MINISTRY OF THE ENVIRONMENT OF THE CZECH REPUBLIC
MASARYK UNIVERSITY IN BRNO
UNIVERSITY OF PARDUBICE
THE CZECH ENVIRONMENT MANAGEMENT CENTER

PROCEEDINGS FROM
INTERNATIONAL WORKSHOP

"ECONOMIC AND SOCIAL ASPECTS OF SUSTAINABLE DEVELOPMENT"

ENVIRONMENTAL ACCOUNTING APPLICATION ON MICRO AND MACRO LEVEL

Brno, September 5 - 6, 2005

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CONTENTS

SUSTAINABLE DEVELOPMENT IN MANAGEMENT OF A CONSTRUCTION COMPANY

Jiří Kalabis - Jiří Brokeš - Ludmila Vacková

1 INTRODUCTION - PRESENTATION OF THE COMPANY

ŽS Brno, joint-stock company, is an up-to-date multi-profession construction company. It is one of the four biggest and most important construction companies in the Czech Republic, and the biggest construction company in Moravia, existing for more than 50 years.

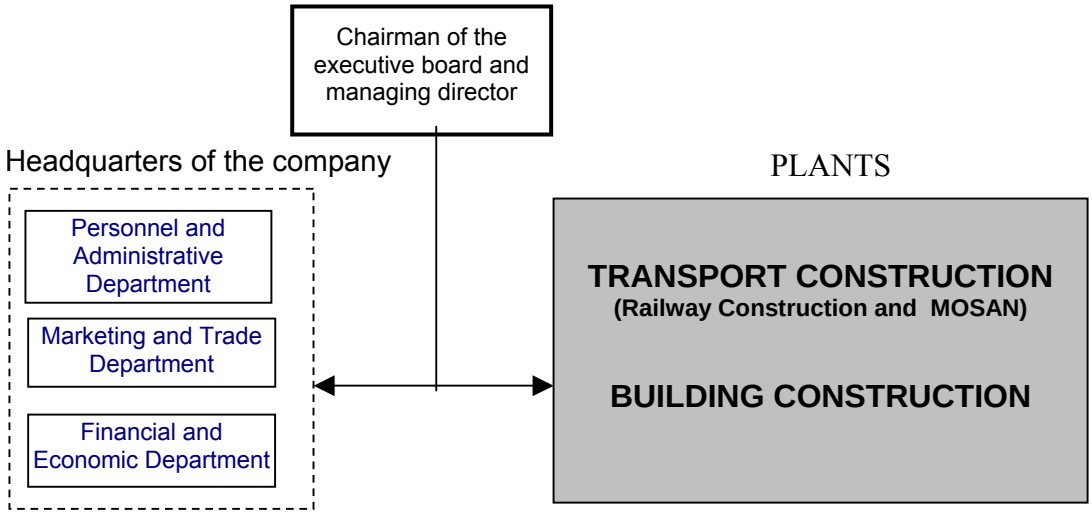
ŽS Brno, joint-stock company, is the direct successor of the state company Železniční stavitelství Brno, established in 1952 as a specialised company for construction of railways.

Within the last 5 years, the turnover of the company tripled, and its sales in 2004 were more than 8 billion CZK (250 million EUR). The company has ca 2000 employees.

Our activities exceed the territory of the Czech Republic - we build in Slovakia and in Hungary, and also in several countries of south-east Europe - In Croatia, Montenegro, and in Bulgaria.

In the middle of 2003, an important change in ownership structure of the company occurred through entry of the Spanish construction company OHL (Obrascón Huarte Lain, S.A.). This company is the sixth biggest construction company in Spain, having activities almost all over the world - from Mