and will be willing to modify his personal goals in this sense and to exert the maximum efforts [4]. Rewards are generally considered to provide very strong stimulation. However, this incentive instigates employees rather towards passively increasing performance, but the consequences for improving working or social behaviour are mostly not manifested. Modern employees also need to feel the interest of the corporation in their development, awareness and future. Thus stimulation is best provided by choice and implementation of suitable management styles, effective and transparent communication and general awareness of employees, evaluation of the comprehensive performance of employees, education, level of working relations and, last but not least, also care for health and safety at work and care for a suitable working environment.

2.2 Legislative Framework of Occupational Health and Safety in the Czech Republic

Occupational health and safety (OHS) is an important element of the social pillar of sustainable development. The legislative framework for the area of OHS in the Czech Republic is stipulated by the Labour Code (hereinafter the "Code") [10]. The Code imposes on the employers the duty to provide for safety and protection of health of employees with respect to the risks of potential danger to the life and health related to the performance of work. This responsibility is an integral and important part of senior employees' working duties at all management levels.

The employers are obliged, not only to create a safe and harmless working environment and working conditions through suitable organization of OHS, but also to adopt measures to prevent risks, eliminate them or at least minimize the effects of unavoidable risks. The employers are also obliged to ascertain and monitor risk factors and processes, evaluate them and ascertain their causes. Where possible, they should replace hazardous techniques, working or production means, raw materials, etc. by safe or less hazardous ones. They should also reduce the number of employees exposed to the action of risk factors to the lowest number required to ensure operations.

The employers must also adopt measures required for handling extraordinary events, such as accidents, fires and floods, as these events directly endanger health and safety of workers. The required number of employees must be determined according to the type and size of the workplace; these employees must be trained by the employer and, in these cases, they organize the provision of first aid, call the ambulance, the firefighters or the police and also organize evacuation of the employees. The employer is also obliged to ensure the provision of first aid to the employees.

With respect to remuneration, the employers should not use such manners of remuneration that involve exposure of employees to increased danger of injury and that endanger safety and health of employees upon increase of working performance.

The employers are obliged to ensure that employees are trained with respect to legal and other regulations concerning OHS, in order to supplement their expertise and requirements for the performance of work, and in relation to the risks that could be encountered by the employees at the workplace. They must also require and control compliance therewith. If such risks cannot be eliminated or adequately reduced, the employees must be provided with personal means of protection. These means must not endanger their health, must not obstruct work and must comply with all the requirements placed thereon.
In case of a job-related injury, the employer is obliged to ascertain the causes and circumstances and he shall keep records of job-related injuries of all types.
The Code stipulates that employees have the right to occupational safety and health protection, to information on the risks of their work and to information on measures for protection against their effects. If they have a reason to believe that their work directly and seriously endangers their life or health, they are entitled to refuse to carry out the work, without this being assessed as non-fulfillment of the employees' duties. The employees are also entitled to participate in discussion of issues related to OHS through their trade union or a representative for this area or directly participate in discussions concerning OHS. The employers are also obliged to organize tests of OHS at all their workplaces and facilities at least once annually and to remedy any ascertained shortcomings.

2.3 Health and Safety Management System (HSMS)

It follows from the previous text that the management of an enterprise must conceive requirements related to the provision for OHS as an integral part of its decision-making processes and must adopt measures that will not be at variance with these requirements. Introduction of HSMS should facilitate these measures.
HSMS is based on the same principles as environmental management systems (EMS) and quality management systems (QMS) and supports the introduction of integrated management systems in companies. Similar to QMS or EMS, enterprises can rely on standards that form the basis for establishment and improvement of HSMS and on standard requirements, based on which they are able to carry out audit and certification. The enterprises can currently use the following standards [3]:

- **OHSAS 18001:1999 Occupational health and safety management systems – specifications.** This standard specifies the requirements on the system allowing enterprises to manage their risks and improve their performance.
- **Safety Checklist for Contractors (SCC).** This standard is also used for evaluation and certification of corporate HSMS. It also partly covers the area of environmental protection. It is intended for enterprises that carry out activities that cause increased danger to life and health of employees or that arrange these activities through their subcontractors. This standard is based on a catalogue of questions in the area of occupational safety, protection of health, and partly also environmental protection. The catalogue of questions constitutes a list of requirements that must be fulfilled by an enterprise in order to be successfully certified. An SCC certificate can be obtained together with a QMS certificate pursuant to ISO 9001.
- **Safe Enterprise.** This program, which has been announced by the Ministry of Labour and Social Affairs of the Czech Republic, also provides a guideline for introducing HSMS. It also includes requirements concerning environmental protection and fire protection. The program is intended for large and medium-sized enterprises that carry out high-risk work. Its requirements are compatible with the requirements of standards ISO 9001 and ISO 14001, which allows for creation of an integrated management system in an enterprise.

Implementation of HSMS can bring the following benefits for an enterprise [6]:

- compliance with the applicable legislative and other technical requirements concerning OHS;
- reduction of losses related to fines for non-compliance with safety requirements;
- advantages in the competitive environment;
- demonstration of systematic limitation of risks or dangers to safety and health of all persons affected by activities, products or services of the enterprise;
- reduction of the risk of occurrence of undesirable events (job-related injuries, accidents);
- minimization of costs related to accidents at a workplace;
- demonstration of the commitment to ensuring and improving HSMS adopted at all levels and at all positions in an enterprise, particularly by the top management.

It is clear that the main objective of this system is to ensure occupational safety of persons and to ensure security of the entire operation and its vicinity. Industrial enterprises have recently adopted a pro-active approach to this area, and placed emphasis on prevention and, particularly, minimization of the risk of harm to health of employees and losses of lives. An increasing number of persons are also interested in HSMS certification.

Experience with implementation of HSMS can be documented on an example of enterprises in the chemical industry where the issue of OHS plays a very important role. Research aimed at the use of HSMS in Czech chemical enterprises was implemented in the second half of 2005[6]. The research yielded the following findings:

- All respondents consider increased safety and improvement in the area of health protection at work to be important. Indeed, in relation to the need for managing this area, a number of chemical enterprises resolved to implement an HSMS.
- Almost 21% of respondents have introduced this system and obtained certification. This includes primarily large companies. 31% of respondents had been introducing the system at the time of the research (representatives of small, medium-sized and large companies). 31% of respondents do not contemplate to implement this system; the respondents believe that the system would not lead to any increase in safety or improvement in the area of occupational health protection; furthermore, no such system is required by their business partners.
- 60% of respondents used the OHSAS 18001 methodical guideline for building the system; 40% of respondents employed the Safe Enterprise program.
- As the main reasons for implementing HSMS, the respondents mentioned particularly provision for permanent improvement in the area of OHS (90% of respondents); an attempt to ensure a higher level of occupational safety (85% of respondents); and greater involvement of employees in these processes (75% of respondents). An attempt to reduce the number of job-related injuries can also be considered to be an important reason for introduction of the system (65 % of respondents).
- Implementation of HSMS has created demonstrable effects for the enterprises. More than one half of the respondents have observed the following basic benefits of the system: attainment of compliance with the requirements for OHS (90% of respondents); improvement in the area of occupational safety management (75% of respondents);

[6] The research has been realized by the University of Pardubice in cooperation with the Association of Chemical Industry of the Czech Republic. Upon finding the primary information, a questionnaire was used addressing 107 companies, members of the Association of Chemical Industry of the Czech Republic. 29 questionnaires out of the addressed companies were returned (i.e. 27% return). Companies involved in the research produced 60% of total turnover of chemical industry.

improvement in the area of involvement of employees in the aspects of OHS (75% of respondents); and improvement of relations with governmental agencies (65% of respondents).

- 90% of respondents confirmed that implementation and maintenance of the system was a genuine tool for increasing OHS. 10% of respondents conceive this system only as a formal measure, but refer to improved order in their company.

The research confirmed that the systems have fulfilled the expectations of the respondents (the benefits of introducing the system correspond to the reasons for which the system was implemented). 95% of respondents observe that benefits of the system prevail over the costs expended in relation to implementation and maintenance of the system. 95% of enterprises that have introduced the system or have it implemented for a longer period also plan to maintain the system.

Conclusion

Under the current conditions, the concept of sustainable development is a basic model of development of the society. Sustainable development is unconceivable without balancing the three fundamental pillars - economic, environmental and social. At the present time, most companies view sustainable development particularly within the context of economic development, while respecting sound approach to the environment; only a minority of businesses acknowledge that the need for sustainable development is not caused only by economic and environmental limits, but also by social limits.

Thus, from the viewpoint of sustainable development, enterprises must pay attention, not only to economic and environmental aspects of business activities, but also to the social area. Important aspects in the social area include, e.g., development of human resources, health and safety of employees, work-life balance, diversity at the workplace, certainty of employment, etc. In order to understand the importance of social aspects, it is necessary that an enterprise be aware of the significance of human resources for its current and future success. People in an enterprise and their potential constitute an important precondition for its successful economic development. A very important role in the framework of social aspects is played by OHS. All the requirements following from the laws must be fulfilled in this area. Proper care related to OHS and to acceptable working environment could be a very important incentive for the employees to actively improve their performance. The elements of OHS and care for employees should be incorporated in the enterprise's management system. HSMS could contribute to this end. Although these management systems are not used by businesses as frequently as QMS and EMS, the related experience indicates demonstrable benefits of the system. The systems contribute to attainment of accordance with the requirements for OHS, improve the management of occupational safety and increase the involvement of employees in the aspects of OHS. Implementation of HSMS also affects the image of the enterprise amongst external stakeholders, particularly governmental agencies.

Acknowledgements

This work was supported by the Grant Agency of the Czech Republic under project No. 402/06/1100.

References:

[1] Armstrong, M.: Personální management. Praha: Grada Publishing, 1999, ISBN 80-7169-614-5.

[2] Blašková, M.: Riadenie a rozvoj ľudského potenciálu. Uplatňovanie motivačného akcentu v procesoch práce s ľuďmi. Žilina: Žilinská univerzita v Žilině, 2003, ISBN 80-8070-034-6.

[3] HSMS - systém bezpečnosti a ochrany zdraví při práci dle SCC checklist [online]. [cit. 2006-12-06]. Dostupné z <http://www.iso-standard.cz/hsms.html>

[4] Koubek, J.: Řízení lidských zdrojů. Základy moderní personalistiky. Praha: Management Press, 2005, ISBN 80-7261-033-3.

[5] Plamínek, J.: Vedení lidí, týmů a firem. Praha: Grada Publishing, 2002, ISBN 80-247-0403-X.

[6] Rusko, M., Balog, K., Tureková, I.: Vybrané kapitoly z environmentálneho a bezpečnostného manažérstva. Bratislava: VeV Bratislava, STRIX Žilina, 2006, 160s. ISBN 80-969257-5-X.

[7] Rynda, I.: Trvale udržitelný rozvoj a mezinárodní spolupráce [online]. [cit. 2006-11-08]. Dostupné z <http:// www.fp.vslib.cz/kch/sedlbauer/tema9.htm>

[8] Stýblo, J.: Cesty ke zvyšování firemní výkonnosti. Praha: Professional Publishing, 2002. ISBN 80-86419-215.

[9] Trnková, J.: Společenská odpovědnost firem. Business Leaders Forum, únor 2004.

[10] Zákon č. 262/2006 Sb., zákoník práce

Jaroslava HYRŠLOVÁ, Marie BEDNAŘÍKOVÁ
Department of Economy and Management of Chemical and Food Industry, University of Pardubice, CZ-532 10 Pardubice
E-mail: jaroslava.hyrslova@upce.cz; marie.bednarikova@upce.cz

CALCULATION OF PROFITS FROM THE SALE OF SAVED ALLOWANCES BY ČEZ IN THE CR

Tomáš Chmelík

Introduction

Allowance savings in the year 2005 are composed of two parts. Profit is calculated through the simple subtraction of costs related to allowance savings from the yields acquired from their sale. While the yield from the sale of allowances is basically the same methodically for each part of the savings, i.e. the number of allowances multiplied by the price, the nature of cost calculations is different for every part of the savings. The individual parts of allowance savings are as follows

1. Reducing emission intensity during electricity production

This factor comprises two components:

- Reducing emission intensity in production from coal through optimisation of sequencing and shutdown of power plants and installation of conservation technologies
- Substitution of production at coal power plants with production from renewable and nuclear sources

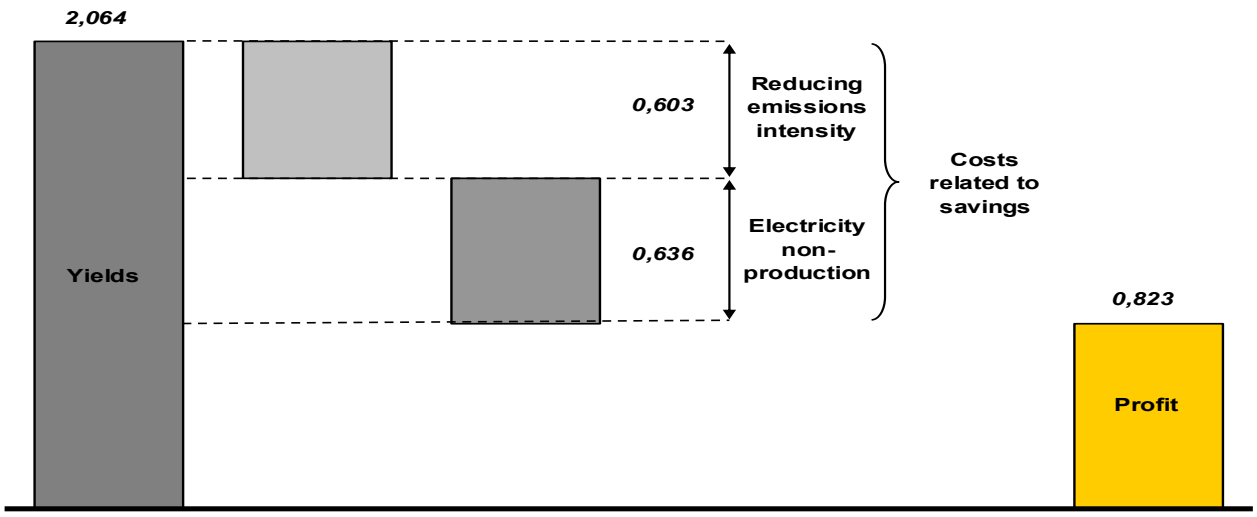
2. Non-production of electricity at coal power plants

The table below summarises the individual yield and cost items:

		Emission reduction (Mt)	Cost (CZK bil.)	Yield (CZK bil.)	Profit (CZK bil.)
1	Improvement of emission factor	1.480	0.605	0.825	0.219
2	Electricity not produced	2.637	0.636	1.239	0.603
	Total	**4.117**	**1.241**	**2.064**	**0.823**

It follows from the summarised table that in 2005, ČEZ's facilities included in the emissions trading scheme released **4.117 million tonnes** less of CO_2 than the number of allowances allocated by the allocation plan (the allocation was 36 867 184 allowances, while emissions in 2005 reached a level of 32 750 326 tonnes of CO_2). Given an average sale price of 16.5 euros and a rate of CZK 28.5 per Euro, the sale of this excess profit before tax (hereinafter profit) amounts to a volume of **CZK 823 million**. The method of calculating the individual parts is described in detail below.

Procedure for stipulating profits from allowances (CZK bil.)



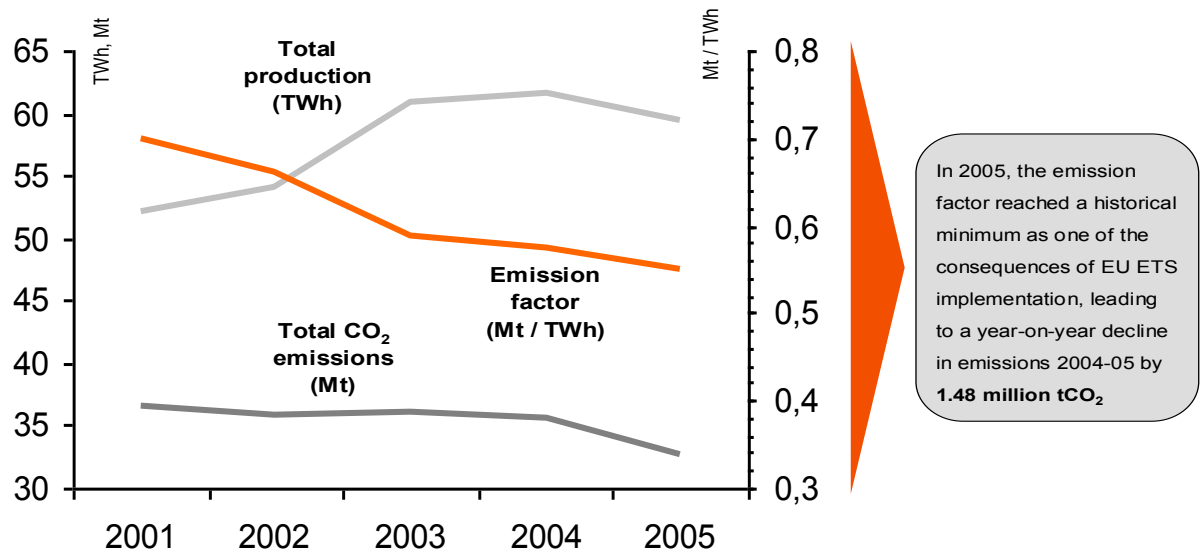
1. Reducing emission intensity in production from coal through optimisation of sequencing and shutdown of power plants and installation of conservation technologies

1.1 Calculation of savings

Quantification of the impact of this component is calculated based on a comparison of the emission factor in 2004 (i.e. before the launch of the EU ETS) and the emission factor in 2005 (when the impact of the EU ETS is already apparent).
Comparison of the emission factors is indicated in the following table:

	2001	2002	2003	2004	2005
Total production (TWh)	52.162	54.118	60.934	61.602	59.470
CO2* emissions (Mt)	36.515	35.890	36.083	35.647	32.750
Emission factor	0.700	0.660	0.589	0.576	0.551

* CO_2 emissions are converted so as to be cleared of the impact of the change in the monitoring and reporting method induced by the launch of the EU ETS (see the introduction to Part 2.)
Emission reductions achieved through an improvement of the production emission factor are based on a comparison of the real level of emissions in 2005 and the level of emissions that would occur if the emission factor had not been improved, i.e.:
Reduction = (production in 2005 * emission factor 2004) – emissions in 2005 = **1 480 095 t CO_2**.
Thanks to an improvement in electricity production efficiency, a total of 1 480 095 allowances were saved.



1.2 Calculation of profits

By multiplying the volume of savings by the average sale price of allowances, i.e. 16.5 euros at a rate of CZK 28.5 /euro, we calculate the yield which totals **CZK 824.7 million**.
The calculation of costs includes only the extra costs incurred directly in consequence of EU ETS operation. A number of measures at power plants were planed regardless of the EU ETS, but were accelerated in consequence of the EU ETS – in terms of cost calculation, only the effect of this acceleration is accounted for (time value of money). At the same time, it must be noted that a number of investment measures implemented or launched in 2005 will bring

emission reductions only in upcoming years. In 2005, there is a substantial prevalence of emission savings achieved through the sequencing of power plants and optimisation of their operation. The cost item for this factor also includes costs related to the implementation and operation of the EU ETS at ČEZ (implementation of monitoring standards, system administration, emissions verification). Costs induced by the EU ETS system totalled **605.3** million crowns in 2005.

Costs can be classified in the following manner (CZK mil.):

Investment induced by EU ETS	391.03
Costs of investments (time value of money)	208.09
Human resources – capacity development	5.00
Verification of emissions	1.16
Total	**605.30**

In terms of concrete measures at power plants, they comprise the following events, which include investments and the time value of money, where relevant (CZK mil.):

Measures	EU ETS effect
EME – reconstruction of the black oil station, reduction of own consumption	7.00
EME – reconstruction of LJ K 11 heater drive EMĚ III	8.30
ETI – upgrade of TG 5 at ETI 1	14.00
ETI – reconstruction of feeding pumps	13.59
ETI – reconstruction of cooling pumps	9.00
EPO – reconstruction (new TG)	23.77
EDE – replacement of main feeding pumps	33.00
ECH – reconstruction of boilers	0.33
ECH – replacement of main feeding pumps	33.00
ELE – replacement of 110 MW turbine in block B4	0.52
ETU – reconstruction of Ljungstrom sealing	1.43
Optimisation of the setting portfolio	38.50
ETU – complex repairs	181.60
ETE – upgrade and increase of efficiency	88.10
ETE – shortening of the GO with increased availability	0.32
ETE – harmonisation of the block cooling mode	2.97
EDU + ETE – increased availability	10.00
Maintenance of efficiency of expiring facilities	133.69
TOTAL	**599.12**

After subtracting costs from yields, we get a profit of **CZK 219.4 million.**

2. Non-production of electricity implemented at coal power plants

2.1 Calculation of emissions

In the course of 2005, the method for emissions monitoring became stricter; this particularly concerned the stipulation of carbon content in fuel based on laboratory analyses (not by calculation using aggregated tabular values) including analysis of the calorific value, oxidation and emission factor. By comparison of the value reported according to the new method required within the EU ETS and the tabular values used in the past, it is possible to determine a difference of about 6% in the method, which is about 2.2 million allowances from the allowances allocated to ČEZ for the year 2005.

Although these 2.2 million allowances are in some sense extra allowances, ČEZ was not over-allocated in reality. The total allocation to ČEZ was 36.8 million allowances, while the real expected needs of ČEZ in 2005 were about 37.5 million allowances. This real need is calculated as follows:

- If the EU ETS system were not valid, or if the market prices for allowances were not sufficiently motivating, ČEZ would release at least 1.48 millions tonnes more of CO_2 into the air in 2005 than was really the case (reduction of emissions in production of the emission factor – see Part 1).
- Another expected need is represented by unrealised exports in the amount of 3 TWh, which is about 3.3 TWh of electricity in terms of production. This is the value of the year-on-year decline in exports compared to 2004, and from the perspective of allocations it was relevant to believe that the value of exports in 2005 would at least equal exports in 2004 (this is a conservative estimate; like domestic consumption, exports may be expected to rise given developments in Europe). Exports were not realised because after taking into account all the relevant parameters (in particular allowance prices and the price of cross-border profiles), they were not economically attractive. Given that low-emission sources (atom, water) are used in the basic regimen, the increase of production would be realised in coal power plants, whose emission factor is set at a level of 1000 for easier use. Hence we achieve emission reductions in the volume of 3.30 million tonnes of CO_2 from non-production as a result of the decline in exports.
- Had ČEZ failed to adapt its behaviour to the motivational incentives of the EU ETS and realised the same volume of exports as in 2004, it would have used up the volume of allowances in 2005 calculated in the following manner: Needed volume of allowances (in millions of units) = 32.75 [real emissions in 2005] + (1.48) [savings in production] + 3.30 [unrealised production] = 37.53.

Simple subtraction of the allowances needed to cover expected emissions defined according to the principles above (i.e. 37.53 million allowances) from the allocation granted to ČEZ within the framework of the NAP (36.87 million allowances) results in a volume of about 0.66 million allowances that ČEZ would not receive in 2005.

Hence, in the context of the purpose of quantifying profits, all the saved allowances remaining from the total savings can be considered the effect of non-production of electricity (4 116 858 after deducting the impact of the factors described in Part 1), which amounts to **2 636 763** allowances (4 116 858 – 1 480 095 = 2 636 763).

2.2 Calculation of profits

By multiplying the volume of savings (2 636 763) by the average sale price of allowances for 16.5 euro and a rate of CZK 28.5 /euro, we calculate the yield which totals **CZK 1 238.9 million**.

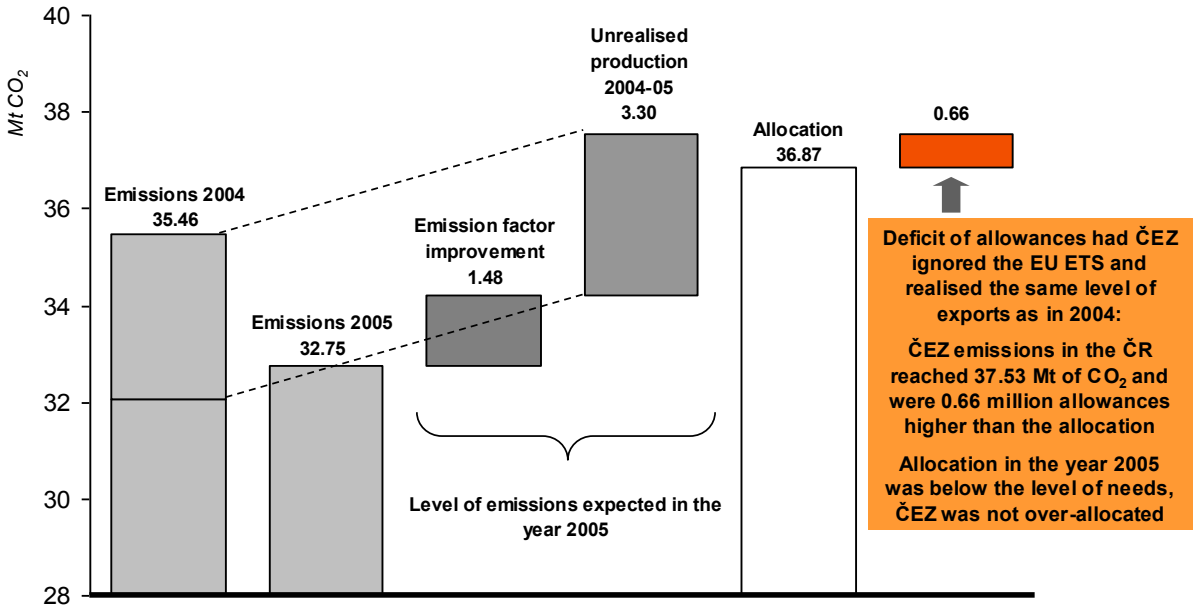
It follows from this calculation that 2 636 763 tonnes of CO_2 were not released because production was not realised at the power plants, representing a lost business opportunity.

In terms of production, this level of emissions represents **2 637 703 MWh** of electricity not produced. For calculation of the costs, the following values are used:

Average variable costs per MWh for production from coal in 2005	CZK 600
Average price per MWh of electricity from coal in 2005*	CZK 841
Lost margin per MWh of electricity from coal not produced	CZK 241

* The average price deduced from the export opportunity price (price in Germany minus the price of cross-border profiles)
Thus costs for this factor are calculated using the following formula:
2 636 763 MWh * 241 CZK/MWh = **635 686 497** CZK

After subtracting costs from yields, we get a profit of **CZK 603.3 million.**



Tomáš Chmelík
Environmental Products
Czech Technical University, Fakulty of Electrical Engineering

ČEZ a.s.
Tel.: +420 211 042 610
GSM: +420 606 666 148
E-mail: Tomas.Chmelik@cez.cz

ECONOMETRIC MODELING FOR ENVIRONMENT WITH MAPLE

Zuzana Chvátalová

Abstract

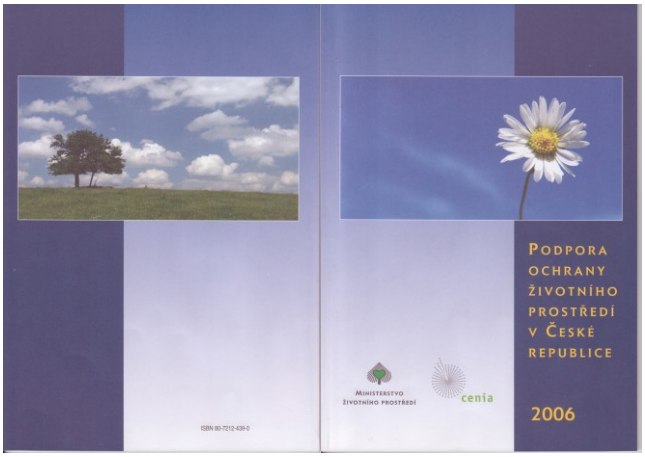
The article deals with possibilities of using the econometric modeling for microeconomic variables as an important support tool for environmental management decision-making. The microeconomic variables in econometric models are described using quantitative methods, which are based on outputs of mathematical disciplines. All this is expressed through computing process and graphical visualizations with help of computer system Maple, which is a product of Canadian Company Maplesoft.

Zuzana Chvátalová (RNDr., Ph.D.)
VUT Brno
Kolejní 4, 612 00 Brno, Česká republika
e-mail: chvatalova@fbm.vutbr.cz

SUPPORT FOR ENVIRONMENTAL PROTECTION IN THE CZECH REPUBLIC

Lenka Kadlečková, Radka Pokorná

System of financial support for environmental protection is one of the basic economic instruments to achieve the objectives of the State Environmental Policy of the Czech Republic. To allow easy orientation in the types of provided support, the Ministry of Environment in cooperation with Czech Environmental Information Agency (CENIA) annually releases a publication „Support for Environmental Protection in the Czech Republic“.



The publication presents detailed information on the most significant grants that may be exploited in the realization of both the investment and non-investment measures aiming to improve the environment. These grants are provided from public budgets as well as from other domestic and foreign financial resources. These grants are aiming, in particular, to meet the commitments of the Czech Republic within the European Union, primarily in those fields, for which transition periods have been negotiated.

The particular programmes of support for environmental protection are defined in the publication as follows: subject and purpose of the programme, conditions of access to support, type of support, links to other programmes, programme duration, organization of the programme, percentage of satisfied eligible applicants, contact person.

The publication is divided into three thematic parts.

The first part contains information on domestic support provided from public resources, broken down to the particular ministries responsible for the provision thereof (i.e. the Ministry of Environment, Ministry of Agriculture, Ministry of Transport, Ministry for Regional Development, Ministry of Industry and Trade, Ministry of Defense and Ministry of Finance), and potentially other subjects providing support (i.e. the State Office for Nuclear Safety and Czech and Moravian Guarantee and Development Bank).

The most significant source of financial support provided from the public budgets is the State Environmental Fund of the Czech Republic. With regard to its income (formed especially by charges and fees paid for polluting or causing damage to the individual environmental compartments, and with regard to its expenditures focusing on the environmental protection and improvement measures (in particular, in the field of water protection, air protection, waste management and the field of nature conservation and landscape management), the State Environmental Fund is a long-term stable non-budgetary source of finance in this area. Its indispensability is shown not only in the national programmes but also in the co-financing of the projects supported from the European Union funds.

Of significance is also the amount of support provided from the state budget, although its year-to-year volumes fluctuate in dependence on the sum and the priorities of adopted state budget. Through the cancellation of National Property Fund of the Czech Republic (by the Act No. 178/2005 Coll., on cancellation of National Property Fund), the state budget took over, among other things, also the financing of costs relating with the rehabilitation of environmental damage caused in the past by the privatized enterprises (i.e. the rehabilitation of damage caused by groundwater contamination, soil contamination, and in consequence of insecure harmful waste landfills).

In the second part of the publication, an overview of foreign assistance under the particular programmes in the field of environmental protection, i.e. a description of the European Union funds, Phare programmes, bilateral and international financial cooperation is presented. Foreign financial sources represent significant financial assistance accelerating the realization of the objectives of State Environmental Policy of the Czech Republic as well as fulfillment of the tasks ensuing from the membership of the European Union.

At present, increasingly more and more actual is the theme of the Czech Republic preparation to draw on European financial resources in the budgetary period 2007 - 2013. Czech Republic as well as other member states of the European Union have to, in preparing the development strategies and in deciding on orientation of the particular programmes of support, take into account new rules of cohesion policy of the European Union.

The final chapter focuses on important addresses and information sources in the field of environmental protection, such as contacts to the state administration bodies, regional development agencies, significant foundations acting in the field of environmental protection or foreign financial institutions.

The publication also contains contacts to institutions and individuals responsible for the provision of particular supports, contacts to where it is possible to acquire detailed information, as the conditions of access to support differ, requiring to thoroughly get acquainted with them. Besides inquiries relating to support for particular projects focusing on environmental protection and improvements, it is possible to forward suggestions to enhance the quality of this publication.

Ing. Lenka Kadlečková
Ministry of Environment of the Czech Republic
Department of Economic Instruments
Unit of Public Support
Vršovická 65
100 10 Prague 10
Czech Republic
tel.: +420 367 122 345
fax: +420 267 126 345
e-mail: lenka_kadleckova@env.cz

Ing. Radka Pokorná
Department of Economic Instruments
Unit of Public Support
Vršovická 65
100 10 Prague 10
Czech Republic
tel.: +420 367 122 098
fax: +420 267 126 098
e-mail: radka_pokorna@env.cz

EXPERIENCE OF SLOVAK REPUBLIC ON FULFILLING OF IPPC REPORTING OBLIGATIONS – FIRST REPORTING PERIOD

Kapustová Blanka, Schneiderová Viktória, Lišková Katarína

1. IPPC process in Slovak Republic

Process of integrated permitting in Slovak Republic is managed by the Ministry of Environment of Slovak Republic (MoE SR), which is the central state administration body in the matters of integrated pollution prevention and control, and Slovak Environmental Inspection, which is permitting as well as inspecting body. The number of IPPC installations in Slovakia is about 536, the number of integrated permits issued is 464 (this number consists of changes of permits issued). [2]

In IPPC process there are also acting Slovak Hydrometeorological Institute (SHMI) and Slovak Environmental Agency (SEA). SHMI is the organization responsible for the collection and processing of data on emissions of IPPC installations, while SEA was authorized by Ministry to fulfill reporting obligations in IPPC.

Since SEA is not involved into permitting process, it does not have primary data and information on permitting of concrete installations. Due to this reason, SEA must require for data needed to elaboration of documents from SEI and SHMI.

2. Providing for reporting obligations fulfilling on IPPC

Reporting obligations for Slovakia in the area of IPPC are represented by 2 European legislation rules, which refer to the basic European legislation rule on IPPC – Council Directive 96/61/EC concerning integrated pollution prevention and control: 1) Commission Decision 2000/479/EC of 17 July 2000 on the implementation of a European pollutant emission register (EPER), 2) Commission Decision 2003/241/EC of 26 March 2003 amending Commission Decision 1999/391/EC of 31 May 1999 concerning the questionnaire relating to Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC). [2]

Slovak Republic had been fulfilled 2 reporting obligations on IPPC in 2006 for the first time. One of them was delivering of the questionnaire concerning IPPC for reporting period 2003 - 2005 (it means the second reporting period on IPPC) following from Commission Decision 2003/241/EC concerning the questionnaire relating to Council Directive 96/61/EC on IPPC, the second obligation was to deliver the EPER Report to European Pollutant Emission Register.

3. IPPC Questionnaire

The subject of the questionnaire was to give information on Directive 96/61/EC implementation into Slovak national legislation. Questionnaire consisted of 45 questions aggregated into 17 groups. The goals of the questionnaire were 1) to find out if Member States implemented the requirements of Directive sufficiently and in accordance with other environmental tools of EC, 2) to collect useful information and data, to make different approaches clear, those which are used by Member States for Directive implementation, 3) to assess the effectiveness of Directive.

Questionnaire consisted of information about:

- general aspects of transposition of IPPC Directive into Slovak legislation,
- the number of installations with integrated permit issued during 2003 – 2005 under certain categories of industrial activities according to the Annex I of Directive 96/61/EC,

- available representative data on limit values stated for special categories of industrial activities 2.2 and 3.1 according to the Annex I of Directive 96/61/EC and BATs, which such values derives from,
- information on integrated permit procedure, participants of the proceedings, affected bodies, permitting bodies,
- necessities of application form on integrated permit issue,
- conditions of permit issue and necessities of permit,
- re-assessing and up-date of permit conditions as well as requirements on providing of harmonization of those requirements with permit conditions,
- status of BAT development and transboundary co-operation,
- participation of the public in permitting procedure.

3.1 IPPC Questionnaire elaboration

In questionnaire elaboration process, mainly employees of SEA participated. In questions for which specific numerical data were needed to prepare answers, employees of SEI participated, and in final version of questionnaire verification employees of MoE of SR participated.
Works on questionnaire elaboration covered obtaining of information and basic documents, answering the questions, verification of information and confirmation by MoE of SR. The whole process covered 6 months of intensive work.

3.2 Problems specification arised during questionnaire elaboration

Problems had been arised mainly in case of answers which needed specific numerical data, e.g. the number of installations in each category in Annex I, total number IPPC installations, analysis of site control inspections.
Background documents were obtained of SEI, selected data were filled and verified using the list of integrated permits issued, which is published on www.sizp.sk. Taking into account the fact, that installations are not listed according to the category of industrial activity but according to the date of issuing the permit, it was strongly needed and time consuming to find relevant data. The list of integrated permits issued at www.sizp.sk does not consists of the complete list of permits issued by relevant inspectorates, permits issued from May 2004 till June 2005 are missing.
In case of full functionality of Registry of integrated permits issued which was planned by SEA as a part of IPPC Information System (IPPC IS), it would be easier to avoid problems mentioned above or reduce them significantly. Registry would allow rapid access to selected permits and information about installations. Registry will start its operation in July 2007, will be fully publicly accessible. It will contain integrated permits issued and changes of permits, which are published on SEI web page in form of downloadable documents. Since SEI does not consider as important to operate and use the Registry of integrated permits issued, inserting data into such registry will be provided by SEA (being responsible administrator for IPPC IS), even if data inserted in this way will be not verified by its owner which is SEI.
In future, on filling a new questionnaire, the same problems may be arising and being related to different information given, such as the number of IPPC facilities and IPPC installations, number of integrated permits issued and its changes. Problems might be expected in answering questions on the number of re-assessed permits, non-up-dated/up-dated permits till the end of 2008, number of applications on major changes in installation etc. A new questionnaire for the third reporting period 2006 - 2008 will require more detailed information on number of permits and installations.

4. EPER Report

Submitting data on IPPC installations and its emissions into EPER was provided by the co-operation between SEA and SHMI. SEA participated in development of Integrated Registry of Information System, which is operated by SHMI. SHMI is the institution fully responsible for collection and processing of emission data, on that account according to the mutual agreement between both institutions, the whole process of data processing was provided by SHMI. SEA provided the transfer of data in format required to European Commission.

4.1 Collection of data on emissions from IPPC installations on national level

The Act No. 245/2003 Coll. on IPPC defines the IPPC operator's obligation to probe, collect, process and assess data and information given in permit and in executive legislation rule and every year to collect data on emissions from previous year and to submit it till 15th February in written and electronic form into Information System on IPPC.
Executive rule with respect to the Act on IPPC is the Decree of the Ministry of Environment of Slovak Republic No. 391/2003 Coll. implementing the Act on IPPC, which defines the way how to report data on pollutants emitted to the air and water. Data has to be submitted to SHMI for each installation of the facility using forms which are published by MoE of SR in MoE´s Bulletin and on MoE´s web page. In annexes of this Decree there are details on scope and specification of data on installation and its emissions to air and water. Operators of IPPC installations in Slovakia are obliged to report every year data on emissions from previous year and to submit it into Information System on IPPC.
Data on IPPC installations and its emissions are edited and processed in Integrated Registry of Information System (IRIS), which is a part of IPPC Information System.
The administrator of IRIS is SHMI, administrator of IPPC Information System as a whole is SEA. IRIS is the only registry of IPPC IS, which was developed and also located in SHMI. SHMI accepted modification of existing database air emissions data processing (in National Emission Information System), and water emission data (in Total Inventory on Waters), being appropriate alternative for emissions data processing. The main reason why such solution was accepted was try to avoid duplication of data collection and improving the quality of data processing. After processing and verification of emissions data submitted by the operators, such data are imported to IRIS. [1]

4.2 Difference between Slovakian IRIS and European EPER

At national level, in IRIS there is collected a lot of information on emissions from IPPC installations for each year, and without threshold limits. Only those emissions which exceeded threshold limits are reported to EPER. This is the reason why IRIS contains more data on emissions then required by EPER, at the same time IRIS contains such data related to each year started in 2004, since in 2004 the Decree stipulating collecting and reporting of data on emissions to IRIS came into force.

4.3 First data reporting to IRIS

For the year 2004, totally 249 installations reported required data to IRIS. Air emissions were reported from 244 installations, including 91 installations with exceeded threshold limits relevant for EPER. 85 installations reported water emissions, in 28 of which exceeded threshold limit relevant for EPER. Totally, 3 186 572 tons of air emissions and 60 143 tons of water emissions were reported to IRIS. [1], [3]
In Assessment Report made by SHMI in relation with the first data collection on emissions from IPPC installations there is a statement, that since it was the first data collecting, verification and processing, adequate deficiencies and failings are the consequence of it. It is

also stated, that SHMI obtained very low number of emission reports which met deadline stated in legislation. [1] It is a consequence of the fact, that operators of IPPC installations didn't meet the obligation given in legislation, partly even in case of knowing about it, they supposed that reporting obligation to IRIS comes into force after issuing of integrated permit. This misunderstanding was caused by non-unambiguous explanation of legislation by operators. The other reason is that SEI issues permits with incorporation of description of obligation for IPPC operator to submit data to IRIS, although such obligation is given in legislation. On the basis of this reality, operators of IPPC installation which didn't have integrated permit issued yet supposed that obligation mentioned was not relevant to them. In integrated permit made by SEI it is also stated the list of pollutants which operator has an obligation to monitor, but the list of pollutants given in permit is not the same as the list of pollutants given in Annex II of Decree on IPPC Act implementation. This is the reason why operators didn't report data on certain emissions.
Within category of industrial activity „Waste management", the emissions into air were not reported at all, only a few landfill operators reported some emissions to water. For example, methane emissions were reported only from energy sector, but from breeding of livestock and landfills were not reported at all. In many reports operators didn't stated e.g. coordinates of installation, they argue it is the matter of safety.
In Slovak legislation, there are incorrectly two different definitions of the term „IPPC installation", the consequence of which was the distortion of the number of installations. In general, mainly non-unambiguous legislation and double setting of obligations (in integrated permit, in executive rule) are responsible for majority of data missing.
Other significant reason of missing data is the fact, that mainly operators of landfills and installations on livestock breeding don't know how to calculate or estimate mainly air emissions.
On that account Slovak Environmental Agency works on the guideline which will be used by operators of IPPC installations. Such guideline will provide them with the review of obligations related to IPPC legislation, appropriate commentaries and instructions how to fulfill such obligations. Guideline will consist of the methodology on calculation of air emissions from landfills mainly. Such calculation would be applicable also for other operators.

4.4 First data reporting to EPER

Currently, in Slovakia there are about 536 IPPC installations, only 346 of them (65%) are registered in IRIS.
From the amount of installations registered in IRIS, only 249 reported emissions data (72% from registered, 46% from total amount). From the number of 346 registered installations, in case of 103 installations (30% from registered, 19% from total amount of installations) the threshold limits were exceeded and those were reported to EPER.
Volume of total air emissions reported to IRIS was 3 186 572 tons in 2004, volume of water emissions was 60 143 tons.
As for EPER, according to the threshold limits exceeded, volumes of 2 775 514 tons of air emissions and 59 182 tons of water emissions were reported. It means, that EPER covering Slovakia includes 87% of the volume of air emissions and 98% of the volume of water emissions reported, those are emissions reported and recorded in IRIS. Real volumes of emissions from the total number of IPPC installations must be much higher. [3]

5. Information System on IPPC as a tool for reporting procedures providing [4]

Information System on IPPC, which has been building and operating at SEA (http://ipkz.enviroportal.sk/informacny-system.php), is focused on providing of complex system of collection and processing of information and data to inform European communities, as well as public.

The IPPC IS is a subsystem of the Information System of Environment Departments at SEA and its main objective is the establishment of a system for:

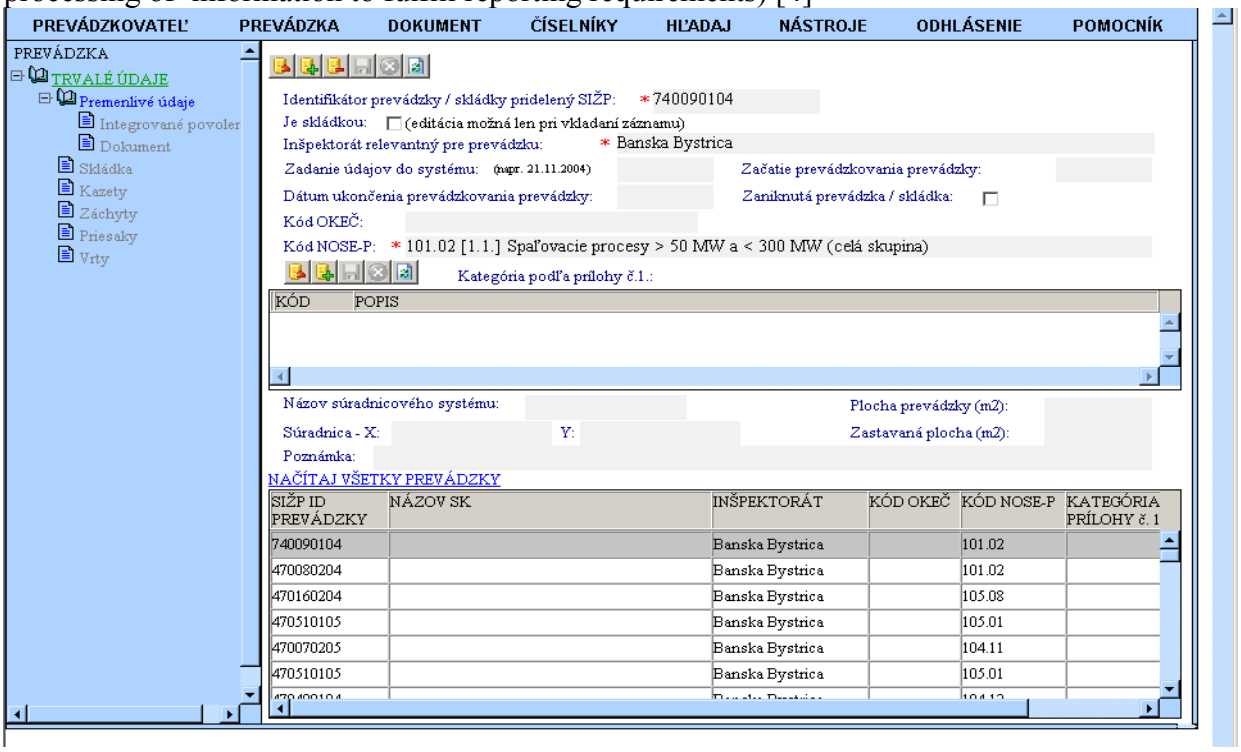
- Providing information about the IPPC permitting process and related activities,
- Supporting information for the execution of the Act on IPPC in Slovakia
- Creating conditions for meeting reporting requirements of the Slovak Republic.

The IPPC IS is divided into six registers, namely: 1. Registry of Operators and Facilities under IPPC, 2. Integrated Registry of Information System (= Integrated Registry of Pollution), 3. Registry of BATs and BREFs, 4. Registry of Environmental Quality Standards, 5. Registry of Authorised Persons, 6. Registry of Integrated Permits Issued.

On our experience of fulfilling of reporting obligations, a need of unique IPPC IS is unequivocal, since operation of such system assuming involvement of relevant institutions may provide users with data and information on higher quality level. IPPC IS can guarantee valuable and verified source of data and information without duplications useless, and it can ensure improvement and simplification of work load of institutions involved in IPPC process. Time saving is also significant issue, if information and data are gathered in one site and up-dated regularly and, of course, verified.

By an example of reporting to EPER and IPPC questionnaire, problems with availability and quality of IPPC data came out. In case of reporting to EPER, less problems appeared, since data were given from IRIS developed and operated by Slovak Hydrometeorological Institute. In case of IPPC questionnaire filling, there were more problems, since primal owner of majority of data is Slovak Environmental Inspection, which, despite of owning rights, doesn't input those relevant data into IPPC IS. Relevant registries of IPPC IS are due to this reason filled by employees of Slovak Environmental Agency, which can use publicly available data only, and those are not verified. Reality was such, that SEA, even being system administrator, was not enable to use this IS for reporting obligations fulfilling, which are obligations given to SEA by Ministry of Environment of Slovak Republic, as well as the obligation to develop and operate the IPPC IS was given to SEA by the same Ministry.

Example of the form of application „IPPC Installations Database“ (for colleting and processing of information to fulfill reporting requirements) [4]



6. Conclusion

Problems of a lack, confusedness and quality of data, and high time consuming of fulfilling of reporting obligations showed urgent need of IPPC IS operation.
Information system makes the work of institutions involved easier, provides access to verified data and eliminates duplications in data and information given by different institutions. As well as, it is very effective tool to inform public on IPPC process.

References:

1. ĎURKOVIČOVÁ, D., FÁBRYOVÁ ET AL., 2006: Integrated registry of information system – Assessment report. SHMI, Bratislava 2006, Slovak Republic. 60 p.
2. ANONYMOUS, 2006: Questionnaire on the implementation of Directive 96/61/EC concerning integrated pollution prevention and control (IPPC) – Slovak report during period 2003 - 2005. Slovak Republic, 2006. 47 p.
3. ANONYMOUS, 2006: EPER Report. Slovak Republic, 2006.
4. www.enviroportal.sk

Ing. Blanka Kapustová, PhD. , Ing. Viktória Schneiderová, Ing. Katarína Lišková
Slovak Environmental Agency
Centre of Environmental Policy and Informatics in Banska Bystrica
Department of Environment Care - IPPC Unit
Tajovskeho 28, 975 90 Banska Bystrica, Slovak Republic
tel. 00421 48 4374 161
fax 00421 48 4230338
e-mail: blanka.kapustova@sazp.sk, viktoria.schneiderova@sazp.sk, katarina.liskova@sazp.sk

COMPUTATION LIBRARY ARROW

Karel Kisza, Matěj Štefaník, Jaroslav Ráček

Abstract:

This paper presents the development of a computation library ARROW for ecological assessment. The library is built on Java and XML technologies. The base of data for this system is the HEIS database containing all necessary data for using library for the environmental assessment. There is described the way of communication between the library and HEIS database, the technologies used during its development, and basic principles of functionality of the library in the document.

KEYWORDS: computation library, environmental assessment, Java, XML.

Introduction

There is quite a number of legislative duties resulting from the membership of Czech Republic in the European Union which are concerned with the protection of environment. One of them is Directive 2000/60/EC of the European Parliament and the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. The purpose of this directive is to establish a framework for protection of inland surface waters, transitional waters, coastal waters and ground waters. The requirement for meeting the demands, beside other things, is adoption of the state systems of monitoring and assessment of the surface waters. These problems are solved by the Computation library ARROW.

The development and subsequent implementation of the library is based on the analysis that has been made at the Institute of Biostatistics and Analysis of Faculty of Science of Masaryk University which solves these problems from the biological point of view. As the main methodology for assessment of state on the basis of biological community was suggested the use of comparison of assessed locations with the reference state (model). Providing that this methodology has quality reference database it enables the comparison of expected (natural) and real state of assessed locality.

The whole process of ecological assessment can be split into two phases:

1. Import of the model into the system and its subsequent preparation for the analysis.
2. Usage of this model for ecological assessment.

Functional analysis

Import of the model into the system and its subsequent preparation for the analysis:

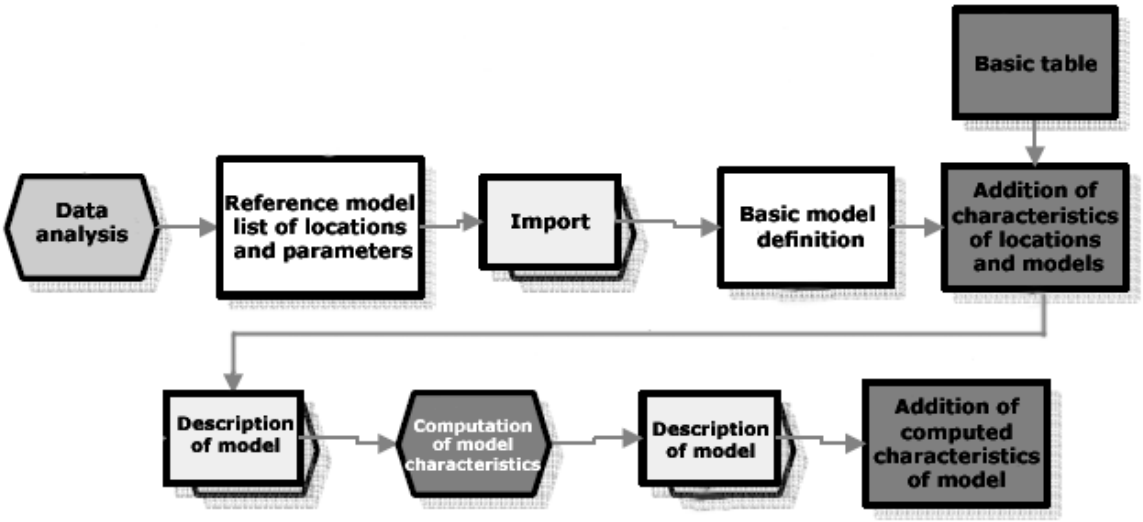


Fig. 1: Import of the model into the system and its subsequent preparation for the analysis

First of all it is necessary to make data analysis which is usually completed by external team of co-workers (biologists from Faculty of Science). This analysis consists of four steps:

- division of referential data into homogenous groups based on the structure of their biological community,
- definition of abiotic characteristics of reference locations,
- definition of biological community of reference locations,
- assignment of unknown locations to reference category.

The result of this analysis is a list of locations which are subsequently used in the model and a list of locations (and their samples) in particular reference categories of the model (as well as text description of model and its categories).

This empty data model is consequently filled with relevant data (concrete values of samples, parameters of locations, etc.) from primary database.

This step brings the model description which contains a list of locations in reference categories, a list of variables for the usage during the computation of the model, the text description of the model and its categories for all locations and their samples in the model and their complete biotic and abiotic record.

At this stage we have all necessary data for performing the computation. Computed characteristics are in the last part saved into resulting XML structure. Usage of this model for ecological assessment:

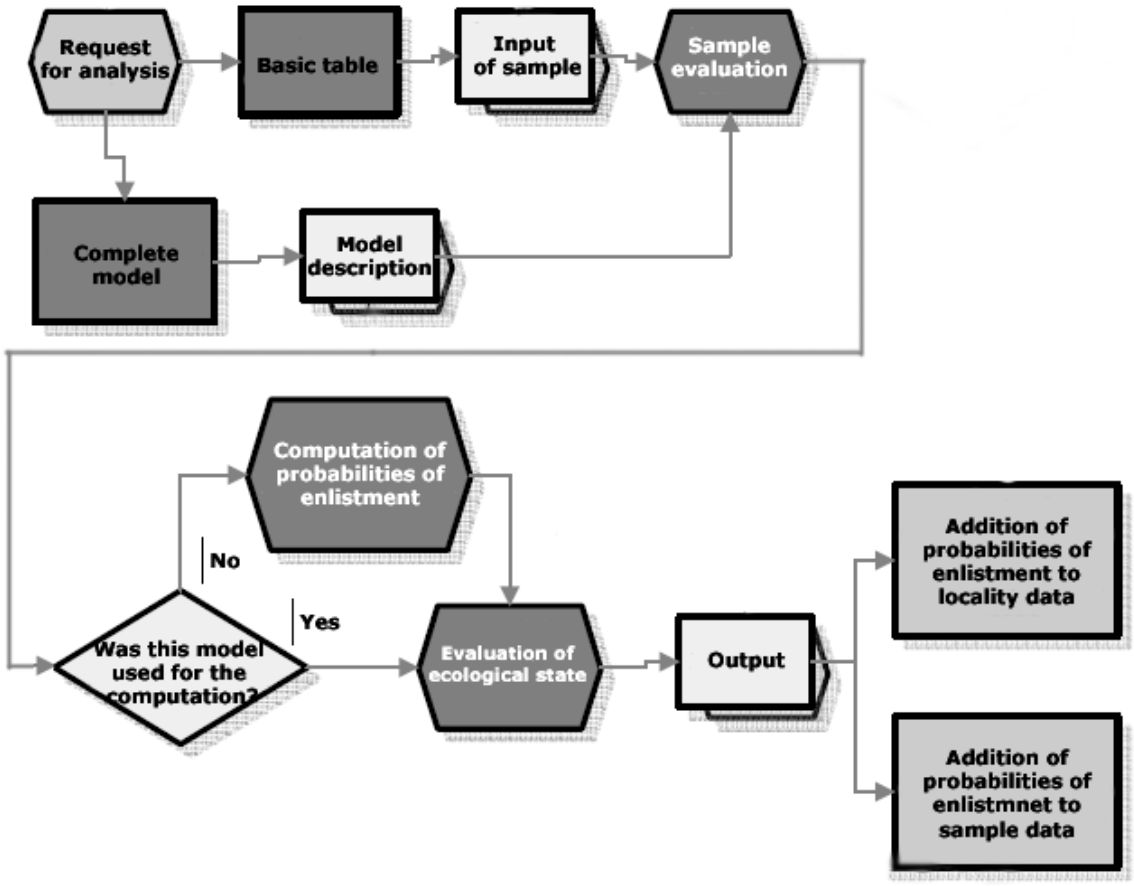


Fig. 2: Usage of this model for ecological assessment

At the very beginning is specified which model will be used for the assessment of every location. Complete data of the model are loaded from the database providing that the model had been computed before. If the model had not been computed before, the data required for computation of model are loaded from database. It means complete description of the model (biotic, abiotic), particular locations (probabilities of enlistment into reference categories of the model – if they are available). Beside of this information there are loaded maintenance values like the number of request etc. After collecting all necessary data the model is computed. This procedure is equal to that described in the first section.
In the next step the assessment of new samples is performed on the basis of the model. The results are probabilities of enlistment of particular sample into a reference category of the model. In the end the result is written into output XML file.

System requirements

Main system requirements were to reach maximum interoperability between particular information systems and architectures and a possibility of involvement of the library into arbitrary IS and interconnection with primary database containing input data.

System design

With regard to system requirements, the solution in form of a separate library written in the programming language Java has been proposed. The computation itself is initiated by the input XML file which contains all necessary information loaded from primary database. The output is again in the XML form. This solution enables to run the service practically

everywhere and to integrate its functionality into arbitrary architectures. The library is also independent on concrete type of database system thanks to the interface designed in this way (XML can be created in many ways). For provision of the unified model of input and output XML data is used XML Schema technology.

Performance

In the first version of the library was used DOM interface but during the first testing we realized that this approach is not quick enough. We tried variety of optimization techniques but we could not reduce the computation speed to lower values than minutes. This performance was far away from the requirements. This result led to the usage of a different paradigm which was SAX interface.
SAX enabled us much greater speed, efficiency and processing really big XML files (100MB and bigger).

Conclusion

The development and the implementation of the Computation library ARROW for assessment of surface waters is a big step towards fulfillment of the obligations of EU concerning assessment of environmental information. The computation library dramatically accelerates processing of gathered information and enables more effective decision making which then by return enables better environment.
The designed model brings effective solution and enables easy extensibility of this model for other aspects of environmental information. Its simple structure, the way of communication and service oriented architecture also provides possibility of its usage for broad public.

References

[1] Jarkovský J, Dušek L, Némethová D, Kubošová K, Brabec K, Gelnarová E: Matematické metody hodnocení dat biologických společenstev využitelné pro hodnocení stavu povrchových vod. Masarykova univerzita, Brno (2005)
[2] SAX Documentation, http://www.saxproject.org
[3] DOM documentation, http://java.sun.com

Mgr. Karel Kisza, Mgr. Matěj Štefaník, RNDr. Jaroslav Ráček, Ph.D.
Department of computer system and communication
Faculty of informatics, Masaryk University
Botanická 68a, 602 00 Brno, Czech Republic

METHODICAL ASPECTS OF ACCOUNTING, STATISTICS AND REPORTING OF SUSTAINABLE DEVELOPMENT IN THE ENERGY SCOPE ON THE EXAMPLE OF RENEWABLE ENERGY SUPPORT SCHEMES

Jaroslav Knápek, Erik Geuss, Michaela Ouředníková

Abstract: The main topic of the conference „Accounting and Reporting of Sustainable Development on the Microeconomic and Macroeconomic Level“ is developed in the article within the scope of the energy sector on the specific example of accounting, statistics and reporting together with subsidies of renewable energy sources (RES) from the public finances of the Czech republic and European Union.

Keywords: Energy sector, accounting, reporting, statistics, subsidies, public finances, renewable energy sources.

Introduction

In our article for the international conference „Accounting and Reporting of Sustainable Development on the Microeconomic and Macroeconomic Level“ we focus on the methodical aspects of accounting and statistics in the sphere of public support for renewable energy sources (RES). It is a very up-to-date subject of the Czech energy and environmental policy.
Problematic of the support and utilization of RES has been indicated this year by the Ministry of Environment as one of the ten most important environmental issues.
In the previous articles and studies on this subject[7] we focused on the description and evaluation of the RES public support schemes in the EU countries and Czech republic. We developed main propositions of the effectiveness analysis of such support and among others we came to the conclusion that certain changes in the methodology of all key processes are necessary, namely:

- In the procedure of granting the public financial supports by various bodies (state, regions, towns, municipalities, EU funds, etc.)
- In the procedure of economic effectiveness analysis of the public financial support (from public sources) and in the evaluation of the support efficiency from different aspects (state, investor, project, etc.)
- In the methodology of accounting and reporting on these supports in the scope of both national accounting and reporting, or international comparison and control of the compliance with international commitments (e.g. in particular reporting on the compliance with European legislation and achieving its objectives (8% RES share) but recently also other political commitments on the EU or UN level).

It is also obvious, from the theoretical aspects, that the current conditions of constantly limited financial sources and the pressure on the economically effective solutions of practical issues lead us to <u>search for the balance between proposed measures</u> (i.e. support of RES penetration which is political decision) and <u>consistent and economically rational means of public financial support of these measures</u> (which is a crucial task namely in the next five years in the conditions of EU Structural Funds financing).

[7] For example: Knápek J., Geuss, E: Vybrané aspekty efektivnosti veřejných výdajů v oblasti energetiky ve vazbě na reporting udržitelného rozvoje, sborník mezinárodní konference Envibrno, 2006.

What is the public financial support for RES?

In the following text we focus on the selected methodological issues of supporting the electricity generated from RES and we do not duplicate our propositions which have been already discussed and published before (see Sources).
Rational investor, whose interest is economic benefit maximization, will make decision under criterion of Net Present Value – NPV:

$$NPV = \sum_{t=1}^{T_{ž}} CF_t \cdot (1 + r_n)^{-t} \quad (1)$$

CF_t cash flow (revenues minus expenses realized in the t-year)
r_n nominal discount rate
$T_{ž}$ lifetime of investment

Discount rate (in the formula (1)) represents a rate of return which an investor expects from the investment. If NPV > 0, then the investor should make such investment. This NPV criterion enables to deduce the so called minimum (production) unit price (c_{min}), which is a price of production providing the investor a return on investment equal to the discount rate used in the relation (1).

$$\sum_{t=1}^{T_{ž}} c_{\min t} \cdot Q_t \cdot (1 + r_n)^{-t} = \sum_{t=1}^{T_{ž}} V_t \cdot (1 + r_n)^{-t} \quad (2)$$

$c_{min\,t}$ minimum (unit) price of production in the year t [CZK/units]
Q_t amount of productions [units, e.g. MWhours]
V_t expenses in the year t [CZK]

Investor can easily compare the market price (c_{max}) with the price (c_{min}), which he would need in order to achieve return on investment at least equal to the required (expected) rate of return (discount rate). If the price c_{min} is higher than c_{max}, it means that the project NPV is negative (< 0), therefore there is no motivation for investor to make such investment. If there is a joint interest to still make RES investment, it is necessary to support such projects from public sources.

Principle of public support

Practically (with some exemptions) it is a rule for the projects of electricity generation from RES, that $c_{min}>c_{max}$. Which means that the investor needs to achieve a price higher than on the free (unregulated) electricity market. If the electricity generation from RES is of public interest, it is necessary to change through some support the relation between c_{min} and c_{max} into $c_{min} <c_{max}$.
Project support of any kind always requires solution of several crucial issues:

(1) who is responsible for covering the excess costs resulting from the renewables support
(2) how to design supporting scheme in order to change not only the relation between c_{min} and c_{max} for certain commodity (e.g. electricity) but simultaneously, to stimulate the investors in economically rational behaviour (rational design and selection of projects, motivation for cost cutting, rejection of irrational projects, etc.)
(3) how to structure such support scheme in order to minimize its transaction costs on one hand and on the other hand, to achieve its transparency, predictability for the investors and elimination of undesirable market mechanism interventions
(4) how to assure that this scheme reflects the state preferences in a specific area.

Change of relation between c_{min} and c_{max} means on one hand either the excess costs of electricity generation or on the other hand a requirement of the additional revenues for the

operator of renewable energy installation (for electricity generation). To simplify it we can speak about the excess costs resulting from electricity generation from RES. These excess costs can be shared in principle by three types of entities (categories):

(1) tax payers (if the support is granted e.g. from the state budget, no matter if directly or indirectly – e.g. via specific funds such as Czech Energy Agency funds)
(2) consumers (if the support is covered e.g. through passing the excess costs of the renewable electricity redemption on the current production prices)
(3) third entities – e.g. funds specialized in the RES project support with the aim of emission reduction, or funds for allocating the finances from the EU funds at the national level.

When we strictly focus on the first two cases, it is obvious that the choice of various principles has different impacts on consumers – category of tax payers does not coincide with the category of electricity consumers. In the Czech republic it was decided to choose a principle that the RES support mechanism is financed by the electricity consumers. It has its logic, because the more the electricity is consumed, the more the need of electricity from RES is induced.

The change of relation between c_{min} and c_{max} can be achieved by many different ways (means of support). Some types of support are focused on the change of c_{min} level (while c_{max} remains constant). A typical example is investment subsidies, subsidies fixed on production (e.g. green bonus), advantageous loans, investor risk lowering, etc. If the investor obtains an investment subsidy, it is obvious that his c_{min}* will be lower than c_{min} without such subsidy. Other forms of support are focused conversely on the change of c_{max} level. A typical instrument is e.g. environmental taxes increasing generation costs (electricity generated from the conventional sources), quotas setting a share of RES utilization for electricity generation, guaranteed minimum redemption prices, etc.

Setting the specific support level for RES under the Act 180/2005 Sb. and its differentiation

Projects for electricity generation from RES (RES projects) have their distinct technical and economic characteristics. Annual utilization of installed capacity ranges from cca 1000 hours (photovoltaic), across cca 1700-1900 hours (wind power plants), 3000-5000 hours (small hydropower plants), 6000-6500 hours for biomass sources, to cca 8000 hours (sources using landfill gas and gas from wastewater treatment plants). It leads to huge differences in the amount of electricity generated for one unit of installed capacity. On the other hand, also investment and operation costs of typical RES projects (using different types of RES) are very diverse. It evokes that c_{min} differs for particular types or RES projects (resp. types of RES).

In the Czech republic through the Act 180/2005 Sb. it has been decided to choose a support principle that the redemption prices are set at the level to fetch out an equal return on investment for investors.

Redemption prices, which are set for the particular types of RES through the price decisions of Energy Regulatory Office (ERO), are deduced rationally from the minimum redemption prices – see above indicated relations. Practically, for the minimum price (c_{min}) setting type projects (for RES utilization) are used. More concretely the principle of c_{min} calculation is described in the specialized literature[8] (2).

The basic principles of c_{min} calculation are: (1) Calculation on the basis of the Cash Flow OF a project during its lifetime. (2) Use of nominal values. (3) Use of discount rate which should

[8] Beneš, M., Vašíček, J., Knápek, J.: Výkupní ceny elektřiny a zelené bonusy za elektřinu z obnovitelných zdrojů energie. Obnovitelné zdroje energie 2006 - sborník. Pardubice: Parexpo, 2006, s. 1-10.

be as high as relevant business risk. (4) Neglecting the form of financing (it is impossible to anticipate often very different forms of project financing) – discount rate is in such case the weighted average cost of capital (WACC – see next).
Currently, the practice of ERO is that the redemption prices of renewable electricity are set in the way to be equal to 7% discount rate used in the calculation of minimum electricity price for the particular types of OZE.

From the methodological aspect, it can be stated that the processes for setting legal RES support as the price decisions of ERO do not impinge on the problems with accounting, statistics or reporting. However problems result from the possible concourse of supports, i.e. support in the form of minimum redemption price (under the Act 180/2005 Sb.) and subsidy from the State environmental fund or other public sources (e.g. EU funds).

Concourse of public support from different public sources?

Despite the various schemes implemented through the Act 180/2005 Sb. the electricity generation from RES has increased slowly so far. This situation is caused by a range of factors (namely microeconomic factors) such as complication with receiving construction permission, long time of obtaining various permissions, lack of suitable localities, sometimes opposition of local communities to realize projects (e.g. wind power plants), etc. Nevertheless, some new opinions have recently occurred that it is necessary to increase motivation of investors through some additional support, in particular as investment subsidy. Necessary financial sources would be covered mainly from the EU funds (e.g. Operational Programme Environment). Fundamental proclaimed goal is to shorten the payback period of investments and to make the investment in RES for the electricity generation more attractive.
If we neglect the disputableness of this opinion from the aspect of possible more effective utilization of these sources for supporting other projects bearing in principal the same effects, it is necessary to consider this opinion from the aspect of return on investment and effective utilization of sources from EU funds.
Granting investment subsidies implies several parallel effects: (1) it increases the rate of return (of particular project) (2) it shortens the payback period, (3) it lowers a business risk for an investor.
The influence of subsidy on the rate of return, resp. corresponding discount rate (WACC), is possible to illustrate on the example of wind power plant project[9]. The dependence of the rate of return on the level of subsidy illustrates the following figure. E.g. for 40% subsidy the payback period decreases from the initial 11 years to less than 8 years.

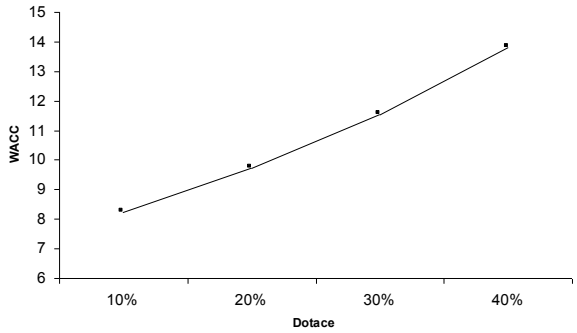


Figure 1: Dependence of the rate of return of model project on the investment subsidy level

[9] For more details see Knápek J., Geuss, E: Veřejná finanční podpora obnovitelných zdrojů energie, její efektivnost a dopady na podnikatelskou sféru, sborník konference Zlín, Zlín, 2007

As it is indicated in the previous text, the level of return on investment is influenced also by the structure of financing. In fact, the rate of return (return on investment) is much higher than which is shown in the figure.
In this situation the following question is relevant: Does the return on investment correspond to business risk? As it is indicated in the beginning of this article, the characteristics of support mechanism according to Act 180/2005 Sb. is that it aims at business risk reduction. What remains for the investor is to deal with a risk connected with natural conditions and technological risk. Substantial part of business risks is however eliminated. To some extend of simplification it is possible to compare (from the rate of return aspect) such type of entrepreneurship (or business) with business in the field of electricity distribution which is a regulated activity by virtue of being a natural monopoly.
Regulated price for the distribution is set in principle on the basis of weighted average cost of capital in relation to operation assets. The used value WACC corresponds to WACC used in the case of RES. It would lead us to comparable values also in case of energy generation companies operating on unregulated electricity market.
From this aspect it is possible to consider that the aim of shortening the payback period (of RES projects) while remaining other parameters (variables) of the support scheme under the Act 180/2005 Sb. is ineffective utilization of financial sources.

For this reason the explicit task for the statistics and reporting which follow is to line up all the relations connected with the concourse of supports, it is necessary to monitor these connections, to describe them and therefore to come up with important and necessary information especially for politicians and all key decision makers.

Effectiveness of public support and other methodological conjunctions

If we apply general principles and rules of effectiveness, in optimal case we should avoid the public support allocation of different source or project than of source (project) which bears the highest utility (effect).
When correctly setting priorities and criteria of public policies (energy, tax, environmental), there is no objective reason why the project effectiveness evaluation supported from public sources should result from different procedures and rules than from those ones used in microeconomics for business plans and investment decisions procedures.
The above indicated presumptions imply that the financial analysis and project evaluation offer basic information for decision about the project acceptation or rejection, i.e. these procedures should be also used for decision about the supporting or not supporting project from public financial sources (i.e. ex ante analysis). Alike, these procedures should be used also for the effectiveness evaluation of project support schemes (ex post analysis).
The following question should be posed in this context: Does current methodology of accounting and reporting correspond with this aim of financial analysis? Respectively: To which extend the current methodology of selection and evaluation of projects is linked to standardized accounting procedures?
The answer is not simply obvious. E.g. in the analysis of RES support scheme from the State Environmental Fund and in the analysis of this mechanism in the proposed Implementation document „Operational Programme Environment“ we come to conclusion that the methodologies of project selection are only partially linked to the standardized accounting procedures and also design of these methodologies is not completely rational and consistent for the statistics and reporting purposes.
In this connection we refer to other published articles (see Sources), broader discussion on the crucial issues and problematic is however still missing.

Conclusion

The field which has been of our special interest for a long time is very large. One of its part – methodological aspects of public support schemes and its effectiveness evaluation – exceeds scope of this article and its presentation at this international conference. Therefore we expect that in the following years of this conference and other similar meetings we come back to this problematic again.

In our article we attempted to sketch out and document that apart from the accounting and reporting system in the field of RES support from public sources there is still a range of challenges and unsolved problems.

Very concrete and up-to-date challenge which we identified in our article, is the methodological change in the following spheres:

a) Public support accounting according to current legislation (taxes, accounting, RES support) and in conditions of concourse of support for RES from various public sources.

b) Statistics and reporting in the evaluation of this public support while considering the imbalance between environmental effects quantification in comparison with relatively explicitly quantified costs.

c) Fulfilling new arising informative obligations at the national level and especially at EU and UN level.

We believe that using the concept of methodological arrangements sketched in our article it should provoke discussion and consequent improvement and specification of the whole public RES support procedure, including reporting on our compliance with international commitments and international legislation implementation, not only in the sphere of renewable energy sources.

Doc. Ing. Jaroslav Knápek: Czech Technical University in Prague, Faculty of Electrical Engineering, Head of Department of Management, Economics and Humanities, Praha 6, Zikova 2, e-mail: knapek@fel.cvut.cz, tel. 224353315
Ing. Erik Geuss: Czech Technical University in Prague, Faculty of Electrical Engineering, Department of Management, Economics and Humanities, Praha 6, Zikova 2,
e-mail: erik.geuss@volny.cz
Ing. Michaela Ouředníková: Czech Technical University in Prague, Faculty of Electrical Engineering, Department of Management, Economics and Humanities, Praha 6, Zikova 2,
e-mail: ouredm3@fel.cvut.cz

ENVIRONMENTAL PROTECTION EXPENDITURES OF PARTICULAR ECONOMY SECTORS

Eva Krumpová

Environmental protection is now being integrated into all policy fields with the general aim of ensuring sustainable development. All activities inevitably affect the environment to some degree, which means that all sectors of the economy: government agencies and local authorities, enterprises involved in industrial or other business activities, enterprises which provide specialized producers (such as collection and treatment of waste, sewage treatment, or environmental consultancy) and households have their specific role to play in the overall efforts to minimize the negative consequences.

The legal framework for statistics on environmental protection expenditure is the Council Regulation 58/97 concerning Structural Business Statistics (SBS) and the

Regulations later adopted amending the SBS Regulation. In the framework SBS Regulation are reporting important variables include environmental protection related variables. Concretely are reported variables: Environmental investments into integrate and end-of-pipe technology and current environmental protection expenditures.

Expenditures on environmental protection are composed of investment expenditures and non-investment (current) cost of environmental protection that are related to activities aimed at environmental protection (methods, technologies, processes, equipment or its parts), whose main purpose is the recording, removal, monitoring, checking, reduction, prevention, or elimination of pollution or any other damage to the environment.

Pollution treatment investments (End-of-pipe) are investments which do not affect the production process itself, and the amount of pollution generated, instead they serve to treat pollution already generated (e.g. sewage treatment plants, filters).

Pollution prevention investments (Process-integrated) are investments which lead to a modified or adapted production process. They serve to reduce the amount of pollution generated at the source.

It is suitable for more detailed data analyses and assessment of the value realized environmental expenditures use the information which sector of economy financial resources expend and if expenditures were from the public or business sector, from specialized producers or from households.

Business sector includes all activities in NACE 01-99, excluding public sector (mainly NACE 75) and specialized producers (mainly NACE 90 and NACE 37).

The public sector includes central, regional and local governments, authorities, communities and government agencies (mainly NACE75: public administration and defense).

The specialized producers of EP services include enterprises (both privately or publicly owned). These are mainly activities within NACE 90 (90.01 Collection and treatment of sewage; 90.02 Collection and treatment of solid waste; 90.03 Sanitation, remediation and similar activities) and Recycling (NACE37).

The ratio of fixed assets acquired for environmental protection between the public sector, business sector and specialized producers:

Sector	Unit	Year										
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Public	CZK mil.	10 976,0	12 566,4	12 363,4	10 997,5	10 992,7	10 709,0	12 050,2	7 122,0	8 009,8	10 045,5	7 967,6
	%	34,0	33,9	30,5	31,8	38,0	50,0	60,6	47,7	41,2	49,6	43,7
Business	CZK mil.	21 276,0	23 705,3	26 684,2	21 689,2	17 540,9	10 256,4	7 276,8	7 329,5	10 204,7	8 685,2	8 619,0
	%	66,0	64,0	65,9	62,8	60,6	47,9	36,6	49,1	52,4	42,9	47,2
Specialized producers	CZK mil.	.	764,8	1 455,9	1 850,1	422,2	434,2	565,4	467,0	1 249,7	1 517,5	1 661,7
	%	.	2,1	3,6	5,4	1,5	2,0	2,8	3,1	6,4	7,5	9,1

Environmental expenditures from household aren't monitored in the Czech Republic and current environmental expenditures has been inquired in the business sector by Czech Statistical office since year 2003 and recently by public sector for reference year 2006 (data will be published on September 2007).

References:

1. Proceedings International Conference, Environmental Accounting, Sustainable Development Indicators, Krumpová E., Environmental Protection Expenditures in the Czech Republic – Data Acquisition, Prague, 2005
2. Sous-groupe sur l'information et les perspectives environnementales, Working Group on Environmental Information and Outlooks, Environmental Performance and Information Division, OECD, 2003
3. Environmental protection expenditure in accession countries, Eurostat, 2002

Eva Krumpová,
Czech Statistical Office

REPORT ON SUSTAINABLE DEVELOPMENT – AN IMPORTANT DOCUMENT FOR COMMUNICATION

Hana Lorencová

The third report on sustainable development of the Czech Coal group is ready for publication this year. The Czech Coal energy group has long been convinced that it must be capable of sharing part of its funds and professional capacities and knowledge with society as a whole. The group has based its long-term corporate success on responsibility in the social area and in the area of protection of the environment that is above and beyond its legal obligations.
Sustainable development is perceived in our association as harmonization of the economic, social and environmental dimensions of everyday life and business. It is primarily necessary to find the necessary balance. The Czech Coal group monitors the state of the indicators of sustainable development and analyzes factors in the regions where its members are located. Attempts are made to prevent problems, to evaluate the benefits and impacts on the surroundings and thus to improve cooperation with governmental agencies, municipalities and stakeholders.
Annual Reports are part of the methodical management of activities of our social responsibility in accordance with the principles of sustainable development. These are also useful in the stage of preparation, for evaluation of our own activities. Experience gained in preparing reports and their importance for communication with target groups form the content of this lecture.

Hana Lorencová Ing., Ph.D.
Mostecké uhelné společnosti a.s.,
V. Řezáče 315 434 01 Most
+420 47620 3471 H.Lorencova@mus.cz

COMPARABLE ANALYSIS OF FINANCIAL STATEMENTS OF TELECOMMUNICATION COMPANIES OF EUROPEAN UNION

Jonas Mackevicius, Stanislovas Radavicius

Abstract

Financial statements are one of the most important economic information resources. Financial statements made in a correct way provide detailed and very important information about companies financial status quo, results of it's activities, change in shareholders equity, cash flow and other data that is necessary for management of companies, their partners especially when they have to make a decision.

In a competitive European Union telecommunications market, comparable analysis of financial statements is one of the problems today. Having made a research about income statement, balance sheet, cash flow statement, statement of changes in shareholders equity between telecom companies in old (Deutsche Telekom, France Telecom, British Telecommunications, TeliaSonera) and new (TEO LT, AB, Lattelecom and Elion) countries - members of European Union, it is defined that there some very important differences. Financial statements are different in terms of financial indicators, grouping and number of items in each statement. Therefore, it was difficult to compare some of the financial indicators of the companies mentioned above, and calculate various indicators of company's liquidity, payment ability, profitability, equity turnover and other financial indicators. Lack of ability to compare financial results of various telecommunications companies negatively impacts economic grow and development of telecommunications business in European Union.

Jonas Mackevicius,
Professor Hab. Dr. of social Sciences
Department of Accounting and Auditing
Vilnius University
Sauletetelio al. 9, LT – 10222
Vilnius, Lithuania
Tel: +370 5 2366153

Stanislovas Radavicius,
Dr. of social Sciences
TEO LT, AB
Savanoriu Ave. 28, LT-03501
Vilnius, Lithuania
Tel: +370 5 2305033

RESULTS FROM IGA GRANTS

Petra Mísařová

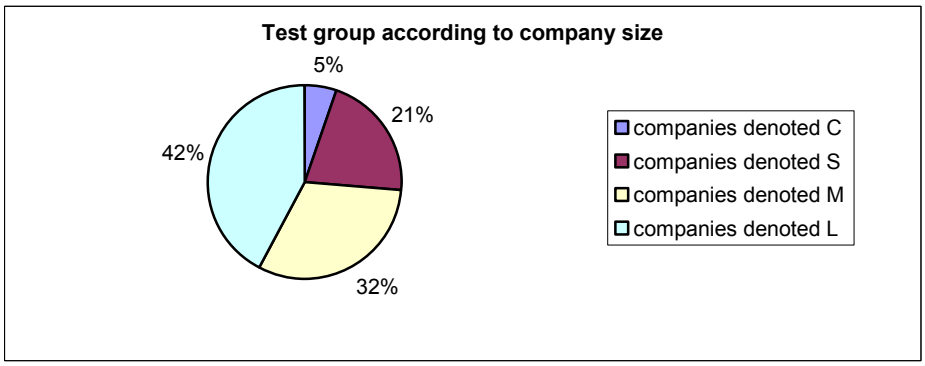
Introduction

A survey was performed in the framework of the grant provided by the internal grant agency of the Mendel University of Agriculture and Forestry, No. 68/2006, termed "Trends in EMS and managerial accounting in the CR". This survey was only one part of the entire grant. A written survey was employed to determine primary information. All the organizations that have a validated environmental management system in the CR according to the European EMAS II Program were addressed. In relation to the number of enterprises, all unclear items in the returned questionnaires were consulted by telephone or e-mail with employees of these companies.

76% of the questionnaires were returned. All the companies that were included in this system have introduced an environmental management system according to the European EMAS II Program and also have an EMS certificate according to the ISO 14000 international standards. However, this fact is not important in relation to the stated targets of the grants.

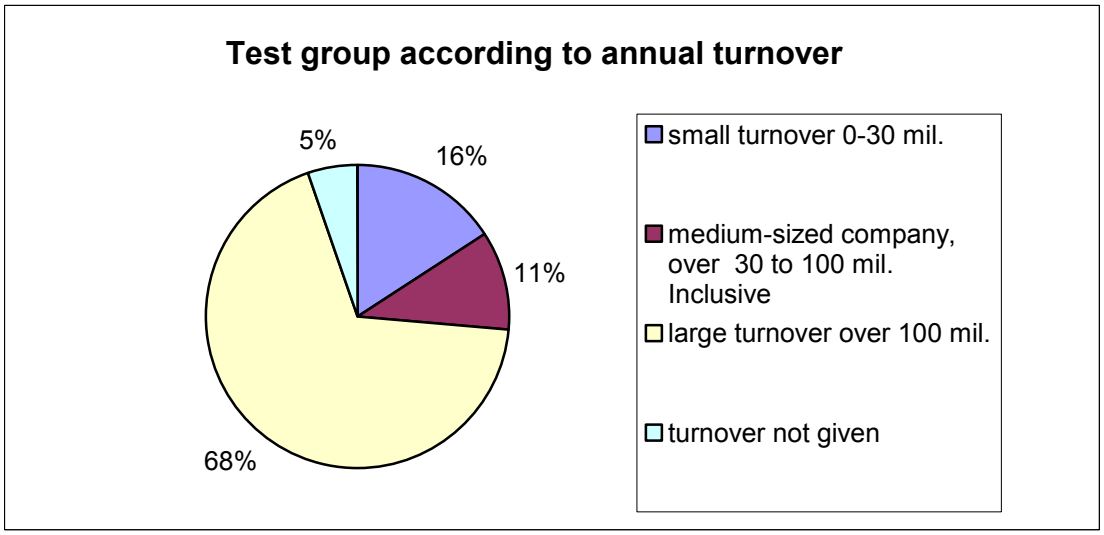
First, the basic results of the survey will be summarized. The test sample consisted mainly of large and medium-sized companies with a turnover of greater than CZK 100 million annually. These facts are documented by Graphs No. 1 and 2, drawn up on the basis of the collected data. 53% of the companies are domestically owned and 47% have foreign owners. The respondents consisted mostly of persons in middle management (79% of respondents), while only 21% were representatives of top management.

Graph No. 1 – Test group according to company size



In the graph, C denotes micro companies to 9 employees and the test group contains only 1 such company. Medium-sized companies with 10 – 49 employees are denoted by letter S, and the test group contains 4 such companies. Medium-sized companies with 50 – 249 employees are denoted by letter M, and there are 6 such companies. The largest group, of 8 companies, consisted of companies in the category denoted L, formed of large companies with over 250 employees.

Graph No. 2 – Test group according to the annual turnovers



Results of the survey

The questionnaire used to determine the primary data in this survey was divided into four subject areas. This article will be concerned only with the part dealing with environmental accounting and environmental reporting.

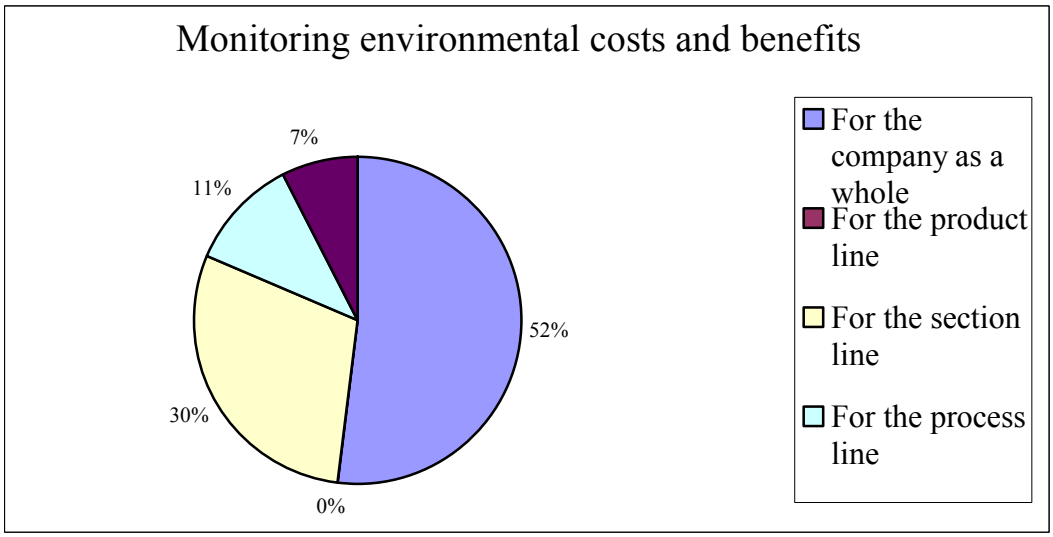
This part was concerned first with determining whether the company practice is acquainted with the term "environmental accounting". A total of 95% of respondents stated that they had encountered the concept of environmental accounting. However, further questions revealed that only 58% of those questioned employ environmental accounting in their company as a voluntary instrument of environmental conduct. These were large companies and medium-sized companies with 50 – 249 employees, but also included 3 medium-sized companies with 10 – 49 employees. Looking at these facts from a different point of view, half the companies in the category of large companies, with more than 250 employees, do not employ the concept of environmental accounting in their business activities.

62% of companies with turnover of greater than CZK 100 million employ environmental accounting as one of their managerial instruments in company management. All the companies in the medium-sized category of companies according to turnover (more than or equal to 100 million, incl.) stated that they employ data obtained from environmental accounting. It followed from the survey that one small company (turnover to CZK 30 mil.) stated that it uses environmental accounting as a voluntary instrument of environmental conduct and company management.

The concepts of environmental costs and environmental benefits were also considered in the survey. The survey confirmed that these terms are familiar in company practice. 95% of respondents stated that they had encountered these concepts. Greater attention was then paid to monitoring and evaluation of environmental costs and environmental benefits, rather than simply to whether these terms were familiar. Except for one company, all the others that were familiar with the term environmental accounting also monitor and evaluate these costs. Conditions are more complex in relation to environmental benefits. Two thirds of companies familiar with this concept also monitor environmental benefits. Clear identification and specification of environmental benefit is a problem here. Consultations with the individual companies indicated that they do not evaluate environmental benefits because of the difficulty entailed in quantification. Conditions are simpler in relation to environmental costs; however, companies do not include all the relevant costs under environmental costs. This is because of the difficulties associated with identification or quantification.

The way in which these environmental costs and benefits are monitored is a very important aspect. Most companies monitor these costs and benefits in the framework of either financial or corporate accounting. 4 companies stated that they monitor these data separately, outside of the accounting system. In was found in conversations that this is performed, e.g., through various tables. Only one company of those that answered this question admitted that they determine these data only on request, i.e. in single determinations, e.g. in resolving a particular problem.

Graph No. 3 Monitoring and evaluating environmental costs and benefits



The way in which these environmental costs and benefits are monitored and the recipients of this information are very important aspects. It clearly follows from Graph No. 3 that more than half the companies monitor and evaluate environmental costs and benefits for the company as a whole. A substantial fraction (30%) monitors these costs and benefits along the section line. Some companies also mentioned combination of the individual variants of monitoring. This monitoring according to the section line or process line applies only to large companies from the standpoint of turnover (turnover of greater than CZK 100 mil.) and large (250 or more employees) and medium-sized (50-249 employees) companies from the standpoint of the number of employees. These results are logical and the results obtained could be expected. More detailed monitoring and evaluation of environmental costs and benefits leads to a greater administrative and time burden on the company. Only large companies, with sufficient employees and finances, have the capacity for this. The companies must also determine the level of benefit from detailed determination and monitoring of this data. Monitoring of environmental costs and benefits is undoubtedly beneficial for all companies, but each company must consider whether the costs of determining this data are excessive.

The survey determined this fact in the question of whether this information contributes to improving decision-making in the particular company. 74% of companies answered “yes”, i.e. this information contributed to improving decision-making in their company.

Further voluntary instruments related to environmental protection include ecolabelling, cleaner production (prevention of waste generation), life-cycle assessment (LCA), etc. Only 5 of all the companies with validated European EMAS II Programs stated that, of these voluntary instruments, they employ cleaner production, i.e. preventing waste generation, and one company employs life-cycle assessment.

Environmental reporting

This consists in communication of information on company conduct in relation to the environment, addressed to the surroundings of the company, the company's employees, neighbours of the company and other external and internal stakeholders. Environmental reporting is a written instrument of communication. Thus, companies employ it to issue reports on how well they are achieving their environmental targets.

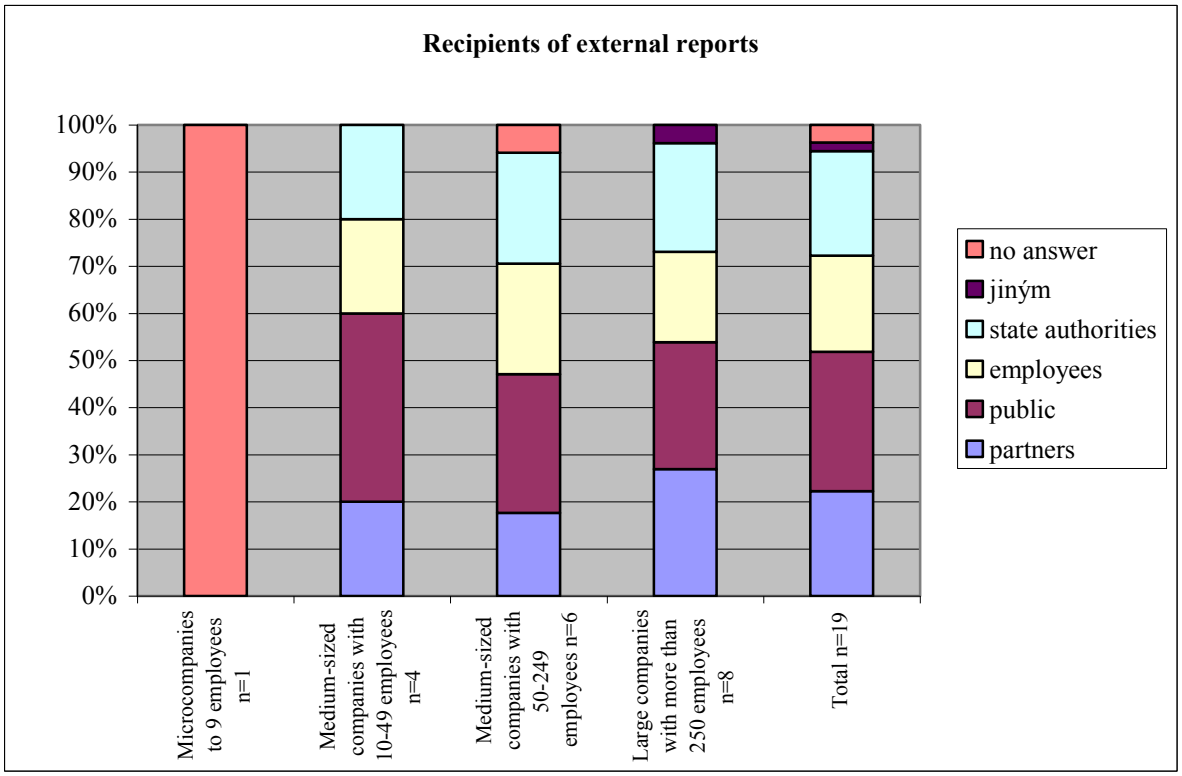
In the framework of this part of the survey, it was most important to determine whether the companies write regular reports about their environmental conduct based on their monitored environmental data. Of the total number of companies surveyed, 90% stated that they do. Most companies (79%) write both internal, for internal use in the company, and external reports for disclosing environmental data for the surroundings of the company. 11% of the companies, i.e. 2 companies, stated that they create only external reports. These were medium-sized companies, both in the number of employees and in evaluation of companies from the standpoint of turnover.

Further primary data related to environmental reporting were determined separately in relation to internal and external reporting.

The respondents stated that 37% of the internal reports are intended for all employees of the company, 22% are intended for the entire company management, including medium-level management and 19% are also intended for employees. 50% of companies stated that they issue internal environmental reports at annual intervals. The second most frequent interval for drawing up internal reports was quarterly. Only a very small percentage of companies issue monthly or semi-annual reports. On the other hand, 18% of companies stated that they issue internal environmental reports at longer than one-year intervals. This survey did not reveal whether the company size had any influence on the reporting interval, from the standpoint of either magnitude of turnover or number of employees. It followed from personal discussions that this is determined only by internal company requirements and the organizational structure of the company.

It follows from graph No. 4 that external reports are intended for business partners, the general public, employees and the state authorities. The survey did not indicate an unambiguous preference for any group. The vast majority of companies (68%) that draw up reports for external reporting do so annually. Only some medium-sized and large companies draw up external reports more frequently than once annually; this is then semi-annually or quarterly.

Graph No. 4 – Recipients of external reporting



Information stated in the individual reports is mostly expressed in physical units. A great many companies publish their information in environmental reports also in monetary terms. 58% of companies stated that they give the information in their reports in both physical and monetary units.

All the companies that participated in the survey also stated that they publish, in some form, reports drawn up on the basis of information obtained in the framework of an introduced environmental management system. Recommendations or schemes that companies can follow exist for drawing up reports. However, 70% of companies state that they draw up reports according to their own schemes and only 30% draw up reports according to a pattern. The manner of publishing these reports was a very important question posed to companies. The companies almost all stated that they publish their environmental reports on their web sites and also in printed form as individual reports. Only a small percentage of companies (9%) stated that that they publish their environmental reports in printed form together with other information published about the company.

In the conclusion of this part of the questionnaire, 31% of the companies stated that they frequently request information related to the environment. These were mostly large companies with foreign owners. This information is requested only infrequently in 69% of companies. The vast majority of companies stated that their business partners request this information from them, followed by the state authorities.

When the opposite question was posed to the companies, as to whether they request information related to the approach to the environment from their business partners, the answers were similar. 37% of companies stated that they frequently request this information, 58% rarely request this information and 5% do not request it at all.

Conclusion

Concepts such as “environmental management systems”. “environmental accounting”, “environmental costs and benefits”, etc. began to appear relatively recently compared to the

other Member States of the European Union. The grant under which the survey was carried out is concerned with companies with a validated European EMAS Program. This program was prepared by the European Commission and is implemented in the framework of the European Union.

This article contains the results of one part of this questionnaire, concerned with environmental accounting and environmental reporting. The concept of environmental accounting is well known amongst the companies that returned their questionnaires. However, not all the companies implement environmental accounting in their business activities as a voluntary instrument of environmental conduct. In order for environmental accounting to provide the relevant information to support decision-making processes in the company, it is necessary to concentrate primarily on definition of environmental costs and benefits, following for the company from an environmentally sound approach. It is not always an easy matter to identify, collect, quantify and analyze individual environmental costs and benefits and this is often demanding on time and expenses. However, without inclusion of the relevant environmental cost and benefit items in the decision-making processes, it is impossible to improve the management of the company. Particularly environmental costs can be an important item in the overall costs of the company and their identification, quantification and analysis can contribute to their reduction and thus to increased effectiveness of company activities leading to greater profit levels in the company.

Environmental reporting is understood as a report on the relationship of the company towards the environment. Most companies draw up environmental reports irregardless of their size, majority owner or sphere of business. Through environmental reporting, the company presents its positive approach to the environment. One of the inadequacies of environmental reporting is the lack of feedback. Companies mostly publish their reports on their web sites and in printed form. The survey indicated that companies know for whom these reports are intended but that there is no feedback from these recipients. So far, these are unilateral publications by the companies.

There are spheres of business where the publication of environmental reports for the surroundings of the company constitutes an essential part of the communication of the company with its surroundings. In a great many cases, business partners mutually request information on their environmental conduct. It would be very beneficial if the state were to provide an advantage to companies that publish data on their environmental conduct, e.g., through lower administrative bureaucracy in public tenders, various controls or official documents for particular facts.

References

[1] HYRŠLOVÁ, J., MÍSAŘOVÁ, P. Aplikace environmentálního účetnictví v České republice. In *Systém účetnictví a reportingu udržitelného rozvoje na mikroekonomické a makroekonomické úrovni.* Univerzita Pardubice, 2006, s. 61 - 67. ISBN 80-7194-866-7.

Ing. Petra Mísařová
MZLU Brno,
Zemědělská 1, 613 00 Brno
email: petra.misarova@email.cz

CLEANER PRODUCTION AND ITS PRACTICAL APPLICATIONS

Klára Najmanová

Abstract

The main objective of this paper is to show practical applications of Cleaner Production principles in various fields such as industry, services, agriculture or health care and educational institutions. Cleaner Production is about making more efficient use of the materials and energy while minimizing the generation of wastes and emissions. Cleaner Production is a preventive strategy and as such it is meant not to solve the problem but to prevent it. To be able to accomplish high eco-efficiency and to minimize negative environmental impacts, the lessons learned from Cleaner Production projects must be known.

1. Introduction

Cleaner Production (CP) is the continuous application of an integrated preventive environmental strategy to processes, products, and services to increase overall efficiency, and reduce risks to humans and the environment (UNEP, 2002).

For production processes, Cleaner Production results from one or a combination of conserving raw materials, water and energy; eliminating toxic and dangerous raw materials; and reducing the quantity and toxicity of all emissions and wastes at the source during the production process. For products, Cleaner Production aims to reduce the environmental health and safety impacts of products over their entire life cycles, from raw materials extraction, through manufacturing and use, to the "ultimate" disposal of the product. For services, Cleaner Production implies incorporating environmental concerns into designing and delivering services (UNEP, 2002).

The main objective of this strategy is to eliminate the causes of environmental pollution from production processes or provision of services. CP can be applied universally to processing, business and/or administrative organisations.

Cleaner Production is a "win-win" strategy as it protects the environment, the consumer and the worker while improving industrial efficiency, profitability, and competitiveness.

Cleaner production is a universally applicable, integral preventive strategy which does not solve environmental problems by transferring them from one environmental component to another. This strategy looks for the sources of pollution and tries to minimize them. This approach is currently the only one that can lead to a continuous decrease in negative environmental impact. CP strategy is in full compliance with the concept of sustainable development (Remtová a Sucharovová, 2003)

2. History of Cleaner Production

The Cleaner Production concept started between 1970‘s and 1980’s. Already in 1992, the United Nations Conference on the Human Environment laid the foundations to a support of preventive measures, in contrast to the then existing corrective measures or end of pipe technologies.

The Programme on Minimalization of Toxic and Dangerous Wastes published in 1984 in the USA created an impulse to set up a prevention of waste production movement. At the same time, the Environmental Liability Act came into force and raised the pollution taxes significantly. Due to these measures, pollution and waste prevention became profitable. The definition of “Sustainable Development” in the report Our Common Future in 1987 presented yet another encouragement to implementing prevention strategies.

The history of Cleaner Production in the Czech Republic started by the first pilot project implemented in Chemopetrol by the World Environmental Centre in cooperation with CEMC (The Czech Environment Management Center). The implementation of CP and expert training was continued by a Czech-Norwegian training course conducted by the Norwegian Society of Certified Engineers (NSCE). The NSCE organized a number of initiatory CP trainings providing the funds and the staff. Graduates of the first training programme founded the Association of Managers for Cleaner Production in 1993 which has been active up to these days (Remtová a Sucharovová, 2003).

3. National Cleaner Production Center

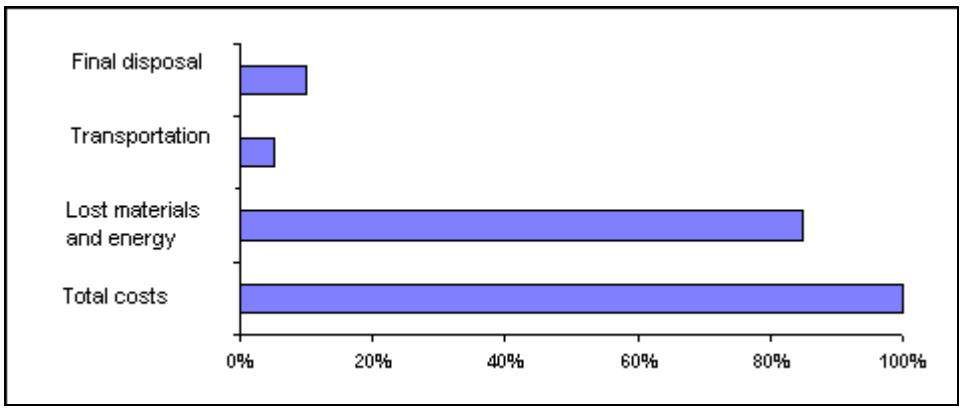
In 2000 the National Cleaner Production Programme (NCPP) was approved in a form of Resolution No. 165. National Cleaner Production Centre (NCPC) is placed within CENIA, Czech Environmental Information Agency and its main objective is the fulfilment of NCPP.
CP Unit at CENIA, Czech Environmental Information Agency operates as the National Cleaner Production Center (NCPC) and the Agency for National Cleaner Production Programme at the same time. At the international level Czech National Cleaner Production Centre is a member of UNIDO (United Nations Industrial Development Organization) and UNEP (United Nations Environmental Programme) network of NCPCs. The main aim of the NCPC is the promotion of CP strategy to the public and private sector in cooperation with several important partners: Cleaner Production Centre Brno, CP Training Centres at partner universities, Association of Managers for Cleaner Production and regional information centres.

In September 2006, a new project Partnership for Sustainable Consumption and Production was started. The project is being carried out by CENIA and was financed by the European Social Fund and the Czech Republic. The main aim of the project is the introduction of more sustainable patterns of consumption and production. The project focuses on education and the practical application of instruments for sustainable consumption and production, such as sustainable/green purchasing, Cleaner Production Assessment, Environmental Management Systems, Environmental Management Accounting, Ecodesign, Monitoring & Targeting etc. Small and medium size enterprises (SMEs), public services, institutions, nongovernmental organisations and universities are the target groups.

4. Importance of the Cleaner Production

Although CP offers significant economic and environmental benefits, it is still a relatively unknown concept. Primarily in SMEs there is a potential for savings. According to CP project outcomes, on average up to 25% of waste generation can be reduced through non-investment measures (Dobeš, 1998).
It is important to understand that costs being spent on waste transportation and final disposal do not include the total costs. Waste is actually being manufactured. According to projects results, the rate of total production expenses and costs of waste treatment, including its production, is 12:1 (Dobeš, 1998). As Figure 1. shows, it is the waste production that is often not considered, but comprises the greatest financial loss.

Figure 1: Total expenses including waste production, transportation and disposal



Source: Dobeš, 1998

5. Practical applications of Cleaner Production

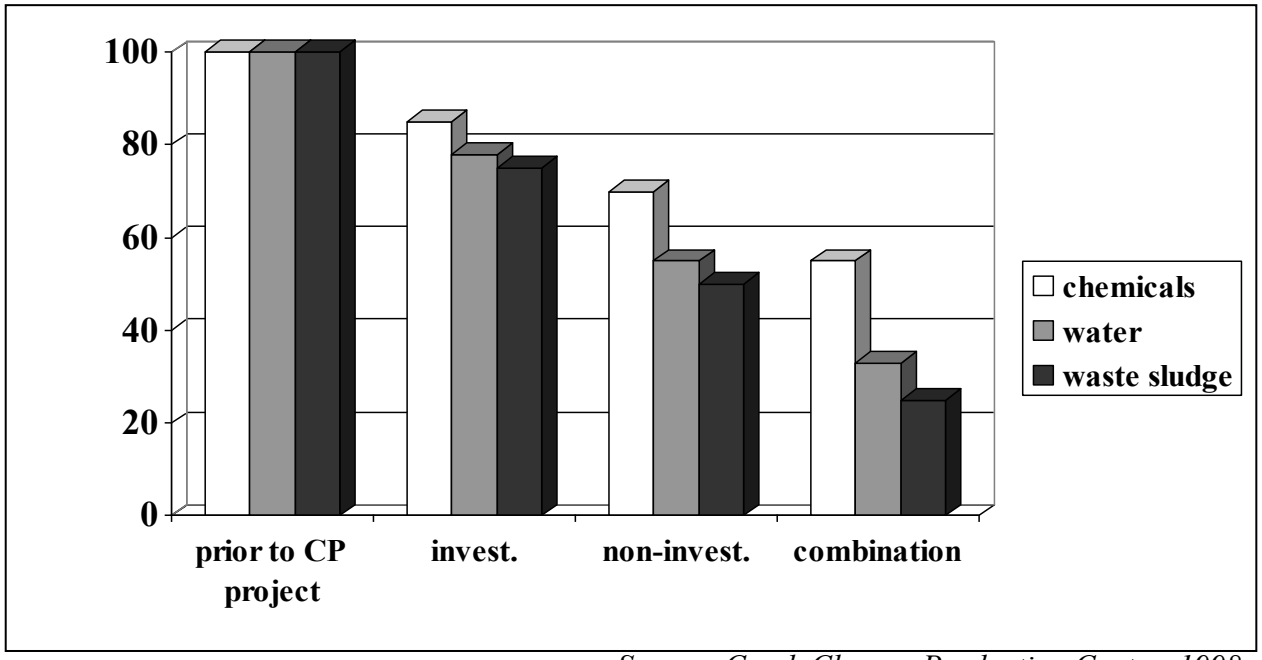
The main application tool of CP is the **Cleaner Production Assessment (CPA)**. This concept involves a process which verifies material and energy flows of a given production system in order to identify the causes of negative environmental impacts. Subsequently, it assesses the possible measures to remove the negative impacts including the financial analysis of the corrective measures.

The CPA is a voluntary instrument for environmental protection. No subject is obligated to use the CPA. If a company does use the CPA to obtain the necessary information for improvements, the final decision as whether to implement the measures stands upon the company's management (Remtová, 2006).

Application of CPA can be very beneficial to a company while it is also implementing Environmental Management System (EMS). This practice ensures the inclusion of preventive measures which are much less expensive than the typical reactive (end-of-pipe) measures. Best available techniques (BAT) are often used in CP projects. At the same time, CP can help companies effectively implement new environmental regulations (Klášterka et al., 2007).

There is a common idea that saving measures are very costly. In reality, substantial savings may be accomplished without large investments. Figure 2. shows material and waste generation savings obtained through investment and non-investment measures (proper maintenance procedures). Combination of these two measures led to a 45% reduction in chemicals consumption, 70% reduction in water consumption and 85% reduction in waste sludge generation.

Figure 2: Case study: Metal Surface Treatment Plant
(Chemicals, water consumption and waste sludge generation in %)



Source: Czech Cleaner Production Center, 1998

For some measures within the CP projects (such as the introduction of BAT, significant energy savings, switch to renewable energy sources etc.), an endowment, e.g. from the Ministry of Industry and Trade through the operation programme Entrepreneurship and Innovation 2007-2013, may be found.
Financing through savings, based on a professional guarantee to achieve the expected effects of the saving measures (EPC-Energy Performance Contracting) presents another option. EPC is nowadays offered by some elite energy service corporations or projects. In this case, the company retroactively reimburses the technical assistance and investment through the savings achieved, on the basis of a positive cash flow. Therefore, the company or organisation does not have to invest any of its finances into the saving measures and the financial risk of a failure is completely borne by the consulting corporation or project.

5.1. Cleaner Production in industry

Traditionally, CP is being implemented in industry (for example engineering industry, wood processing industry, chemical industry, food processing industry, metallurgical industry or paper mills). In all areas, a potential for material and energy savings can be identified. Table 1, presents a balance sheet for a CP project carried out in a stoneware enterprise. The project focused on the reduction of energy consumption.

Table 1: Results from the CP project in stoneware

Reduction in thermic energy consumption: 25 038 GJ/year
Financial savings: 3 433 000 Kč/year
Cost of investments: 12 170 000 Kč
Investment return: 3,6 years

Source: Cleaner Production Center Brno

5.2. Cleaner Production in agriculture

Considerable opportunities for the application of Cleaner Production lie in the field of agricultural production. The farming business nowadays has to face not only new legislative requirements, resulting from the membership of the Czech Republic in the European Union, but also keen competition and public pressures. Cleaner Production may become an instrument to effectively reduce the negative environmental impacts of agricultural production, meet the legislative requirements and at the same time improve the communication with the public and the profile of the whole community. Table 2 shows the financial balance of a project in a feed store company.

Table 2: Results from CP project in farming business

Reduction in waste production (grain crops): 3 412 t/year
Financial savings: 6 141 000 Kč/year
Cost of investments: 5 000 000 Kč
Investment return: 0,8 year

Source: Cleaner Production Center Brno

5.3. Cleaner Production in educational institutions

Cleaner Production can be also successfully applied in schools. Municipality of the Židenice a city district in Brno, in cooperation with Cleaner Production Center Brno, proposed and is currently putting into practice CP project in elementary and middle school. This project has been added into a Good Practice Database administered by the Healthy Cities of the Czech Republic (www.dobrapraxe.cz).

Table 3. Results from CP project in educational institution

Reduction in thermic energy consumption: 255 GJ/year
Reduction in drinking water consumption: 219 m^3/year
Financial savings: 223 000 Kč/year
Cost of investments: 1 011 000 Kč
Investment return: 4,5 year

Source: Cleaner Production Center Brno

5.4. Cleaner Production in public health system

Pilot CP projects in health care institutions have shown that even in this sector significant potential for more efficient use of materials and energy sources exists. Table 4 presents a project balance sheet from a rehabilitation facility.

Table 4. Results from CP project in public health institution

Reduction in thermic energy consumption: 4 264 GJ/year
Reduction in water consumption: 104 000 kWh/year
Reduction in drinking water consumption: 12 916 m^3/year
Financial savings: 1 863 000 Kč /year
Cost of investments: 4 034 000 Kč
Investment return: 2,2 year

Source: Cleaner Production Center Brno

Summary

Cleaner Production as a preventive strategy can be applied in various fields both in private or public sector. Through Cleaner Production Assessment sources of pollution and waste generation can be identified and eliminated. Practical applications of CP do not depend on either size or character of enterprises. This paper presented CP project results from an industrial enterprise, health care institution, educational institution and farming business.

References

1. Dobeš, V., editor (1998) Cleaner Production, Waste and Pollution Prevention: Manual for industrial enterprises (Čistší produkce, prevence odpadu a znečištění: Metodická příručka pro průmyslové podniky) Czech Cleaner Production Centre, Prague, pp. 126.
2. Klášterka, J., Růžička, P., Babička, L., Remtová, K. (2007) EMAS, Environmental management and Audit Scheme: Emas Programme Handbook (EMAS, Systém environmentálního řízení a auditu: Příručka k programu EMAS). Planeta 1/2007, Ministry of Environment, Prague.
3. Remtová, K., Sucharovová, D. (2003) Cleaner Production (Čistší produkce). Ministry of Environment, Prague, pp. 26.
4. Remtová, K. (2006) Voluntary Environmental Activities: Manual for Enterprise (Dobrovolné environmentální aktivity: Orientační příručka pro podniky). Planeta 6/2006, Ministry of Environment, Prague.
5. UNEP (United Nations Environmental Programme) (2002) Changing Production Patterns: Learning from the Experience of National Cleaner Production Centres, pp 35.

Klára Najmanová
CENIA, Czech Environmental Information Agency
National Cleaner Production Center
Kodaňská 10, 100 10 Praha 10
Tel.: +420 267 225 289
Fax: +420 271 742 306
E-mail: klara.najmanova@cenia.cz

ENVIRONMENTAL CHARGES IN THE CZECH REPUBLIC

Petra Nováková

System of environmental protection, having been established in the Czech Republic after 1990, employs a wide range of economic instruments of environmental policy. Some of them were in use already in the period before 1990 (for example, fees and charges for air pollution). However, only after 1990, new conditions of arising market economy established space for meaningful application of economically oriented tools.

The function of environmental pollution charges is also partly performed by some general charges, for example, consumer taxes on fuels.

The fees and charges are paid in conformity with the rules defined by the respective legislation. They are especially paid by industrial firms and companies providing services for the citizens. The factual checks on payments of fees and charges are carried out, in most cases, by Czech Environmental Inspectorate or regional authorities. Most of the fees and charges are levied by revenue authorities and the collected financial resources form income of the State Environmental Fund or municipal budgets. Major part of the collected fees and charges are used to support environmental protection activities.

In 2005, the following fees/charges that are included among economic tools of environmental protection were in effect:

- ⇒ air: air pollution charges (for operators of especially large and large stationary sources, medium stationary sources and small stationary sources);
- ⇒ water: for intaken amount of groundwater, for waste water discharge to surface waters, for permitted waste water discharge to groundwater, and for water intake to cover the watercourses administration and basin agency administration;
- ⇒ waste and packaging: for waste deposition, to support collection, processing, recycling and disposal of selected vehicle wrecks, for operation of a system of municipal wastes gathering, collecting, transporting, sorting, recycling and disposal, for registration and for annual record-keeping on the list of authorized persons in line with the Act on packaging;
- ⇒ rocks: charges for allotment/exploitation area and for extracted minerals from exclusive deposits or for exclusive minerals after their treatment and beneficiation;
- ⇒ land: for setting aside from agricultural land resources and for setting aside pursuant to Act on forests.

In 2005, one amendment only was prepared in this field. Through amendment to Act No. 44/1988 Coll., on protection and utilization of mineral resources (the mining act), annual charges for allotment/exploitation area were modified. For every hectare of allotment/exploitation area, these charges will range between 100 and 1000 CZK in gradation depending on the level of environmental protection of the area concerned (see § 32a Payments). This new system of payments of charges for allotment/exploitation area differentiates the amounts of annual charges in dependence on particular and potential impacts of mining activity and at least partly takes into account ecological loss associated with occupation of land.

In 2005, there also continued, in conformity with the Government programme declaration, the preparation of concept of ecological tax reform. From the 1st January 2008 on, Czech Republic in line with the EC directive has to introduce new consumer taxes on fuels and

electric energy and at present the preparation of two new acts, Act on solid fuels taxation and Act on electric energy taxation is under way. The legislation being prepared will start from the draft of ecological tax reform concept.
In overall evaluation for 2005, the most significant progress was achieved, in particular, in the following fields:

- ⇒ renewable energy sources – act on support for use of renewable energy sources is a modern standard even in comparison with other member states of the EU and its adoption and resulting character has been generally positively evaluated by both business carrying entities and non-governmental organizations;
- ⇒ nature and landscape protection – the adoption of the Government Regulation defining a national list of sites of European importance was a very significant step for consistent protection of sites included in the European System Natura 2000;
- ⇒ access to environmental information – through amendment to so-called active dissemination of information, amendment to act has strengthened the significance of good and complete environmental information as the prerequisite for adequate involvement of the public in decision making by public administration bodies and also for control of public administration activities in a broad sense of word;
- ⇒ electric and electronic devices – amendment to Act on wastes and its implementing legal regulations modified specific obligations for subjects acting in this field with regard to the fact that electric and electronic devices are a special type of waste representing potentially significant source of environmental risk;
- ⇒ wastes land filling and utilization on the ground surface – through the adoption of the regulation, new requirements in this field were defined.

However, in a complex view on environmental legislation it is unquestionable that in comparison with other legal domains environmental legislation is a set of unusually numerous and rather fragmented regulations that do not form consistent entirety and even its individual parts are not mutually sufficiently linked.
For this reason, there has been under way the preparation of integrated Act on the environment (at present, draft of this Act), whose aim is to significantly improve the transparency of legal standards in the field of environmental protection.

Mgr. Petra Nováková
Ministry of the Environment, CR
Vršovická 65,
100 10 Praha 10
Tel.: 267 122 300
Fax: 267 126 300
E-mail: petra_novakova@env.cz

USE OF THE CONCEPT OF ADMINISTRATIVE COSTS FOR ASSESSMENT OF ENVIRONMENTAL CHARGES' EFFICIENCY – CASE OF AIR POLLUTION CHARGES

Jan Pavel, Leoš Vítek

Abstract

With respect to a relatively long time which has passed since the key parameters of the current Czech system of environmental charges were set up, it appears as rational to carry out its assessment. One of the potential approaches, accentuated recently by e.g. OECD, is based on the measurement of administrative costs.

The presented paper focuses on a discussion of the fundamental methodological approach towards assessment of administrative costs in the Czech Republic and on an interpretation of the results. The methodological approach under discussion is illustrated on the example of charges for stationary sources of air pollution. Based on their example, it is demonstrated that the function of environmental protection charges has presently narrowed down to a mere source of income. This, however, is not an optimal situation since from the perspective of administrative costs it would be more appropriate to replace such charges by standard taxes.

Key words: administrative costs, efficiency, environmental protection charges.

Introduction

Efficiency assessment of environmental protection market tools is a rather complex process further complicated by the necessity of using multi-criteria approach. Among these criteria, as advocated e.g. by OECD (1997), is also that of a volume of administrative costs. These are specified as costs burdening public sector in association with the implementation of a given tool. Within their analysis, it is necessary to take into account the fact that these costs represent a subset of transaction costs, i.e. they do not bring any direct benefit. Existence of such costs can thus only be justified by positive impacts of the given tools on behaviour of the targeted subjects.

The presented paper has a character of a case study and indicates a direction which should assessment of economical and administrative tools in the future follow.

Methodology of Administrative Costs' Assessment

In order to measure the volume of administrative costs related to selected charges of environmental protection, a method of so-called "re-calculated staff member" has been chosen. This method has already been successfully used for quantification of administrative demandingness associated with individual taxes of the Czech tax system (see Pudil et al. 2004). The main advantage of this method rests in its simplicity and subsequent opportunity to compare the results with the data already measured for other taxes/charges.

The key element of the "re-calculated staff member" method is splitting employees of the examined institution according to the relation of their work to the agenda of charges. This way, employees are divided into three groups: (i) those related with individual charges, (ii) unrelated, and (iii) impossible to exactly determine. The third case relates to so-called overhead employees who cannot be assigned directly to any agenda, e.g. cleaning staff, IT administrators, etc.

Based on the above-mentioned method, it is subsequently possible to calculate the coefficient that quantifies how many percents of the activity of the given organisation represents the

agenda associated with environmental protection charges. By this coefficient is subsequently multiplied the value of annual expenditures of the given organisation and thus the absolute value of administrative costs is determined. After the absolute administrative costs are divided by the volume of revenue generated by the charges, relative value of administrative costs may be arrived at.

Certain weakness of the presented method rests in the fact that organisations of the public sector in the Czech Republic do not use modern methods of budgeting and registration of costs (e.g. cost centres), but rather account merely on incurred expenditures. This represents serious impacts not only on a recoding the mentioned overhead activities, but mainly with respect to the calculation of capital expenditures. In order to exactly quantify administrative costs, only depreciation should enter the expenditure side within a given year. However, with respect to the fact that in case of public sector organisations, individual investments are, by law, not depreciated and in most cases the exact structure of individual investments is indeterminable (because of the long period of depreciation of immovable property, for a more detailed estimates it would be necessary to know the structure of investments many decades back), a simplification has been considered based on an assumption that the size of investment expenditures in individual years remains relatively constant.

Air Pollution Charges

In the sphere of air protection, the key legislative norm is the Act No. 86/2002 Coll., on air protection, which divides sources of pollution into stationary and mobile. From the perspective of our area of interest, stationary sources off air pollution are the relevant one, defined as facilities of combustion or other technological process that pollute or could pollute air. With respect to the system of charges, relevant is also classification according to their size or a nominal thermal output, respectively, into:

- small (nominal thermal output smaller than 0.2 MW),
- medium-sized (nominal thermal output from 0.2 MW to 5 MW inclusive),
- large (nominal thermal output from 5 MW to 50 MW inclusive),
- extra-large (nominal thermal output above 50 MW).

The following part of the paper presents results of administrative costs' quantification for charges assigned to extra-large and medium-sized air polluting sources.

Administration of charges from extra-large sources of air pollution is combined with the administration of charges from large polluting sources and it is carried out on two levels. The agenda associated with determination of charges is carried out by regional offices while the collection of the charges is entrusted to the relevant local financial bodies (ÚFO). For the sake of accuracy it is necessary to point out that starting from 1 January 2007, the agenda has been delegated onto customs offices within the scope of the Act No. 230/2006 Coll. that amends the Act No. 89/1995 Coll., on a state statistical service, in wording of later amendments, and other related acts. A different system can be found in the case of charges from medium-sized polluting sources, where the agenda of regional offices is taken over by municipalities with enlarged scope of agency.

Because of the limited scope of the paper, we will not get into more detailed description of the methodological procedure at this point. More detail on this issue may be obtained from the publication Jílková et al. (2006).

Results of the Measurement

The following two tables summarise the results of measurement of administrative costs for both above mentioned types of air protection charges. In the Table 1 are information on charges from large and extra-large polluting sources. As follows from the presented data, the volume of relative administrative costs of the charges in question has in 2003–2005 increased from 2.46% in 2003 to 2.79% in 2005. The increase of the relative administrative costs is caused partly by the increase of absolute administrative costs and in part by the decrease of revenue from the charges.

The Table 2 summarises results from the measurement of charges from medium-sized polluting sources. As indicated by the presented data, the very existence of these charges seems to be from the perspective of administrative costs absolutely inefficient. Based on the carried calculations, the incurred costs at the level of municipalities with enlarged scope of agency and ÚFOs are on average by 30% higher than the volume of collected revenue. Most of the system's expenditures (approx. 90%) are incurred at the level of the entrusted municipalities. For illustration purposes, sensitivity analysis of relative administrative costs has also been carried out. The calculation of the volume of relative administrative costs has been carried out under assumption of a 20% increase (upper limit) and decrease (lower limit) of absolute administrative costs. As follows from the last two rows of the presented table, even such a large potential measurement error does not qualitatively change anything on the formulated conclusion on the absolute inefficiency related to the current setup of charges for medium-sized air pollution sources.

Table 1: Total administrative costs of charges from large and extra-large sources of air pollution in 2003–2005

	2003	2004	2005
Revenue (CZK '000)	441 284	374 481	410 745
Administrative costs expended by ÚFO (CZK '000)	4 826	4 967	4 663
Administrative costs expended by regional offices (CZK '000)	6 032	6 378	6 804
Total (CZK '000)	10 858	11 345	11 467
Relative administrative costs (%)	2.46	3.03	2.79

Source: Statistical environmental yearbooks from 2003–2005, own calculations

Table 2: Total administrative costs of charges from medium-sized sources of air pollution in 2003–2005

	2003	2004	2005
Revenue (CZK '000)	31 588	25 275	25 707
Administrative costs expended by ÚFO (CZK '000)	4 826	4 967	4 663
Administrative costs expended by municipalities (CZK '000)	29 156	30 826	32 886
Total (CZK '000)	33 982	35 793	37 549
Relative administrative costs (%)	108	142	146

Source: Statistical environmental yearbooks from 2003–2005, own calculations

Comparison with Other Tax Tools

Concrete assessment of the efficiency of collected revenue from charges for environmental protection with respect to administrative demandingness is possible to carry out only vis-à-vis the situation in other charging and taxing tools. The following table summarizes the values of relative administrative costs associated with individual taxes and mandatory insurance premia in the Czech Republic in 2004. The calculations were based on the same methodology as in case of the analysis described above. This way, concrete comparison is possible.

Table 3: The share of administrative costs associated with collection of taxes and selected charges in CR relative to the tax revenue in 2004

Tax	Organisation responsible for the collection	Administrative cost/revenue ratio (%)
Private Income Tax	FÚ	1.17
Corporate Income Tax	FÚ	0.66
Value Added Tax (DPH)	FÚ+CS	1.65
Consumption Taxes (Excises)	FÚ+CS	0.97
Road Tax	FÚ	7.28
Real Estate Tax	FÚ	17.83
Inheritance Tax	FÚ	147.67
Donation Tax	FÚ	30.43
Real Estate Transfer Tax	FÚ	5.41
Customs	CS	1.00
Health Insurance	ZP	2.18
Social Security Insurance	SSZ	0.41
Total relative administrative costs		1.30
Charges from large and extra-large sources of air pollution	KÚ+FÚ	3.0
Charges from medium-sized sources of air pollution	ORPP+FÚ	142.0

Explanation: FÚ – Financial Offices, CS – Customs, ZP – Health Insurances, SSZ – Czech Administration of Social Security, KÚ – Regional Offices, ORPP – municipalities with enlarged scope of agency

Source: own calculations

From the table above it becomes clear that the efficiency of the Czech tax system is from the perspective of administrative demandingness relatively good and stays at around 1.3% of the tax revenues. Majority of the existing taxes are efficient; the only exception represents the inheritance tax where the figure of relative administrative costs exceeds 100%.
The values measured for the selected charges of environmental protection indicate that the average costliness of their administration compared to other taxing tools is higher. In case of the charges for medium-sized sources of air pollution, the inefficiency is absolutely clear as the value of administrative costs exceeds the revenue collected from these charges.

Conclusion

The results of the presented analysis of administrative demandingness of the agenda of environmental protection charges unambiguously point towards the necessity of performing an assessment of the existing system and proposing its modernisation. The existing level of charges, based on the price level of the early 1990s, is utterly inadequate and does not have any effect on the behaviour of economic subjects. The charges has thus transformed merely into a source of revenue of public budgets. However, as it is clear from the measured values, into a very expensive one.

References

1. Jílková, J. (2004): Daně, dotace a obchodovatelná povolení – nástroje ochrany ovzduší a klimatu, Praha.
2. Jílková, J. a kol. (2006): Analýza efektivnosti zpoplatňování zdrojů znečišťování ovzduší z hlediska nákladů provozovatelů a státu na výběr poplatků a jejich výnosnost a návrh na úpravu v této oblasti, studie MŽP, Praha
3. Jílková, J. - Pavel, J. - Vítek, L. - Slavík, J. (2006): Poplatky k ochraně životního prostředí a jejich efektivnost. 1. vyd. Praha : Eurolex Bohemia
4. Musgrave, R. A. – Musgraveová, P. B. (1994): Veřejné finance v teorii a praxi. Management Press, Praha.
5. OECD (1994): Economic Instruments in Environmental Policy: Lessons from OECD Experience and their relevance to Developing Economies, Paris.
6. OECD (1997): Evaluating the Efficiency and Effectiveness of Economic Instruments in Environmental Policy, Paris.
7. Pavel, J. – Vítek, L. (2005): Efektivnost poplatkových nástrojů na ochranu životního prostředí z hlediska administrativních nákladů. Praha 25.09.2005 – 27.05.2005. In: Environmentální účetnictví. Indikátory udržitelného rozvoje. Ústí nad Labem : Universita Jana Evangelisty Purkyně
8. Pudil, P. – Vybíhal, V. – Vítek, L. – Pavel, J. – kol. (2004): Zdanění a efektivnost, Praha.
9. Sandford, C., M.Godwin, P. Hardwick (1989): Administrative and Compliance Costs of Taxation. Bath: Fiscal Publications.

Ing. Jan Pavel, Ph.D., Ing. Leoš Vítek, Ph.D.

University of Economics, Prague,
Faculty of Finance and Accounting, Department of Public Finance,
W. Churchill sq. 4, 130 67 Praha 3, pavelj@vse.cz; vitek@vse.cz

SUSTAINABLE PRODUCTION AND CONSUMPTION-TERMINOLOGY

Květoslava Remtová

The Government of the Czech Republic approved by government decree No. 1242 from the 8. December 2007 a document „Strategy of sustainable development of the Czech Republic“ that was submitted by the government board for sustainable development. The document was also submitted to the Parliament of the Czech Republic for information and it became the starting point for elaborating the initial documents and strategy decisions in the framework of the state, regional and public administrations for their cooperation with interested parties. The document „Strategy of sustainable development of the Czech Republic“ is also intended as a longterm framework for policy decisions in the context of international agreements.
The implementation of the strategy of sustainable development in practice calls out not only for a need to understand a philosophy of sustainable development but also for a good orientation in the constant creating of new professional terms and special expressions that are used in the field of sustainable development. As regards the environmental pillar which is one of three basic pillars of sustainable development there is a significant increase of terms in the fields of sustainable production and consumption.

The implementation of sustainable production and consumption in practice is not possible without good cooperation between many parties and stakeholders. The effectiveness of this good cooperation depends very much on the use of universal terminology and a universally accepted understanding of the professional terms. Unfortunately the present situation is not good in this respect. There are two main causes. The first one is the difficulty of translation. Sometimes the translators take for the same English word different Czech equivalents. The second one is the relatively rapid development in this field. Over time the various expressions or definitions became more accurate and little by little changed their meaning, range and position. Of course experts can understand from their overall knowledge, but it takes some time and also it is not a pleasant task. People who are not environmental experts, but are obliged to work in some associated tasks and need to understand environmental terms, are confused and disappointed. They do not have the time and the opportunity to follow this „word changing process“.

In the framework of a completed project „Research and support of sustainable production and consumption (number 1C/4/25/04), which was undertaken for the Czech Ministry of the Environment I was given the task of reducing this problem, by creating a vocabulary of main concepts which are used in sustainable development, sustainable production and sustainable consumption with the focus on environmental policy, relevant strategies and instruments.

To make the dictionary as useful as possible, it was necessary to find a structure which would be useful also in those cases in which the user does not know the correct official Czech term and knows only some equivalent Czech term or English one. It entailed making a dictionary that would contain not only correct official terms, but also the unofficial Czech terms used as equivalents. Also this dictionary must be able to serve as a simple vocabulary.

The proposed dictionary has quite a common basic structure. The Czech terms (abbreviations are also included) are placed in alphabetical order. When the term consists in two forms (that is the adjectival and substantive forms) then the place of term is determined by the adjectival

form. The only exception is a group of environmental policy tools. In this group the place of term is determined by the substantive form, so all tools are on one place.

The English equivalent is placed under the Czech one. An interpretation of the term begins with the official definition. If the official definition does not yet exist, the term is given a definition which explains the term in the best way or if it is necessary, more definitions are given. The interpretation of terms depends upon their importance. In every case there are given important practical information and reference to relevant literature. Also other equivalents and relevant terms are mentioned and the references are given.

The vocabulary has two lists or rather two indexes. The first one contains all Czech terms with their English equivalents in alphabetical order of Czech terms. The other one contains all English terms with their Czech equivalents in alphabetical order of English words. These two lists make it possible to use this vocabulary as a dictionary.

At the present time the vocabulary has more than 200 terms and is published on the internet: www.slovnik-usf.info for the use and for the checking too. All your comments on this vocabulary, critical comments or some other remarks on the literature, proposals for new terms and more importantly any omitted terminology specially from environmental accounting and reporting (this part of the vocabulary is still incomplete and needs revision) send please on e-mail: Remtova@vse.cz. Terms from sustainable accounting send also to: Jaroslava.Hyrslova@UPCE.cz and Alena_Krejcova@env.cz.

Květoslava Remtová,
University of Economics, Prague

ENVIRONMENTALLY ADJUSTED GDP: THEORETICAL AND METHODOLOGICAL APPROACHES

Iva Ritschelova, Egor Sidorov

Introduction

Gross Domestic Product (GDP) has been one of the general aggregate indicators used for decision-making on a macroeconomic level for a long time. Within the last decades the appropriateness of this indicator for policy-making was argued in number of discussions. The general conclusion from these debates is that GDP is a good measure for economic activity, but it isn't fully coherent with the concept of sustainable development. Economic activity and economic growth shouldn't be the only focuses of policy; therefore additional tools for decision development should be available. One of the alternatives is an Environmentally Adjusted GDP (eaGDP) indicator. In the first part of the paper, the brief history of national accounting is provided. The second part is devoted to the criticism of the conventional GDP indicator. The third part of the paper deals with the environmental extensions of the SNA. Finally, the conception, possible uses and weaknesses of eaGDP are discussed.

1 History of National Accounting

The contemporary System of National Accounts (SNA) in its final version of 1993 is "a conceptual framework that sets the international statistical standard for the measurement of the market economy" [1], supported by such world-significant organizations as UN, the Commission of the European Communities, the International Monetary Fund, the Organization for Economic Co-operation and Development, and the World Bank.

As SNA is before all an information system, its concept, methodology and aims are closely connected with the reason for which it was developed. SNA is based on the number of theoretical assumptions and defined system boundaries, which limit its "usability". In other words, SNA can not always satisfy increasing information needs. Its main aim is to provide the data on economic activity in different countries. Since the system of national accounting is one of the most developed and widespreaded information systems, one encounters a lot of examples of overestimation of its abilities, misunderstanding and inappropriate use. One of the common examples is substituting such terms as "GDP" (a classic SNA-based indicator) and "welfare level" (which definitely has a wider meaning).

The history of national accounting development goes back for several centuries. The first attempts at estimating national accounts refer to William Petty (England, 1623-1687) and Pierre Le Pesant, sieur de Boisguilbert (France, 1646-1714) who lived in the second half of the XVII century. The aim of those estimates was to "assess the financial health of the state and to estimate the feasibility of possible tax increases needed to finance the war" [2]. In the XVIII century Francois Quesnay (France, 1694-1774) wrote his "Tableau Economique" where he attempted to depict transactions between the main groups of economic players of the time (namely farmers, landlords and artisans).

In 1936 the world-reknown work by Wassily Leontief (1905-1999) came into being. There he introduced the input-output analysis while working on the problem of general equilibrium. The work of John Maynard Keynes (UK, 1883-1946) significantly influenced the development of macroeconomic theory in general and national accounting in particular [3]. His ideas and analyses of WWII financing issues, developed and extended in the works of subsequent authors, were incorporated into the later developed system of national accounts.

The Keynessian principles, which are regarded to have helped "to win the war" [4], worked through money flows in the economy, giving the government the regulatory role in managing economic growth and leveling business cycles. The market price was used as a universal denominator. Furthermore the success of the Keynessian principles of macroeconomic management became very popular, and any critics were eliminated by the success they reached. "In this atmosphere the GNP … rapidly became an end of policy in itself." [4]

The second half of the XX century is the period of intensive SNA development. One can decompose the process into three steps. *The first generation of SNA* accounts was introduced in 1953 in the countries of Organization for European Economic Cooperation (OECC, the forerunner of the OECD). This system is characterized in the literature as "simple in structure" [2]. The main reason for it was obviously the limited amount of data that the participating countries could accumulate.

The second generation of SNA was presented in 1968 under auspices of the United Nations Organization. The introduced accounting system was a logical development of its precursor and had a wider international framework.

The latest version of SNA was published in 1993. It was supported by the number of significant international organizations, such as the United Nations, the Commission of the European Communities, the International Monetary Fund, the Organization for Economic Co-operation and Development, and the World Bank. Due to this fact, the SNA-1993 can be considered to be the first "universal" accounting standard.

SNA in its last version introduced a number of elements aimed to support environmental accounting development, among other aims. The significant number of changes was made due to the workshops held in 1980's sponsored by the United Nations Environment Program (UNEP) and the World Bank [5]. Their general purpose was to find ways of adjusting SNA in order that it would reflect environmental issues in a better manner. First, the balance sheets, in addition to produced and financial assets, contains information on range of natural assets. However, environmental assets without clearly defined ownership and not observable through market values are out of SNA conventional boundaries and therefore aren't registered. Second, the satellite accounts concept introduced enables environmental accounting development "without overburdening the system with different (often conflicting) concepts" [2]. Although much progress has been made since then [6], the environmental accounting framework is still under development and the relations between the economy and the environment are still shown in terms of satellite accounts.

In addition SNA-1993 explicitly states that GDP is not, or at least only partialy a welfare indicator [7]. According to the United Nations Statistics Division statement, all the "recent aspects of globalization and the appearances of new economic phenomena … [lead] to new topics that warrant a comprehensive rather than an incremental update of 1993 SNA" [1]. It makes the whole system more suitable for satisfying the growing information needs of both decision-makers and society. SNA can not be, and probably should not be, flexible enough to follow all the newly borne requirements and theories. On the other hand, the satellite accounts' concept enables the processes of innovation.

In 1987 the publication that "has set the environmental agenda" [8] for several decades, "Our Common Future", was issued. It served as a background for such significant events as Earth Summit, which proclaimed the intensions of moving towards "sustainability". In 1992 the UN Conference on Sustainable Development introduced the Agenda 21 agreement package aimed at covering the numerous aspects of human activities that impact the natural environment. Finally, "the unfavorable environmental consequences of continuing economical expansion have brought about awareness that economic growth must be bounded by additional policy constraints" [2].

The approaches to "greening" of SNA in order to incorporate environmental concerns finally were aggregated in 1993 in *the first version of SEEA* (System of Integrated Environmental and Economic Accounting). It recognized the variety of approaches to environmental accounting and called itself a "work in progress" focused on the further discussion of development rather than an action guide. SEEA was a result of aggregation of experiences in the field of environmental accounting collected from variety of countries in the world.

The second version of SEEA was published in 2003. Through the fact that a lot progress has been made since 1993, SEEA 2003 also has only a "complementary" character: a lot of issues connected with environmental evaluation and definition of the patterns of environmental processes still exist. SEEA is still a satellite system of SNA that comprises four categories of accounts: physical accounts, environmental expenditures accounts, accounts for environmental assets measured in physical and monetary terms, and accounts which consider how the existing SNA might be adjusted to account for depletion, defensive expenditures and degradation.

2 Functions of Conventional GDP Indicator

The three functions of the System of National Accounts (SNA) are [7]:

1. to help economists to measure the level of economic development and the rate of economic growth, the change in consumption, savings, investment, debts and wealth (or net worth) for not only the total economy, but also for each of its institutional sectors (such as government, public and private corporations, households and non-profit institutions serving households), as well as individual branches;
2. to enable the forecasting of the future growth of the economy or studying impacts on the economy and its sectors of alternative government policies and tools; and
3. to promote the integration of economic and related statistics in order to allow national and international comparative analysis.

GDP is one of the main indicators that can be derived directly from the national accounts data. GDP is a general measure of the performance of the economy in terms of economic activity. GDP has number of important functions, which, of course, are closely connected with the functions of the whole system of national accounting.

It is a tool that indicates the need for *new policy initiatives* on the one hand. On the other, it enables the analysis of the initiatives *which have been already carried out*. According to US Congressional Budget Office [9] GDP a) is an aggregate indicator reflecting the result of changes in the nation's assets and national wealth, b) is a measure of national income mostly based on the market value of goods and services, and c) is a resulting indicator, which incorporates the influence of financial and factor input flows in the framework of the economy.

GDP is exclusively focused on economic activity. The growth of economic activity, no matter by what manner it has been stimulated (e.g., by employment growth, technological progress, or in consequence of natural disaster) positively affects the GDP. Its properties are closely connected with the concept at the basis of conventional national accounting.

3 Environmental Criticism of GDP

The discussion about the tools for managing national welfare and sustainability in the second half of the XX century evoke a lot of criticism of how SNA treats the rest of the non-marketed world, and how GDP reflects the specifics of economic-social-environmental relationships. Too much attention was paid to economic growth provision. A number of criticisms state that the way the current macroeconomic management approaches the environment and the way

policy success is measured seriously threaten the future. Too many factors are out of the decision-makers' eyesight.

GDP criticism comes out of the fact that this aggregate indicator is often used as measure of well-being due to the absence of the other widely accepted alternative. Under these circumstances we should state that GDP as an indicator of *economic activity* fulfills its duties according to the aims it was developed for. In general GDP reflects only those human activities which can be descripted as *market transactions.* "It doesn't distinguish between the costs and benefits, between productive and destructive activities. […] It treats everything that happens in the economy as a gain for nation, while ignoring everything that happens outside the realm of monetized exchange, regardless of importance to well-being." [4]

Generally speaking the talk is about an indicator that could have a much more "sustainable character" than GDP. We should also mention that the significance of GDP should under no circumstances be underestimated: it is a necessary tool for economic activity management. On the other hand economic activity is only one of several factors influencing sustainable development. One of the directions to sustainable development is incorporating environmental concerns into decision-making.

There is no general consensus on how the new environmentally adjusted aggregate economic measure should be calculated. Different literature sources propose different approaches. One is discussed in SEEA 2003 [6]. In order to give a more comprehensive picture of existing viewpoints we need to introduce a short overview of concepts discussed in different research works. Some of these concepts were incorporated within the SEEA 2003 framework.

Adjusting conventional GDP by a measure of *environmental services*. This approach is described in e.g. Peskin [10], CBO [9]. GDP should be increased (augmented) by the measure of environmental services, which is not accounted for in the classical national accounts, since they have been historically treated as free gifts from nature. These services are chiefly viewed as waste disposal services, which are provided free of cost by the environment. The same approach is given e.g. in CBO [9]. On the other hand, this approach is arguable, since these services are being used by polluters without paying for them and therefore their value is simply hidden in the profits of these economic agents, i.e. GDP already contains them (e.g. [9]).

Adjusting conventional GDP by a measure of *environmental damages*. According to different researchers' opinions environmental damages can be either added or subtracted according to different viewpoints. On the one hand, negative externalities associated with the fact that producers use services of the environment should be deducted from GDP [11]. On the other hand, there is an opposite view on the matter: "since gross product includes the consumption of assets by definition, conventional GDP is understated because it does not measure the consumption of environmental assets" [11], in other words the value of environmental damage can be added to the GDP.

Adjusting conventional GDP by a measure of *defensive expenditures.* Defensive expenditures within the sphere of environmental accounting are generally connected with the environmental protection expenditures that are being made by economic entities. According to the accounting practice these expenditures are accounted as production cost if incurred as intermediate consumption by business, or as final consumption when made by households or by the government. One can arrive at the viewpoint that environmental protection expenditures are only defensive expenditures aimed at preserving the existing status quo, and therefore do not contribute to welfare increase in any way. Number of literature sources (e.g. [11], [12]) express the idea, that such expenditures could be rather deducted from GDP, since they do not contribute to welfare. On the other hand SEEA [6] argues against such practice,

since defensive expenditures are part of economic transactions, and their exclusion will cause misbalance within the system of national accounting.

Adjusting conventional GDP by a measure of *resource discoveries.* According to the existing point of view [9,11], when measuring net domestic product, the value of natural resource discoveries should be added to the net product in the period they were made "in order to maintain consistency between product and wealth accounts, augmented to include natural resources" [11].

Adjusting conventional GDP by a measure of *natural resource depletion.* Natural resource depletion within the framework of environmentally extended national accounting boundaries is supposed to have the same character as the depletion of the reproducible capital. That is why in order to calculate the net national product the measure of depletion of natural resources should be subtracted.

4 Why eaGDP?

The growing concern about environmental problems in general is connected with the fact, that the extent of human (before all economic) activities has lately become a real threat to the environment. "In the period, when world's population and the scale of economic activities were relatively small, environmental inputs were often regarded as "free" goods and the environment was treated as a "sink" for disposal of waste." [8]

There are several functions of environment. In general they are: providing *life support systems*, providing the *natural resources* for human economic and other activities, the *waste receptacle function*, and *non-marketed services provision* (e.g. recreation). The use of these "environmental services" is increasing year by year along with economic activity and population growth. Under these circumstances it is no longer possible to regard the natural environment as a free unlimited base, which enables economic activities and economic growth. The practice of treating things which aren't really "free" as "free" "gives the wrong signals for the directions of economic growth" [13].

According to the environmentalists' view, human kind is approaching the limits of environmental capacities. The economic decisions, which reflect almost every aspect of the life of society, above all force the depletion and degradation processes in the environment. It is well known that Adam Smith's "invisible hand" fails in the questions of the relation between the market and the environment. This is the sphere where the public interest and interest of the future generations should be protected by governmental interventions and by the building of new patterns of environmental friendly behavior. Under these circumstances the market definitely needs a new system of adjusted economic signals, i.e., a system of prices which incorporates environmental elements.

This is the reason why the economic activities and growth-aimed actions should be limited by environmental concern incorporation. The decision makers on all levels should not ignore the environmental factor in the name of purely economic development. That is why there's an urgent need to revise the approach to environment and to extent the traditional approaches to it by viewing the resource it provides as assets similar to traditional assets of capital, labour and land. From a more general perspective, this issue is closely connected to the issue of welfare management. Since there is no universally accepted agreement about which components define welfare, there is no universal agreement about how it should be done. Environmental economics has developed an approach based on integrating the economic and environmental elements. Any management system needs an information base for planning, monitoring, coordinating and assessment functions. So in order to treat the environment right and to provide the balance between the economic and environmental aims the respective information framework should be created. One of the approaches is to extend the existing SNA framework by incorporating the environmental concerns into it. SNA is

traditionally an economic informational framework. But due to its almost "global" character and relatively long tradition of use (which means that the methods and procedures are somehow developed, and significant amounts of historical data are available) this can be a sensible decision. As it was already mentioned the concept was firstly described in SEEA in 1993, and in 2003 the revised version of SEEA was issued.

The concept proposed in SEEA deals with extending SNA's framework by introducing the satellite accounts, which can depict the environmental concerns, without changing the SNA system itself. One of the basic features of SEEA is to provide a framework for elaboration and measurement of environmentally adjusted product and income, which will account for costs of environmental depletion and changes in environmental quality.

5 Extending SNA Boundaries

GDP measures the "additional value of goods and services that are newly created in the economy and are available for domestic final uses or for exports" [7]. In other words GDP is equal to the value of all goods and services produced within the economy (i.e., output) less the value of all goods and services used in the production processes (i.e., intermediate consumption). The part of the product that is sold to the end users is called *final* goods (or services). All the elements are valued at market or equivalent market prices [7].

The general relationships [7]:

Output + Taxes less subsidies on products + Imports = Intermediate consumption + Gross capital formation + Final consumption + Exports

Production approach to GDP calculation:

Gross value added = Output – Intermediate consumption

Then:

Gross value added + Taxes less subsidies on products = Gross capital formation + Final consumption + Exports – Imports

By definition [7]:

GDP = Gross value added + Taxes less subsidies on products

Final expenditure approach to GDP calculation:

GDP = Gross capital formation + Final consumption + Exports – Imports

The economic activity within the framework of a national economy is represented on the one side by the flow of products and services (i.e. expenditures on output), and on the other — the flow of income (i.e., payments for production factors). Therefore, the general economic activity indicator, i.e., GDP, can be measured either as the sum of expenditures on the output, or as the sum of income generated during the production relations. Produced goods and services are the general focus of the System of National Accounting. Each step within the technological chain of producing a certain good (or service) creates an *added value*. The total value added is equal to total factor income in the economy for the period. It is used for calculation of GDP, in order to avoid double counting: at each stage of good manufacture the value added at this stage is included into GDP.

Production boundaries, determined in SNA specify what can classified as *economic activities* in the SNA framework. According to [7] SNA boundaries include the following activities: a) the production of all individual or collective goods and services that are supplied

or intended to be supplied to production units other than themselves; b) the own-account production of all goods that are retained by their producers for their own final consumption or gross capital formation; c) the own-account production of housing services by owner-occupiers and personal services produced by the employment of paid domestic staff; and d) the production of all agricultural goods for sale or own final use and their subsequent storage; the gathering of uncultivated crops; forestry; wood-cutting; the collection of firewood; hunting and fishing; carrying of water; the processing (threshing, milling, preserving etc.) of agricultural and other food products; the weaving of cloth, dress-making and tailoring, the production of footwear, pottery, utensils, furnishings etc. Additionally illegal and hidden (i.e., due to tax avoiding schemes, non-compliant with existing standards) goods and services are included. Due to the contemporary circumstances the several amendments were introduced. The production boundary also includes natural growth of cultivated forests; creative works' development and leasing of the rights to use them; finally, own account developed software, which can be used for more than one year.

The economic activity is possible only due to the presence of assets, which belong to the nation. "An asset is any material or process that has the potential to generate a continuing flow of income." [9] The quantity of the particular asset available at the certain time is defined as a *stock* of the asset. The general property of the stock is the ability to generate the *flow* of services during the chosen accounting period. This is the general differences between stock and flow measures within the national accounting system. The capital assets in the national accounts are represented by the following elements: a) dwellings; b) other buildings and structures (non-residential buildings; other structures); c) machinery and equipment (transport equipment; other machinery and equipment); d) cultivated assets (livestock for breeding, diary, draught, etc.; vineyards, orchards, and other plantations of trees yielding repeat products); e) mineral exploration; f) computer software; g) entertainment, literary or artistic originals; and h) other intangible fixed assets.

The capital stock generates the flow of both *factor* and *final* services [9]. The general peculiarity of the conventional national accounting system is that it recognizes only the factor services of the reproducible capital and marketed renewable and non-renewable natural resources. Most of the *natural capital* remain out of SNA bounds due to the fact that their services are non-marketed even through the fact that they contribute to the quality of life.

It has been acknowledged that nature is closely related to economic reality. If this linkage is not considered, the decisions based on information from SNA can be misleading. What the decision makers really need is an information system for development of the policies which are more consistent with the sustainable development concept. The environment in the conventional national accounts is reflected in two ways: first, "commercial natural resources" [11], which are participating in market transactions and therefore can be expressed in market prices, and, second, environmental resources, which are currently outside the market. Incorporation of environmental capital and its services within the SNA framework can be a step towards sustainability measurement. In this connection the conventional system framework, i.e. SNA boundaries, should be extended in order to enable incorporation of the new data. Generally in the literature (i.e. [9, 6]) three types of revisions are being addressed. They are a) expanding the asset boundary, b) expanding production boundary, and c) revising the production boundary.

First, accounts should reflect natural resource depletion and environmental degradation. More comprehensive information about the investment and depreciation connected with a wider definition of disposable national capital (i.e. natural capital in addition to reproducible one) should give decision makers a clearer picture of how the productive assets are being maintained. In the meantime GDP ignores most changes taking place on the side of environmental capital. The general limitation is connected with the reality that SNA contains

information on reproducible capital only, leaving most of natural capital out-of-bounds. In this respect the accounts are less informative, and, therefore, possibly preventing decision-makers from necessary policy initiatives development. The production of goods and services causes wear and tear on the capital stock. In order to exclude capital consumption the NDP indicator is used more often, since it is the measure of GDP less the depreciation of the existing capital stock. NDP can be interpreted as the part of income that remains after putting aside the necessary resources to maintain the capital stock. After redefining the system boundaries, NDP would be modified for both the use of reproducible capital, and the depletion and degradation of environmental assets. The accounts with the extended asset boundaries in this manner will give a more comprehensive economic interpretation of changes in national assets.

Second, environmental services (i.e. recreation capacities, biodiversity), which definitely affect the quality of life of society, should also be incorporated into national accounts' framework [9]. Including these services in national income will increase the current GDP, and, hence, accent the contribution of natural resources and the environment to the GDP. The absence of such practice ignores the contribution of the natural environment to quality of life. The production boundary which is discussed here is very important, since it "determines also the consumption boundary for household activities" [14]. However, introducing the changes into this specific boundary of national accounting can possibly break the fundamental principles on which the whole system is based: market transactions. "Reference is made to the use of labour and capital inputs in transforming goods and services into outputs [designed for market transactions] … Excluded from this definition are domestic services for own consumption by households, and natural processes which are not under the managerial control of institutional units." [14]

If one introduces the changes into the production boundary, the fundamental identity between the value of generated factor income, added value, and income used for consumption of goods and services, and purchases of capital goods is destroyed. This can disturb the conventional theories about the relations between a number of economic aggregates, e.g. income, employment, inflation, etc. "The pragmatic approach to SEEA implementation as reflected in its operational manual … is therefore to extend asset boundary only." [14] The production and consumption accounts boundaries are left without changes, while the asset boundary is extended by natural assets and their changes affecting both production and asset accounts.

Third, the so-called environmental expenditures, which are already being incorporated within SNA, should be explicitly differentiated from the other forms of investment or consumption. Some researchers even assume (e.g. [9]), that these expenditures should be subtracted from the GDP measure. Instead of subtracting, the components of environmental expenditures could be reorganized within the accounts in order to identify how much is spent for reduction of risks, e.g. caused by pollution.

Finally, the "pragmatic approach" to national accounting boundaries extension introduced in SEEA [6] can be expressed as follows [14]: a) the assets transferred between the environment and the economy are being accounted as "other changes" in the Asset accounts, so the production and income accounts are not affected in any way; b) the values of depletion and degradation are introduced within the production and income accounts as "Natural capital consumption"; and c) finally, stocks of environmental assets can be accounted for in both physical and monetary measures, while monetary measures are used for valuation of "losses of the environmental functions of waste absorption and other environmental services" [14].

6 Calculating eaGDP

The approach discussed in SEEA supposes to introduce changes generally to the asset accounts, and to reclassify items of the flow accounts. After the environmental assets are included into the newly established accounting boundaries, the compilation of environmentally adjusted aggregates, e.g. environmentally adjusted Gross Domestic Product, is also possible. Environmentally Adjusted Gross Domestic Product will be expressed by the following identity (environmental costs = costs of environmental depletion and degradation):

Environmentally adjusted GDP	=	Gross capital formation ***less Environmental costs***	+	Final consumption	+	Exports	–	Imports

According to existing national accounting practice, one can get the measure of the environmentally adjusted Net Domestic Product by subtracting the capital consumption from the eaGDP measure. We should note that the current level of overall knowledge, methodology development, and statistics available enables us to make the environmental adjustments to conventional GDP (NDP) only *partially*. SEEA doesn't provide any judgements on the issue, giving different approaches how one can proceed. The "pragmatic approach" to environmental adjustments of conventional national accounting system provided in SEEA assumes the following three possible directions: a) making allowance for *depletion* of environmental assets, which were "used up" due to economic activities; b) redefining approach to *defensive expenditures* made in order to correct harm resulting from economic activity; c) treating environmental degradation which occurs despite the defensive actions of the society, as a decline of wealth.

The *depletion* of cultivated livestock, which has always been incorporated in the SNA's accounting boundaries, has always been accounted for within the national accounting systems. The idea of treating all environmental resources in the same manner that depreciation of stocks of created capital is deducted to obtain NDP becomes possible after environmental extension of the accounting system boundaries. The general idea is to deduct the depletion of the stocks of natural capital over the accounting period from the measure of GDP (or NDP) in order to show how the "economic production affects measure of wealth which include environmental assets and measures of income which are concerned about maintaining the levels of these assets as well as of produced assets" [6]. The additions and deductions to the stocks of both nonrenewable and renewable environmental resources are under consideration. One of the issues standing before the accountants is to find appropriate tools to measure the value of depletion, which theoretically can be calculated by multiplying the change in the stock of an environmental asset by an appropriate price. The conventional accounts deal only with those assets which "participate" within market transactions, and therefore have a determined market price. Since the environmental assets included in extended asset accounts are not valued in markets, "artificial" valuation methods should be developed.

The term *defensive expenditures* can be interpreted in a very wide sense. Intuitively the defensive expenditures can be defined as expenditures people are observed to make in order to protect themselves against a potential or an actual decline in environmental quality [15]. In practice there is no consensus about what types of expenditures should be treated as defensive. For instance, SEEA treats environmental protection expenditures as an "obvious candidate for inclusion" [6]. Nevertheless, health expenditures related to environmental pollution can also be chosen among some others.

The environmental protection expenditures can be both current and capital. Those expenditures aimed to "combat the environmental degradation in current and future periods"

[6] can be classified as capital. Both current and capital environmental protection expenditures affect the level of GDP. Number of commentators proposes to subtract the volume of these expenditures from GDP, since they do not contribute to welfare, and are only aimed at bringing back the original *status quo*. SEEA expresses the national accountants' point of view, arguing that it is impossible to deduct this part of GDP in such manner, since omitting the part of economic activities that have taken place in the accounting period will disturb the consistency of the whole system of national accounting. SNA is before all aimed at measuring the economic activities, changes in national output and expenditure with no regards to their moral or necessity aspects.

An additional problem connected with environmental protection expenditures is how they are reflected within the system of national accounting. One of the issues is to find a) the dividing line between intermediate and final goods and services; and b) the dividing line between investment and maintenance expenditures [9]. The respective expenditures made by business can be classified either as intermediate consumption or gross capital formation. Environmental protection expenditure on the side of government can be classified as final consumption or as gross capital formation. All the expenditures made by households are treated as final consumption. The issue standing before the accountants is to find methods, that will enable the symmetric treatment of environmental protection expenditures by government, industry and households. In particular, SEEA proposes to reclassify these expenditures using a "gross-gross" method, when environmental protection expenditures will be treated as gross capital formation on the one hand, and as consumption of fixed capital on the other. Due to the fact that part of intermediate and final consumption will now be treated as gross capital formation, the measures of GDP and NDP will experience slight changes (see [6]).

Incorporation of *environmental degradation* into the system of national accounts is "more difficult, less certain and more controversial" [6] than the two previous adjustments. Natural capital is regarded to have three general functions: resource function, sink function and service function. Environmental degradation causes reductions in sink and service functions of environmental capital. The conceptual reasoning for deducting environmental degradation from the national aggregate product measure is based on the following assumptions. Society disposes of an asset which is capable of providing it the same services over the very long term; this property enables to take the value of the services as income [6]. Assets degradation can be registered as either the decline of the value of its services, or the decrease of its length of life, as well as their combination. In any case, the connected decline of the value of the asset should be treated as a deduction from income, since it jeopardizes the possibility of getting the same income in the future. As we have already mentioned, conventional economic theory treated the environmental assets as "free gifts" of nature; present environmental economics proposes to treat environmental assets in the same manner as produced economic assets, and therefore to incorporate degradation into the aggregate indicators of SNA.

SEEA points out that incorporation of environmental degradation will be the most difficult issue of all above mentioned, due to several reasons. The general issue is the fact, that environmental functions aren't still described and specified exactly in quantified terms at the current level of knowledge. Since the physical description of some functions is not available, the comprehensive monetary evaluation is also not possible. The two general approaches to degradation valuation are discussed in SEEA. Those are damage-based, and cost-based methods, one describing what has happened to the stock of environmental asset, while the other based on the measure of income.

7 Possible Uses

The informational value of environmentally adjusted GDP is that it facilitates the diagnosis of the past performance of the system defined within its boundaries, contributing to further policy analysis and formulation.

The eaGDP can be one of the indicators that are closer to sustainable development philosophy. It can be used for comparison with conventional measures of national income and as an intergenerational equity indicator. The indicator itself and the components it consists of can contribute to evaluation of long-term growth potential of the economy.

EaGDP can be an indicator for policy priority setting, and for assessment of mutual success or failure of the policies combining economic and environmental concerns. It enables making the analysis of the economy performance "before" and "after" adjustments. The breakdown by industries (information on costs allocation) can be a basis for incentive actions planning.

The approach can be used for internalization of environmental costs among those who cause pollution and degradation (e.g. by the means of "green" taxes, or marketable pollution permits). Additionally, the decomposed indicator can be used for the assessment of distributional impacts of environmental and natural resource policies: the benefits and costs of environmental and resource policies can have a more substantial impact on certain industry sectors or income groups than on others.

Since GDP is a popular discussion topic in mass media, eaGDP could also attract the public attention. In other words, eaGDP can easily be a communication tool for attracting attention to the environmental problems that the nation is facing.

If taken per-capita and calculated in constant prices, eaGDP can be used as a tool for the cross-boarder and intertemporal comparison of countries' performance. EaGDP can be used for the purposes of modeling future economic growth trend development.

El Serafy [5] states that "there's a fundamental difference between developed and developing countries in regard to their need to adjust their accounts for environmental and ecological losses." The economies of developed countries are mostly represented by secondary and tertiary production. They either have liquidated their natural resource wealth, or are taking measures to conserve them. That is why the contribution of the primary sector is not significant, and resource depletion doesn't influence the potential of these countries to generate income in future. On the other hand, *ecological degradation* and *pollution* are serious issues within the highly industrialized (and therefore highly urbanized, motorized, etc.) countries. In addition the tradition, of incorporating environmental aspects into the decision making processes on both micro- and macro-economy levels is already established.

The other case is the developing countries, whose economies significantly depend on the extractive industries. This is the reason why, for example such developing countries as China, Philippines or India showed a great interest in adjusting the national accounts. The owners of mineral deposits' in these countries are quite aware of the *depletion* of the resources their economies are based on. In such countries the distinction between "revenue and income" [5] definitely should be available for decision makers, where revenue can be defined as conventional NDP, and income as that discussed by Hicks. In case such countries do not use environmental adjustment one can state that national accounts exaggerate their income. It can lead these countries to a consumption level that is obviously "beyond such economies' means".

In the end, the application of the new approach will definitely "yield new insights" [9] and stimulate further progress in the field.

8 Weaknesses of eaGDP

EaGDP has a certain number of limitations and issues connected with its calculation; these are widely discussed in the literature. First is the fact that not all aspects of the environment can be monetized, or even measured in physical terms. Thus, any correction of income can be only partial. Second are the valuation issues connected with non-market effects. In addition, a significant number of proposed valuation techniques already exist and there is a real risk of mixing measures which are different in their nature within one indicator. (It is evident, that the system should contain measures in terms of the common metrics.) Providing market data together with e.g. shadow price evaluations will possibly break the system's integrity. The *pro* argument can be the fact that presently certain items in SNA are also being evaluated on the non-market principle, i.e. owner-occupied housing. Third, a serious discussion is going on about including or deducting defensive expenditures and pollution damages in/from income indicators. Fourth, the transboundary pollution issue. The practical issue is who should account for this pollution due to the fact that it can have even a world-wide effect. Fifth, there is a discussion about the nature of eaGDP. The environmentalists tend to regard this indictor as an attempt at environmental sustainability measurement and management. Economists (e.g. El Serafy [5]) argue, that the indicator based on SNA framework, regardless of the extensions provided, still remains economic in nature, and it is impossible to "administrate" the environment by its means. Sixth, there is no consensus if the valuation techniques should be "universal", or if different countries should use tachniques tailored to their realities. Additionally, an other issue is "identifying the most appropriate way of gauging physical changes in the environment and natural resource reserves" [9], since there is no agreement in this respect either.

EaGDP is a closer measure to the sustainable income indicator. But it is not totally the same, since not all forms of capital are introduced within the environmentally expanded national accounts. But neither human, nor social capitals have any significantly developed theoretical base: under these conditions the eaGDP is a good alternative for conventionally used macroeconomic indicators. In addition, as we have already mentioned, eaGDP is based on the weak sustainability concept, which allows trade-offs between different types of capital. In other words, it doesn't give the policy-makers any idea about the structural changes within the assets, and therefore the physical capacity to provide economic utility.

References

1. Retrieved February 20, 2007 from www: http://unstats.un.org/
2. De Haan, Mark *Accounting for Goods and for Bads. Measuring Environmental Pressure in a National Accounts Framework*. Retrieved February 28, 2007 from www: http://www.cbs.nl/
3. Heal, Geoffrey; Kriström, Bengt *National Income and the Environment*. Retrieved January 16, 2007 from www: http://papers.ssrn.com/
4. Cobb, Clifford; Halstead, Ted; Rowe, Jonathan *If the GDP is Up, Why is America Down*? October 1995. Retrieved January 17, 2007 from www: http://www.rprogress.org/
5. El Serafy, Salah *The "El Serafy" Method for Estimating Income from Extraction and its Importance for Economic Analysis.* A Synoptic Paper, 2002. Retrieved February 29, 2007 from www: http://www.ngps.nt.ca/
6. Integrated Environmental and Economic Accounting 2003 (SEEA 2003), UN, 2003. Retrieved January 28, 2007 from www: http://unstats.un.org/
7. *Handbook of National Accounting: National Accounts - A Practical Introduction*. Department of Economic and Social Affairs, United Nations, New York, 2003. Retrieved March 27, 2007 from www: http://www.who.int/

8. Asafu-Adjaye, John *Integrating Economic and Environmental Policies: The Case of Pacific Island Countries*. Retrieved February 21, 2007 from www: http://www.unescap.org/
9. *Greening the National Accounts*. CBO papers, March 1994. Retrieved February 10, 2007 from www: http://www.cbo.gov/
10. Peskin, Henry M.; delos Angeles, Marian S. *Accounting For Environmental Services: Contrasting the SEEA and the ENRAP Approaches.* Retrieved February 27, 2007 from www: http://www.idrc.ca/
11. Hamilton, Kirk *Green adjustments to GDP.* Environment Department, The World Bank, Resources Policy, 1994.
12. Hunt, Alistair *Latest Trends in Green Accounting in Europe*. University of Bath. Retrieved February 21, 2007 from www: http://ww4.comune.fe.it/
13. Nordhaus, William D.; Tobin, James *Is Growth Obsolete*? Reprinted from Milton Moss (ed.), The Measurement of Economic and Social Performance, Studies in Income and Wealth, Vol. 38, NBER, 1973. Retrieved January 15, 2007 from www: http://cowles.econ.yale.edu/
14. Bartelmus, Peter *Greening the National Accounts: Approach and Policy Use*. Prepared by January 1999 ST/ESA/1999/DP.3 DESA Discussion Paper No. 3. Retrieved January 2, 2007 from www: http://www.un.org/
15. Retrieved January 27, 2007 from www: http://glossary.eea.europa.eu
11. Hamilton, Kirk *Green adjustments to GDP.* Environment Department, The World Bank, Resources Policy, 1994.
12. Hunt, Alistair *Latest Trends in Green Accounting in Europe*. University of Bath. Retrieved February 21, 2007 from www: http://ww4.comune.fe.it/
13. Nordhaus, William D.; Tobin, James *Is Growth Obsolete*? Reprinted from Milton Moss (ed.), The Measurement of Economic and Social Performance, Studies in Income and Welath, Vol. 38, NBER, 1973. Retrieved January 15, 2007 from www: http://cowles.econ.yale.edu/
14. Bartelmus, Peter *Greening the National Accounts: Approach and Policy Use*. Prepared by January 1999 ST/ESA/1999/DP.3 DESA Discussion Paper No. 3. Retrieved January 2, 2007 from www: http://www.un.org/
15. Retrieved January 27, 2007 from www: http://glossary.eea.europa.eu

Iva Ritschelova, Egor Sidorov
Jan Evangelista Purkyne University,
Usti nad Labem,
Czech Republic.
ritschelova@rek.ujep.cz, sidorov@rek.ujep.cz

ENVIRONMENTAL REPORTS AS IMPORTANT ELEMENT OF PRO-ENVIRONMENTALLY ORIENTED POLITICS

Miroslav RUSKO, Tatiana KREČMEROVÁ

Introduction

The reporting obligation for the area of environment has established by the access of SR to EU on 1 of May 2004. It´s concerned to the presenting data and information arising from the requirements of the legal regulations EC in the following areas: horizontal measures, air protection, waste management, water protection, nature protection, industrial pollution control and risk management, chemical substances and genetically modified organisms, noise from the motor vehicles and machines and nuclear safety in the form of the several reports and interviews to the European Commission.

Environmental reporting or presenting reports on the behaviour of companies in face of the environment is information tool, by which the company informs voluntary the stakeholders, e.g. shareholders, administrative bodies, importers, consumers, public etc. about its environmental profile, thus effects by which effects on the environment and about the activities, which made in this area or aims to do. Environmental reporting is the most often published with the company annual report as its part or as the part or the single publication accordance the company character and its environmental activities.

Environmental Reporting

The environmental reporting is a mechanism, by which the company shares the information concerning its environmental behaviour. The voluntary reporting is publication of information by company on the voluntary basis.

In principle, the process has double form:

- at the level of the state (voluntary and mainly obligatory or resulting from the international conventions or memberships)
- at the level of the company (obligatory and voluntary)

The official uniform definition of environmental reporting doesn't exist by that time and structure, time frequency and indicators, which should use by the environmental activity assessment, are also not established. Global Reporting Initiative (GRI) and Public Environmental Reporting Initiative (PERI) have taken up this question. From the published proposals results that the company should describe in the environmental reporting all own effects on the environment and not just them, which are good presented. The establishment of uniformly counted indicators should help to the environmental activities of companies could be compared respectively.

The environmental reporting origin was initiated by the reaction of industrial companies and other institutions on the industrial accidents, after which were for the public subsidence established and mainly published the guides of company behaviour, into which were beside the safety guides also the guides determining company behaviour in relation to environment. The most noted example is the guides published by the Canadian association of chemical industry, from which were developed after their acceptance and modifications the Responsible Care Programme. The accident of oil tanker Valdez Exxon in 1989 inspired the Coalition for Environmentally Responsible Economics (CERS) to the similar action. Implementation of EMS/EMAS contributed to the next dissemination of environmental reporting, where the company is obligated to inform about its environmental politics, eventually in the case of EMAS to publish environmental declaration. The international

standard ISO 14020 declares to the environmental declaration, the some basic guides are mentioned there, which should be complied by the creation of environmental declaration. The German standard institute (Deutsches Institut fur Normung) has published the standard 33922 that provides the schema for the elaborating of „Report on environment protection intended for public“.

Mainly big companies publish the environmental reporting. The small and middle companies they arrange to their annual reports. The environmental reporting is extended mainly within the developed and prosperous companies. This tool is not supported by the state, but many companies with implemented EMS/EMAS practise the environmental reporting. In future it will be more use than now. It can reach to its transformation on the sustainability reporting of whom the GRI already considers but the situation with both existing reporting is more probably.

Otherwise, the environmental report feeding to companies is voluntary activity but also this area has resp. develop their rules, methodology and ethics. The voluntariness and the procedure according to the generally received rules guarantee the credibility, comparability, and verifiability of given system or statement. The reporting doesn't origin in itself and is not alleged separately but as a part of the wider corporate marketing strategies and public relation. The environmental reporting is used to incorporate to the compact company ecomarketing strategy [1].

The environmental reporting doesn't relate just to EMS/EMAS, which ministered by the environmental reporting development, because in their requirements contain the basic elements of extern communication and relation to the public, but relates also with the voluntary „extension“ to the legal requirements in the sector of industrial accidents, health and safety protection at work and management with chemical substances and appliances. The new element is the orientation and specialisation of reporting on the positive affection of the partners - capital institutions, banks, insurance companies, education, and autonomies. The environmental reporting brings the utility to the organisations by themselves and to the environment. The organisations gain in two main directions [2]:

- better management with sources, e.g. reduction of energy, water and raw material consumption,
- various advantages, e.g. the improving of the relations with consumers and stock-holders,
- demonstration of effort to investors about reduction environmental risks etc.

The company reports contain the most often these elements:

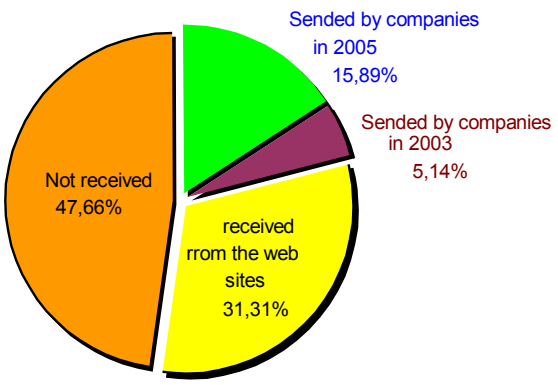
- introduction presented by the company director,
- company history,
- environmental politics of company,
- overall state of company regarding environment,
- carried development through the specific goal defined in previous report,
- formulation of new goals or activities to the improvement of environmental behaviour of company in future.

ENVIRONMENTAL POLITICS

The environmental politics is public available lettering declaration of company expressive the liabilities, scopes and principles of its environmental behaviour. It has to be compatible with other politics of organisation (e.g. quality, health and safety protection at work) and it has to form the frame for the company activity and for further elaboration into the environmental goals in context of the overall company strategy. The working-out of the environmental politics is the step at the building of the effective functioning system of environmental

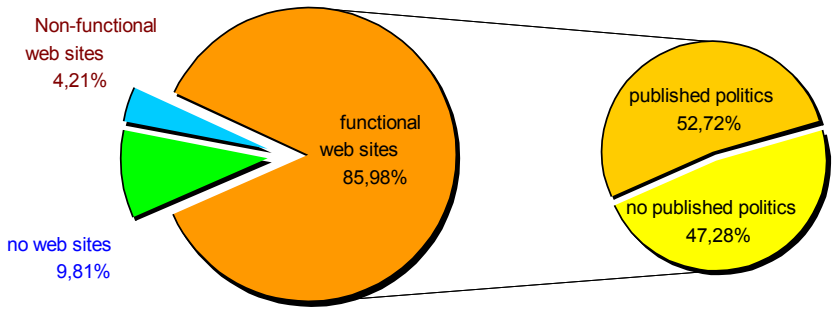
management. It is the point, from that all goals, target values and system realisation are unwinded. The environmental politics can content move ranging from very liberal to specific [3]. All organisations should have published at least one liberal politics that contains key environmental areas. These areas cannot be fully exactly defined but they shouldn't stay unmarked. Some organisations combine the safety and health protection at work into the liberal declaration of environmental politics. The politics should be available to public and also to own employees. In 2005, the organisations with EMS implemented according to ISO 14001 in SR were addressed with a request for the completion of questionnaire and with a request for providing of company environmental report and company environmental politics. 24, 8 % of informants answered to our request for the providing of environmental report but it wasn't possible to workout the relevant output from the received reports. The reports provided unevenly data from the individual elements of environment, e.g. insisted on waste water, air contamination, waste production etc. The most of the reports were in form of the commented text; just a few provided the concrete data in tables. Just a few organisations published data in the time sequence. From these results it's necessary to unify the methodology so that the provided reports were acceptable from the material and formal side.
Globally, we received 112 environmental politics (52,34 %), 34 (15,89 %) as an answer on the request, 11 (5,14 %) politics from the similar inquiry in 2003 and 67 (31,31 %) from the official web sites of companies – graph 1.

Graph 1 The techniques of obtaining of environmental politics



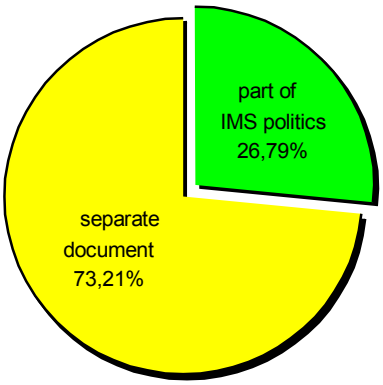
At the present, the internet is regarded as day-to-day form of communication. That's why we were interested in this possibility.

Graph 2 Environmental politics on the web sites [4]



As we can see from the graph 2, almost 86 % of companies have the functional web sites. Over 50 % of companies have published the environmental politics on the web sites. This number is very low. Considering the advantages of worldwide network (cheep, fast and simple way to address of consumers and purchasers, possibility of immediate update of information). The Slovak companies should improve along this line. The interesting indicator is that 9 politics (10, 34 % from all available politics on the web sites) are written in English. Remaining 78 politics available on the web sites are published in Slovak.
Some organisations combine the declaration of politics of quality, safety and health protection at work and environment into one global declaration of company politics – IMS politics. Other organisations prefer the declaration of environmental politics as a separate document. The proportion of these two possibilities within all 112 available politics is represented on graph 3.

Graf 3 The way of the declaration of the environmental politics



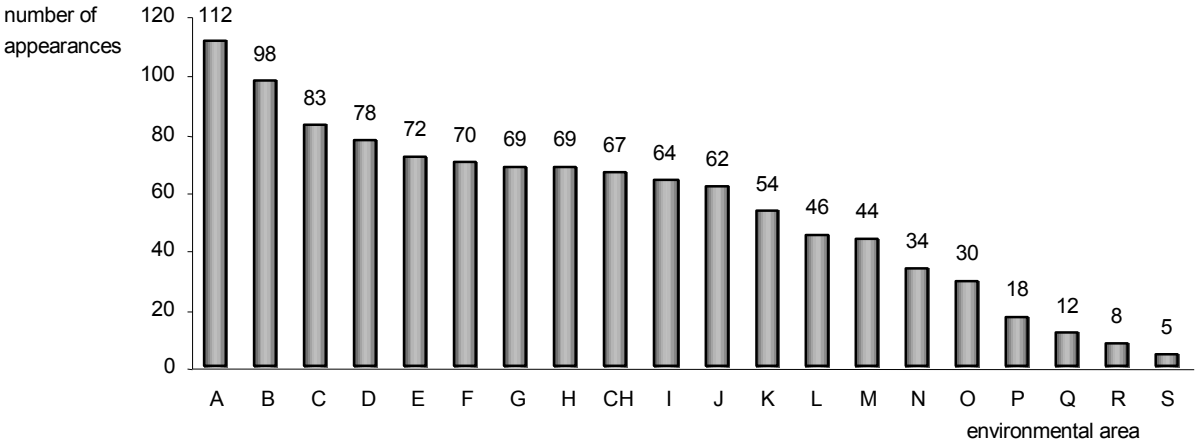
Within the declaration of the environmental politics, 71 % of companies, which filled the questionnaire, have the environmental politics published publicly and 29 % have published it just for intern need. The environmental politics can be accommodated so that it complies with the needs of the given company. It should relate all company activities, products and services.

Table 1: Key to the evaluation of environmental politics

A	Compliance with the legislation about the environment
B	Increasing of the environmental awareness, eligibility and behaviour of employees (education, training, motivation)
C	Minimization of negative effects (emissions, pollutants, waste water, noise....) on environment
D	Publishing of environmental information and open communication with a public
E	Assertion of principle of the implementation of preventive measures, prevention principle
F	Taking into account the environmental effects and environmental risks of current or new activities of companies
G	Care, protection and improving of the state of environment
H	Increasing of involvement of employees by the implementation of principles of environmental politics and principles of EMS into practice
CH	Minimization of waste production and their environmental recovery
I	Maintaining and constantly improving of EMS
J	Effective use of raw materials, materials and natural sources (water, fuels...)
K	Rational use of all types of energies
L	Health protection of employees (by improving of working environment), consumers, public
M	Regularly definition, actualisation and evaluation of environmental goals and programmes

N	The preference of adherence of guides of environmental behaviour by contract partners
O	Cooperation with public, expert organisations, local governments by the development of legislation and environment protection
P	Replacement of environmentally unfavourable substances, materials, procedures and technologies by most favourable
Q	EMS implying at all levels
R	Creation of emergency and crisis plans and holding of preparedness of employees
S	Consultancy providing

Graf 4 Interpretation of environmental politics



We can note (graph 4) that the very important point A „Compliance with the legislation about the environment“ is engaged in all 112 politics. The area of „increasing of the environmental awareness, eligibility and behaviour of employees“ was reached in almost 100 appearances. Then larger distance follows, but still more than 2/3 of all politics have reached the points C and D, so „Minimization of negative effects on environment“ and „publishing of environmental information and open communication with a public“. In the range of 1/2 and 2/3 of appearances are placed very aligned areas. It's possible to include into e.g. „assertion of principle of the implementation of preventive measures, prevention principle“, „taking into account the environmental effects and environmental risks of current or new activities of companies“, „care, protection and improving of the state of environment“, „minimization of waste production and their environmental recovery“, „effective use of raw materials, materials and natural sources“.
The graph continues with more dramatic decrease. From the point N could consider rare detection of these areas in company environmental politics. The appearance of the last category „consultancy providing“ is possible to classify more or less as an exceptional event.

Conclusion

The voluntary reporting is information publishing by the company on a voluntary basis. For example, the disclosure of not very confidential information within the annual reports, web sites etc. The voluntary reporting of environmental information is actively supported and in some cases even necessitated. It becomes more and more popular and on the present is used by private and also by public organisations.

Literature

[1] SUCHÁNEK, Z., JUNGWIERTOVÁ, P. Environmental reporting – providing of environmental reports and information. In.: Environmental aspects of business. Special 1999. ISSN 1211-8052. s. 39-41

[2] Why should companies produce environmental reports? Available on: http://www.defra.gov.uk/environment/envrp/faq.htm [cit. 2005-11-01

[3] KUHRE, W. LEE. ISO 14001 Certification : environmental management systems. Prentice Hall PTR, Upper Saddle River, NJ, USA. 1995. ISBN 0-13-199407-7. s. 48-50.

[4] RUSKO, M., VITTEK, L., 2005. Analysis of EMS use in SR. In. RUSKO, M., BALOG, K. [Eds.] Environmental Management 2005. Conference textbook., ISBN 80-969257-4-1

Miroslav RUSKO,
Slovak University of Technology in Bratislava, Faculty of Materials Science and Technology, kpe@mtf.stuba.sk, Bottova 24, 917 24 Trnava, Slovak Republic
Tatiana KREČMEROVÁ
Mendel University of Agriculture and Forestry, Faculty of Agronomy,
xkrecmer@node.mzlu.cz, Zemědělská 1, 613 00 Brno, Czech Republic

NATIONAL ECO-LABELLING PROGRAMME

Pavel Růžička

The National Eco-labelling Programme (as a programme for the type I environmental labelling) has been operated in the Czech Republic since 1995. Based on requirements and interest of producers, the Ministry of Environment has initiated an origin of the National Programme for Environmental Labelling that covers all three existing types of environmental labelling setting out its organizational structure and rules for creation, verification and registration of environmental labels, claims and declarations. The Ministry is now about to officially publish the Rules of the National Programme.

Different types of environmental labels and declarations

Type I
- Labels
- Pass-or-fail criteria
- Examples:

Type II
- Any written or spoken environmental statement
- No third party verification
- No pass-or-fail criteria

Type III
- LCA based
- Third party verification
- No pass-or-fail criteria
- Registered trademark:

Pavel Růžička Ing.
Ministry of the Environment, Czech Republic

HCS MODEL 3E – MICRO-SOLUTION OF MACRO-PROBLEMS – SUSTAINABLE DEVELOPMENT

Karol Hatiar, Peter Sakál, Thomas M. Cook, Viliam Bršiak, Branislav Sekera, Jozef Výboch

Abstract

Agenda 21 adopted in Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment. Idea of sustainable development can improve the quality of life for human and at the same time take responsibility to protect global common goods and natural resources.

A model for a participatory ergonomics program (HCS 3E model) that is specific for countries of Central and Eastern Europe has been generated as a part of conducting a joint USA – Slovak Republic cooperative project "Transformation of Industry in Slovakia through Participatory Ergonomics". This HCS 3E model – applies „National strategy of sustainable development of Slovak Republic"(macro-level) in enterprise micro-level (3E – Environmental Health, Ergonomics, Economy). Based on four years work within "Participatory Ergonomics" project, our HCS 3E model recognizes humans as the object and subject of all our efforts. We focus on the concept that the work environment must maintain each person's quality of life while at the same time sustaining both the environmental and economical conditions.

This model has been applied in eighteen enterprises and preliminary results are very promising. We are confident in recommending this model to neighboring Central and Eastern Europe countries.

Key words

Sustainable Development, Ergonomics Programs, Transformation of Industry, Health Effect, Cost Benefit

Introduction

Sustainable development (SD) represents a new direction of Human civilization advance in the 21st century adopted in Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992 as document Agenda 21. That document was signed also by representatives of former Czecho Slovakia

Slovak Republic government accepted this document in framework of program "National strategy of sustainable development SR", prepared on the base of worldwide general trends of 21st century.

Program for Further Implementation of Agenda 21 and the Commitments to the Rio principles, were strongly reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa from 26 August to 4 September 2002.

Concept of SD in framework of AGENDA 21, was in the Slovakia elaborated to regional and local level as a local agenda 21 (LA 21). This concept is understood as development destined to provision of basic necessaries of individual and society at the present time without violation of environment and resource next generations meet their own needs. SD is based on four basic dimensions - pillars [1]:

- Institutional
- Environmental,

- Social
- Economic,

Three basic attributes of SD exist according to academician Blažej [1] on the base on institutional level in framework of mentioned pillars exists:

- *Social* **justice** *in exploitation and division of natural resources*, agility of opportunities and elimination of poverty on the world.
- Environmentally acceptable *c development of economy* as **commensalisms** *pod requirements of economy and environment.*
- **Acceptability** *of adequate quality of environment and human life quality requirements.*

It is visible that in framework of international concepts of ions of sustainable development is necessary look for opportunities how to suspend in reasonable cases processes eventuate in decrement and contribute to revitalization, stabilization and growth especially small and medium enterprises.

1. Opportunities of Sustainable Development in framework of privatization and transformation industry process

Process of privatization and transformation of industry in Slovakia and in neighboring countries of Central and Eastern Europe have begun in framework of approximation to EU procedures.

New acts were accepted by parliament of Slovak Republic in framework of harmonization of its legislation with EU legislation. Some of those laws define employer duties in the area of Occupational Health and Safety. To this group of laws belongs Act of Parliament number 124/2006 of Collection of Laws "about safety and health protection at work" and about changes and complementation of some acts, Act of Parliament number 126/2006 of Collection of Laws "about Public Health" and about changes and complementation of some acts and session of statutory order (appendix 1).

<u>Reference to ergonomics</u> in Slovak legislation is however only two times and by **<u>one word</u> in § 26 of the Act of parliament number. 124/2006 which describes duties of occupational health service as follows**:

(1) Occupational health service in employer especially:

a) Recognizes hazards and evaluate health risk attempt the health of employees at work,
b) Monitors factors of work -bench and the status of working conditions which may impact health of employees,
c) supports adapting of work to the workers,
d) Offers counseling to employers and to employees especially in:
   1. Planning of work rest schedule and workplace layout,
   2. Technicalities and substances applied at work potentially dangerous for health,
   3. **protection and positive impact of health, hygiene, physiology a psychology of work, <u>ergonomics</u> including equipment of individual and collective protection,**
e) Takes part in:
   1. Completing of programs for employees health protection and support, improving of working conditions and evaluation of new equipments and technicalities from occupational health point of view,
   2. Measures of tertiary prevention (rehabilitation medicine),
   3. Analysations of incapacity to work, occupational diseases, work related diseases and health risks,
   4. First aid organizing in attempts the life and health of employees' case,

f) Trains employees in the first aid providing (§ 8, section 1, chapter a) the third subparagraph),

g) Cooperates in providing of information, education training in the area of protection and positive affect of health, hygiene, physiology, psychology of work and ergonomics,

h) Surveying of employees health in relation to work.

(2) Only health care professionals especially qualified in performing of duties of occupational health service may perform that.

The problem in Slovak Republic is that institutions of safety of work, occupational health and public health are separated in despite of fact, that some of their competencies and activities are overlapped and that they are complementary each other. Ergonomics is in this relations ignored even though in developed countries represents a regular part of enterprise occupational health and safety programs [2].

This is the reason why in Slovakia are not on enterprise level currently created ergonomics teams, which works in enterprises of developed countries. Ergonomics programs in developed countries integrates all knowledge serving to reaching positive health effect and cost benefit, necessary to competitiveness on global marketplace.

Mikroergonomics [14], where belong about mentioned activities, in contrary of separated safety of work and occupational health areas is not satisfied only by decreasing of accident rate and occurrence of work related diseases. It is because is in behalf of enterprises long-term stability and competitiveness focused also on effectiveness and cost benefit of ergonomics process as a part of enterprise processes. This is the reason why is subject of interest of process management [21], crisis management [15] and strategic management [19] as well.

Legislation materials related to occupational health and safety have to be respected also in the case of irreversible decay and bankruptcy status of enterprise. But applying legislation materials and acts alone are not sufficient in the case of stabilization, revitalization and growth strategies of enterprise.

The primary role of ergonomics in this process is to find appropriate preventive programs using appropriate scientific approaches to solution of workplace problems [2; 4; 7; 8; 12].

A model for a participatory ergonomics program that is specific for countries of Central and Eastern Europe in framework of conducting a joint USA – Slovak Republic cooperative project (No. 019/2001), entitled "Transformation of Industry in Slovakia Through Participatory Ergonomics" (shortened title – "Participatory Ergonomics") [3; 4; 5]. This project was built upon seven years of successful cooperation with the Department of Occupational and Environmental Health in the College of Public Health at the University of Iowa, Iowa City, USA. This cooperation has been made possible through a grant from the Fogarty International Center of the National Institutes of Health in the US to support a research and training program in occupational and environmental health in five countries in Central and Eastern Europe. In particular, the University of Iowa partners have many years of experience using participatory ergonomics in a variety of industries to reduce work-related injuries and illnesses and to improve economic competitiveness. This is an approach that is badly needed in the Slovak Republic and neighboring post-socialist countries.

As the period of economic transformation continues, ergonomics is being increasingly recognized as an important independent science that can contribute greatly to both the health and safety of the population and to sustained economic development. Attention to ergonomics can also contribute to development of the ethical, social, and judicial consciousness of society.

We in project “Participatory Ergonomics” framework concentrated on looking for microergonomics knowledge and experience from developed countries to increasing of economy potential and competitiveness of enterprises based on successful programs of participatory ergonomics. This project has practical and scientific targets.
To this project the scientific aims belonged creation database of musculoskeletal system problems occurrence and study of their relations to the work and to working environment conditions.
Practical purpose of that project was initiation of ergonomics program at least in 8 enterprises in Slovak Republic, development methods for evaluation of workplaces, ergonomics risk assessment, health effect and cost benefit evaluation, and completing proposal of model of ergonomics program based on participatory ergonomic approach for enterprises in Slovak Republic and neighboring countries of Central and Eastern Europe in the process of transformation industry.
We completed that project successfully. Ergonomics program was initiated in 18 enterprises in Slovakia instead of planned 8 enterprises. In 10 enterprises from them we obtained official written expression of interest proceed in ergonomics program.
Ergonomics analysis was performed for all 18 enterprises and results were submitted to top management, but we were required do not publish that results.
We invented and practically proved methods for workplace dimension evaluation, ergonomics risk assessment, health effect and cost benefit evaluation.
For implementation of ergonomics program based on participatory approach in enterprises of Slovak Republic and neighboring countries of Central and Eastern Europe in the process of transformation industry in framework of stabilization, revitalization and growth strategies of enterprise we proposed model HCS 3E [13].

The Ergonomics – Environment – Economy (HCS 3E) Model of Participatory Ergonomics

Based on four years of work within our “Participatory Ergonomics“ project, the HCS 3E model recognizes humans as the object and subject of all our efforts. We focus on the concept that the work environment must maintain each person’s quality of life while at the same time sustaining both the environmental and economical conditions. This model is based on the following assumptions and consists, in general, of following steps:

1. Information and public relation within the target population
2. Contacts with potential partners
3. Obtaining commitment of top management
4. Initiating the participatory ergonomics process by stages:
    a. Ergonomic analysis of working conditions and risk assessment
    b. Initiation of a participatory ergonomics process by conducting workshops for top management and workers (risk announcement)
    c. Development of personal and material preconditions for proceeding with the participatory ergonomics process (risk management)
    d. Development of a process for monitoring progress
    e. Implementation of proposed control measures.

1. Information and public relation within the target population

In the past, ergonomic programs in Socialist countries lacked market-based incentives to continue to develop and improve. Rather, more extensive ergonomic programs were seen as something requiring significant external financial support and as being too luxurious for the average enterprise. For decades, in the countries of "real" Socialism, ergonomics was never

understood as an important condition for economic competitiveness and long-term economic stability. Unfortunately, this lack of understanding about the real economic value of ergonomics still persists among many representatives of top management of important enterprises in former Socialist countries, including Slovakia.

Between 1997 and 2004, we conducted a number of ergonomics workshops throughout Slovakia that focused on the importance of ergonomic programs aimed at prevention of work related diseases and on the importance of ergonomics in promoting the competitiveness and sustainability of Slovak enterprises.

We organized six international workshops, two of them in cooperation with the Trade Union of Construction Workers of the Slovak Republic - STAVBA and the International Construction Institute in Rome, Italy. These two workshops were oriented especially to ergonomics in construction and were held in 1999 in Dudince and in 2000 in Piestany. Another workshop was held in Prague, Czech Republic, in 2000. In 1999, we also conducted eight regional workshops throughout Slovakia in cooperation with regional Public Health Institutes in Bratislava, Trnava, Trencin, Zilina, Banska Bystrica, Nitra, Kosice and Presov. These workshops were directed primarily to scientific workers from departments of Occupational Preventive Medicine of the above-mentioned Public Health Institutes.

The aim of these workshops was to prepare conditions for cooperation in implementing participatory ergonomics programs within enterprises in the Slovak Republic. Additionally, in 2000, we organized five workshops focused on work-related musculoskeletal injuries and illnesses in agriculture, the textile industry, and in computer-related office work. In the year 2002 we organized again an international ergonomics workshop in Trnava. We discussed the role of ergonomics in the process of the transformation of industry with participating experts from neighboring countries and representatives of enterprises with which we expected to cooperate in implementation of ergonomics programs as part of this project. All of these workshops were well received by the participants and the sponsoring organizations but we lacked the resources to apply this information to specific enterprises within Slovakia.

Because of new Slovak government legislation requiring employers to conduct risk assessment and risk communication and to apply preventive measures against work-related injuries, we were asked by the institutions that were responsible for education in the area of safety of work in Bratislava to take part in the education of state Health and Safety inspectors and Health and Safety technicians from all Slovak enterprises. This education included an explanation of the role of ergonomics in relation to Occupational Health and Safety systems in Slovakia. The majority of the inspectors taking part in these training courses expressed interest in being involved in our project. During the last three years ideas related to participatory ergonomics and the concept of the HCS 3E model have spread to the Department of Industrial Engineering and Management of the Slovak Technology University through coursework in ergonomics and strategic management.

2. Contacts with potential partners

We oriented our contacts for potential partners for our Participatory Ergonomic project to public health and health and safety professionals. (Unfortunately, Occupational Health and Work Safety institutions are in the Slovak Republic are still separated although we expect that very soon Slovakia will officially accept the integrated model of Occupational Health and Safety that is typical of the more developed member countries of EU.) We utilized new legislation in the Slovak Republic to arrange direct contact with top management officials in various enterprises and to provide these managers with basic information about how participatory ergonomics programs can help these enterprises to comply with new EU legislation.

3. Obtaining commitment of top management

A basic requirement for successful application of the HCS 3E model is involvement and commitment of an enterprise's top managers. We obtained this commitment by providing detailed information about the HCS 3E program purpose and its relation to fulfilling the requirements of the new Slovak Republic legislation. Once they clearly understood the purposes and scope of the program, top management usually appreciated the fact that we involved them in preparing to form and content of the workshops that would be presented to workers within their enterprises.

It is noteworthy that, during the last several years, we have experienced greatly increased interest in ergonomics programs from both health and safety professionals and managers of many enterprises.

4. Initiating the participatory ergonomics process

The process of starting an ergonomics program is gradual and has various stages depending on the specific conditions in each enterprise. The process usually consists of the followed steps:

a) *Ergonomic analysis* of working conditions (risk assessment) is usually accomplished by using a modified Nordic Questionnaire [9], by interviewing workers, and by analyzing video records. Patterns of musculoskeletal system symptoms are, including discomfort, numbness, and pains located to certain body areas, are often indications of work and workplace conditions that could benefit from ergonomic improvements[]. Further indicators of the severity of such problems are the number and causes of physician visits. Evaluation of these problems includes calculation of the prevalence of both symptoms and physician visits.
b) *Workshops* organized for top management (information) and workers (group problem solving participatory training) present information about the results of the ergonomic analyses and discussions about possible workplace improvements (risk announcement) are used to begin the participatory ergonomics process.
c) *Development of personal and material preconditions* for proceeding of participatory ergonomics process (risk management).
d) *Development of annual control ergonomics process system* enabling model continuing and corrections (by health effect and cost benefit analysis).
e) *Implementation of measures proposed* on the base of the results of annual control.

Evaluation of the HCS 3E of participatory ergonomics model

The participatory ergonomics process in various enterprises needs to be evaluated and its effectiveness needs to be assessed. We use two main criteria – health effects and cost-benefit.

Health effects include the occurrence of symptoms of the musculoskeletal system, in particular, symptoms related to work and to working conditions. The main criteria are the incidence of musculoskeletal symptoms and changes in the prevalence of symptoms related to work and working conditions [2; 7; 8]. We evaluate these health effect indicators using a battery of programs prepared in the EPI INFO data analysis system. These programs allow us to describe various groups of workers and divide them according to the types of workload they experience. We also use these programs to evaluate the occurrence, location and severity of the symptoms of interest. We also evaluate the possible effects of confounders such as: age, sex, exposure, body parameters like body stature and body weigh, and stature-weight relationships such as body mass index. We strive to establish relationships between

symptoms and specific risk factors and working conditions using observational data, video recordings, and information from worker interviews [9, 10]

Cost Benefit Analysis (CBA) is a methodical process which answers the question: What and to whom does a particular activity provide benefit and why and to whom does it take away resources? Environmental and ergonomics projects are generally intended to benefit the public and may be performed by nonprofit organizations, public entities, private contractors, and/or enterprises. The intent of many of these projects is not only to maximize profits or cash flow for the investor but also to provide a benefit to all subjects involved in the activity. Typical examples of such project include protection of the environment, human health protection and many other similar pursuits. Therefore, the overall effects of many projects include more than cash flow and involve evaluating parameters of benefits to all involved subjects. In the case of more variants comparison (zero investment or variant without project, minimum variant, maximum variant) the method of CBA enables establishing the order of proposed variants of projects or establishing the preferences of individual projects [12; 16; 17; 18; 20].

Conclusions and recommendations

During this project period we have so far obtained data on a total of 3059 persons from 18 Slovak Republic enterprises. To date, ergonomics processes have been completely developed in five Slovak enterprises although our goal is to initiate the participatory ergonomics process in as many enterprises in Slovakia as possible. Our experiences and the conditions of the transformation of industry have shown us that it is necessary to begin this process in as many factories as our resources will allow. Unfortunately, some of the enterprises where we have already started the ergonomics process are being changed in some ways that will not allow us to complete our activities

We have found that this model allows us:

- To integrate research activities, data collection, building of data bases, and use of such data in epidemiological studies of health effect of factors of work and working conditions and to evaluate the program's health effects and the effectiveness of adopted measures;
- To collect and prepare data for prevention and legislation activities;
- To better understand the current status of the process of transformation of industry from the point of view of opportunities for improving worker health and economic success through participatory ergonomics programs;
- To identify further possibilities for developing cooperative research projects and gradual development of a Health and Safety Network of Excellence.

Modern ergonomics brings chances return to natural and pragmatic values and strategies which till appearing of scientific and industrial revolution enabled development of tools, technicalities and new strategies which are still used. It takes, instead of too sophisticated criteria and tables, simple natural and pragmatic criteria: both - positive Health Effect and Cost Benefit. Revitalization and development of enterprises by HCS 3E model may help in creation of material fundamentals of Sustainable Development.

This process is extremely important not only for the targeted developing countries but also for more advanced countries of the European Community because it tends to lead to greater economical and political development throughout Europe.

We believe that this model is meeting our expectations in the both the practical and scientific areas and brings new stimuli to economic development in Slovakia and other neighboring countries that are in the process of adapting to conditions in the European Community.

Acknowledgement: *This work was sponsored by U.S. – Slovak Science and Technology joint Fund under Project Number # 019/2001 "Participatory Ergonomics".*

References:

1. BLAŽEJ, A.: *Udržateľný rozvoj – základná rozvojová paradigma 21. storočia.* Úrad vlády SR, 2005, 57 s. ISBN 80-88707-70-6.
2. COHEN, L.C., GJESSIG, CH.C., FINE, L.J., BERNARD, P.B., MCGLOTHLIN, J.D. *ELEMENTS OF ERGONOMICS PROGRAMS: A Primer Based on Workplace Evaluation of Musculoskeletal Disorders. U. S. Department of Health and Human Services.* Public Health Service, Centers for Disease Control and Prevention, NIOSH, Publication No. 97-117, Cincinnati, DHHS (NIOSH) Publication No. 97-117, 1997, 133 pp.
3. COOK, T. M., HATIAR, K. ROSECRANCE, J. C.: *A model for participatory ergonomics in the Slovak Republic.* In Podgorski, D., Karwowski, W.: Ergonomics and Safety for Global Business Quality and Productivity. Proceedings of the second international conference ERGON-AXIA 2000, Warsaw, Poland, 19-21 May, 2000. Central Institute for Labour Protection, Warsaw, 2000, p.411-414.
4. HATIAR, K., COOK, T.M.: *Participatory Ergonomics in Slovakia.* EuroRehab, XIII, 2003, 3, p. 162-167, ISBN – 1210-0366
5. HATIAR, K., PALÁT, M.: *Základy ergonómie.* p. 150 – 158. In: BUCHANCOVÁ, J., a kol.: Pracovné lekárstvo a toxikológia, OSVETA, Martin, 2003, 1133 pp. ISBN 80-8063-113-1.
6. HATIAR, K.: *Ergonómia a preventívne ergonomické programy.* Bezpečná práca, 35, 2004, 1,s. 8-13. ISSN 0322-8327.
7. HATIAR, K.: *Ergonómia a preventívne ergonomické programy (2): Riziká v pracovnom procese z hľadiska ergonómie.* Bezpečná práca, 35, 2004, 2, s. 3 – 6. ISSN 0322-8327.
8. HATIAR, K.: *Ergonómia a preventívne ergonomické programy (3): Hodnotenie rizík v pracovnom procese z hľadiska ergonómie.* Bezpečná práca, 35, 2004, 3, p. 3 – 10. ISSN 0322-8327.
9. HATIAR, K., KOBETIČOVÁ, L., HÁJNIK, B.: *Ergonómia a preventívne ergonomické programy (4):Ergonomická analýza pomocou modifikovaného dotazníka "NORDIC QUESTIONNAIRE".* Bezpečná práca, 35, 2004, 4, 20-28. ISSN 0322-8327.
10. HATIAR, K.: Ergonómia a preventívne ergonomické programy, 5 časť: Ergonomické hodnotenie a riešenie priestorových pomerov pracovísk. Bezpečná práca), 35, 2004, 6, s. 17 – 22 a 26 - 30. ISSN 0322-8327.
11. HATIAR, K., COOK, Th. M., SAKÁL, P.: *Trendy manažovania podnikových ergonomických programov.* In 8.medzinárodná vedecká konferencia Trendy v systémoch riadenia podnikov. Zborník abstraktov. Košice: TU, 2005, s. 17. ISBN 80-8073-358-9.
12. HATIAR, K.: *Možnosti využitia metodiky CBA v environmentálnych a ergonomických projektoch - I..* In Finanční a logistické řízení – 2005. Ostrava: VŠB-TU, 2005, s. 104 - 111. ISBN 80-248-0854-4.
13. HATIAR, K., COOK, Th. M., SAKÁL, P.: *HCS model 3E účastníckej ergonómie.* Internetový časopis, STU Bratislava, MtF Trnava, http://web.mtf.stuba.sk/sk/casopis/archiv/2006/3/hatiar.pdf, 20.11.2006.
14. Kodak´s Ergonomic Design for People at Work, Second Edition. The Kodak Company. John Wiley and Sons Inc., Hoboken, New Jersey (published simultaneously in Canada), 2004, 704 p., ISBN 0-471-41863-3.
15. MIHÓK, J., VIDOVÁ, J.: *Riadenie podniku v kríze.* Košice: Strojnícka fakulta Technickej univerzity v Košiciach, 2006, 245 s. ISBN 8073-533-6.

16. MRVOVÁ, Ľ., SAKÁL, P.: *Využitie metodiky CBA v environmentálnych a ergonomických projektoch a programoch II.* In Vedecké práce MtF STU v Bratislave so sídlom v Trnave, 2005, 19, s. 71 - 77. ISSN 1336-1589
17. SAKÁL, P.: *Možnosti využitia metodiky CBA v environmentálnych a ergonomických projektoch - II.* In Finanční a logistické řízení – 2005. Ostrava : VŠB-TU, 2005, s. 239 - 244. ISBN 80-248-0854-4.
18. SAKÁL, P., MRVOVÁ, Ľ.: *Využitie metodiky CBA v environmentálnych a ergonomických projektoch a programoch I.* In Vedecké práce MtF STU v Bratislave so sídlom v Trnave, 2005, č. 19, s. 65 - 70. ISSN 1336-1589.
19. SAKÁL, P., PODSKĽAN, A.: *Strategický manažment.* Bratislava: Vydavateľstvo STU, 2004. 256 s. ISBN 80-227-2153-0.
20. UHROVČÍKOVÁ, P., SAKÁL P, COOK, T. M.: *Skúsenosti z využitia metodiky CBA v environmentálnych a ergonomických projektoch.* In Zborník z medzinárodnej konferencie „Technika ochrany prostredia - TOP 2006“, 28. – 30.06. 2006, Častá – Papiernička. Bratislava, STU, 2006, s. 485 - 492. ISBN 80-227-2436-X.
21. ZÁVADSKÝ, J.: *Procesný manažment v praxi manažéra.* SP SYNERGIA, Trnava, 2004, 238 s. ISBN 80-98734-8-2.

doc RNDr. Karol Hatiar, CSc.
STU Bratislava, Materiálovotechnologická fakulta, Katedra priemyselného inžinierstva a manažmentu, Paulínska 16, 917 24 Trnava, e-mail: hatiar@mtf.stuba.sk, karol.hatiar@stuba.sk
prof. Ing. Peter Sakál, CSc.,
STU Bratislava, Materiálovotechnologická fakulta, Katedra priemyselného inžinierstva a manažmentu, Paulínska 16, 917 24 Trnava, e-mail: sakal@mtf.stuba.sk, peter.sakal@stuba.sk
prof. Thomas M. Cook, PT. PhD.,
Department of Occupational and Environmental Health, Ergonomics and Biomechanics Facility, University of Iowa, USA, e-mail: thomas-cook@uiowa.edu
MUDr. Viliam Bršiak MPH.,
Regionálny úrad verejného zdravotníctva so sídlom v Žiline,V.Spaniola 27, 01171 Žilina, e-mail: ppl@ruvzza.sk
Ing. Branislav Sekera,
INVESTMENT & BUSINESS CONSULTING, spol. s r.o., externý doktorand STU Bratislava, Materiálovotechnologická fakulta, Ústav priemyselného inžinierstva, manažmentu a kvality, Paulínska 16, 917 24 Trnava, e-mail: sekera@stonline.sk
Ing. Jozef Výboch,
STU Bratislava, Materiálovotechnologická fakulta, Ústav priemyselného inžinierstva, manažmentu a kvality, Paulínska 16, 917 24 Trnava, externý doktorand, e-mail: vyboch@mtf.stuba.sk, jozef.vyboch@stuba.sk

Appendix 1

The most important statutory orders published in connection with protection of employees health at work:

- NV SR 357/2006 Z.z. o podrobnostiach o faktoroch práce a pracovného prostredia vo vzťahu ku kategorizácii pracovných činností a o náležitostiach návrhu na zaradenie pracovných činností do kategórií z hľadiska zdravotných rizík.
- NV SR 272/2004 Z.z. ktorým sa ustanovuje zoznam prác a pracovísk, ktoré sú zakázané tehotným ženám, matkám do konca deviateho mesiaca po pôrode a dojčiacim ženám, zoznam prác a pracovísk spojených so špecifickým rizikom pre tehotné ženy, matky do konca deviateho mesiaca po pôrode a pre dojčiace ženy a ktorým sa ustanovujú niektoré povinnosti zamestnávateľom pri zamestnávaní týchto žien.
- NV SR 286/2004 Z.z. ktorým sa ustanovuje zoznam prác a pracovísk, ktoré sú zakázané mladistvým zamestnancom, a ktorým sa ustanovujú niektoré povinnosti zamestnávateľom pri zamestnávaní mladistvých zamestnancov.
- NV SR č.115/2006 Z.z. o minimálnych zdravotných a bezpečnostných požiadavkách na ochranu zamestnancov pred rizikami súvisiacimi s expozíciou hluku.
- NV SR č.247/2006 Z.z. o podrobnostiach o ochrane zdravia pred záťažou teplom a chladom pri práci.
- NV SR č.269/2006 Z.z. o podrobnostiach o požiadavkách na osvetlenie pri práci.
- NV SR č.253/2006 Z.z. o ochrane zamestnancov pred rizikami súvisiacimi s expozíciou azbestu pri práci.
- NV SR č.276/2006 Z.z. o minimálnych bezpečnostných a zdravotných požiadavkách pri práci so zobrazovacími jednotkami.
- NV SR č. 281/2006 Z.z. o minimálnych bezpečnostných a zdravotných požiadavkách pri ručnej manipulácii s bremenami .
- NV SR č. 416/2005 O minimálnych zdravotných a bezpečnostných požiadavkách na ochranu zamestnancov pred rizikami súvisiacimi s expozíciou vibráciám, zo dňa 17.8.2005.
- NV SR 355/2006 Z.z. o ochrane zamestnancov pred rizikami súvisiacimi s expozíciou chemickým faktorom pri práci.
- NV SR 359/2006 Z.z. o podrobnostiach o ochrane zdravia pred nepriaznivými účinkami nadmernej fyzickej, psychickej a senzorickej záťaže pri práci.
- NV SR 351/2006 Z.z. o podrobnostiach o ochrane zdravia pred účinkami optického žiarenia pri práci.
- NV SR 391/2006 Z.z. o minimálnych bezpečnostných a zdravotných požiadavkách na pracovisko.
- NV SR 392/2006 Z.z. o minimálnych bezpečnostných a zdravotných požiadavkách pri používaní pracovných prostriedkov.
- NV SR 393/2006 Z.z. o minimálnych požiadavkách na zaistenie bezpečnosti a ochrany zdravia pri práci vo výbušnom prostredí.
- NV SR 329/2006 Z.z. o minimálnych zdravotných a bezpečnostných požiadavkách na ochranu zamestnancov pred rizikami súvisiacimi s expozíciou elektromagnetickému poľu.
- NV SR 338/2006 Z.z. o ochrane zdravia zamestnancov pred rizikami súvisiacimi s expozíciou biologickým faktorom pri práci.
- NV SR 395/2006 Z.z. o minimálnych požiadavkách na poskytovanie a používanie osobných ochranných pracovných prostriedkov.
- NV SR 396/2006 Z.z. o minimálnych bezpečnostných a zdravotných požiadavkách na stavenisko.
- NV SR 339/2006 Z.z. ktorým sa ustanovujú podrobnosti o prípustných hodnotách hluku, infrazvuku a vibrácií a o požiadavkách na objektivizáciu hluku, infrazvuku a vibrácií.
- NV SR 354/2006 Z.z. ktorým sa ustanovujú požiadavky na vodu určenú na ľudskú spotrebu a kontrolu kvality vody určenej na ľudskú spotrebu.
- NV SR 298/2006 Z.z. o podrobnostiach o požiadavkách na zariadenia spoločného stravovania.

MONO-CRITERIAL AND MULTICRITERIAL VALUATION OF ENVIRONMENTAL PROJECTS

Jana Soukopová

Introduction

Projects from the field of the protection and formation of the environment (environmental projects) have, as opposed to public projects a range of specifics that are related to the problem of sustainability, which main goal is to preserve the environment for future generations in as little changed form as possible. Therefore they are not only valuated according to their economic effectiveness, but also from a view of their impact on the environment. In such evaluation a range of problems, that are not that obvious in other fields of the public sector, are met.

The most well-known classification of valuation methods of public project, created by Bénard (1991), divides these methods according to the number of the assumed criteria of valuation to two groups, mono-criterial and multicriterial methods of valuation. At present both groups of methods are used to valuate the environmental projects, i.e. in static as well as dynamic form[10].

1. Mono-criterial methods of valuation of environmental projects

Mono-criterial methods for the valuation presume the existence of one predominant criterion, to which other criteria can be transformed. This criterion would be profit in the private sector, or one of the financial ratios. However, when evaluating environmental public projects, this criterion would be most often the level of cost, or another ratio indicator related to expenses. Most of the mono-criterial methods are based on a presumption that it is possible to quantify the cost of the valuated offer, i.e. in monetary units.

In practice the most common mono-criterial methods to valuate environmental public projects are: cost minimalising analysis, cost effectiveness and cost-benefit analysis. These methods come under the so-called cost-output methods.

Cost Minimalizing Analysis - CMA

CMA is one of the easiest mono-criterial methods and it is usually used to valuate environmental projects. The lowest costs are one of its valuating criteria upon meeting the given criteria of a project. Problem arises with this method, when the capitalized cost of the compared projects is the same. Then, in order to decide the project, the operational (current) cost is also important, apart from the capitalized cost. Therefore, it is necessary to change the CMA formula and to compare the sum of the capitalized and operational cost as it is shown in the relation (1.1.):

$$C = C_0 + \sum_{t=1}^{n} C_t \tag{1.1}$$

where C is the total cost,
C_0 is the capitalized cost,
C_t is the operational cost in year "t"
t is a given time period,
n is the number of years of the project useful life.

[10] It is also important to mention another classification that distinguishes the valuation methods to static methods, that do not take into account the aspect of time, and the dynamic methods that take into account the aspect of time (more e.g. Valach, 2006).

As it is evident from the given relation (1.1.1), CMA does not include the aspect of time in its basic version. However, in order to valuate effectively, the aspect of time is crucial, because the outputs of the valuation are distorted without including the aspect of time. In order to valuate in a sufficient time horizon, it is necessary to convert the cost (benefit) to the present value. The **present value** – PV increases within one year to a **future value** – FV, depending on the interest rate (for the public sector according to the discount rate) according to the relation $FV = PV\,(1+r)$. In a year "n the future value FV is then defined by a relation $FV = PV\,(1+r)^n$. The present value PV_t of all the cash flows arising from the projects during the life of the public project is then defined by a relation:

$$PV_t = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+r)^t} \tag{1.2}$$

where CF_t is the cash flow in year "t",
B_t are the benefits in year "t",
r is the discount rate[11].

The Cost Minimializing Analysis, when the time aspect is included, is defined as follows:

$$C = C_0 + \sum_{t=1}^{n} \frac{C_t}{(1+r)^t}, C \rightarrow \min \tag{1.3}$$

This method is already suitable to valuate environmental public projects under fixed setting of conditions and parameters to solve the project. However, the cost-benefit analysis is a more complex method, that valuates the projects not only according to cost, but it also considers the benefits of the project.

Cost-benefit Analysis, CBA

To perform the cost-benefit analysis, the stages are proceeded as follows:

Stage 1 Ascertainment of the nature of the project[12].

Stage 2 Identification of the impacts of the project (positive as well as negative).

Stage 3 Identification of important economic impacts.

Stage 4 Identification of physical impacts of the realization of the project.

Stage 5 Monetary valuation of important benefits, where the principle measure units of measure are **monetary units**[13].

Stage 6 Discounting of cost and benefit flows.

Stage 7 Valuation according to the valuation criteria that are the net present value , or B/C indicator. In practice either one of the criteria is used, or a number of criteria at the same time.

Net Present Value – NPV

[11] In theory, the discount rate defines the best possible benefit of alternative investment to the valuated investment, whereas the benefit should be achievable at the same risk. (Soukopová 2005).

[12] It is a specification of the area that the project deals with, including the specification of the group of inhabitants influenced by the project.

[13] Valuation of benefits in monetary units is done in case of environmental public projects by means of non-market valuation methods, shadow prices, or substitution markets (more see Soukopová 2006, Tošovská 1997).

NPV is defined as a total of the present value of future cash flows arising from the project and the cash flow in the zeroth year:

$$NPV = CF_0 + \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} = CF_0 + PV \tag{1.4}$$

where NPV is the net present value of a project,
PV is a present value of a project,

The project can be assumed as acceptable if there is met a criterion that the indicator of the net present value is not negative.

Internal Rate of Return - IRR

Internal rate return is defined for the public sector (Ochrana 2004: 16) as "*such a value of discount rate, where a present benefit value of the assumed alternative equals the present cost value of the assumed alternative of the public project*, i.e. IRR (the desired discount rate) meets the following equation:

$$0 = CF_0 + \sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t}, \tag{1.5}$$

While the *NPV* is based on a fixed discount rate, in case of the *IRR* we look for the discount rate that satisfies the above-mentioned equation (1.5). However, this equation cannot be used to calculate the *IRR* directly, as it is not possible to express it explicitly from this formula because of the power *t* of subtotal (1+*IRR*). Internal rate of return (*IRR) is* most often derived from the linear interpolation (more e.g. Sieber). It is possible to assume from a point of view of the internal rate of return that the project is to be acceptable, if it meets a criterion, that the indicator *IRR* expresses a higher, or equal discount rate than the required minimal rate of return (discount rate *r*). However, it is difficult to determine *r* for the public sector. It is possible to solve this problem in a way that when evaluating the projects, an alternative that has the highest rate of return evaluation of the projects is selected.

Payback period (PP)

The payback period is, generally speaking, a period when the investments are paid back from the monetary incomes, that are to secure the investments.

An investment project can be assumed as acceptable if it meets a criterion that the payback period is shorter than or equal to its life, whereas it is deemed the lower the value of the PP, the better the project. Thus when mutual comparison of the projects is done, then a project, of which the value of the payback period is the lowest should be chosen. When comparing public projects, we use the simple payback period and the real payback period, which takes into account the discounted cash flows.

Indicator B/C is constructed as follows:

$$B/C = \sum_{t=0}^{n} \frac{B_t}{C_t} (1+r)^t \tag{1.6}$$

where B_t is the benefit in period *t,* and C_t is the cost in period *t,*

Investment project can be assumed acceptable if it meets a criterion that the indicator B/C is higher than or equal to one. If B/C = 1, then the project is indifferent, thus it is neither profitable, nor unprofitable; from this point of view it can be assumed as acceptable, if it has other complementary effects. Whereas, the higher the B/C value, the more effective the project is. When mutually comparing the projects, there should be selected those projects that have the highest effect from the unit of costs.

Cost-effectiveness analysis – CEA

Another mono-criterial method used to evaluate the environmental projects is the cost-effectiveness analysis. CEA is used in case the valuation of benefits (profits) of projects in monetary units is where the usage of the CBA would be complicated. In this type of analysis the effectiveness of a project is not stated in monetary units, but the outputs are measured by means of suitable natural units, or physical units. (Soukopová 2005). The nature of this method is then the selection of a project that has the lowest cost on an output unit. When evaluating the environmental public projects, the so-called required investment per unit of measure is ascertained e.g. to remove the unit of pollution and it prefers projects with the lowest required investment per unit of measure. [14]

$$S = \frac{C}{E} \rightarrow \min, \tag{1.7}$$

where C is total discounted costs that are calculated from the equation 1.3.
S is required investment per unit of measure
E is output unit (e.g. amount of pollution)

Evaluation of mono-criterial methods

The main advantage of valuating the environmental public project by means of mono-criterial methods is that these methods provide clear valuation of effectiveness of these projects in a form of one a financial or a cost indicator and easily measure the projects in relation to each other. However, they also have their minuses. The easiest method CMA does not take into account the aspect of time, and if we use equation 1.3 to calculate the total cost, yet its great weakness is, that upon valuation it omits the benefits of environmental projects, and therefore does not take into account the impact on the environment. CBA is indeed the most complex mono-criterial method, but also the most difficult method to perform, that can be used when deciding on the realization of environmental investment. Its important benefit is the consideration of the time aspect. This analysis enables the calculation of benefits for the environment also in a long-term horizon and thus it provides an integrated economic view of the realization of measures. Therefore when the effectiveness of the projects is assessed, there can be also used the long-term basis of effects, which is a significant feature of investments to protect the environment. The main disadvantage is the difficult valuation of environmental benefits in monetary units. Thus it is possible to realize it by means of non-market valuation methods, that together form an apparatus for the area of valuation of the environment (more e.g. Tošovská 1997, Soukopová 2005). However, this valuation is very costly and moreover, it often does not lead to the desired relevant results. Moreover, the mono-criterial methods lose their main advantage, in case of the preferential methods, which are a comparison based on the financial, or the cost indicator, that clearly provide information on effectiveness or non-effectiveness of the valuated investment, independent from the preferences of the applicant.

Actually, the monetary value of these benefits is estimated by subjects that are bound with them, and they often overestimate their value. Then it is possible to solve this problem by means of non-preferential methods, substitution markets, or to use the third of the given mono-criterial methods, the cost-effectiveness analysis. It does not require the valuation of benefits in monetary units, but in physical units and natural units. It can be the amount of pollution, impact on the environment and other at environmental projects. Valuation by the

[14] This procedure is based on the theoretical relation between the amount of pollution and the cost to remove it, of which it is obvious that the lower the pollution is, the more rise in the cost to remove it, the amount of the removed pollution on a unit gradually decreases.

CEA method seems very easy, but there also arise various problems relating to the selection of the output indicator. The most substantial cases are when there are more benefits, or it is not possible to compare individual benefits mutually (more e.g. Soukopová 2005).Therefore it brings a question if it is possible to compare individual benefits mutually at all in the area of protection of the environment. Moreover, although it is a clear advantage that all of the mono-criterial methods, from the group of the dynamic methods, take into account the aspect of time, they also meet a problem of fixing the discount rate. A suitable amount of the discount rate is discussed in the public sector very much, in theory as well as on practical level, i.e. in cases when it concerns long-term public projects. It is evident that a low discount rate will mostly influence those public projects that yield a profit in a long time period. The lower the discount rate is selected, the more profitable the long term projects would appear and vice versa.

2. Multicriterial methods of valuation of environmental projects

The above-mentioned mono-criterial methods evaluate environmental projects on a basis of one valuation criteria. However, in most of the real situations we decide according to more criteria. The problems of the most multicriterial decision are usually classified according to the character of the set of the decision variants to **multicriterial valuation of variants**, whereas the problem of the permissible variants is set in a form of a definite list, and to **multicriterial programming**, whereas set of permissible variants is defined by a set of conditions which the decision variants have to comply with in order to be permissible.
In order to evaluate environmental public projects, we only take into account the methods of multicriterial valuation of variants, as when evaluating the public projects, we always evaluate projects from a closed problem (list) of variants of a project. The formulation of the problem to valuate multicriterial variants is as follows: A list of variants $A = \{a_1, a_2, ..., a_n\}$A and a list of valuation criteria $K = \{k_1, k_2, ... , k_k\}$ are given. Each variant $a_i, i = 1, 2, \ldots, n$ is defined according to these criteria by criterial values $(y_{i1}, y_{i2}, \ldots, y_{ik})$. Fiala, Jablonský, Maňas (1994) then express the mathematical model of the problem of multicriterial valuation of variants in a form of a criterial matrix:

$$Y = (y_{ij}) \tag{2.1}$$

$D = \{a_{i1}, a_{i2}, ..., a_{im}\}$ is then set m of selected variants of projects, where $1 < i1 < ... < im$, $1 < ij < n$, $j = 1, \ldots m$.

The valuation of variants may be in various units and measures. Then transformation of the input to comparable units is important, which enables aggregation according to all of the criteria. It is enabled by scales approach that belongs to the easiest methods of multicriterial valuation.

Scales

The most known scales are:

- *Nominal (binary) scale*, based on identity or non-identity operation, that is defined by a binary logic value 1 (identity), or 0 (non-identity). The valuated variants are indifferent from a point of view of the valuated criteria. A disadvantage of valuation by means of the binary scale is that if this type of evaluation is used, neither the preference of individual criteria is measured, nor the weight of the individual criteria is taken into account, whereas it is not possible to presume that these weights would be identical.
- *Ordinal scale*, that is used as a classification scale, that evaluates individual criteria by means of marking (e.g. 1 – 5, where 1 = the best value and 5 = the worst value, or as a

graduated table that valuates individual criteria within the range of a given scale (e.g. 1 – 10, where 1 = the worst value, 10 = the best value). By this the ordinal scale exceeds the main disadvantage of the binary scale, as it ranks the criteria from the least important to the most important.

- *Cardinal numerical scale* that is used as an interval scale and as a ratio scale.

Scales to evaluate environmental public projects are most often used within the framework of expert valuation, where the ordinal point scale is the most often used scale. The principle advantage of the scales approach is definitely their relative simplicity when evaluating the variants. A disadvantage is that these procedures do not distinguish between importance of individual criteria. To solve this disadvantage there are used methods that use the evaluation of the weight of the criteria.
Therefore most of the valuation methods used understanding of the weights of the criteria for the multicriterial valuation. The point method is probably the most often used multicriterial method to evaluate the environmental projects.

Point method

This method ranks among methods based on partial valuation of variants, whereas individual variants are evaluated independently from each other. The evaluator assigns a particular score from a selected scale (see above) to an individual option in relation to the given criteria, where the better a given option is rated, the higher the point evaluation in relation to this criterion. The number of points of the point scale depends on the evaluator's ability to distinguish it, which does not have to be the same for all the criteria. However, a maximum (or a minimum) score assigned to the best (or the worst) value of the criteria shall be the same for all of the criteria. At the same time with the individual evaluation, there is not excluded a case, when none of these variants reaches an extreme score is done (it can be a hypothetically set number). The valuation of variants is calculated in this method as follows:

$$h_i = \sum_{j=1}^{k} v_j y_{ij} \ , \tag{2.2}$$

where h_i is valuation of "i" option, $i = 1, 2, \ldots, n$,
y_{ij} are values of the criterial matrix Y,
v_j is the normative weight of "j" criterion, $j = 1,2, \ldots, k$

and variants a_i are ordered in a way that the highest the value h_i, the more the "*i*" option is preferred.

The weight sum approach is another of the methods often used.

Weight Sum Approach - WSA

It is based on a principle of maximalization of the benefit, whereas it presupposes the linear function of the benefit. When used, there a normalized criterial matrix $R = (r_{ij})$ is created, elements of which are gained from criterial matrix Y and its rows complying with optimal [15] (I), or basaline variant [16] (B) using the transformation equation:

$$r_{ij} = \frac{y_{ij} - B_j}{I_j - B_j} \ . \tag{2.3}$$

[15] Optimal variant is such a variant that reaches the best values in all of the criteria.
[16] Baseline variant is such a variant that reaches the worst possible values in all of the criteria.

This matrix represents a matrix of the benefit value of "i" variant according to "j" criterion. It is clear from the relation that the criterial values y_{ij} are transformed linearly in a way that $r_{ij} \in$ <0,1>, where the I_j equals value 0 and B_j equals value 1. When the additive function of the benefit is used, then the benefit of the variant a_i equals:

$$u(a_i) = \sum_{j=1}^{k} v_j r_{ij}, i=1, 2, ..., n . \tag{2.4}$$

The variant that reaches a maximum value of benefit is then selected as "the best", or the projects are ordered according to the falling value of the benefit function. Thereby the easiest and therefore the most often used method of individual comparison of variants to evaluate the environmental public projects were shown. However, there is another group of methods, the methods of the pair comparison of variants that evaluate the projects in relation to each other. One of the most well-known and used is the lexicographical method.

Lexicographical method

It ranks among the easiest methods of the multicriterial analysis. The valuation is done as follows: the first step is ranking the criteria according to their importance from the most important to the least important k_1, k_2, …, k_k. It is further presupposed that there is available valuation of the variants in a form of criterial matrix Y according to the individual criteria. Another step is to select from a set of variants A of a subset $A^{(1)}$, elements of which are variants a_i, that reach the maximum value according to the most important criterion k_1. Next a subset of variants $A^{(2)}$ is selected, elements of which are variants a_j, that reach the maximum value according to the most important criterion k_2 on the set of the variants $A^{(1)}$ and so on. The selection process of variants finishes when any of the subsets $A^{(i)}$, i = 1, 2, …., k is one-element; then this variant is assumed to be best. Alternatively, all the criteria k_1, k_2, …, k_k are gone through and subset $A^{(k)}$ contains more variants that are equal, according to the assumed criteria. Consequently, one compromise variant is selected out of them, according to an additional criterion.

Evaluation of multicriterial methods

Multicriterial methods evaluate environmental public projects not only on the basis of one criterion, but more criteria. Inclusion of this fact means to approach the reality more, and therefore a better possibility to implement the decision made. At the same time it also brings certain difficulties to include all the information and to find a compromise decision that would reflect influence of all of the criteria of the decision. To evaluate the environmental public projects, multicriterial methods are widely used. It is so, because the influence on the environment is better evaluated according to more criteria. These criteria are either qualitative, or quantitative. From the most often methods used for environmental public projects I have selected scales approach, the point method and the weight-sum approach, that belong among the methods of individual evaluation of variants; and the lexicographical method as the only representative of the pair comparison methods. However, there are many other multicriterial methods (e.g. TOPIS method, benefit function, methods of the class ELECTRE, PROMETHEE and so on), (more e.g. Fiala, Jablonský a Maňas 1994, or Soukopová 2005)

As aforesaid, an evident advantage of the multicriterial methods is their closer approaching to reality and real decision criteria, where we do not evaluate according to one criterion, but more criteria, often colliding with each other. Nevertheless, these methods also have their weaknesses. The scales approach does not take into account the preferences of individuals and the importance of the criteria. This weakness is solved by the point method to evaluate on the basis of qualitative criteria and the weight-sum approach to evaluate on the basis of the

quantitative criteria. Yet there still arises a question that if we had a relevant evaluation and we selected the most effective project according to it, would it be possible to guarantee that we selected the right criteria? And in case the criteria were selected appropriately, were the weights of the evaluation set properly?

3. Conclusion

Evaluation of public project from the field of protection and formation of environment brings various particularities. The project approach to public expenditures tries to focus on the objective, goals and final effects of the resources invested. Corresponding cost are related to them. Therefore it is important to implement environmental accounting in order to optimalise the decision-making on environmental public projects. Then, were not the investment realized, all the cost that arised would be evident. Optimal decision on what project to chose cannot be done without their economic evaluation (economic analysis). There are various methods of economic analysis to evaluate public projects that valuate the public projects on the basis of one, or more criteria. The essence of the economic approach to analysis and valuation of public projects is to aspect of common sense in negotiations of the participating subjects in a view that a rational conduct lies in effective use of restricted sources in order to reach the goals at the maximum, or desirable benefits. Lately, it has been often stressed that a choice of a suitable method to evaluate the public projects in the Czech Republic is still a weak part of the evaluation process. In the article I tried to analyse and evaluate advantages and disadvantages of mono-criterial and multicriterial methods. The result of this analysis, as well as from a view of practical experience with evaluation shows that it is recommended to combine mono-criterial, or multicriterial methods of evaluation, or even more methods of evaluation; whereas at least one method should be from the group of mono-criterial methods, and one method from the group of multicriterial methods. In case of mono-criterial methods, I would recommend all of the methods aforesaid, where their choice would be left on the evaluator, depending on the character of a project. All of them have their strengths and weaknesses that can be unsurmountable, or absolutely irrelevant for a given project. As for the multicriterial methods of valuation, in order to valuate the environmental public projects, I would recommend either the point method, or the weight-sum approach, primarily because they are both simple while taking into account the preferences of the evaluator and the importance of the criteria of valuation. The scales approach when used for evaluation does not take into account the importance of the criteria and therefore I would not recommend it for the valuation of environmental public projects.

References

1. Bénard, J. 1991, *Public economics III*., EÚ ČSAV, Prague, ISBN 80-238-5978-1
2. Fiala, P., Jablonský, J. a Maňas, M. 1994, *Multicriteria decision-making*, UEP, Prague, ISBN 80-70709-748-7
3. Soukopová, J. 2005, *Valuation methods of public projects*, Brno, Thesis work, Faculty of Economics and Administration, Mendel University of Agriculture and Forrestry in Brno, Brno
4. Soukopová, J. 2006, Metody mimotržního oceňování a jejich využití pro hodnocení environmentálních veřejných projektů. In *The System of Accounting and Reporting for Sustainable Development at Microeconomic and Macroeconomic Levels*. 2006. Brno : University in Pardubice, 2006, SBN 80-7194-866-7. pp. 209-216, 8 vol.
5. Tošovská, E. 1997, 'Techniques of non-market valuation'. In Moldan, B. aj. 1997. Economic aspects of protection of the environment. 1st ed. Praha, Univerzita Karlova, Vydavatelství Karolinum, p. 138–151, ISBN 80-7184-311-3
6. Valach, J. 2006, *Investment decision-making and long-term investment.* Ekopress, II. Revised edition, Prague, ISBN 80-86929-01-9

Mgr. Ing. Jana SOUKOPOVÁ, Ph.D.
Masaryk University, Faculty of Economics and Administration,
Department of Public Economics, Lipová 41a
602 00 Brno-Pisárky,
tel:, fax:, e-mail: soukopova@econ.muni.cz

EVALUATION CRITERIA OF THE EUROPEAN COMMISSION ON ASSESSMENT OF NATIONAL ALLOCATION PLANS FOR 2008 – 2012 – SUPPLEMENTARY COMMENTS ON THE NATIONAL ALLOCATION PLAN OF THE CZECH REPUBLIC

Jaroslav Suchý

1 Kyoto target

Kyoto target will be meeting independently of the EU ETS activities.

In the reference year for the Kyoto target, i.e. in 1990, the Czech Republic was part of Czechoslovakia, whose economy was based on heavy industry, accompanied by substantial mining of energy materials. Industry was then highly energy- and material-intensive and most of the production had low added value. In 1990 – 1995, the economy underwent Fundamentals changes, privatization and the first wave of restructuring. The production capacity of the metallurgy industry has been reduced; the mining of brown coal decreased in 1990 – 2005 by 38% and the consumption of black coal decreased by 43%.

The installed output of the electrical energy system, which is historically based particularly on brown coal, decreased from 15 238 MW in 1990 to 13 794 MW in 1995 and subsequently increased to 17 412 MW in 2005. In 1990, this volume corresponded to almost 79% of the output from coal-burning power plants; in 2005, coal-burning power plants corresponded to 61% of the installed output and contributed to approx. 68.5% of electricity production. In 2006, the installed output of the sources of ES CR corresponded to a total of 17 565 MW, of which thermal sources burning fossil fuel corresponded to 11 538 MW, nuclear power plants to 3 760 MW, hydro-electric power plants to 2 164 MW and wind turbines to 71 MW.

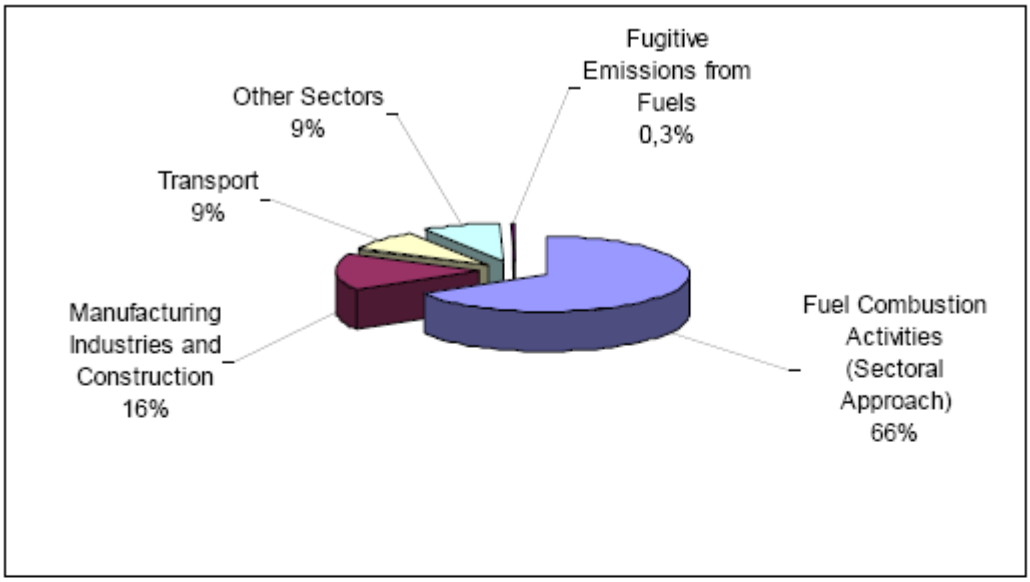
Act No. 309/1991 Coll., on protection of the air, stipulated parameters for reduction of pollutant emissions to a level that was basically comparable with the requirements of the thenvalid Directive 88/609/EEC on the limitation of emissions of certain pollutants into the air from large combustion plants. The stricter emission limits were entry into effect at December 31, 1998. By this date, 2,000 MW of output had been shut down in the least efficient and oldest brown-coal burning power plants. The remaining power plants were equipped with sulphur-removal units and more effective equipment for separation of solid particles and fluid furnaces had been installed in some cases.

The increasing consumption of electricity is covered by new capacities with higher efficiency (including steam-gas cycles), high utilization of the Dukovany Nuclear Power Plant and, recently, also the Temelín Nuclear Power Plant. The individual branches of industry have undergone similar innovations.

During the 1990's, about 1,000 municipalities in the CR were converted to gas; this numer increased 2.5times by 1998. The consumption of gas increased by 42 % over the same period. Gas has mostly replaced coal burned inefficiently in small heating sources.

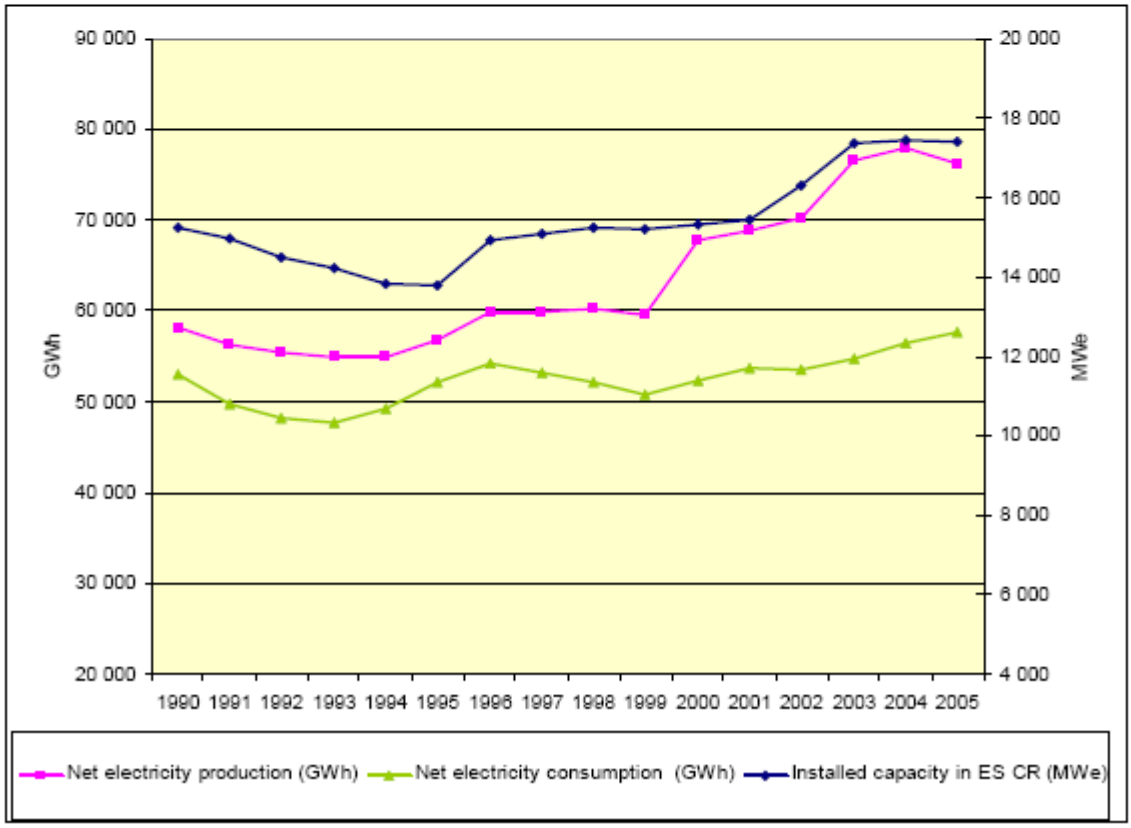
These economic changes were accompanied by reduction in greenhouse gas emissions. In the base year, 1990, total aggregated emissions of greenhouse gases in the Czech Republic amounted to 196.2 Mt. The Czech Republic's Kyoto commitment is minus 8% of that amount, corresponding to 180.6 Mt. According to the most recent inventory, for 2004 (CHMI, 2006), aggregated greenhouse gas emissions correspond to 147.18 Mt.

Composition of greenhouse gases emissions according to sector in 2004



Source: Common Reporting Format for the provision of inventory information by Annex I Parties to the UNFCCC

Installed capacity of the power system and production and consumption of electricity



Source: ERO

The increase in road transport is a growing problem in the Czech Republic. While CO_2 emissions from transport corresponded to 3.5% in 1990, this had increased to 9.1% by 2004 and had doubled in absolute terms.

The moderate increase in emissions in branches included in EU ETS and the increasing emissions from transport will not threaten meeting of commitments; nonetheless, the transport situation requires further measures. Further areas outside of EU ETS, particularly energy savings in households, will be positively affected by implementation of Directive of the European Parliament and Council 2006/32/EC of April 5, 2006 on energy end-use efficiency and energy services, utilization of finances from the European funds to promote savings and renewable energy sources and other promotional measures, described in the enclosed Annex.
Potential transfer of allowances to other countries could not practically affect meeting the Kyoto targets. However, it is assumed that the allowances will be used to cover emissions from operation of sources in the territory of the Czech Republic and other mechanisms of sale of greenhouse gases will be employed only to a "safe degree" so that the commitment is met. In addition, the central Kyoto Register ITL has internal "safeguards" that, if the number of AAU units transferred to other countries approaches the "critical level", prevent further transfer of AAU units abroad. The system of trading motivates participants in a positive manner to economically effective reduction of emissions, leading to introduction of more efficient technologies and increasing competitiveness. From the standpoint of future targets, it can be expected that investments will be developed in the area of renewable energy sources and energy savings. The funds obtained from emission trading should be seen as a stimulus for these investments. Investments through the "Green Investment Scheme" (GIS) and Point Implementation (JI) should be very important, so that is possible to minimize the risk of double counting in the area of energy production to the maximum degree. Further ways of minimizing risks following from double counting include, e.g., projects in the area of production of electrical energy and projects concerned with reducing greenhouse gases other than CO_2.
In the National Program to Mitigate the Impact of Climate Change, the Czech Republic declared a target to reduce CO_2 emissions by 30% by 2020 compared to 2000, by using all the promotional measures available. The National Allocation Plan for 2008 – 2012 contributes to meeting this target in that it allows "business as usual" (BAU) for companies operating in the territory of the Czech Republic. If the assumptions on which it is based are fulfilled, it does not increase the costs for companies per production unit. The lifetimes of most coal-burning power plants in the Czech Republic will end in 2010 – 2015 (they were built in the 1960's and 1970's). The starting up of new power plants with an efficiency of about 40% will result in a marked change in greenhouse gases emissions.
In spite of most carbon dioxide emissions are derived from industry and energy production, especially from branches within EU ETS, where a moderate increase in expected, it can be assumed that the Kyoto commitment will be met in spite of increasing industrial production and increasing GDP.

2. Emission trends

In describing emission trends, consideration was taken of trends in the individual areas of the national economy and separately in the individual branches included in EU ETS. This is based on the assumption that there will be no fundamental change in production technologies and in the installed capacity of energy sector by 2012, decrease of that emissions between the period 2008-2010 can be able only by improving utilization of resources and technically limited replacement of fossil fuels by renewable energy sources.
As installations classified under EU ETS are mostly subject to Directive 96/61/EC on IPPC (Act No. 76/2001 Coll. in the CR) and a number of them have been granted integrated permits pursuant to this Directive, which are valid for a period of eight years, the production base of Czech industry is fixed.

Progress in the economy of the CR in the 1990's was based on fundamental economic transformation, in which it is difficult to determine trends, including emission trends. Estimates of further development of the economy are based on the forecasts of the Ministry of Finance and the Czech National Bank; it is assumed that the 2008 – 2012 period will correspond to the period of one economic cycle. In relation to the volume of investment incentives for new technology, granted by the Government in 1999 – 2004, it is expected that industry will continue to make a substantial contribution to the GDP and that there will be a further shift in production towards products with higher added value and thus a substantial increase in gross added value.

Forecasts of economic developments

		2000	2001	2002	2003	2004	2006 Prelim.	2006 Predict.	2007 Predict	2008 Exp.	2009 Exp.
Gross domestic product	CZK bil. 2000	2189.2	2242.9	2285.5	2367.8	2467.6	2617.8	2 775,0	2 911,0	3 051,0	3 199,0
	prev. year. = 100	103.8	102.6	101.9	103.6	104.2	106.1	106,0	104.9	104.8	104.8
Expenditures of households for consumption [1]	CZK bil. 2000	1149.2	1 174,0	1199.7	1271.5	1304.7	1335.1	1 387,0	1 445,0	1 505,0	1 566,0
	prev. year. = 100	101.3	102.2	102.2	106,0	102.6	102.3	103.9	104.2	104.1	104.1
Expenditures of gov. institutions for consumption	CZK bil. 2000	460.9	477.6	509.6	546,0	528.8	532.2	527,0	529,0	528,0	526,0
	prev. year. = 100	100.7	103.8	106.7	107.1	96.8	100.7	99,0	100.6	99.7	99.7
Gross capital formation	CZK bil. 2000	645.1	688,0	720,0	709.6	768,0	790,0	886,0	958,0	1 030,0	1 105,0
	prev. year. = 100	110.8	106.8	104.6	98.6	108.2	102.9	112.2	108.1	107.6	107.3
- fixed capital	CZK bil. 2000	612.5	652.9	686.1	689.1	721.8	747.9	797,0	859,0	927,0	1 001,0
	prev. year. = 100	106.1	106.8	105.1	100.4	104.7	103.6	106.6	107.8	107.9	108,0
- changes in stocks of valuables	CZK bil. 2000	32.6	35.5	33.9	39 222,0	46.2	42.1	90,0	99,0	103,0	104,0
Export of goods and services	CZK bil. 2000	1387.4	1542.5	1575.2	1688.5	2044.1	2260.4	2 547,0	2 817,0	3 107,0	3 480,0
	prev. year. = 100	116.6	111.2	102.1	107.2	121.1	110.6	112.7	110.6	110.3	110.4
Imports of goods and services	CZK bil. 2000	1453.5	1639.2	1721.7	1859.1	2196.9	2305.7	2 569,0	2 832,0	3 104,0	3 406,0
	prev. year. = 100	116.3	112.8	105,0	108,0	118.2	104.9	111.4	110.2	109.6	109.7
Domestic end use	CZK bil. 2000	2255.3	2339.6	2429.2	2530.2	2600.6	2655.3	2 788,0	2 914,0	3 035,0	3 160,0
	prev. year. = 100	103.8	103.7	103.8	104.2	102.8	102.1	105,0	104.6	104.1	104.1
Methodical discrepancy [2]	CZK bil. 2000	0,0	0,0	39 235,0	39 124,0	19,0	39 268,0	-2,0	-7,0	-15,0	-25,0
Contributions to increase in GDP [3]:											
- domestic end use	% points	39 288,0	39 328,0	39 328,0	39 117,0	39 296,0	39 084,0	39 329,0	39 176,0	39 086,0	4,0
- - end use	% points	0.8	39 328,0	39 235,0	39 287,0	0.6	39 142,0	39 264,0	39 115,0	39 326,0	39 328,0
- - gross capital formation	% points	39 327,0	2,0	39 173,0	-0.4	39 116,0	0.8	39 116,0	39 115,0	39 084,0	39 084,0
- foreign trade balance	% points	0,0	-1.4	-2,0	-0.6	39 173,0	4,0	39 083,0	0.6	0.7	0.6

1) *The consumption of nonprofit institutions is included under consumption in the household sector*

2) *Deterministically determined effect of use of the prices and structures of the previous year as a basis for calculation of actual increments*

3) *Calculation on the basis of prices and structure for the previous year, where the contributions are all additive*

Source: MF

Interannual changes in gross added value (HPH) in the CR (%)

	2008	2009	2010	2011	2012
HPH total	5.5	4.9	4.7	4.6	4.5
HPH industry	6.0	5.0	4.8	4.6	4.4

Compared with EU-25 and EU-15, the CR attains greater rates of GDP increase. Forecasts of trends in HPH are related to current developmental trends and are based on the expert estimates of the CNB and MF CR. This means that the HPH index for 2005 will equal **1,288** in 2010 and **1,408** in 2012[1]

The expected increment in HPH in industry is derived from trends in the past, investment levels and estimates of the future market environment. The HPH index for industry for 2005 will equal **1.392** in 2010 and **1.520** in 2012.

Of the known trends in the branches of industry in the 1990's, account was taken of the fundamental reconstruction of refining, coke and cement plants, volume reduction and technical conversion of production of iron and steel, and the contribution of new technologies

in electricity production and heating (especially fluid combustion). Probable trends were evaluated on the basis of information obtained from the individual industrial federations and verification through the documents of the government agency CENIA, the Czech Environmental Information Agency, which is the evaluating entity in the IPPC permit process. The updated forecasts, prepared for the National Program to Mitigate Climate Change, were also used.

Emissions from combustion processes were calculated in the forecasts using the EFOM/ENV linear optimization model. This model, which is also used in other countries, was also used to calculate the benefits from some measures for evaluation of scenarios with additional measures and without them. The basic document consisted in the Greenhouse Gases Emission Inventory for 2004, prepared by the Czech Hydrometeorological Institute in 2006. The method of calculation is described in the National Allocation Plan and is processed by the MARKAL model, which was also used in creation of the NAP for 2005 – 2007.

Verified CO_2 emissions from sources included in EU ETS for 2005 equaled 84.5 mil. tons, of which 82.5 mil. tons were derived from fossil fuels. The difference between emissions determined in NAPI and emissions verified for the first year in the first trading period (2005) was caused partly by the effect of introduction of the trading scheme and partly by uncertainties in calculation of allocations and determination of the total amount of emissions in NAP I[2]. It can be assumed that these two factors make approximately the same contribution to the difference, i.e. 50% each.

According to the promotive analysis greenhouse gas emissions not including the effect of EU ETS would equal almost 89 mil. tons. Thus, if emissions for 2001 -2012 were calculated linearly in relation to emissions in 2005 (only emissions from fossil fuels), then these forecast coefficients would be employed for the individual sectors from 2005 to 2012.

---

1 Gross added value = Gross domestic product – taxes for products + endowment for products.... Gross added value was choose by reason of it expresses some changes with production of values in economy more precisely.

2 Estimates for 2005 were performed using the data for 1999, 2000, 2001 and 2004. Robust linear regression was employed and consequently the estimate is higher and the error is lower than the relative difference between the estimate and the verified emissions, i.e. the reduction is statistically significant. Pairs of data for 2005 estimates and verified emissions were further subject to the pair nonparametric t-test (Wilcoxon test for median differentiation), which indicates that the estimates for 2005 are significantly higher (for the whole set of sectors), at the 99% probability level (p=0.01). It can be stated very roughly that the effect of increased combustion of biomass (not estimated), assignment of sources and other low-cost or no-regrets measures means that the effect of EU-ETS is about 5-7%. Other re-allocation is felt only as bonuses.

Survey of data for calculation of allocations in NAP II

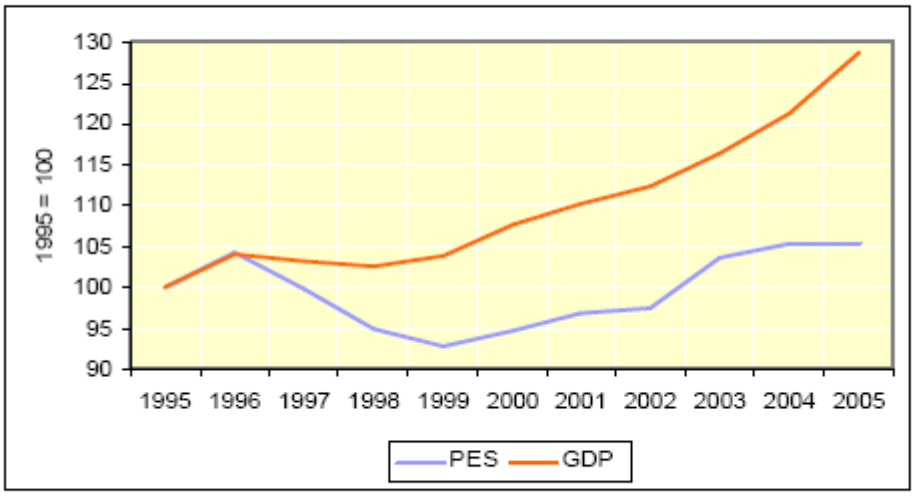
	Proposed allocation	2005 Emissions	Annual growth coefficient comp. to 2005	Reference emission value for 1999-2001	Annual growth coefficient comp. to ref. value for 1999 - 2001
Public energy production	68 612 367	55 953 434	1.0416	62 582 467	1.0186
Energy production - companies	3 859 579	2 527 031	1.0884	3 581 155	1.0151
Refineries	1 133 937	996 971	1.0261	1 055 983	1.0143
Chemical production	4 953 650	4 684 701	1.0112	4 580 533	1.0158
Coke	272 304	238 046	1.0272	231 746	1.0328
Production and processing of metals	14 047 127	12 225 291	1.0282	12 115 266	1.0301
Cement	3 374 841	2 553 038	1.0574	3 048 171	1.0206
Lime	1 263 392	1 008 137	1.0462	1 202 714	1.0100
Glass	862 008	782 407	1.0196	760 687	1.0253
Ceramics	975 608	718 082	1.0632	862 461	1.0250
Paper and cellulose	946 099	758 608	1.0452	971 403	0.9947
Total	**100 300 912**	**82 445 746**	**1.0399**	**90 992 586**	**1.0197**

The complex coefficients of the Markal model, including trends in the sector, emission intensification and initial division of emissions into the individual sectors, are given in the last column of the table. The increase in GDP used in calculation was took from the Czech National Bank over (it is in step with the Eurostat data) and it can be different from the European Commission data.

3. Reduction potential

In determining the reduction potential, account was taken of the fact that substantial decoupling has occurred in the CR since 1990.

Decoupling – consumption of primary energy sources to trends in GDP



Source: Czech Statistical Office, Ministry of Industry and Trade

It should be pointed out that the expected increase in GDP in CR is larger than that anticipated by the European Commission.

The reduction potential of 2% annually for 2006 – 2012 is an expert estimate based on calculation of the annual reduction in CO_2 emissions in 1990 – 2000, equal to 2,3% annually, the contribution of renewable energy sources to total CO_2 emissions in 2005, equal to 2,4%, and the expected implementation of additional measures mentioned in the National Climate Program, as calculated by the model.

5. Prevention of Discrimination

It is apparent from the text of NAP II that the chosen means of allocation is nondiscriminatory. The calculation model works with distribution of allowances amongst the individual branches according to emissions in 1999 – 2001, permitted by the substantially unchanging composition of installations in EU-ETS in 1999 – 2005.
Individual corrections in the sense of the Directive are not employed in the NAP. The "individual corrections" in the calculation mechanism are only corrections for installations that emitted less prior to 2005 than in 2005 – the calculation was then based on the value for 2005, as these were companies whose data indicate economic growth. On the basis of the general valid principles of the calculation, discrimination thus does not occur in the sense of the individually used calculation methods.

6. New Installations

The assignment of allowances to new installations in the Czech Republic is subject to the provisions of Section 10 of Act No. 695/2004 Coll., on conditions for trading in allowances for greenhouse gases emissions and Annex 3 to this Act, where subparagraph 4 imposes the obligation of harmony with Community legislation. New installations are defined in the Act in accordance with Directive 2003/87/EC of the European Parliament and Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

NAP II makes provision for a reserve of 1.5 mil. allowances for new installations. Of this amount, approx. 1 mil. are reserved on the basis of notification by existing operators and 0.5 mil. are designated for currently unidentified installations. We are of the opinion that the amount of the reserve corresponds to future requirements. After using up the reserve, the operators will be forced to purchase allowances or to use flexible mechanisms. A sufficient reserve for new installations should maximally reduce this probability of exhausting of the reserve.

7. Early Actions and 8. Clean Technologies

Bonuses for early actions are proposed in NAP II primarily for fluid combustion, which is far more energy-efficient. These equipments were installed at the end of the 1990's and required considerable expenditures by the investors. 4 JI projects are also involved.
In NAP II, clean technology is considered to include installations for combined production of electricity and heat. The Czech Republic is unusual in the high proportion of centrally supplied heat. Electricity produced from CHP corresponded to 17% of the total amount produced in 2005.
Because of the extensive and transparent adjustment of the bonus system, which was proposed by the ME and MIT working group, bonuses are not discriminatory in character. The system was approved by a commission established pursuant to Act No. 695/2004 Coll. to discuss NAP II. The commission, which held the public discussion of NAP II, included representatives of the public from industrial federations and NGO's.

Allocations and bonuses in the framework of NAP II

	Allocated quantity	EA bonus	CHP bonus and CH bonus
Public energy production	68694255	1 032 651	1 638 712
Energy production - companies	2986807	253 262	73 855
Refineries	1147316	0	0
Chemical production	5451699	325 621	119 605
Coke	260754	0	0
Production and processing of metals	14667513	847 457	260 854
Cement	3152038	231 595	0
Lime	1160459	13 142	0
Glass	863421	7 622	526
Ceramics	866648	32 233	0
Paper and cellulose	876901	248 208	75 896

Other Criteria and Rules

The European trading scheme entails problems related to inclusion of small installations in the trading system, where these installations are not capable of utilizing EU-ETS flexibility because of transaction costs. In accordance with the criteria of Annex I of the Directive, NAP II includes 399 installations, where approx. 70% of emissions are derived from the 20 largest installations. The individual industrial branches are variously sensitive to the precision and accuracy of setting allocations, because they include various percentages of small companies. The means of allocation by the model described in NAP II takes this fact into account.

Jaroslav Suchý
Ministry of the Environment
Czech Republic

ENVIRONMENTAL REPORTING BY A TRANSPORT ORGANIZATION

Petr Škapa

Transport is a sector with a substantial impact on the environment, particularly on air pollution, which extends beyond the boundaries of regions and the borders of countries and continents.

Transport is a source of burdening of the environment by excessive noise and vibrations. The other negative trends in transport include the increasing number of accidents, connected with the loss of human lives and health and property damage. Transport is also a potential source of pollution of the water and soil in transport of hazardous goods. The high energy intensity of transport should also be mentioned.

Environmental pollution and energy intensity differ for individual kinds of transport. However, in spite of all these negative aspects, further development of society cannot be imagined without transport.

The tables at the end of this paper give the contribution of the individual kinds of transport to the energy intensity, pollution of the air by some pollutants, and fraction of accidents in transport of hazardous goods.

From the standpoint of communication between transport organizations and the public, and also of evaluation of the individual kinds of transport, the concept "Information on the environment" can be characterized as data, statistics and other quantitative and qualitative information that a decision-making authority (at the level of the organization itself, state administration) and also the general public require for evaluation of the state and trends in changes in the environment, for formulation and refinement of environmental policy and for purposeful use of funds for improving the quality of the environment.

Information on environmental pollution by operation of transport forms the basis for environmental reporting by a transport organization. Environmental information frequently refers to a number of aspects of processes and phenomena. Environmental information is based on a large amount of data from comparison and measurements and can be misused in business relations.

Requirements on the quality of environmental information can be characterized as follows:

- factual accuracy,
- availability,
- reliability
- temporal limitations,
- potential for analysis.

Information on the state and trends in factors affecting pollution of the individual components of the environment is important for

- monitoring trends in pollution, energy intensity and, on basis of knowledge of these trends, performance of qualified forecasts of further trends in transport businesses,
- assessment of the individual kinds of transport from the standpoint of energy intensity, pollution of the environment by the individual kinds of transport and thus also in assessing domestic transporters, as well as comparison with foreign transporters,

- determination of the necessary measures for assessment of the individual components of the environment (reduction of use of primary resources, reduction of charges, etc.),
- compliance with the valid legal regulations,
- facilitation of decision-making in the area of the economics of transport organizations.

It is the purpose of environmental reporting to obtain and evaluate environmental information necessary for managing activities in an organization and presenting the environmental approach of the organization to stakeholders. The benefits of environmental reporting include:

- provision of basic information for improving the environmental management system of the organization,
- increasing employee motivation,
- reducing the risk of penalties for failure to comply with legal regulations,
- the possibility of presenting a good environmental profile of the organization and thus gaining advantages in negotiations with bodies of the state administration and local self government,
- employing the environmental profile of the organization in negotiations on credit and insurance for the organization,
- promoting good relationships with stakeholders.

In communications on the environmental profile of the organization, stakeholders can be divided into two basic groups, i.e.

- internal users, i.e.
  - management and owners of the transport organization
  - employees of the transport organization,
- external users, i.e.
  - state administration and local governments,
  - business partners,
  - financial and insurance partners,
  - the competition,
  - the general public.

Each of the above groups of users of environmental reporting has different requirements on provision of information.

For the management of a transport organization, an environmental information system becomes an important factor for success and the quality of information required for internal decision-making and is very important for communication with the public on environmental protection policy.

Communication on the environment with employees and the surroundings is an instrument in the policy of the approach of the transport organization towards the environment. Its role lines in improving and evaluating the choice of this policy.

There are a number of reasons why a transport organization should communicate with the public on environmental protection, which affects its activities, because

- the environment is a social issue that affects all organizations and individuals living in the given area,

- the organization and all its activities must respect the basic legal regulations on protection of the environment and communicate on this subject with its own employees and with the public.

The quality of communication on environmental protection is based on the clarity and lucidity of the formulation and content of the information. The organization must provide proof of the actual intention to provide information in a simple manner on its progress, results and/or environmental projects in a manner such that both its own employees and the public understand its choice of approach.

The public reacts very strongly to environmental information. It is thus necessary to gain confidence, as unsatisfactory development and interpretation of results could induce the company's own employees and the public to demand an explanation.

In actual fact, communication on protection of the environment must be adjusted to suit its purpose and must correspond to expectations and requirements. The approach towards employees of the organization must be different from that towards neighbors of the place where the transport organization is located and inhabitants along transport routes.

Prior to introducing environmental communication, it is necessary to

- identify environmental impacts,
- identify environmental target values,
- provide for monitoring of environmental impacts on the basis of environmental target values.

In the next phase of preparation of environmental communication, it is necessary to

- define tactics for communication and environmental policy programs,
- establish the directions and tactics of communication in relation to internal and external users,
- choose suitable means and mediators.

The next phase of resolving the aspect of environmental communication of a transport organization consists in evaluation of the results of communication, objective evaluation of positive aspects and inadequacies and adoption of measures to improve environmental policy, including communication with stakeholders.

The perception of environmental impacts through the target intentions of stakeholders can differ. This is a very important aspect, because it entails the potential for discrepancies that continue to exist between environmental impacts and their perception by stakeholders inside and outside the organization. The organization can also choose a positive method of communication on the basis of what suits it, but it is necessary to also bear in mind that it is not always good tactics to excessively emphasize one's activities, especially favourably.

From the standpoint of communication of the organization with stakeholders in the area of the environment, the following questions should be posed:

- ***why should we communicate***
  - here, it is necessary to define reasons why communication is introduced
- ***what should we communication about***
  - it is necessary to take into account the needs and expectations of the public.
- ***with whom should we communicate***
  - in the area of the environment, the organization must address its employees before the other stakeholders,
  - the organization will choose its target plan or intentions both according to its policy and also according to the nature of the other stakeholders.

- ***when is communication necessary***
  - when the environmental policy of the organization wishes to inform stakeholders of its activities and about its intentions,
  - whenever the environmental policy of the organization has negative consequences for the environment during the normal or developmental activities of the organization.

The **targets of communication** will depend on identification of target intentions, such as:

- reduction of the percentage of inhabitants in a particular area that complain about noise emissions,
- acquainting the stakeholders with actual developments, e.g. at the level of discharge of waste waters into rivers, or of technical safeguarding of places (buildings) where substances harmful to waters are managed.

The **communication policy** will depend on

- bringing care for the environment into accordance with the general policy of the organization,
- continuity and interconnection of all communication events, so that there is no contradiction between them or with the defined policy of environmental protection.
- the fact that it must be disseminated inside the organization before events are commenced outside it.

Means of communication can be characterized as

- environmental declarations on the targets that the organization wishes to achieve,
- regular submission of reports on the environmental impact of the organization in the particular area.

Evaluation is the last stage in the area of communication of the organization with the public on environmental protection and is related to consideration of the progress achieved, taking into consideration perception of public opinion and, of course, in relation to the set targets established by the communication policy.

Table 1: Energy intensity of transport in TJ.

Druh dopravy	Rok					
	2000	2001	2002	2003	2004	2005
SD celkem	**159 880**	**170 061**	**171 196**	**189 159**	**170 642**	**178 813**
IAD	83 106	86 389	86 230	94 367	91 484	89 794
SVD	12 793	14 643	12 988	14 189	21 042	23 663
SND	55 060	59 436	62 726	69 584	58 116	65 356
ŽD	**7 274**	**8 209**	**8 177**	**9 012**	**3 443**	**3 918**
VD	**946**	**799**	**733**	**719**	**128**	**145**
LD	**8 343**	**8 043**	**8 934**	**10 592**	**13 645**	**15 884**

Zdroj: MŽP, CDV Brno

SD highway transport; IAD individual automobile transport; SVD public highway transport; SND highway freight transport; ŽD railway transport; VD water transport; LD air transport.

Table 2: Structure of energy consumption by individual kinds of transport (%)

Druh dopravy	Rok					
	2000	2001	2002	2003	2004	2005
SD celkem	**90,6**	**90,9**	**90,6**	**90,3**	**90,8**	**89,9**
IAD	47,1	46,2	45,6	45,0	48,7	45,2
SVD	7,3	7,8	6,9	6,8	11,2	11,9
SND	31,2	31,8	33,2	33,2	30,9	32,8
ŽD	**4,1**	**4,4**	**4,3**	**4,3**	**1,8**	**2,0**
VD	**0,5**	**0,4**	**0,4**	**0,3**	**0,1**	**0,1**
LD	**4,7**	**4,3**	**4,7**	**5,1**	**7,3**	**8,0**

Zdroj: MŽP,CDV Brno

SD highway transport; IAD individual automobile transport; SVD public highway transport; SND highway freight transport; ŽD railway transport; VD water transport; LD air transport.

Table 3: Production of CO_2 by individual kinds of transport (THOUS. TONS)

Druh dopravy	Rok					
	2000	2001	2002	2003	2004	2005
IAD	6 364	6 343	6 330	6 924	8 874	8 947
SVD	940	1 077	955	1 041	1 503	1 577
SND	3 875	4 356	4 618	5 141	4 120	4 322
ŽD-MT	537	606	604	665	254	259
VD	70	59	54	53	9	11
LD	1 389	1 345	1 406	1 524	1 069	1 244

Zdroj: MŽP, CDV Brno

IAD individual automobile transport; SVD public highway transport; SND highway freight transport; ŽD-MT railway transport – motor powered; VD water transport; LD air transport.

Table 4: Production of SO_2 by individual kinds of transport (TONS)

Druh dopravy	Rok					
	2000	2001	2002	2003	2004	2005
IAD	1 976	1 970	1 954	770	1 118	282
SVD	277	322	282	200	333	50
SND	1 103	1 258	1 333	963	919	138
ŽD-MT	171	193	192	148	57	9
VD	22	19	17	12	2	
LD	624	549	533	539	66	75

Zdroj: MŽP, CDV Brno

IAD individual automobile transport; SVD public highway transport; SND highway freight transport; ŽD-MT railway transport – motor powered; VD water transport; LD air transport.

Table 5. Number of accidents with escape of hazardous substances in highway and railway transport.

Druh dopravy	Rok	Kategorie					
		OH	ONL	RL	NL	NTL	OL
Silniční	1997	2 177	216				
	1998	2 285	139				
	1999	2 558	171				
	2000	2 611	162				
	2001	3 007	79				
	2002			3 900	225	7	27
	2003			4 145	182	5	32

	2004			3 751	271	8	26
	2005			4 028	220	2	24
Železniční	1997	68	266				
	1998	115	216				
	1999	141	159				
	2000	137	1289				
	2001	140	95				
	2002			136	91	1	6
	2003			160	81	2	9
	2004			260	72	2	7
	2005			123	93	2	6

Zdroj: HZS ČR

SD highway transport; ŽD railway transport; RL petroleum substances; OL other substances; NL hazardous substances, OH oil accidents, ONL other hazardous substances, NTL hazardous solid substances.

Table 6: Emission intensities of individual kinds of transport in the CR. Freight transport

Druh polutantu	Čisté tkm na tunu příslušného polutantu		
	SD	ŽD-T	ŽD-E
CO_2	10 047	6 484	**22 881**
CO	661 659	1 035 767	**175 496 530**
NO_x	1 026 401	577 077	**12 856 696**
VOC	2 747 500	4 488 354	**194 444 000**
SO_2	**35 699 534**	20 400 839	12 757 483
PM	15 115 398	7 298 558	**268 842 244**

Emission intensity of passenger transport

Druh polutantu	Osobokm na vznik 1 tuny příslušného polutantu					
	IAD	BUS	ŽD-E	ŽD-T	MHD-BUS	LD
CO_2	10 248	8 935	**13 229**	9 894	7 902	5 048
CO	437 703	1 137 353	**101 465 350**	1 580 448	895 172	3 830 556
NO_x	2 470 367	785 976	**7 433 052**	880 525	690 253	766 111
VOC	2 479 761	4 833 750	**112 415 570**	6 848 563	3 819 400	13 790 000
SO_2	**33 122 245**	30 400 943	7 375 693	31 130 923	30 312 698	13 440 546
PM	**229 639 790**	11 163 395	162 076 120	11 288 594	10 933 397	

Source: Zeman: Emission intensity of basic kinds of transport in the CR, 2005

Doc. Ing. Petr Škapa, CSc.,
VŠB-TU Ostrava, Institut dopravy,
17. listopadu 15, 708 33 Ostrava Poruba,
tel.: 59 732 4428, e-mail: petr.skapa@vsb.cz.

ENVIRONMENTAL ACCOUNTING AND TRADING IN CO_2 EMISSIONS

Ladislav Špaček

Environmental accounting is an instrument that permits the creation of a concept of the impact of the activities of a company or planned changes therein on the vicinity of the company, on the environment, through combination of financial and material data.

The Czech economy has long been based on industrial production. The Czech lands were known as the industrial workshop of the Austrian-Hungarian Empire. Remarkably successful development occurred in the period between the two World Wars. Even the era of central planning was not capable of completely eliminating the entrepreneurial and creative spirit. A number of activities were concerned with innovation and introduction of originally waste-free and later low-waste technologies with emphasis on saving material and energy. The human factor, together with foreign investments, has been responsible for relatively successful transformation of the economy in recent years. Industry has been transformed from central planning to a market economy and, in spite of all the administrative obstacles, businesses continue to be the driving force of current successful economic development.

In the Czech Republic, industrial production is historically founded on advanced machinery production based on internal metal production, as well as an advanced chemical industry, construction-material industry, paper industry, foodstuff industry and other industrial areas that are generally considered to be energy-intense, leading to relatively high energy (material) intensity of the Czech economy.

Structural changes in the process of transformation of the economy after 1990, up to accession to the EU, led to some changes in the proportion of the individual production spheres of industry and an absolute reduction in consumption of energy in industry, but simultaneously led to significant modernization through extensive investments in a number of spheres. It should be borne in mind that, at this time, the gross domestic product attained a higher value, in comparable prices, than that in 1989. The familiar argument that the reduction in greenhouse gas emissions at the beginning of the 1990's was caused only by a reduction in production and energy consumption is quite irrational from the longer point of view.

Modernization in a number of branches of industry has entailed a substantial improvement in the energy efficiency of processes and thus a further increase in energy efficiency will be increasingly difficult in the absence of further, expensive modernization investments and the development of new, more energy-effective technologies in the future. Most processing branches now have specific energy consumption values comparable with those of developed partners in the EU.

The active participation of production enterprises in implementation of IPPC Directive 96/61/EC has made a substantial contribution here. Companies active in the Czech Republic had incomparably more stringent conditions for obtaining integrated permits. In the older countries of the EU, the Directive was to be elaborated by 1999 and the companies thus had 8 years to obtain a permit. In the Czech Republic, Act No. 76/2002 Coll., on integrated pollution prevention, did not allow any exemptions and requires that operators who do not have an integrated permit by October 30, 2007, i.e. less than four years after the first opportunity to submit an application, terminate the relevant activities, i.e. including all chemical production.

In addition to implementation of adopted measures, industry simultaneously actively participated in the preparation and implementation of the strategy of sustainable development, and auditing of the existing and preparation of new environmental legislation. Fundamental emphasis was placed on preventative measures, combating excessive bureaucracy and

especially preservation of equal conditions for operation of a corporation and thus the competitiveness of industrial enterprises in the Czech Republic.
While the idea of sustainable development may have seemed somewhat vague in its initial form, it is gaining a quite concrete dimension at the present time in relation to the aspect of climate change and its potential consequences and limitations for future economic development.
Only development of society that respects the social dimension can be sustainable – this encompasses a general improvement in the living conditions of people in developing and developed countries that respects environmental aspects – reduction of the anthropogenic causes of climate change, including reduction of the impact of climate change, and an economic dimension – this should be possible for acceptable costs using the technologies available today and in the future. This idea has been accepted by industry and constitutes the basic philosophy of most important corporate entities at the present time.
Stabilization of the climate requires commencing of immediate, but well devised actions and exertion of long-term efforts over the next few decades. Legal requirements and incentives must be well-balanced and must be selected so as to avoid an increase in emissions and so that a reduction is achieved over a relatively short time interval. The climate change program in the CR must be based on the real potential at the present time and realistic assessment of future possibilities. Steps should be taken that permit utilization of short-term opportunities to reduce emissions, connected with measures of a medium- and long-term character, so as to retain the principle of balanced sustainable development in the Czech Republic and also in the European Union under the conditions of a fully open economy of the CR.
In the area of climate change, we are certainly not starting from scratch. In this connection, I would like to point out the approach employed in performing the voluntarily accepted task of the CR in connection with ratification of the Kyoto Protocol and with the first experience gained in trading in emission allowances.
The European Union Greenhouse Gas Emission Trading Scheme –(EU ETS) is one of the instruments devised by the Community with a view of fulfilling its commitment to reduce greenhouse gas emissions under the Kyoto Protocol to the UN Framework Convention on Climate Change. The Czech Republic, as a new EU Member State, is obliged to join EU ETS, although the original agreement between the EU 15 States on sharing the Kyoto commitment within the framework of the EU (2002/358/EC) is not directly applicable to it. Thus, in fulfilling its commitments, the Czech Republic continues to be bound by its individual obligations. This is all contained in the introduction to the material adopted by the Government of the CR.
Comparison of the results achieved in implementing the Kyoto Protocol in recent years leads to interesting findings:

1. Emissions in CR decreased by 25.8%, for comparison, EU 15 reduced emissions by 1%
2. Absolute emissions in CR decreased from 194.3 MT in 1990 to 141 MT in 2005 and their contribution to the production of global emissions decreased from 1.2% to one half of this amount.
3. Decoupling – for an increase in GDP of 23% in constant 1995 prices, greenhouse gas emissions decreased to less than 75% of their original value.
4. Almost 400 installations participate in NAP. 85% of emissions are generated in the 45 largest installations and over 95% of emissions are produced in the 100 largest installations.
5. The national allocation plan for 2005 – 2007 corresponded to an amount of 97.6 MT. For fulfillment in 2005 of 82.5 MT, 30 installations had insufficient allowances; however, for fulfillment in 2005 *(2006? – trans.)* of 82.5 MT, 35 installations had insufficient allowances.

Has anyone considered whether it is appropriate to use this instrument, whether it does not correspond to excessive administration and persecution of small and medium-sized companies?
In the chemical and refining industry, trading affects only 20 installations in 16 companies, of which 11 are member companies of SCHP CR (Association of the Chemical Industry of the CR) On this relatively small sample, we have mapped in detail the experience of companies over two years of trading, which can be summarized as follows:

1. For 7 companies with emissions from 7 to 27 thousand tons, this involves excessive administration (this includes 5 companies that are not members of SCHP CR).
2. A further 4 companies have a substantial difference between CO_2 emissions covered by EU ETS and those reported to IPR, because the Draft NAP does not respect the proposal for allocation for combustion processes according to the requirements of Commission Communication No 5055 of January 4, 2006.
3. During work to date, the basic documents for prepared new production processes and an increase in current production have not been taken into consideration.

The opinion of the Ministry of the Environment on the Decision of the European Commission of 26 March, in which the ME welcomed the reduction in NAP for the CR to 86.8 MT, i.e. by almost 15%, is completely incomprehensible to me. I am convinced that the Minister cannot actually believe his subsequent statement, "Today's decision by the Commission is certainly not a decision that would limit Czech industry. The allocated number of allowances is, in fact, 5% higher than the actual emissions of Czech industry. It is apparent that the Commission decided not to repeat the error in allocating allowances in the previous control period and that its goal is to increase the price of emission allowances on the market".

Conclusion

So far, I have been of the opinion that protection of the climate and the creation of equal conditions on the market were really involved, but now it seems that the instruments have suddenly become the goal. Together with the fact that the rules of the game have been changed substantially in favour of those that are not meeting their obligations, this supports to my opinion that:

1. These are not an economic instrument that should replace potential tax adjustments, which are in the competence of national governments, but rather administrative instruments.
2. The use of this instrument in meeting the obligations of the Kyoto Protocol in the CR is inappropriate.
3. The State is capable of being firm only with those that try their best and communicate, but has no means of enforcing the rules on the rest.

I am glad that environmental accounting has remained a useful voluntary instrument and am convinced that it will be possible to maintain this state of affairs in future years.

Ing. Ladislav Špaček, CSc.,
ladislav.spacek@schp.cz

ENVIRONMENTAL SERVICES

Jiří Študent

Environmental services are most important for economy, employment and competitive advantage it is reason why OECD and Eurostat have interest about this sector. Definition of environmental services mentioned in The environmental goods and services industry – manual for data collection and analysis issued by OECD and Eurostat in 1999. Because it is not easy distinguish between environmental services used for other reason then for help the environment DG Environment held first meeting consultants which will prepare study about this industry.

In Czech Republic for description of environmental services we can use statistic research ŽP 1 – 01. This data describe relatively exactly environmental services because they are focus on demand side. But if you want describe competitive advantage of services you can't use this information. CEMC – Czech Environmental Management Center is partner for project "**Consequences of the Liberalization of Environmental Services"** starting 2007 and terminate 2009. Project supported by the Grant Agency the Czech Republic. Other partners are Univerzita Jana Evangelisty Purkyně v Ústí nad Labem, Národohospodářský ústav AV ČR. This project oriented on disclosure of barriers on EU market for this sort of services and competitive advantage Czech services after removal this obstacles.

Aim of CEMC is research among environmental industry and evaluation of competitive advantage. CEMC will concentrate on internal potential individual organization to distinguish the base of competitive advantage. If based on cost advantage we expect short live of organization, if based on innovation and learning scheme we expect long live in open international market.

Jiří Študent, executive director
CEMC - Czech Environment Management Center
Czech Republic
Jevanská 12, 100 31 Praha 10
tel: (+420) 274 784 447-8, fax: (+420) 274 775 869
cemc@cemc.cz, www.cemc.cz

THE CONCEPTION OF ENVIRONMENTAL GOODS IN THE INTERNATIONAL TRADE

Eva Tošovská

Introduction

The growing significance attributed to the environmental protection and sustainable development strategy, has been a cause of an increasing focus of separate countries on trade in the goods that may contribute to the environmental protection and efficient utilization of natural resource. These so called „environmental goods“ (EG) include those that „measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise ad eco-systems, including cleaner technologies, product that reduce environmental risk and minimise pollution and resource use“ (see Environmental Goods...1999).

The objective is to find a solution and arrangement in this sphere that would beneficial both to environmental protection and international trade (win-win effects), while it would not be discriminative to the developing countries. There is predominant opinion at international level that the optimal way is liberalising trade in environmental goods. In opening domestic markets to the international economy by reducing tariffs and other trade-distorting measures, advanced know-how embedded in such goods and environmental technologies will become more readily available, reducing tariffs environmental goods will be cheaper, trade liberalisation also provides incentives for technological progress expansion and enables the transfer of valuable skills. Liberalising trade in this sector can also be a powerful tool for economic development by generating economic growth and employment.

On the other hand, there is different opinion articulated namely by developing countries, that liberalization can have the negative impacts on vulnerable industries of developing countries, in particular fledgling small and medium-sized enterprises, and sections of populations without the purchasing power to access privately-delivered environmental goods.

Commitments undertaken in diverse international fora support the liberalisation and market expansion of the environmental goods sector. Among these commitments, the mandate in the 2001 Doha Ministerial Declaration of the World Trade Organization, is especially important for its multilateral impact. This declaration calls „for negotiations to reduce or, as appropriate, eliminate tariff and non-tariff barriers for trade in environmental goods“[17]. However, implementing such a strategy poses major challenges.

The aim of this presentation is to analyse the methodological issues connected with identifying environmental goods for international trade purposes. It tries to characterize the main barriers avoiding reaching a consensus on suitable approaches to listing environmental goods earmarked for accelerated liberalisation. The several indicators have been used to describe the achieved level of trade liberalization in environmental goods in the Czech Republic in the second part of presentation. The presentation is closely connected with definition of the environment industry presented on last year conference.[18] If defining the environmental industry is fraught with difficulties, measuring exports and imports in „environmental goods“ and analysing levels of tariff protection is probably even more difficult.

[17] see paragraph 31 (iii) of the Doha Ministerial Declaration of the WTO, 2001

[18] See Tošovská, E., Ritschelová I: Eco-industry in the Czech republic, Proceedings…2006, p.212.

1. Identifying environmental goods for international trade purposes

It is quite evident, that identifying „environmental goods“ from international trade point of view is essential first step in order to analyse (and reduce) levels of tariff protection. Environmental goods is not special trade nomenclature product categories. Today, customs tariff schedules are based on the Harmonised system (HS). However, there is no special HS chapter for „environmental goods“ as there is, for example, for cotton goods, steel products and other.

1.1 List-Based Approaches

In the absence of any internationally agreed list of EG, an attempt was made to develop such a classification in recent years. At first, there is namely illustrative categories of environmental goods with harmonised commodity description and coding system (HS) product codes submitted by OECD and Eurostat in year 1998. The ambition of this list has been to create a framework for more detail analysis of trade flows and tariff burden of this segment of market. EG is identified at the 6-digit level of the HS system which is common to all WTO members. The list is not exhaustive because some EG have no equivalent HS commodity code. A several modification of list of EG has been proposed later, especially by APEC (Asia-Pacific Economic Cooperation). Many different countries submitted revised versions of lists of EG.

Practically, all „list of EG“ have to face the similar methodological problems. The most serious concerns multiple uses. Many environmental products have multiple end-uses, many of which are not environmental. (In preparing the illustrative list of EG by OECD-Eurostat, a relatively wide „sweep“ was taken, so that few products considered by expert evaluators to have more than negligible environmental use were excluded)[19]. Identifying EG that embody particular processes that have been defined as „cleaner“ is also a serious problem. A technology that reduces resource use or pollution today may be relatively dirty in a few years, as more advanced technologies become available. Another open question is whether to take into account also EG based on so-called „process and production methods (PPMs) criteria[20] and products which cause significantly less environmental harm at some stage of their „life cycle“ than alternative products that serve the same purpose. All problems mentioned above are still under discussion in the negotiations.

One group dominated by developed and newly industrialised countries supports the so-called „list“ approach, which consists of listing goods earmarked for accelerated liberalisation. This block of countries recommends to accelerate the negotiations with aim to reach a consensus on final version of list of EG and after that to shift to own tariff reduction negotiation.

The European Community (EC) is supporter of broad definition of environmental goods. The EC suggested to not only include goods used in pollution control and resource management, but also „goods that have a high environmental performance or low environmental impacts“. The EC acknowledged that some of these products might need to be defined through standards, which require certification, proposing to use schemes included in the existing international network Global Ecolabelling Network.[21] However, the EC proposal was widely rejected by many developing countries.

The US proposed that two lists be established: a „core list“ of goods that everyone agrees are environmental and a second, „complementary list“ of other proposed environmental goods. Tariffs would be eliminated on the „core list“ of goods by 2010, and countries would be required to liberalise a certain percentage of products from the „complementary list“ by 2010.

---

[19] See Environmental Goods and Services, The benefits of further global trade liberalization, OECD 2001, p.14

[20] Namely the US has rejected inclusion of goods based on non-product related process and production methods (PPMs) – the way they have been manufactured (due to Article III of GAT)

[21] see Bridges – Trade Biores, ICTSD, IUCN, vol.5, No. 4, March 2005

The similar proposal to establish two lists of EG put forward also China. China suggested the possibility of developing a „common list of EG“ which would include goods of interest to both developed and developing countries and a „development list of EG“ which would provide for special and differential treatment, allowing developing countries to select a list of products on the common list for no or less reduction commitment.
The common feature of all approaches mentioned above is the same base: list of environmental goods.
On the other hand, there is second group, which includes most developing country WTO members, which remains skeptical of the list approach, arguing that the lists submitted so far only contain goods of export interest to rich nations . Developing countries do not have comparative advantages in trade in these products. That is why those countries indicated their support for inclusion of environmentally-friendly natural products of export interest such as juta, coir, rattan and bamboos in the list of environmental goods. These goods have inherently beneficial environmental aspects such as biodegradability. Developing countries have proposed some alternative methods to liberalising trade in environmental goods.

1.2 Alternatives to List-Based Approaches

The only alternative to the list approach that is seriously being discussed is the „environmental project approach“, put forward by India. According this approach tariffs on environmental goods and services that are being used in specific projects would be reduced or eliminated for the duration of the project. Such projects would be approved by a Designated National Authority based on certain criteria to be developed by the Committee on Trade and Environment WTO. This approach, India believes, provides sufficient policy space for national governments to achieve environmental objectives. The supporters of India approach pointed out that environmental project approach leads to minimization of multiple end-uses of EG and to suitable connection EG with environmental services.
Among alternatives to list-based approaches is possible to include also „criterial approach“ suggested by Korea. For the identification of environmental goods, Korea suggested a number of practical and simple criteria they had used to draw up their proposed list. These include that the end use of the products should be primarily for an environmental purpose, that products should be classifiable under the HS code and that environmentally preferable products and goods that are defined by the process and production methods (PPMs) or their superior environmental performance should be excluded „for practical reasons“.[22] Korea's proposal mentioned above attracted most support as a practical way forward.
WTO members remain broadly divided into two camps over the approach to take on the list of environmental goods also during the negotiations at WTO Ministerial Conference being held on December 2005 in Hong Kong. The negotiations are still under way in Committee on Trade and Environment (CTE) WTO.

2. Analysis of environmental goods customs tariffs in the Czech Republic

In spite of fact that the agreed list of EG does not exist yet and all methodological issues are not solved yet, the first preliminary analysis of EG customs tariffs in the Czech Republic is presented. This analysis is based on “illustrative categories of environmental goods with harmonized commodity description and HS commodity codes” (Environmental goods..1999). The environmental goods involved in this list are structured into three main parts:
Part A – Pollution management group
of which goods for

- air pollution control (a1)

[22] more see Bridges - Trade BioRes, ICTSD, IUCN, No.4, March 2005

- wastewater management (a2)
- solid waste management (a3)
- remediation and cleanup (a4)
- noise and vibration abatement (a5)
- environmental monitoring, analysis and assessment (a6),

Part B – Cleaner technologies and products

Part C – Resource management

- water supply (c2)
- goods for renewable energy plants (c4)
- goods for heat/energy saving and management (c5).

The following analysis is based on the data of the General Customs Office Prague which cover period 1993 – 2002 year. It includes 161 tariff lines of environmental goods, of which more detail data are available only for part A (a1 – a6). The present analysis of the tariff burden in the Czech Republic aims at expanding the range of information to consider in developing the Czech Republic's position in the course of the negotiations.

We have used several indicators below to describe the achieved level of liberalisation of trade in environmental goods in the Czech Republic.

The first indicator is **the share of bound tariffs on environmental goods** in the total number of the tariff lines. Czech Republic, identically to e.g. the U.S. and EU, ranks among the countries that have adopted bound tariffs (i.e. contract rates of duty) for all tariff lines of industrial articles. Commitments undertaken by the Czech Republic with regard to the bound customs tariffs on industrial articles are fully reflected also in the environmental goods analysis. All environmental goods tariff lines are subject to bound tariffs in the Czech Republic. By this, transparency of trade transactions gets significantly improved for all potential exporters of this type of goods.

Another widely recognised important indicator of the country's degree of openness to trade is represented by **the share of duty free tariff lines** in the total number of the tariff lines. Table 1 below provides information on the share of duty free tariff items in the total number of environmental goods tariff items in the Czech Republic (2003).

Tab. 1: Share of duty free tariff lines of environmental goods in the Czech Republic

Number of tariff lines of environmental goods (EG)	Duty free bound	Duty free bound	Duty free non-bound	Duty free non-bound
	Number	%	Number	%
Total environmental goods (161)	19	11.8	/	/
out of which, goods serving:				
A1 air pollution control (27)	1	3.7	/	/
A2 waste water management (68)	6	8.8	/	/
A3 solid waste management (19)	/		/	/
A4 remediation and cleanup (3)	/	/	/	/
A5 noise and vibration abatement (3)	/	/	/	/
A6 environmental monitoring, analyses /21/	8	38.1	/	/
B,C – other /20/	4	20.0	/	/

Calculated based on the data of the Czech General Customs Office (duty free non-bound tariffs are not used in the Czech Republic).

It follows from the table data that the share of the duty free tariff lines in the overall number of the environmental goods tariff lines in the Czech Republic amounts to practically 12%. The

degree of openness of the Czech Republic to the environmental goods imports (as measured by this indicator) as almost 4 times higher than a similar indicator for the EU (3.2%) and comes close to the same indicator for Canada (13.7%). On the other hand, it is 3 times lower compared to a similar indicator for the U.S. (34.7 %).[23]

Another feature providing description of an overall level of tariff protection with regard of environmental goods is defined as **the average bound customs tariffs** on environmental goods and their separate subgroups. The reason for choosing the simple average method for the bound tariffs has been an opportunity to make comparisons to certain other available information.

Tab. 2: Simple average of bound tariffs for environmental goods (2003)

Goods	**%**
Total environmental goods	4.0
out of which, goods serving:	
A1 air pollution control	3.6
A2 waste water management	3.9
A3 solid waste management	4.4
A4 remediation and cleanup	2.9
A5 noise and vibration abatement	4.0
A6 environmental monitoring, analyses etc.	1.4
B, C – other goods	7.1

The simple average of bound tariffs for environmental goods in the Czech Republic amounts to 4.0%. The leading advanced QUAD countries (i.e. Canada, the EU, Japan and the U.S.) show a lower value of the indicator (2.5%). As a useful illustration, we are adding that e.g. a selected group of developing countries (Argentina, Brazil, Chile, Malaysia, India, Indonesia and Thailand) record the average tariffs for environmental goods at 28.7%.

The tariff burden on environmental goods may be examined also from the perspective of **tariff dispersion.** It applies in general that the economic inefficiency of the tariff regime increases with the considerable dispersion of tariffs, i.e. if their structure includes both a high number of tariff peaks and of very low values. A comparatively uniform structure of tariffs is more transparent and, from the administrative point of view, easier to manage, while it also creates less room for tariff escalation.

One of tariff dispersion indicator suitable for performing an analysis of environmental goods consists in the incidence of "tariff peaks". Tariff peaks are understood to include those exceeding the determined reference level. The OECD documents distinguish between "national" peaks where the reference level is represented by the threefold national average tariff and the "international" peak with the reference level set at 15%.[24]

The below table is setting out a calculation of the tariff dispersion of environmental goods in the Czech Republic applying both the "national" and "international" peaks.

[23] Data for the EU, U.S. and Canada have been calculated using Appendix 3 "Bound and applied tariffs on environmental goods in 14 markets" that has been based on the tariff databases of the UNCTAD and WTO. In: Environmental Goods and Services (The benefits of further global trade liberalisation), OECD 2001, p. 77 ff.

[24] Certain other surveys apply 10% reference level, and some other ones even 20% reference level.

Tab. 3: Tariff dispersion in environmental goods in the Czech Republic (2003):

Number of tariff lines of environmental goods	3-fold average	Number of tariff lines with rate of duty exceeding 3-fold average	Number of tariff lines with rate of duty exceeding 15 %
Total environmental goods (161)	12.0	1	1
Out of which, goods serving:			
A1 air pollution control (27)	10.8	0	0
A2 waste water management (69)	11.7	0	0
A3 solid waste management (19)	13.2	0	0
A4 remediation and cleanup(3)	8.7	0	0
A5 noise and vibration abatement (3)	12.0	0	0
A6 environmental monitoring (21)	4.2	0	0
B,C other (20)	21.3	1	1

The tariff dispersion in environmental goods in the Czech Republic, evaluated using the above indicators, is but a minimum one, as the share of lines exceeding national and/or international peaks in the total number of tariff lines of environmental goods is 0.6% in either case.[25] Otherwise, the highest tariff rate for environmental goods is 9% in 2003 (only for a single tariff line), while 15 tariff lines fall within the interval 6 – 7%. In fact, an overwhelming majority of tariff lines of environmental goods is subject to the rate of duty up to 5%.

All indicators mentioned above to describe the high degree of openness of the Czech Republic towards imports of environmental goods. The simple average of bound customs tariffs on environmental goods imported to the Czech Republic was 4,0% in the 2003, its level dropped by approx. 28% in comparison with 1996 year.

After the final "list of environmental goods" is agreed in the frame of WTO, it will be possible to specify the above mentioned analysis.

[25] The only deviation is tariff line „Ethylalcohol" with the rate of 77% (the rate amounted even to 86,1% in 1996).

References:

1. Environmental Goods and Services, The Benefits of Further Global Trade Liberalisation“, Trade. Environment, OECD 2001,
2. Market Access: Unfinished Business, Post-Uruguay Round Inventory and Issues, Special studies 6, WTO 2001,
3. Liberalising Trade in „Environmental Goods“: Some Practical Considerations, OECD, COM/ENV/TD(2003)34, May 2003,
4. Environmental Goods and Services Industry Manual for the Collection and Analysis of Data, OECD/Eurostat, Paris 1999,
5. Tošovská,E., Oravcová E.: Vybrané nástroje obchodní politiky a ochrana životního prostředí v ČR (Selected Instruments of Trade Policy and Environmental Protection in the CR¨), CERGE-EI Discussion Paper Series No.114-2003, December 2003,
6. Tošovská, E.: Analysis of environmental goods’s export, import and tariff rates in the Czech Republic in the period 1993 – 2002, Discussion paper Series no. 2003 – 11, November 2003,
7. Tošovská E.: Foreign Trade in Environmental Goods in the Czech Republic (1993 – 2002), Prague Economic papers, December 2004, No. 4, 291 – 309 pp., Bridges, Trade BioRes .

Judr. Eva Tošovská, CSc.,
AV CR,
Politických vězňů 7, 11121 Praha 1,
tel. 224 005 182, e-mail: eva.tosovska@cerge-ei.cz

COSTS RELATED TO OCCUPATIONAL HEALTH AND SAFETY

Jan Vávra, Jaroslava Hyršlová

Introduction

Sustainable development is a new framework strategy for development of the civilization. Its objective is to provide for development that will ensure balance amongst the three basic pillars: economic, environmental and social. Thus, the concept of sustainability is based on three basic objectives: to maintain high and stable level of economic growth and employment; to effectively protect the environment; and to provide for sound use of natural resources and ensure social development respecting the needs of all. Ensuring sustainability at the enterprise level entails provision for economic growth while respecting a sound approach to the environment and social aspects. Important social aspects of sustainable development include, e.g. corporate philanthropy, communication with stakeholders, provision for health and safety of employees, compliance with the working standards, enforcement of the ban on child labor, provision for work-life balance, enforcement of equal opportunities (for women and men and for other less-favored groups in general), diversity at the workplace (ethnic minorities, handicapped persons and elderly people), provision for requalification of dismissed employees that is necessary for their further employment, certainty of employment, etc. Attention in the area of human resources management is paid primarily to selection and application of suitable management styles, effective and transparent communication and general awareness of employees, comprehensive evaluation of the working performance of employees, education, level of working relations and, last but not least, care for occupational health and safety and care for acceptable working environment.

The area of occupational health and safety (hereinafter OHS) is an integral part of the social pillar of sustainable development. At the strategic enterprise level, it includes specification and implementation of the strategy in the area of OHS, while at the tactical and operational level, it comprises measurement, monitoring and evaluation of the performance of the enterprise in this area, as well as reporting to internal and external stakeholders. In the area of OHS, the enterprise, as the employer, is obliged:

- To create a safe and harmless working environment and working conditions; this must be ensured through suitable organization of OHS.
- To adopt measures to prevent risks, remedy risks or at least minimize their impact.
- To adopt measures for handling extraordinary events (e.g. accidents, fires and floods).
- To provide for employee training in legal and other regulations providing for OHS.
- To provide employees with personal means of protection.
- To ascertain the causes and circumstances of occurrence of job-related injuries and to keep records thereof.
- To provide the employees with information on the risks of their work and information on measures for protection against their effects.
- To organize tests of OHS at all workplaces and facilities and to remedy any ascertained shortcomings.

It follows from the list of duties that enterprises must ascertain any problems related to OHS, resolve these problems, prevent them and provide for safe and harmless work by their employees. Therefore, they must pay attention to the organization of OHS and particularly to the aspects of prevention. They must be prepared to resolve extraordinary events and explain the causes and circumstances of occurrence of job-related injuries. All the aforementioned

activities result in costs that are part of the corporate costs and affect the performance of the enterprise.
The traditionally collected information related to OHS is concerned particularly with the area of job-related injuries. Enterprises record, e.g., the frequency of occurrence of job-related injuries, their type, places of occurrence, the potential period of incapacity for work, etc. This information is then linked, e.g., with the number of employees, the number of hours of work, etc. However, it must be borne in mind in the context of economic relations that it is important, not only to determine the costs related to these injuries, but particularly to ascertain the value lost by the enterprise as a consequence of these injuries and the value thus following from implementation of preventive measures [3; 4]. This article is concerned with the aspects of costs related to OHS. Attention is dedicated particularly to categorization of these costs. In a great many cases, it is expedient to monitor, evaluate and provide both external and internal users with data on the costs related to OHS – i.e. use them to support decision-making processes. Together with environmental costs, they constitute an important part of the accounting system of an enterprise, which could contribute to enforcement of the concept of sustainable development in the practice of industrial enterprises.

1 Basic categorization of the costs of OHS

The costs of OHS include a number of various items. They can be classified in two summary categories [5]:

a) **The costs of operating the OHS management system and other activities related to securing OHS in the enterprise.** The types of cost items and the amount of these costs are relatively stable. It is characteristic for these costs that they are usually not affected by unfavorable incidents, such as accidents, breakdowns or job-related injuries.
b) **The costs incurred as a consequence of unfavorable incidents (e.g. accidents, breakdowns, job-related injuries) – i.e. consequence costs.** These costs can be either direct expenses increasing the current costs or potential loss of revenues and opportunity costs. They are dependent on the type and frequency of individual incidents (accidents, breakdowns, job-related injuries) and their consequences.

It is characteristic particularly for consequence costs that it is very difficult to determine their amount. Nevertheless, it is possible to identify certain factors enabling estimation of the amount of these costs [1; 5]:

1 Type of incident (accident, breakdown, job-related injury) and length of absence.
2 Wage structure and policies of the enterprise; job positions that could be affected by the incident and salaries of employees in these positions and their employment contracts; laws and State social policy, etc.
3 The scope and area of competence of the OHS management in the enterprise. In major enterprises (unlike small enterprises), an incident affects a great many of employees and gives rise to the corresponding activities and internal administrative processes and procedures, the problem is dealt with at a number of organizational levels, etc.
4 The character of job positions that may be affected by incidents, the possibility of replacement, substitutability of individual employees, etc.

A great many studies have been drawn up with respect to the economic relations of OHS. They were concerned either with determination of the costs incurred as a consequence of unfavorable incidents related to OHS (e.g. due to job-related injuries), or evaluation of the costs and benefits resulting from implementation of measures in the framework of OHS [2; 7]. Studies concerned with the subject of costs incurred as a consequence of unfavorable incidents are clearly predominant. The following text is concerned only with this category of costs.

2 Costs incurred as a consequence of unfavorable incidents and determination thereof

The studies concerned with the area of costs incurred as a consequence of unfavorable incidents indicate the effort to distinguish those costs that are unambiguously direct (e.g. indemnification based on a job-related injury) from indirect costs that are also incurred as a consequence of an unfavorable incident, but are not visible at first sight (i.e. are hidden), e.g. non-productive time of co-workers, administrative costs, fines, etc. Classification in the above-described cost categories can be based on the **criterion based on insurance criteria**; thus, costs that can be refunded under the insurance (direct costs) are very often distinguished from costs that cannot be refunded in this manner (indirect costs). Based on this factor, the ratio of direct and indirect costs differs in individual countries given the variances between their legal and insurance systems.

Another option for determining costs incurred as a consequence of unfavorable incidents lies in **activity-based approaches**. These approaches emphasize the causal link between an incident (breakdown, accident, job-related injury) and its consequences and attempt to determine its economic relations. Thus, the object of interest within these approaches consists in activities following after an incident and their economic impact. Within these approaches, it is possible to differentiate costs as unambiguously direct (i.e. clear, visible) and indirect (i.e. hidden). However, the direct or indirect character is based on whether the given costs can be ascertained from the enterprise's accounting system.

2.1 Activity-based methods

The activity-based approach is used e.g. in the Accident Consequence Tree (ACT) method and the Systematic Accident Cost Analysis (SACA).

Within the **ACT method**, the consequences (i.e. also costs or benefits) are classified as [5]:

- Lost working time.
- Loss of short term assets (e.g. materials and products).
- Loss of long term assets (e.g. machines and equipment).
- Additional costs (e.g. transport costs, consultancy and advisory services, fines).
- Loss of revenues (e.g. due to loss of a contract or reduction of the sale price).
- Income (refunds from insurance companies).
- Other costs (e.g. related to modification of insurance policies for future terms).

Other classification of costs is used in the **SACA method**. Similar to the previous approach, this method is again based on the consequence of job-related injuries and concentrates on costs arising from them. The objective of this method is to provide the management with guidelines for identification of these costs that can be used without any in-depth knowledge and experience from the area of accounting and financial analysis. The costs connected with job-related injuries are classified to [6]:

- Costs caused by absence of an employee (e.g. payments of sickness benefits).
- Communication costs (e.g. costs of mutual communication amongst the employees, costs of communication between the employees and the management).
- Administration costs (e.g. salary issues, requirements on reporting, supplementary examination).
- Costs of prevention initiatives (e.g. acquisition of machine parts, training activities).
- Costs related to the disturbance of the production process (e.g., incorporation of substitute employees, loss of revenues, work overtime, etc.).

- Other costs (fines, donations to the affected employees).

2.2 Health & Safety Executive Method

The aforementioned approaches to classification of the costs related to OHS are based on an attempt to differentiate between direct and indirect costs. The direct nature of costs is either based on insurability or takes into account incorporation of the costs in the enterprise's accounting system. Classification of costs to direct and indirect is also used by another method of measurement of costs related to OHS – the Health & Safety Executive method (HSE). The method takes into account financial costs and opportunity costs. Financial costs are defined as costs caused by the necessary activities that must be carried out as a consequence of an incident (accident, breakdown, job-related injury). Opportunity costs are costs for which the enterprise receives no "refund". Thus, this method emphasizes that it is necessary to take account of the costs that would not be incurred by the enterprise had the incident not occurred.

Within the HSE method, the costs are classified in the following categories: injury costs, accident costs and ill-health costs.

Injury costs are costs caused by an injury; these costs are usually covered by insurance and they are subsequently refunded. Costs that are not covered by insurance are more important; these are particularly costs caused by subsequent absence of an employee, damage to property, costs of first aid.

Accident costs constitute an important cost category. Any unplanned incident that results in an injury or illness of workers or that causes damage to equipment, facilities or material is considered to be an unfavorable incident. Accident costs can be classified in two categories:

- Financial costs: additional costs that are caused by an attempt to attain the required output (e.g. work overtime, costs of repairs, costs of additional materials, fines and penalties, etc.).
- Opportunity costs: "non-productive" salary costs in cases where employees cannot work as a consequence of the incident. These costs include, e.g., salaries of workers waiting for a repair of machines or equipment or employees, who are unable to work as a consequence of an injury, and costs caused by downtime of machines or equipment.

For full calculation of these costs, it is necessary to take account of other costs (circumstances) that could be incurred in relation to the incident; a number of items can be difficult to determine.

- First-Aid treatment.
- Transport of the employee to a hospital.
- Making the area safe.
- Putting-out fires.
- Immediate shutdown of equipment and cessation of all activities.
- Time required for the competent employees to record and investigate the incident.
- Meetings to discuss incident.
- Time spent with OHS/legal authority inspector.
- Fees to external consultants providing assistance in investigation of the incident.
- Assessing/rescheduling work activities.
- Recovering work/production.
- Removal of waste, equipment and products, etc. from the workplace and its vicinity.

- Restoration of the standard level of work.
- Repairing any damage/faults.
- Hiring of purchasing tools, equipment, services, plants, working surfaces, etc.
- Salary costs related to the injured worker.
- Salary costs related to the replacement workers.
- Lost working time.
- Overtime costs.
- Recruitment costs for new staff.
- Contractual penalties based on non-compliance with the terms of the contract.
- Cancelled and/or lost orders.
- Re-assuring customers.
- Providing alternative sources of supply for customers.
- Compensation claim payments.
- Legal and solicitor's costs.
- Staff time dealing with legal cases.
- Fines and costs imposed due to illegal conduct.
- Increase in insurance premiums.

Ill-health costs are very important; they equal several tens of millions working days worldwide each year. In a number of cases, these factors are hidden; they become the subject of interest only when the illness becomes permanent or causes permanent consequences or in cases of long-term incapacity for work. Ill-health costs are related to absence of a worker, work overtime, any loss caused by reduction of production, possible failure to meet deadlines for contracts, as well as costs of recruitment and training of new employees in cases of long-term illness. An important factor can lie in inappropriate efforts required from other workers and working stress. This can result in additional costs, e.g. an increase in the illness rate can lead to reduction of working motivation, reduction of performance or frequent migration of labor force and subsequent recruitment and training of new labor force.
All the above important factors should be taken into account when calculating all categories of costs resulting from job-related injuries or other unfavorable incidents. It is clear that the individual types of incidents will vary depending on the sector, structure of labor force, dangerous character of substances that are used in internal corporate processes, age of the production equipment, training or qualification of employees and other factors.

Conclusion

The costs related to OHS can be defined as costs expended by an enterprise in relation to securing requirements related to OHS and incurred by an enterprise as a consequence of unfavorable incidents or illness (e.g. in connection with job-related injuries, accidents, etc.). It is clear from the definition of this cost category that it is suitable for industrial enterprises to monitor these costs. In a number of industrial sectors, these costs will constitute important items (with respect to other cost categories or the amount of the turnover). If the management of an enterprise has available relevant information on these costs, it may use it to support the decision-making process and to influence the amount of these costs. This information can be used to propose measures that contribute to improvement of the care for safety and health protection and thus avoid costs resulting from unfavorable incidents. Good management of

OHS will certainly be reflected in other areas. Possible improvements can be achieved in the area of work productivity and effectiveness of production processes. The fluctuation of employees and illness rate is reduced; all this contributes to greater satisfaction amongst employees and improvement of the quality of their work.
Information on consequence costs is very important for the management. The implemented studies indicate an attempt to differentiate amongst unambiguously direct costs and indirect costs that are incurred as a consequence of these incidents, but are not visible at first sight – they are "hidden" from the management. Activity-based approaches can be readily used to determine these costs. These approaches emphasize the causal link between an incident (breakdown, accident, job-related injury) and its consequences and attempt to determine all its economic effects. Based on these approaches, it is possible to identify the areas of OHS that could primarily be the subject of interest for the management and to quantify benefits that could be attained by suitable measures.

Acknowledgements

This work was supported by the Grant Agency of the Czech Republic under project No. 402/06/1100.

Reference:

1. Dorman P.: The Economics of Safety, Health and Well-being at Work: An Overview *in* ILO (International Labour Organization): Focus Program on Safe Work. Geneva: ILO, 2000.
2. Lanoie P., Trottier L: Cost and Benefits of Preventing Workplace Accidents: Going from a Mechanical to a Manual Handling System. *Journal of Safety Research*, 1998, 29, 2, 65-75.
3. Larsson T.J., Betts N.J.: The Variation of Occupational Injury Cost in Australia; Estimates Based on a Small Empirical Study. *Safety Science*, 1996, 24, 2, 143-155.
4. Monnery N.: The Costs of Accidents and Work-Related Ill Health to a Cheque-Clearing Department of Financial Services Organization. *Safety Science*, 1998, 31, 59-69.
5. Rikhardsson P.: Accounting for Health and Safety Costs *in* Schaltegger S., Bennett M., Burritt R. (Eds.): Sustainability Accounting and Reporting. Dordrecht: Springer, 129 – 151, 2006.
6. Rikhardsson P.: Accounting for the Costs of Occupational Accidents. *Corporate Social Responsibility and Environmental Management*, 2004, 11, 4, 63-70.
7. Söderqvist A., Rundmo T., Aaltonen M.: Costs of Occupational Accidents in the Nordic Furniture Industry (Sweden, Norway, Finland). *Journal of Occupational Accident*, 1990, 12, 79-88.
8. The costs of accidents and ill-health at work. [Online on] *http://www.hse.gov.uk/costs/costs_overview/costs_overview.asp* (03/30/2007).

Jan Vávra, MSc., Ph.D.; Jaroslava Hyršlová, Assoc.Prof., MSc., Ph.D.
University of Pardubice, Faculty of Chemical Technology
Studentská 84, 532 10 Pardubice, Czech Republic
jan.vavra@upce.cz; jaroslava.hyrslova@upce.cz

GREENHOUSE GAS EMISSION TRADING

Pavel Zámyslický

Abstract

The paper introduces the issues of tradable emission rights as a phenomenon of the current global economy. At the same time, it introduces the basic principles of the functioning of this economic instrument and effect on decision-making of subjects carrying business in the sector of energy. Delimitation of trading systems – Flexible mechanisms of the Kyoto Protocol vs. the European system of tradable greenhouse gas emission rights, i.e. the EU Emission Trading Scheme (EU ETS). Summary of market opportunities and threats.

Introduction

The essential measures to support future policy in the field of climate change are considered mitigations and adaptations that have to go hand in hand in order to preserve the current „comfort“, which the planet Earth offers its inhabitants. While adaptations help people adapt to adverse effects that are associated with a change of climatic conditions, mitigation measures mainly aim to reduce greenhouse gas emissions discharged to the atmosphere. Although opinions on the extent and time horizon of this activity are differing, essential is that there exists general acceptance of the necessity to significantly reduce emissions of these gases on a worldwide scale. The key factor in this situation appears to be energy sector which is the largest global „producer“ of CO2 emissions linked with the use of fossil fuels in the process of electric power and heat generation. At present, therefore, the most appropriate policies and measures for energy sector are sought for in all parts of the world. When attending to this problem, we consider, on the one hand, the supply side, i.e. a change in fuel mix and higher use of emissionless and low-emission energy generating sources, and on the other hand, the demand part, i.e. savings and higher effectiveness of energy use.

From the history to the theory

Greenhouse gas emission trading system is able to effectively motivate the economic subjects to reduce greenhouse gas emissions, on both supply and demand sides. Emission trading has been existing in various forms since the late 1960s, when it was for the first time applied in practice in the United States. Since that time, this economic instrument has experienced frequent applications in a number of countries and regions worldwide. The principle of its functioning is rather simple. This means setting of a particular emission target – emission bubble, whose size is given by the number of tradable emission rights (permits/credits/units) allocated to the particular emitters who through these rights cover the production of a regulated polluting substance. Emission source operators then may freely handle the acquired rights, i.e., in particular, mutually trade them. From the logic of the matter it results that on the „emission“ market established in this way, the rights or permits are traded at a price corresponding to the rules of supply and demand. Individual business carrying subjects then compare this price with their costs of avoidance of a unit of the given pollutant. If the costs of avoidance or disposal are lower than the price of the emission permit, then it pays the economic subject to carry out reduction measures and sell the saved permits to another subject, whose marginal costs are at a higher level. This leads to economically effective reductions in a regulated pollutant from the viewpoint of the entire system. I will try to explain, in more detail, the situation on the following practical example.

In our particular case, the costs of avoidance are linked with carbon dioxide emission production limits for industrial sources included in the EU Emission Trading Scheme (EU ETS). These costs of the individual subjects depend on the basic allocation of emission permits, i.e. the measure which is set according to emission target for the given subject/sector/state, and which will affect whether and how much the given subject has to buy on free market. Such decision is also influenced by the price of emission right = permit on the market and right the costs of avoidance = marginal costs of disposal of 1 tonne of emissions.

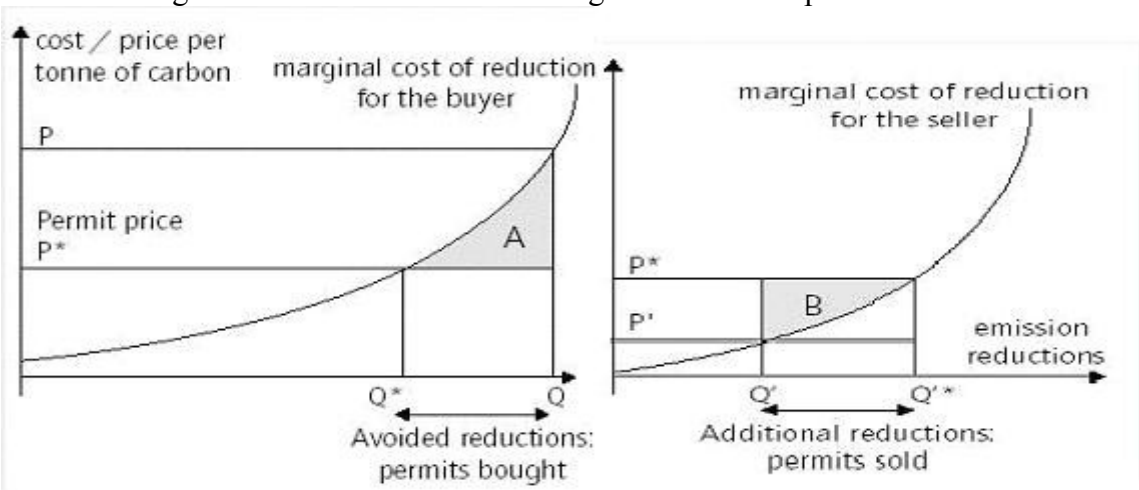


Figure 1 (Marginal Abatement Cost Curve - MACC)

On the Figure 1, the situation of two subjects included in emission permit trading system is shown. For *subject A*, marginal costs of avoidance (P) are higher than permit market price (P^*). Desired level of emission reduction is shown as Q. If under the given situation *subject A* would show economically rational behaviour, it will be reducing, using its own resources, the emissions to the extent of its marginal costs equaling to the price of emission permits (P^*), the emissions reduced in this way will amount to Q^*. The difference between Q and Q^* will be the volume of emissions covered by emission permits that *subject A* should buy on market. *Area A*, highlighted on the Figure, represents cost savings achieved through the purchase of permits, compared to the situation where subject A would accomplish the entire reduction using its own resources – without the trading scheme.
The right side of the Figure shows the situation of *subject B*, which is in the contrary position to *subject A*. Desired level of reduction is indicated Q´. In this situation, marginal abatement costs of emissions are below the market price of emission permit. In this event, *subject B* will show economically rational behaviour, if it realizes higher emissions reduction, up to Q'^*. The difference between Q'^* and Q´ is the number of permits that can be sold on the market. Net profit gained from the sales of emission permits is represented by area B.

Current ways of trading

● **EU Emission Trading Scheme (EU ETS) – European system of CO_2 emission allowances trading** in its principle is a typical example of „Cap and Trade“ system, based on the distribution of a certain limited amount of emission rights (allowances) among polluters, who thanks to the market of these tradable emission rights may choose their individual strategy of further steps, i.e. reduce emissions and sell the allowances, let emissions at the existing level or even increase emissions and compensate for such increase by purchasing allowances. This model is a corner-stone of the present policy of the European Union in the field of combating climate change which is to ensure, in economically effective way, to meet the Kyoto commitment undertaken by the EU states *(note: under the Burden Sharing*

Agreement, this represents a commitment to reduce EU-15 emissions by 8% in the period 2008 – 2012, compared to emissions of the reference year 1990). The EU ETS was established in 2005 and currently it represents the largest market of emission rights in the world. The basic functions of the system are as follows:

I. Definition of regulated sectors and substances
II. Definition of reduction targets
III. Definition of time framework - period
IV. Allocation of emission allowances
(a) based on historical emissions (grandfathering), (b) benchmarking, (c) auctions
V. Allocation of allowances to the accounts of businesses and beginning of trading
VI. Monitoring and reporting of emission data
VII. Verification of emissions of the particular facilities for the control period
VIII. Cancellation of the respective number of allowances
IX. Check by authority (fulfillment/sanction)
X. Evaluation of meeting the targets (or back to step I.)

Trading within the system proceeds in so-called trading periods. For each period, prior to its beginning, the distribution of permits in the form of National Allocation Plans (NAP) is prepared. Each allocation plan is subject to approval by the European Commission and the Member States are obliged to submit the plans 18 months before the beginning of the respective trading period. The first trading period which is perceived as a pilot period (in this trading period there exist certain differences from the system functioning in „standard" periods), is for three years (2005-2007), the following ones are five-year periods and are coincident with the Kyoto Protocol control periods (2008-2012 etc.).
The Directive of the European Communities (2003/87/EC) defines the conditions for entering into the system (defining categories of the facilities which the system is compulsory for). Within the system, the allowances are transferable on the territory of the EU without limitations and holders thereof there may become also natural and legal persons that are not polluters (i.e. those who do not get them through the allocation plan and have to buy them on secondary market). Within the EU-27, the system of trading covers approximately 12 000 facilities and over 50% of greenhouse gas emissions. In the Czech Republic, this area is regulated by the Act No. 695/2004 Coll., in valid wording.

● The next of the instruments used in permits trading are so-called **Flexible Mechanisms of the Kyoto Protocol**. The aim of use of the flexible mechanisms is to achieve maximal reduction in emissions at minimal costs. Flexible mechanisms are based on the fact that the reducing of greenhouse gas emissions represents a global problem and, therefore, it does not matter where the financial resources intended for reductions will be expended. In other words, of concern is the fact that it is better to reduce a larger amount of emissions at lower specific costs in less developed countries than a smaller amount at the same costs in more economically developed countries. In the Kyoto Protocol, the following three mechanisms are defined:

JI – Joint Implementation: This is a project mechanism which can be used in all economically developed countries (Annex I) that ratified and adopted the Kyoto Protocol, i.e., in the Czech Republic as well. The „investor" country provides finance in the form of grant into a particular project in the host country. For this, it gains emission reductions achieved thanks to the project in question. The unit used for 1 t CO_2e of emission reductions under JI is called „ERU". RMU (Removal Unit) units are issued by the state if direct man-caused forest

activities or activities transforming land utilization lead to clean elimination/drop of greenhouse gases.

CDM – Clean Development Mechanism: This is a project mechanism used by advanced countries in developing countries having no commitment under the Kyoto Protocol (non-Annex I). Similarly to JI, the „investor“ country provides finance in the form of grant into a particular project in the host country. For this, it gains emission reductions achieved thanks to this project. The unit used for 1 t CO_2e of emission reductions under CDM is called „CER“ – Certified Emission Reduction.

IET – International Emission Trading: This means „Cap and Trade“ between economically advanced countries (Annex I) that within their commitment have been assigned, instead of permits, Assigned Amount Units (AAU), by which they cover their national emissions. This activity may have the character of entirely inter-governmental trade with national reductions or trade based on specific projects (Green Investment Scheme - GIS).

● **Linking Directive (2004/101/EC)** has brought interconnection of the EU ETS system with the Protocol project mechanisms. It brings larger flexibility which is beneficial to both “worlds“. Facility operator in the EU ETS may use, to cover its own emissions, not only permits but partly also cheaper greenhouse gas emission reduction units, i.e. CER and ERU. On the one hand, this will allow extending export of investments and environmental technologies to the states with developing economies. On the other hand, also positive effect on the price of all types of tradable units should be seen. The price of emission allowances under the EU ETS might show modest drop, which would certainly be welcome by industry, on the contrary, the price of „Kyoto“ units might increase which would mean larger flow of investments into the realized projects. However, the whole system is not entirely trivial and requires, within the states as well as supra-national systems, implementation of a number of procedural measures.

Current situation on emission trading market

At present, a layman may find the situation somewhat not easy to survey as trading with various emission commodities - units, credits and allowances, proceeds within two interconnected systems. This is corresponded to by a range of offered „commodities“ and also by different prices reflecting market supply and demand balance and also differing risk levels posed by the particular rights/permits to their owner. It is definite that each of the mentioned rights/permits represents an equivalent to one tonne of carbon dioxide emissions = CO_{2equiv}. In general, it can be stated that emission trading market is rather young and thus also to a great extent volatile.

The EU ETS market was established in the period between 2004 and 2005, with the trading volume in 2005 having amounted to 362 millions of allowances. In the next year, trading volumes reached approx. threefold increase, having shown interesting price trends. Until April 2006, prices were rising from approx. 20 EUR/allowance to reach the maximum of 29.75 EUR/ allowance (18th April 2006) and to reach, during several days, a drop to 10.90 EUR (2nd May 2006) after the first estimates of verified emissions of the facilities within the EU ETS for 2005 were made available to the public.

The prices within the EU ETS are influenced by large electricity supply companies generating approx. 60% of all emissions. Permit price trends therefore depend on price differences between gas and coal; at high prices of gas (lower specific emissions) it is preferable to incinerate cheaper coal in thermal power plants, although this requires using a larger volume of allowances. Allowance price further depends on winter temperatures that usually also affect gas prices. Emissions produced by the manufacturing technologies are not so flexible

and other sectors have not many opportunities to optimize costs or revenues connected with the allocated emission ceilings.

Figure 2 Allowance price trends including transaction volumes (EUA 07 - 2005-2007, EUA 08 - 2008-2013)

Current low prices of emission allowances being at a level of transaction costs show negative effects on a number of projects in the field of reducing greenhouse gas emissions and of course also on renewable source projects that are potential CDM or JI projects, which are initiated by high prices of emission units and thus also by potential revenues. The current „bear“ trend is also of influence on the price trend of allowance forward contracts for NAP2. Similar trends appear also in CER prices that since 2006 have shown a drop of approx. 20%. The European Commission responded to the fall of prices by reducing national allocated allowances amounts for the second trading period (NAP2). Furthermore, for the second trading period, the Commission attempts to curtail a possibility of entering of emission credits from the flexible mechanisms, which aims to maintain market stability and ensure to meet the commitments under the principle of supplementarity[26]. In general, it can be expected that stricter established emission limits will again increase allowance prices in the second trading period (2008-2012) over the level of 20 EUR. Such increase in the price should recover the motivation factor of emission trading and rise of investments to improve energy efficiency and reduce emissions. Of course, we can also expect effect on spot prices of electricity, where the allowance price is reflected in short-time marginal costs, accounting for 15 – 30% of the total costs, and significantly influences engaging of sources in electric power system. At a rise of allowance price over 30€, a so-called „break point“ would be exceeded, and gas-fired power plants would get in competitive advantage in comparison with coal-fired power plants.

[26] The principle of supplementarity means that at least half of all measures aiming to reduce emissions should be initiated at domestic level

Table 1 Volume and value of "carbon" markets

	2005		2006		2007	
	reality		*reality*		*assumption*	
	[Mt]	[million €]	[Mt]	[million €]	[Mt]	[million €]
EU ETS in total	362	7218	1017	18143	1750	18503
Exchange	262	5400	817	14575	1550	15903
beyond Exchange	100	1818	200	3568	200	2600
Other ETS	7,8	58	31	300	50	500
CDM	397	1995	523	3349	456	3260
CDM 2	4	50	40	571	96	1061
JI	28	96	21	95	45	277
Sum	799	9401	1632	22458	2397	23601

Conclusion

As indicated above, the current emission trading system represents one of the most significant features of the present global economy – the value of completed contracts in the past year exceeded the sum of 22 mld. €. Emission trading offers clear economic benefits compared to non-market approaches to regulation of greenhouse gas emissions. Emission trading system influences a number of sectors of economy and creates new market opportunities. Similarly, it provides further possibilities for application and theoretical research of new economic approaches and methods.

From the market viewpoint, projects focusing on the use of advanced environmental technologies are directly as well as indirectly stimulated. These stimuli are directly triggered through flexible mechanisms of the Kyoto Protocol, allowing direct co-financing of the projects through tradable emission reduction units. This leads to improved economic effectiveness of the projects and better competitiveness on free market. If we look at an example of support for renewable energy sources and subsidy in the form of emission reduction credits, the final price of electricity might be competitive, compared to classical fossil sources.

Another possibility of application of emission reductions is connected with the system of tradable allowances (Cap and Trade), whose most significant example is the European trading system (EU ETS). In this system, the government transfers the obligation to reduce emissions to businesses – the largest producers of carbon dioxide. These subjects are trading on joint market of allowances that represent the right to discharge the respective amount of emissions and whose price affects behaviour of particular actors on market. Such behaviour should again lead to preferred investments in reductions or in emissionless sources that may, in some cases, substitute fossil sources. Compared to the latter ones, the first named sources need not cover their production through the allowances, gaining thus economically quantifiable advantage.

References

1. Zamyslicky, P.: Obchodování s emisemi skleníkových plynů, ČVUT - FEL, Praha 2004
2. Point Carbon – Carbon Market Survey 2007, Oslo 2007
3. Zámyslický, P, Chmelík, T.: Vliv ceny povolenky na cenu elektřiny, ELEN, Praha 2006

Ing. Pavel Zámyslický
Climate Change Department of the Ministry of the Environment
e-mail: pavel_zamyslicky@env.cz, tel: 267 126

MACROECONOMIC ACCOUNTING IN TRANSPORT IN THE CZECH REPUBLIC – INCLUDING EXTERNALITIES

Jan Zeman

Abstract

It is important to monitor external costs especially in economic sectors like e.g. transport where they have a large importance. Can we then find out, that some human activities are more expensive than a conventional economic calculation can show. It results into considerably unequal conditions which are the source of various structural deformations, e.g. an excessive volume of transport and excessive share of a road and air transport in the Czech Republic at the expense of railway and public transport. It can produce important environmental and public health damages. Unfortunately the statistics does not support us with sufficient data.

Introduction

Every business organisation controls its costs and benefits to obtain an overview of their breakdown and optimises ones.

Also the state authorities should do a similar activity. The state is not to take a care about private costs and revenues, it is the private business. On the other side the state requires a reliable book-keeping for a tax collection purposes. But the state should pay attention to social or external costs and benefits. These costs are realised in different forms – from grants from public budgets and tax allowance to classical externalities like economic damages on environment. The external costs basic feature is that costs are not an item in company's books. This fact substantionally influents reliability of an economic analysis.

METHODOLOGY OF A GROSS AND NET EXTERNAL COSTS IN TRANSPORT

Transport belongs among sectors with a high range and variable structure of external costs, which individual carriers do not pay or are covered free of charge. These costs are distributed considerably unequally among different kinds of transport.

External costs of particular kinds of transport have not been yet exactly quantified; nevertheless there have been made attempts for such a calculation. For example author has tried to approximate external costs by adding some available items from particular kinds of transport. (road, rail, air, inland water and city public transport). The original estimates were published several timed, among others in special Czech bi-monthly Doprava.

The used methodology is shown in a following text.

GROSS EXTERNAL COSTS OF PARTICULAR KINDS OF TRANSPORT

Public expenditures for transport infrastructure

are expenditures from the state budget, the State Fund of Transport Infrastructure, loans guaranteed by state for road and railway's infrastructure, state subsidies of regions and municipalities and European Union structural funds. In the case of city public transport only subsidies for the City of Prague transport infrastructure expenditures are available.

Expenditures for recovery of public f transport vehicles

These expenditures are covered from municipal and state budget together. Data are available only for the 20 largest cities.

Public subsidies to cover city public transport loss

These subsidies are diversified according to kinds of transport: the state budget covers only long-distance rail transport, regional budgets cover only regional bus and rail transport and city budgets cover only city public transport. Data are available only for the 20 largest cities.

Traffic police expenditures

These expenditures are not separately registered. According to transport experts of the Ministry of Transport traffic police expenditures can amount from one eighth to one tenth of a total expenses of the state police but a part of city polices is unknown. In our calculation we included only one ninth of State police expenses, the expenses are apportioned according to of the number of accidents, incurred by particular kinds of transport (in the case of road and city public transport the actual amount is larger due to a certain part of city polices expenditures).

General tax allowances

- exemption from real estate tax due to environment protection (according to letter. ´o´ and ´l´ of §4 and §9 of the Act. No. 338/1992 Coll., about reel estate tax),
- excise tax allowances due to environment protection (lower rates excise tax on biodiesel, LPG and CNG and between 1993 and 1995 unleaded petrol too),
- road tax allowances (letter ´e´, ´i´, ´j´ and ´ch´ of §3 the Act No. 16/1993 Coll., about road tax),
- exemption from excise tax for international and intrastate water and air transport based on international agreements.

VAT allowances due to environment protection were abrogated on the date 1. 1. 2004.

Exemption from VAT to international transport

Including fuels based on international reciprocal agreements.

External human health damages

are calculated as economic losses cased by compulsory working inactivity and treatment expenditures injured, more frequently ill and crippled persons as a result of negative influence of a transport. It also includes economic human health damages due to traffic accidents, excessive traffic noise, emissions of SO2, NOx, CO, VOC and ground level (tropospheric) ozone caused by motor transport. PMs quantised only as emissions from vehicles exhaust pipes without tyres abrasion (our estimation is 17 000 t/year). (We have not been able to calculate human health damages owing to PAH from motor transport.)
For our study purposes we used a calculation made by J. Polena form early 80s concerning human health damages by PM, SO2, NOx, CO and VOC from transport.

Traffic accident casualties

Include injuries incurred by motor vehicle in road and city public transport, rail vehicles, air transport and inland navigation.
Deceased (only inculpably) are counted until 30 days from accident including pedestrians and bikers.
Accuracy calculation damage – victim to accidents – is ± 10 %.

Increased morbidity owing to excessive traffic noise

Is calculated on the general morbidity growth basis tables with in growing traffic noise (according to Sisma et al.) and corrective coefficients (0.9 for trains, 1.0 for cars and 1.1-1.2

for aircrafts). Except noise (in dBA) human health is also affected by a quality of noise. (We use adjusted data collected by J. Polena.)
In the case of noise from air transport there are 3 authoritative studies. (J. Polenta et al., J Zeman and MoE). In the case of road transport noise we use an extensive study of Ulrich et al. Accuracy of estimation is ± 20 %.

Increased morbidity owing to emissions of PM, SO2, NOx, CO and VOC

is based on emissions from particular kinds of motor transport took over from CDV Brno. Their economic evaluation is taken over from Polena estimates adjusted on present economic conditions. Corrective coefficients are 1.5 for rail transport, 8.0 for road transport and 12.0 for city public transport). To have been but possibly take into account reality, that road transport is biggest issuer issues to the ground layer atmosphere, which breathe. That answer and given emendatory coefficient, which amounts for motor traction railage 1.5, for road transport 8.0 and for bus MHD 12.0.

Ground level (tropospheric) ozone (0_3) causalities

Emissions from motor transport together with solar radiation form a toxic mixture and change among others to ground level (tropospheric) ozone. The amounts of people having died in the CR due to tropospheric ozone were estimated only for years 1999, 2000 and 2003. Casualties are allocated according to particular kinds of transport.

Damages owing to CO_2 emissions

are calculated according to recommendation of the EU (CEMT Conférence Européenne des Ministres des Transports) as 1 - 2 % of GDP. Regarding special conditions in the CR (above standard emissions of CO_2 and below standard GDP per capita) we used upper limit. This method looks considerably imperfect, but more accurately as compared with e.g. method ExternE.

Damages owing to end-of life vehicles

are calculated according to the number of permanent deregistered vehicles in 2005 in the CR and recycling fee for vehicle. Due to a number of reasons the reality is probably higher then reported number.

Other kinds of externalities

in connection with:

- waste automobile oils, discarded tyres, used accumulators and batteries,
- salting roads in winter period,
- killed animals,
- emissions injuring fields, woods, building etc.,
- fragmentation throughout the country,
- leakage of fuels at traffic accidents,
- slowing-down of city public transport vehicles by road transport (personal cars and lorries),
- share of growing individual transport to obesity and illness connected with.

Appearances hereto, that nonexistent data needed to numeration these of other externality, aren't these in calculation included.

Items not indicated as gross externalities:

- **damages on vehicles owing to traffic accidents** (paid from compulsory and optional insurance, or covered by owner of vehicle),

- **book loss of the Czech Railways** (mainly due to unequally market conditions /rails are depreciated, but roads and waterways are not/ and partially due to unsettled loss from personal transport,
- **appropriation of land for particular kinds of transport,** (internal contradictory with positive and negative consequences),
- **take-off and landing charges** (this charges are not externalities).

Added together above - mentioned items of externalities we obtain an **approximate of minimal gross externalities of five main particular kinds of a transport** in the CR.

NET EXTERNALITIES OF PARTCULAR KINDS OF TRANSPORT

On the other side transport produces certain economic benefit. Above all there is a **revenue from fuels excise tax**, but a correction for **uncollected tax** has to be done (this correction is done according to estimated fuel consumption for particular kinds of transport). Further there is revenue **from road tax**.

NET AND GROSS EXTERNALITIES OF PARTCULAR KINDS OF TRANSPORT IN 2005

Table: Gross and net externalities of transport in the Czech Republic in 2005 (bill. CZK, current prices)

Costs, expenditures and allowances	Road	Rail	Water	Air	CPT*)	Total
Public expenditures for transport infrastructure	52,573	19,813	0,302	0,000	5,057	77,745
State and municipal expenditures for recovery of public f transport vehicles	0,227	0,000	0,000	0,000	1,754	1,981
Public subsidies to cover city public transport loss	4,331	7,166	0,000	0,000	11,887	23,384
Traffic police expenditures	3,549	0,010	0,000	0,000	0,016	3,575
General tax allowances	2,360	0,350	0,036	5,803	0,154	8,703
Exemption from VAT to international transport	5,547	0,076	0,012	1,483	0,000	7,118
External human health damages						
Traffic accidents casualties	24,528	0,098	0,018	0,000	0,096	24,740
Increased morbidity owing to excessive traffic noise	10,653	0,658	0,000	0,006	1,825	13,142
Increased morbidity owing to emissions of CO, NOx , VOC, SO_2 , PM, including electricity	17,041	0,108	0,002	0,094	1,532	18,777

Damages owing to CO2 emissions including electricity	7,276	0,519	0,005	0,610	0,518	8,928
Ground level (tropospheric) ozone (0_3) casualties	.	.	.	.	.	.
Damages owing to end-of life vehicles	0,197	0,000	0,000	0,000	0,000	0,197
Total gross externalities	***128,282***	***28,796***	***0,375***	***7,996***	***14,642***	***188,29***
Fuel excise tax	-65,490	-1,091	0,000	0,000	-3,049	-69,630
Uncollected fuel excise tax	-2,398	0,040	0,000	0,000	0,112	-2,550
Road tax	-8,235	0,000	0,000	0,000	0,000	-8,235
Net externalities	***56,955***	***27,745***	***0,375***	***7,996***	***11,705***	***112,975***

Source: Ministry of Finance, Ministry of Transport, Czech Railways, Traffic Directorate of the Czech Republic Police, Directorate General of the Czech Republic Police, author's estimates.

CPT) - City public transport*

The table shows that gross externalities amounted to CZK 180 billion in 2005. After adding of two missing items (according to situation in previous years) we can estimate that total gross externalities amounted to CZK 189 billion in 2005. It represents 6.4 % GDP. Substantial share, roughly CZK 60 billion, were economic damages of human heath. Other CZK 9 billion was damages on climate.

Table also shows, that transport in the CR (and similar situation is in other countries) is directly and indirectly, openly and hidden, heavily subsidised, so that is essentially less expensive and hence can accumulates more than would responded to an economic reality. It tends to hypertrophy. Table also confirms that the most favoured kind of transport is a road one, which is the most dangerous and less environmentally friendly.

The road tax is very low in comparison with road network expenditures and even newly established motorway toll for vehicles above 12 t. will not substantionally change it. Even relatively high revenue for fuel excise tax does not cover all externalities. Nevertheless we can see a gradual improvement mainly due to increasing of fuel excise tax as of 1. 1. 2004, improvement of a collection in 2005 and decrease of road accidents casualties.

Also to its performance the air and water transports are also heavily subsidised. A main item is an exemption from fuel excise tax and an exemption from VAT in international transport. Water transport need not to pay for use of waterways.

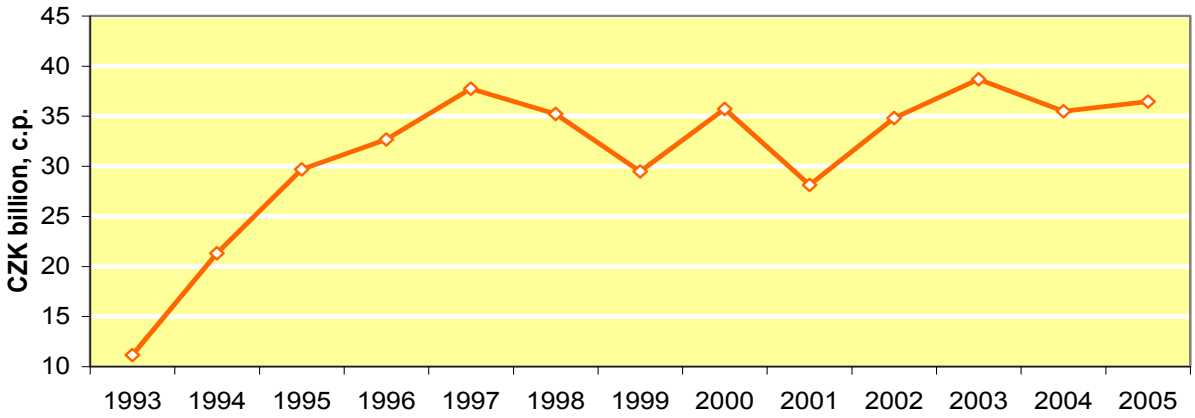
A solution for equalizing of economic conditions of kinds of transport can be found in following steps:

1) Increasing of motorway and highway toll for vehicles above 3.5 tons by using of a satellite technology;
2) Increasing of fuel excise tax by 0.5 – 1.0 CZK/l for petrol and by 2.0–3.0 CZK/l for diesel fuel;
3) Cancellation international agreements about exemption from VAT to international transport and international air and international water transportation from fuel excise tax and resulting cancellation exemptions;
4) Revaluation of priorities in road transport and reduction of buildings motorways and highways in favour of maintenance of railways and second-class roads. Waterworks on the Labe/Elbe should be cancelled due traffic redundancy;

5) To intensify public transport, especially by means of integrated transport systems in the country based on rail transport and in cities based on electric traction. However other main problem of rail transport is obsoleteness of many railways.

The difference between *road transport net externalities* and *rail transport net externalities* displays real transport preferences in the Czech Republic. This sum varies from CZK 29 billion (without 2 unquantified items) to CZK 36 billion (including 2 items) (see following graph).

Graph: Development of net externalities balance in the Czech Republic (CZK billion, current prices)



Source: personal calculations, in intention tables

According to the graph the balance drove from CZK 11 billion in 1993 to CZK 39 billion in 2005. The balance escalated in years 1993 - 97 and than it fluctuated according to inflation, nevertheless the balance was always in favour of road transport. It can be attributed to artificially enhanced road transport efficiency even comparing to rail and water transport.

Conclusion

Calculation of transport externalities is useful procedure for analysing real economic costs in transport, which often remain outside attention of transport policy creators. Their quantification is able to refer to serious mistakes in transport policy in the CR with important influence on environment and people.

Reference:

1. Polena J. et al.: Economic evaluation choice harmful effects transport on environment, UDI 1981, 1982, 1983.
2. Ulrich, S.: Vývoj hluku ze silničních komunikací od r. 1975 do r. 2003 (Die Entwicklung wire Gerauschemission waters Strassen von 1075 bi - 2002, Strasse+Autobahn 10, 2003, s. 571 - 576, translation Lidmila Zrzavecká).
3. Transport yearbooks.
4. Studies CDV Brno Doprava a životní prostředí.

Ing. Jan Zeman, CSc.
CENIA, the Czech Environmental Information Agency, Prague,
E-mail: jan.zeman@cenia.cz

TAX INSTRUMENTS WITH INDIRECT ENVIRONMENTAL IMPACTS IN THE CZECH REPUBLIC

Jarmila Zimmermannova

1. OECD Tax Statistics

In the OECD 2006 Tax Statistics, for the Czech Republic, the following items are shown as environmental taxes:

- air pollution-control charges
- Earth ozone-depleting substance charge
- wastewater discharge to surface water fee
- wastewater discharge to groundwater fee
- groundwater abstraction charge
- surface water abstraction charge
- water and sewage levy
- land withdrawal fee
- forest land withdrawal fee
- municipal waste disposal charge
- waste disposal charge
- nuclear waste charge
- car wreck charge
- toll sticker fee
- motor-vehicle entry fee
- compensation payment for amounts of minerals extracted
- compensation payment for exploitation area
- packaging collection system registration fee
- excise taxes on hydrocarbon fuels and lubricants
- road tax

The database does not include other tax instruments that are intended to support environmental protection. This applies, in particular, to tax relief or tax exemptions.
In principle, we can state that environmental taxes in the Czech Republic may be differentiated to taxes and charges/fees. The taxes may further be differentiated to taxes having indirect environmental effects, and taxes implying some tax relief or exemptions, having indirect environmental protection effects. In the case of charges/fees, „tax“ is imposed on a certain harmful substance; this is an instrument, in contrast to the taxes, directly affecting a polluter.

The present text will deal in more detail with tax instruments only.

The existing tax system in the Czech Republic is formed by the following tax titles :

- value added tax
- excise taxes
- income tax
- road tax
- real estate tax
- inheritance tax and gift tax
- real estate transfer tax

2. Value Added Tax (VAT)

VAT issues in the Czech Republic are regulated by Act No. 588/1992 Coll., on VAT, in the wording of the pursuant regulations.
VAT belongs to the list of taxes that within the European Union are harmonized. Due to harmonization of the legislation with that of the European Union, environmentally friendly products had to be left out of the list of products liable to reduced VAT rate. In the negotiations on the accession of the Czech Republic to the EU, no exemption in this area was applied for and so far no economic instrument which would compensate the producers of environmentally friendly products for this tax relief has been implemented.
During 2006, discussions between the Ministry of the Environment, Ministry of Industry and Trade and Ministry of Finance were held on firewood reclassification from standard to reduced VAT rate, in particular, reclassification of products listed under Customs Tariff Code 4401 (Billet firewood, firewood in logs, branches, faggots or similar forms; woodchips or wood particles; sawdust and wood residues and wood waste, also agglomerated in logs, briquettes, pellets or similar forms). This reclassification is allowed by the Directive No. 77/388/EEC, on VAT.
In connection with energy taxes it is appropriate to pay attention to VAT rate for heat supplies. At the moment of accession to the European Union, Czech Republic had negotiated transition period for the implementation of European Directive on VAT, which was to expire on December 31, 2006. Nevertheless, during 2006 the Ministry of Finance conducted successful negotiations in Brussels, based on which continued exemption relating to reduced VAT rate for central heat supply was negotiated in the European Union.

3. Excise taxes

The issues of excise taxes in the Czech Republic are regulated by Act No. 353/2003 Coll., on excise taxes, in the wording of the pursuant regulations.
Excise taxes belong to the list of taxes that within the European Union are harmonized. Within the European Union, in 2003, Directive 2003/96/EC on fuels and energy taxation was adopted. This Directive has established the minimal rates of excise taxes on fuels and energy. In connection with the implementation of this Directive, Czech Republic has negotiated a transition period for taxation on solid fuels, electricity and natural gas for heating purposes until the end of 2007.
Act No. 353/2003 Coll., on excise taxes, in the wording of the pursuant regulations, allows some exemptions or exceptions for the reason of environmental protection. For energy taxes, such exemption applies to vegetable oils or animal fats and their fractions that are listed under the nomenclature codes 1507 through 1518, are considered to be biomass, biofuel or renewable energy source, and are produced, offered for sale and used for heat and electric power generation or for motor engines. Tax-exemption further applies to specially methylated anhydrous fermentation alcohol under the nomenclature code 2207, biogas under the nomenclature code 3824 90 99, 47 % of biocomponent of bio ethyl-tertiary-butyl-ether under the code 3824 90 99 and esters of vegetable oils and animal fats, if they are produced, offered for sale or used for heat generation or for motor engines.
The Ministry of Finance prepares new legislation in the area of excise energy taxes – act on solid fuels taxation, act on gas taxation and act on electricity taxation. These issues will be dealt with in a separate chapter.

4. Income tax

The issues of income tax in the Czech Republic are regulated by Act No. 586/1992 Coll., on income taxes, in the wording of the pursuant regulations.

In the Czech Republic, two types of income tax are differentiated:

- income tax for natural persons
- income tax for legal persons

From the environmental viewpoint, both types are identically tax-preferred.
The first case applies to preferred use of renewable energy sources. This means exemption from income tax for operation of small hydro-electric power plants up to output of 1 MW, wind power plants, heat pumps, solar facilities, facilities for biogas and wood gas generation and energy use, facilities applying other techniques of biomass-based electric power or heat generation, facilities for the production of biologically degradated substances and facilities for the use of geothermal energy. These facilities are exempted from income tax for the period of 5 years from putting into operation.
Through income tax, the provision of donations for the purpose of financing of environmental activities is supported. This means donations for the municipalities, regions, organizational units of the state and legal persons. The value of donations then can be deducted from tax base serving for calculation of income tax.

5. Road tax

The issues of road tax in the Czech Republic are regulated by Act No. 16/1993 Coll., on road tax, in the wording of the pursuant regulations.
Road tax implies some environmental elements. These are tax exemptions, reduced or increased tax rate and tax relief for environmentally friendly vehicles.

Tax exemption

For the reason of environmental protection, fully exempted from road tax are electric power-driven vehicles and vehicles serving for inland bus transport, provided that for this purpose they drive more than 80 % of kilometers of the total number of kilometers driven by them in the taxation period concerned.

Tax rate

This instrument is used to support vehicles meeting stricter technical and environmental EURO standards. On the contrary, higher tax is imposed on older vehicles failing to meet the established limits. At present, the following specific tax rates are applied:

- if the vehicles meet the EURO 2 level limits, tax rate for them is reduced by 40 %;
- if the vehicles meet the stricter EURO 3 and higher level limits, tax rate for them is reduced by 48 %;
- if the vehicles concerned are older vehicles, registered in the Czech Republic before 1990, tax rate for them is increased by 15 %.

Tax relief

This instrument applies to the vehicles used in combined transport. Tax relief for the vehicles used in combined transport differs in dependence on the number of rides accomplished in the form of combined transport.
The minimal number of rides in the form of combined transport is 31 rides. In this case, the lowest tax relief in amount of 25 % can be applied. If the total number of rides in the form of combined transport is higher then 120, tax relief amounts to 90 % of the total tax amount.
In the case of a vehicle used solely for transportation within combined transport, the highest possible tax relief in amount of 100 % can be applied.

6. Real estate tax

The issues of real estate tax in the Czech Republic are regulated by Act No. 338/1992 Coll., on real estate tax, in the wording of the pursuant regulations.
Real estate tax applies to the structures and lands. This tax also implies environmental elements, in the form of tax exemption for the buildings and lands having positive environmental effects.
For the reason of environmental protection, the following real estates are exempted from real estate tax:

- lands forming one functional aggregate together with the structures serving solely for the purpose of environmental improvements, defined by Regulation of the Ministry of Finance of the Czech Republic in agreement with the Ministry of the Environment of the Czech Republic,
- lands of areas specially protected pursuant to the regulations on the nature and landscape protection, except for national parks and protected landscape areas; in national parks and protected landscape areas the lands classified to belong to their zone I,
- groves, windscreen hedges and hedgerows on arable land, permanent grasslands, water protection zone I lands and other lands that in no way can be used,
- public parks, public areas and sportsground lands,
- structures serving solely for the purposes of environmental improvements, defined by the Regulation of the Ministry of Finance of the Czech Republic in agreement with the Ministry of the Environment of the Czech Republic,
- structures for the period of five years following the year of making a change in the heating system through the transition from solid fuels to renewable energy (solar, wind, geothermal, biomass) system, or a change consisting in a reduced heat demand of the structure, achieved through building adaptations for which building permit was granted.

7. Inheritance tax, gift tax and real estate transfer tax

The issues of inheritance tax and gift tax in the Czech Republic are regulated by Act No. 357/1992 Coll., on inheritance tax, gift tax and real estate transfer tax, in the wording of the pursuant regulations.
As regards inheritance tax and gift tax, exemption from the tax applies to legal persons registered on the territory of the Czech Republic in the case that they receive as gift or inheritance the property intended for the financing of facilities and humanitarian actions in the field of ecology.
The issues of real estate transfer tax in the Czech Republic are regulated by Act No. 357/1992 Coll., on inheritance tax, gift tax and real estate transfer tax, in the wording of the pursuant regulations. This tax implies no environmental elements.

8. Directive 2003/96/EC and its implementation in the Czech Republic

Directive No. 2003/96/EC, restructuring the Community Framework Regulations for the taxation of energy products and electricity, defines for all Member States of the EU mandatory minimal excise tax rates on consumption of the particular types of fuel and energy. This Directive aims to harmonize within the European Union the level of excise taxes on fuels and energy.
As it is stated in the Directive preamble – to achieve proper functioning of the Community home market and the objectives of other Community policies requires to impose, on the

Community level, the minimal taxation rates on the majority of energy products, including electric power, natural gas and coal. The Directive defines the minimal consumer tax on petrol, oil, heavy fuel oils, kerosene, liquid petroleum gas (LPG), natural gas, coal, coke and electricity.
The Directive came into force on January 1, 2004, for the Czech Republic as of the day of the accession to the European Union, i.e. on May 1, 2004.
The directive establishes the minimal taxation levels in dependence on the purpose of energy use – different excise tax rates have been defined for motor fuels, heating fuels and electricity. Motor fuels are further divided into two categories, namely motor fuels and motor fuels for special purposes. Within the Directive, motor fuels for special purposes mean motor fuels used in agricultural, gardening or fishing industry plants, in forestry, for stationary motors, facilities and machinery used in construction, civil engineering or public works, for vehicles intended for use beyond public road network or vehicles that failed to receive permit to be used mainly on public roads. The minimal taxation levels valid for this category are multifold lower than minimal taxation levels for other purposes.
The minimal excise tax rates applying to heating fuels and electric power are differentiated to business use and non-business use, for business use some of the minimal tax rates are lower.
The Directive allows a number of exemptions for the Member States, in dependence on the preferences of the particular states. In principle, there are „offered“ exemptions supporting the use of renewable energy sources and cogeneration in power engineering, and the use of biofuels in the field of transport. In word of the Directive, some exemptions or reduced tax levels may turn up necessary, mainly due to lack of stronger harmonization on the European level, risk of loss of international competitiveness, for social reasons or for environmental management reasons.
Excise taxes on petrol, oil, natural gas, LPG and fuel oils have already been embedded in Act No. 353/2003 Coll., on consumer taxes, in the wording of the pursuant regulations. Excise taxes on electricity and solid fuels are at present not introduced in the Czech Republic.
In connection with implementation into the Czech legislation of the Directive 2003/96/EC on fuels and energy taxation, the preparation of three new acts on excise taxes, namely Act on solid fuels taxation, Act on electricity taxation and Act on gas taxation, is under way. The Act on gas taxation will include gases exempted from the existing Act No. 353/2003 Coll., on excise taxes, i.e. LPG and natural gas.

Act on electricity taxation

In the draft law presented by the Ministry of Finance for interdepartmental discussions, it is envisaged that the obligation to make tax return and pay the tax arises at the moment of electric power supply for final consumption. Should electric power be supplied between producers, distribution or transfer system operators or electricity dealers, it would not be liable to taxation, unless consumed by these entities.
Besides general system of taxation, also specific tax preferences mainly based on environmental and economic interests, apply to electric power. This means, for example, tax exemption for electric power generated from renewable sources or consumed for the purpose of electricity generation.
The introduction of a new tax to the proposed extent represents, according to the Ministry of Finance (draft law for interdepartmental discussions, January 2007), tax collection in amount of approx. 1.836 mld CZK per year. This tax burden will be of effect on economic subjects and of significant impact on the final consumers of electricity and of products for which electricity accounts for high percentage of the product costs.
The effect on economic subjects will amount to approx. 363 mil. CZK per year, representing the costs of increased paper handling of economic subjects in tax administration.

Act on solid fuels taxation

The basic feature of solid fuels taxation is tax on their consumption. In the draft law on solid fuels taxation (January 2007), it is envisaged that the obligation to make tax return and pay the tax arises at the moment of solid fuels delivery for final consumption. Should solid fuels be delivered between producers and traders, no obligation to make tax return and pay the tax will arise. This means that these subjects will bear no financial burden, on the other hand, they will have a record-keeping obligation relating to tax administration. However, should these subjects consume the solid fuels, such consumption would be liable to taxation. From the tax viewpoint, only regulated is the handling of pre-tax solid fuels until the moment of taxation thereon. Once tax is imposed on the solid fuels, it is not necessary for them to further be liable to the provisions of this Act.
The introduction of a new tax on solid fuels to the proposed extent (draft law for interdepartmental discussions, January 2007) represents tax collection in amount of approx. 7.390 mld CZK per year. Such tax burden will be of significant effect on economic subjects and also of significant impact on the final consumers of solid fuels. Should the taxes on solid fuels be fully reflected in electricity prices for final consumers, its price would increase by approx. 4 % only as a consequence of solid fuels taxation.
The effect on economic subjects will amount to approx. 213 mil. CZK per year, representing the costs of increased paper handling of economic subjects in tax administration.

Act on gas taxation

The basic feature of natural gas taxation is tax on the delivery to the final consumer (draft law for interdepartmental discussions, January 2007). In the draft law, it is envisaged that the obligation to make tax return and pay the tax arises at the moment of natural gas delivery for final consumption. Should natural gas be delivered between, for example, distribution or transport system operators or traders, the obligation to make tax return and pay the tax will not arise. This means that these subjects will bear no financial burden, on the other hand, they will have a record-keeping obligation relating to tax administration. However, should these subjects consume the natural gas, such consumption would be liable to taxation. From the tax viewpoint, only regulated is the handling of pre-tax natural gas until the moment of taxation thereon. Once tax is imposed on natural gas, it is not necessary for the gas to further be liable to the provisions of this Act. The principle of tax on natural gas is identical, irrespective of supply via gas pipelines or other means of supply.
Besides general system of taxation, also specific tax preferences mainly based on environmental and economic interests, apply to natural gas. For example, this applies to the use of natural gas for electric power generation or for heat generation by households.
The introduction of a new tax on natural gas to the proposed extent (draft law for interdepartmental discussions, January 2007) represents tax collection in amount of approx. 1.5 mld CZK per year. The introduction of tax on natural gas is expected to have effect on inflation rate in amount of 0.120.

9. Outlook in the area of environmental taxes

Programme Declaration of the Government of the Czech Republic includes environmental tax reform, namely, implementation of Stage I of environmental tax reform and preparation of the next stage of this reform. Implementation of Stage I of environmental tax reform will take place after coming into effect of acts on solid fuels, electricity and natural gas taxes and after amendments to the respective acts to ensure tax revenue neutrality. Implementation of Stage I of environmental tax reform will take place from January 1, 2008 on. For the next stages of

environmental tax reform, the following objectives are outlined in the Programme Declaration of the Government:
„The next objective of the reform will be to establish emission tax on CO2 which will arise through the transformation of the existing air pollution-control charge. This tax will aim to be an incentive to modernize energy production technologies and reduce pollution. An indicative target of environmental tax reform revenue is expected to reach 0.5 – 1 % GDP“.
At the Ministry of the Environment, there has been established interdepartmental working group for environmental tax reform, whose task is to submit to the Government, by 31. 12. 2007, the draft of the next stages of environmental tax reform. Interdepartmental working group is formed by the representatives of the Ministry of the Environment, Ministry of Finance, Ministry of Industry and Trade, Ministry of Transport, Ministry for Regional Development, Ministry of Labour and Social Affairs, Ministry of Foreign Affairs, Association of Industry and Transport, and Czech and Moravian Confederation of Trade Union Associations.

References

1. Draft of Act on electricity taxation (draft law for interdepartmental discussions, Ministry of Finance)
2. Draft of Act on solid fuels taxation (draft law for interdepartmental discussions, Ministry of Finance)
3. Draft of Act on gas taxation (draft law for interdepartmental discussions, Ministry of Finance)
4. OECD: Environmentally related taxes – database
5. Directive No. 2003/96/EC, restructuring the Community framework regulations for the taxation of energy products and electricity
6. Act no. 16/1993 Coll., on road tax, in the wording of the pursuant regulations
7. Act no. 338/1992 Coll., on real estate tax, in the wording of the pursuant regulations
8. Act no. 353/2003 Coll., on excise taxes, in the wording of the pursuant regulations
9. Act no. 357/1992 Coll., on inheritance tax, gift tax and real estate transfer tax, in the wording of the pursuant regulations
10. Act no. 586/1992 Coll., on income taxes, in the wording of the pursuant regulations
11. Act no. 588/1992 Coll. on VAT, in the wording of the pursuant regulations.

Ing. Jarmila Zimmermannova
Ministry of the Environment of the Czech Republic
Vrsovicka 65
110 00 Prague 10
jarmila_zimmermannova@env.cz

METHODOLOGICAL APPROACHES TO THE EVALUATION OF REGION'S ECONOMIC PERFORMANCE

Iva Živlová, Jaroslav Jánský

Abstract

The paper is focused on setting the indicators enabling the evaluation of economic performance of region, defined by county. It show the indicators evaluating the structure of entrepreneurial sector, contribution of the region to the GDP, contribution of selected sectors measured by gross value added, investment activity of region as well as total employment as the main factor of regional development. Information capability of the indicators is verified on underlying information form South Moravian Region and Olomouc Region in years 2003 to 2005.

Key words

Region, economic performance, gross domestic products, gross value added, investment activity, employment

Introduction

Regions in the Czech Republic are defined according to the Act No. 248/2000, endowment of regional development, as regional units defined with the help of administrative borders of counties, districts, communities or associations of communities. Out of the mentioned definition it is clear that it is possible to view the regions from different perspective. For the evaluation of region's economic performance it is necessary to set out, which territorial unit is evaluated. Due to the demand of underlying information for the different analysis it is necessary to adjust the definition of evaluated territories to the real possibilities of getting these data. Useful is evaluating of smaller territorial units, formed by microregions. Microregions are characterized as territorial units, within which are locked the most intensive regional processes. However, underlying information for performance analysis of microregions must be surveyed with the help of sample tasting.

The aim of this paper is proposal of methodological approaches for the evaluation of the regions' economical performance defined by regions. Part of this paper is approval of information capability of suggested indicators on underlying information of South Moravian Region and Olomouc region in years 2003 to 2005.

Results and discussion

Regional development is qualified by number of several agents, which influence the quality of life. Among the most important is the development of entrepreneurial activities in relevant region and its economic potential, development of human potential linked with increasing employment, sufficient technical facilities and operation of relevant territory, maintenance of environment and tourism as one of the important entrepreneurial activities. All of the mentioned factors influence economic performance of relevant region.

Significant differences are originating among the regions considering economical performance and the disparities of regions are further deepening. The existence of disparities is possible to consider as important stimulus for society development, as precondition for formation of more effective forms of labor division and specialization (Hampl 1998). It is necessary to analyze the cause of disparity emergence, because that is the only way of setting

out the strategies for region's total potential activation, where the economical performance is decisive function.
Economic performance of relevant region is determined by its economic base, which is possible to consider as a system formal by economical subjects and relations among them as well as external environment. The activity of market forces has as the result concentration of economic activities into selected regions, the development of this regions and resulting benefits and thus origin of new activities.
The amount and structure of working opportunities is possible to consider as the main factor of region's economic performance. While analyzing the economic performance first of all it is necessary to evaluate the structure of entrepreneurial sector, and so from the point of view
The amount and structure of employment possibilities is possible to consider as main factor of region's economic performance. Firstly it is necessary to evaluate the structure of entrepreneurial sector while analyzing the economic performance and thus from the point of view of representation of activity issue according to the OKEČ, namely industrial agrarian, construction as well as service activities. It is necessary to focus on the firms according to its size – small firms, medium firms and large firms. The performance of region could be influenced by entrepreneurial activities measured by the number of entrepreneurial subjects in the regions on 1000 inhabitants. The changes in number of entrepreneurial subjects in time series, especially the changes in the structure of entrepreneurial sector very significantly influence the overall region's economic performance, because the modern sectors with high share of value added and corresponding higher Wales, which positively influence purchase effective demand. The data of entrepreneurial structure in analyze regions are listed in table no. 1.

Table no. 1: Structure of entrepreneurial sector according to the prevailing activity (in %)

Prevailing activity	2003		2004		2005	
	SMR	OLR	SMR	OLR	SMR	OLR
Industry	14,25	14,73	14,21	14,60	14,07	14,48
Agriculture	6,61	8,03	6,52	7,95	6,66	8,10
Building industry	10,85	11,10	11,07	11,33	11,21	11,44
Services	33,93	38,03	33,28	37,36	33,06	36,89

Source: ČSÚ
Note: The services include trade, lodging, catering, transportation, storage, communication.

The number of entrepreneurial subjects was in South Moravian Region in mentioned years between 251 and 258 thousand, in Olomouc Region between 128 and 129 thousand. The highest share in both regions had services, which share on total number of entrepreneurial subjects in both analyzed regions exceeds 30 %. Rather lover share of services is in South Moravian Region than the country's average, where there is higher share of agrarian enterprises and industry compare to the national average. The development in agrarian sector as well as in industry was encouraged in both analyzed regions a number of changes in activities structure of the enterprises. Very significantly was lowered the number of enterprises in agriculture as well as the restructuring in industry sector was taking place. It is still true that South Moravian Region is always region with traditional agrarian production. Very similar is the situation in Olomouc Region, where the natural conditions destine the focus of agrarian production in mountain and sub mountain region. The agrarian production exceeds in these areas very significantly the national average.

Region's economic performance is significantly influenced by entrepreneurial abilities of entrepreneurs. They condition overall competitiveness of regions, which determines level of income and employment. Incomes are reflected in formation of Gross Domestic Products. Gross Domestic Product is defined as market value of final goods produced in relevant country in given time period. Final goods are considered those goods, which are the final outcome of production process. The contribution of the region to Gross Domestic Product formation could be measured by several different indicators. Among the main ones is the share of region's Gross Domestic Product on total country's Gross Domestic Product, Gross Domestic Product per one employee of the region, Gross Domestic Product per one inhabitant of the region, rate of growth of region's Gross Domestic Product in comparison to the country's rate of growth of Gross Domestic Product. It is necessary to consider that the Gross Domestic Product could be measured in constant prices as well as purchase prices. In constant prices is indicated real Gross Domestic Product and in actual purchase price as nominal product. Important indicator for international comparison and namely for determination of region's eligibility for drawing financial as well as other support from EU structural funds is Gross Domestic Product of relevant region per one inhabitant, recalculated according to the purchase power parity. Selected data of indicators using Gross Domestic Product are listed in table no. 2.

Table no. 2: Formation of GDP in regions

	2003		2004		2005	
	SMR	**OLR**	**SMR**	**OLR**	**SMR**	**OLR**
Formation of GDP in regions in purchase prices (in mio. CZK)	264 721	124 182	283 352	137 560	302 309	144 804
The share of regions' GDP (in %)	10,3	4,8	10,2	4,9	10,2	4,9
GDP per one inhabitant (in thousand CZK)	235	194	251	215	267	227
GDP per one employee (in thousand CZK)	605	513	648	585	671	599
GDP per one inhabitant in purchasing power parity (in PPS)	13 809	11 471	14 744	12 328	15 951	.

Source: ČSÚ

Nowadays macro economical development in the Czech Republic is favorable, the rate of growth of GDP is in comparison to the other EU countries relatively high. The development of the value of GDP produced in analyzed regions contributes to the above mentioned, because the value of this indicator during analyzed time series increases. The share of individual regions on country's GDP remains the same, even though the one of South Moravian Region is about double compare to the Olomouc Region's.

Calculated values of indicators GDP per one inhabitant in the region, respectively per one employee show that South Moravian Region reaches significantly higher values of these indicators, newer the less it is disputatious, if the reached values are sufficient. It would be necessary to carry out further analysis, based on more detail data, enabling to evaluate the factors influencing the creation of GDP in the region. Due to the comparison of regions' competitiveness within the whole EU it is possible to use the indicator GDP per one inhabitant stated in purchasing power parity. Even though this indicator is again higher than in Olomouc Region, in spite of this it does not reach the level of Czech Republic average (16 013 PPS in year 2004).

Individual sectors, represented in the region, notably contribute to the creation of Gross Domestic Products. Their contribution to the creation of that part of Gross Domestic Products, which was crated in the region, it is possible to evaluate with the help of indicator gross value added, determined as difference of market price of goods or services and the input price purchased in another sectors. It is result of difference between total production of goods and services measured in basic prices on one hand, and sub consumption in purchase prices on the other hand. Structure of entrepreneurial sector in relevant region determines the structure of gross domestic product. Thus it is purposeful to analyze gross value added separately in main sectors of national economy and so in industry, agriculture, building industry and services. The data of gross value added are listed in table no. 3.

Table no. 3: Gross value added in regions

	2003		2004		2005	
	SMR	**OLR**	**SMR**	**OLR**	**SMR**	**OLR**
Gross value added in regions in total (in mio. CZK)	240 679	112 904	254 306	123 459	270 955	129 786
Share of industry on GVA (in %)	23,4	29,6	23,7	31,5	24,0	31,7
Share of agriculture on GVA (in %)	3,6	5,6	4,0	6,2	3,5	5,5
Share of building industry on GVA (in %)	7,7	6,8	7,6	7,1	7,8	7,4
Share of services on GVA (in %)	25,1	24,8	24,4	22,4	23,9	22,1

Source: ČSÚ
Note: The services include trade, lodging, catering, transportation, storage, communication.

Gross value added expresses the volume of labor input, which level is determined by the assessment of output, input and efficiency of economic activity of entrepreneurial subjects. The amount of gross value added show indirectly about the level of mechanization, effective use of technology and labor productivity. Gross value added is the base for the formation of Gross Domestic product. Several sectors contribute to its formation, which is clear from table no. 3. These data conflict the general idea that South Moravian Region is above all region with significant share of agrarian production. As the data of entrepreneurial structure mentioned in table no. 1 as well as the share of agriculture on gross value added show that more agriculture-oriented is Olomouc Region. It is again proven that it is necessary to propose additional indicators enabling more objective comparison of the regions in order to evaluate the cause of differences among regions' development and determining subsequent measures for strategies of regions' further development as an example indicator gross value added per one economic subject could be used.

Potential for favorable development of region's economic performance in following year creates high share of expenditures for gross fixed capital. The formation of gross fixed capital expresses the renewal and obtaining new tangible as well as intangible fixed assets, in the form long-term consumption. The value of gross fixed capital determines the level of investment activity of relevant region.

The level of investment activity could be measured by the indicator total formation of gross fixed capital in region, the share of investment in region on total state's investment, and gross fixed capital per one region's inhabitant. Due to the fact that the investment could be expended on different forms of asset influencing by different amount the region's economic performance. It is efficient to follow separately the tangible an intangible investment. Due to the increasing importance of environment protection, great attention is focused on the investment into environment protection, measured by indicator investment into environment protection.

Investment renews and expands asset of entrepreneurial subject, contribute to the development of entrepreneurial activities and to output growth. It is reflected at the end in tax yield of relevant region. This indicator shows statutory share, which falls on to individual municipalities of the region form collected taxes, which are supplied by individual persons as well as legal entities into the state's budget. Tax yield is from the point of view of region's analysis considered as the most valuable characteristics of region's economic prosperity. The Data of investment activities as well as tax yield of analyzed regions are listed in table no. 4.

Table no. 4 Gross fixed capital in regions

	2003		2004		2005	
	SMR	**OLR**	**SMR**	**OLR**	**SMR**	**OLR**
Formation of total region's gross fixed capital (in mio. CZK)	68 376	25 461	72 765	33 340	78 274	28 397
Share of region's GFC on total state's GFC (in %)	9,9	3,7	10,0	4,6	10,6	3,8
GFC per one region's inhabitant (in CZK)	60 578	39 744	64 425	52 111	69 252	44 440
Tax yield (in CZK/inhabitant.)	-	-	12 200	9 960	15 600	13 880

Source: ČSÚ

Very favorable is the rate of renewal as well as purchase of new investment in both analyzed regions in analyzed time period. Indicator enabling to compare the regions is above all indicator gross fixed capital per 1 region's inhabitant. In South Moravian Region is the investment activity higher than in Olomouc Region. High investment activity in South Moravian Region is possible to deduce from indicator share of region's GFC on total state's gross fixed capital. High investment activity in South Moravian Region is not adequately reflected in formation of gross value added and thus in formation of gross domestic product produced in this region. It is possible to draw similar conclusion from comparison with indicator tax yield, which again in South Moravian Region, even though higher than in Olomouc Region, is not adequate to disparity in number of inhabitants.

As it was already mentioned, the main factor of region's development it is possible to consider the amount and the structure of working opportunities. It influences total employment in region. Employment could be measured not only by indicator rate of employment determined by the share of economically active inhabitants to total amount of inhabitants in the region, but also by share of employees in the main sectors and that is industry, agriculture, building industry and services to total number of employees. The data is listed in table no. 5. Additional indicator of employment is average wage in region as well.

Table no. 5: Employment in regions

	2003		2004		2005	
	SMR	**OLR**	**SMR**	**OLR**	**SMR**	**OLR**
Share of economically active inhabitants to number of region's inhabitants (in %)	58,2	58,9	58,1	58,0	58,1	58,1
Share of industry employees (in %)	27,34	32,39	25,95	31,57	26,62	30,12
Share of industry agriculture (in %)	4,11	5,66	4,48	5,24	3,48	4,59
Share of building industry employees (in %)	9,72	8,94	10,41	8,44	10,12	9,33
Share of services employees (in %)	23,26	22,37	23,17	24,04	23,22	23,90
Average wage in the region (in CZK)	14 981	14 102	16 048	15 215	16 984	16 193

Source: ČSÚ

Note: The services include trade, lodging, catering, transportation, storage, communication.

Employment in the region is influenced above all by social-economic development of relevant region and by impact of enterprise transformation in connection to the change of regime after 1989. Out of the data in table no. 5 it is clear that the share of economically active inhabitants out of total number of inhabitants is in both analyzed regions quite similar and does not change during the time. However, the differences between South Moravian and Olomouc Region are in the share of employees in relevant sectors. In Olomouc Region there is higher share of industry employees, however the share is decreasing. In connection to the development in the Czech Republic the average wage is increasing. Again, it is possible to conclude that in the South Moravian Region has higher average wage than Olomouc Region, even though formation of gross value added and also gross domestic product in region does not correspond to this discrepancy. It would be necessary to extend the analysis namely by labor productivity evaluation.

Conclusion

The evaluation of regions from different points of view is practiced only in last few years. The goal of this evaluation is one side the recognition the actual state of region represented with several indicators. On the other hand it is also discovering the difference in social-economic level of individual regions, which could be by favorable aimed regional policy and with the use of adequate tools removed or at lest reduced.
Proposal of the methodical sequence for region's economic performance mentioned in this paper show that the basic characteristics of region it is possible to determine from the data from Czech Statistical Office. However, for the more detail analysis, which would find the cause of discrepancy among the regions these data are insufficient and additional individual survey is required. Due to the fact that the region is formed by cities and towns, very often united in micro regions, it is necessary to take into account these smaller regional units, because they are determining the total level of regions. It is necessary to aim further research this way and reach such a state that the information of micro regions are part of regular survey and processing of statistical data.

Acknowledgement

The contribution presents the results of research „Possibilities of disparity solution between the chosen regions", solved with subsidy of Ministry for Regional Development

References

1. Kolektiv autorů: Úvod do regionálních věd a veřejné správy. Vydavatelství a nakladatelství Aleš Čeněk, s.r.o., Plzeň 2004
2. Statistická ročenka České republiky 2006. Scientia, Praha 2006
3. www.businessinfo.cz

Prof. Ing. Iva Živělová, Csc.
PEF MZLU Brno,
Zemědělská 1, 613 00 Brno, Česká republika,
e-mail:zivelova@mendelu.cz
Doc. Ing. Jaroslav Jánský, CSc.,
PEF MZLU Brno,
Zemědělská 1, 613 00 Brno, Česká republika,
e-mail:jansky@mendelu.cz

Economy-wide material flow accounting and analysis in the Czech Republic

Svetlana Svitakova, MŽP
Jan Kovanda, COŽP UK

Outline

1. Why is monitoring of material flows useful
2. Methodology of economy-wide material flow accounting and analysis (EW-MFA)
3. State of the art in EW-MFA
4. EW-MFA indicators in the Interim Report on the Czech Republic Strategy for Sustainable Development

Why is monitoring of material flows useful (1)

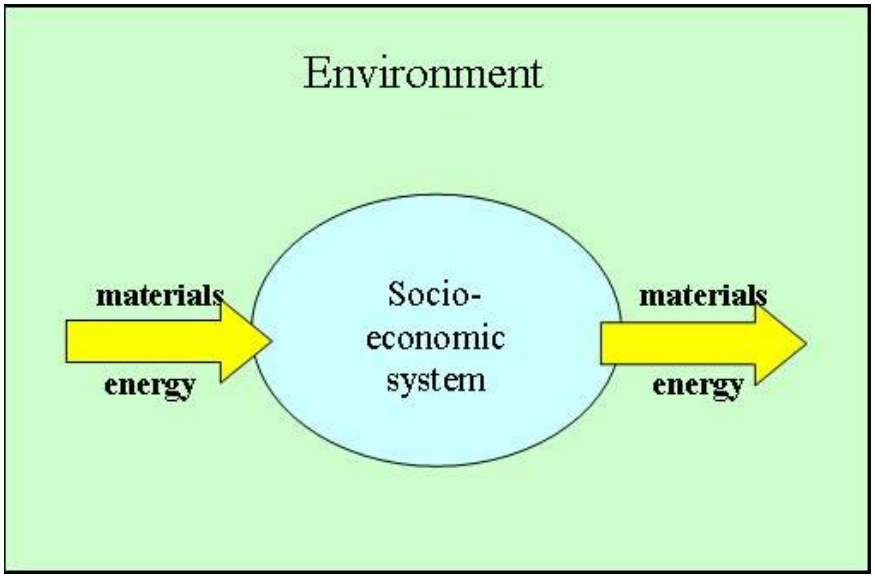
Starting points:

- Socio-economic system is a sub-system of the environment; they are connected through material and energy flows
- These flows are prime reason for pressures exerted by humans on the environment:
  - Input side: pressures related to extraction of materials and energy carriers from the environment
  - Output side: pressures related to materials released to the environment: emissions to air, landfilled wastes

Material flow accounting and analysis:

- Means of assessment of pressures related to use of materials and a tool for reducing these pressures

Why is monitoring of material flows useful (2)

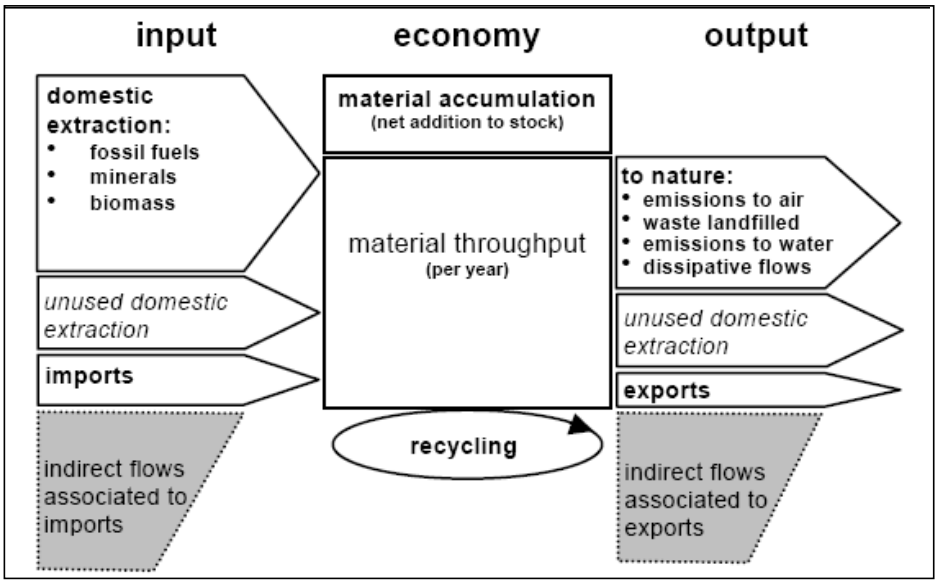


Source: Eurostat 2001, modified

Method: Economy-wide material flow accounting and analysis

- One of leading approaches used for assessing of material flows (abbreviated as EW-MFA)
- Basic philosophy: quantification of material flows using input-output analysis
- Accounting of material flows for whole economies, where boundaries are given by the extraction and the discharge of materials from/to the domestic environment and by political borders for imports and exports
- An ultimate goal is to get a material balance, i.e. a state when inputs equal outputs plus physical additions to the stock

Method: Economy-wide Material Balance Scheme



Source: Eurostat 2001

Method: Selected EW-MFA indicators

Input and consumption indicators

- Direct material input (DMI) = domestic extraction + imports
- Total material requirement (TMR) = DMI + unused domestic extraction + indirect flows associated to import
- Domestic material consumption (DMC) = DMI – exports
- Total material consumption (TMC) = TMR – exports and indirect flows associated to exports

Output indicators

- Domestic processed output (DPO) = emissions to air and water + landfilled waste + dissipative flows

State of the art in EW-MFA

International level:

- EW-MFA indicators compiled and published in official reports of statistical offices and other national and international institutions (Eurostat, OECD, European Environment Agency)

National level:

- EW-MFA indicators compiled within research projects of Ministry of the Environment, Czech Grant Agency etc. and within a pilot project of the Czech Statistical Office
  - Published e.g. in Report on the Environment in the Czech Republic and Interim Report on the Czech Republic Strategy for Sustainable Development (Government Council for Sustainable Development, 2007)

EW-MFA indicators in the Interim Report

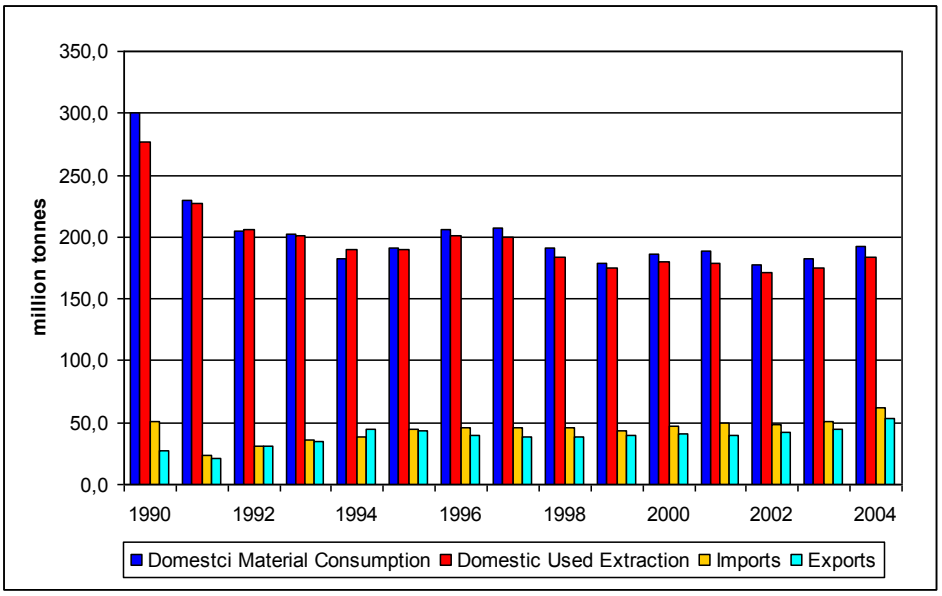
Domestic Material Consumption (DMC)

- Sum of the physical quantity of raw materials extracted and biomass produced in the territory of a particular country. All imports are then added to and all exports are deducted from these materials.

Material intensity of GDP

- Proportion of domestic material consumption to GDP in constant prices. Expressed in kg per CZK 1000 of GDP or as an index.

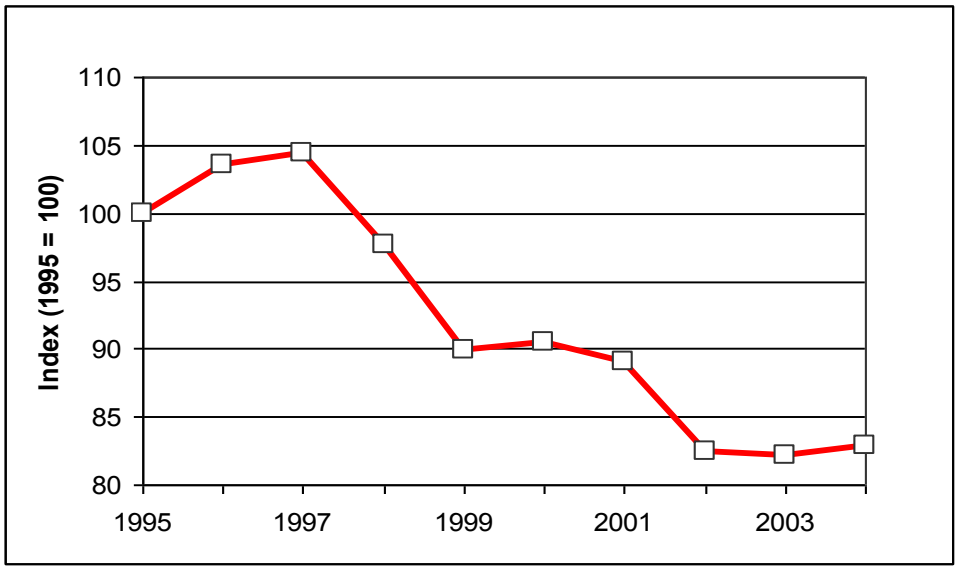
EW-MFA indicators in the Interim Report: DMC, Czech R.,1990-2004



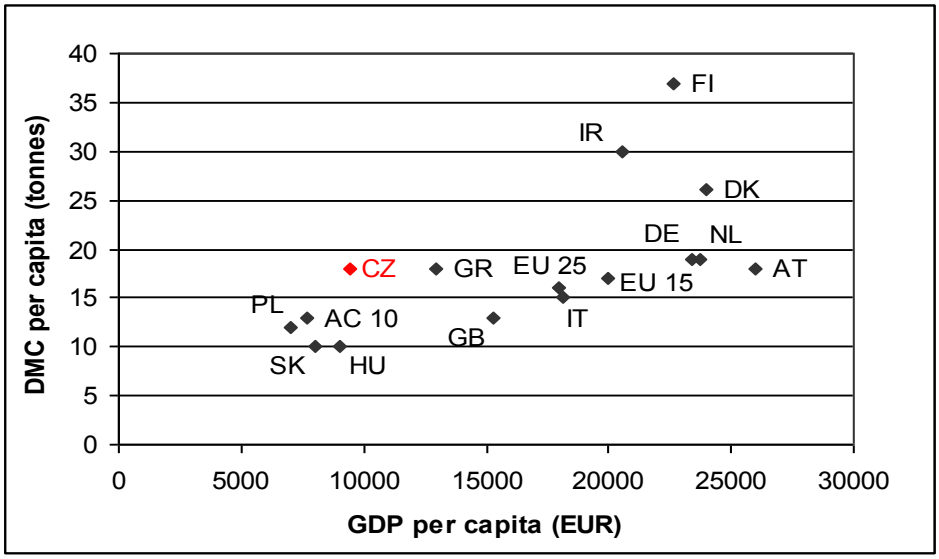
EW-MFA indicators in the Interim Report: DMC, Czech R.,1990-2004

Million tonnes	1990	1995	2004	1990-2004	1995-2004
Food crops	15,9	12,5	11,1	⇓	⇓
Fodder crops	20,4	13,8	9,8	⇓	⇓
Timber and derived products	8,7	7,0	8,1	⇓	⇑
Construction minerals and p.	89,3	51,8	63,6	⇓	⇑
Industrial minerals and prod.	27,8	18,1	19,2	⇓	⇑
Ores and derived products	9,9	5,6	5,5	⇓	⇒
Coal and derived products	110,8	67,7	57,4	⇓	⇓
Oil and derived products	13,8	7,8	8,8	⇓	⇑
Natural gas and products	6,5	8,2	6,5	⇒	⇓
Other	-2,7	-0,8	2,2	⇑	⇑
Total	**300,4**	**191,7**	**192,2**	⇓	⇑

EW-MFA indicators in the Interim Report: Material intensity



EW-MFA indicators in the Interim Report: International comp., 2000



EW-MFA indicators in Interim Report: DMC, conclusions

- Pressures on the environment related to material consumption went down over the period studied (especially due to decrease in coal consumption)
- Material intensity of GDP went down as well
- Foreign material dependency went up over the period studied
- Per capita material consumption in the Czech Republic is comparable to EU-25. Due to low GDP, the Czech Republic suffer from high material intensity compared to EU-15.

PROCEEDINGS FROM

INTERNATIONAL SCIENTIFIC CONFERENCE

SUSTAINABILITY ACCOUNTING AND REPORTING ON MICRO-ECONOMICAL AND MACRO-ECONOMICAL LEVEL

Edited by University of Pardubice

2007

Publication No.

Manuscripts submitted byauthors were processed and printed by Ministry of the Environment of the Czech Republic.

Edition No. I

Number of Copies: 150

p.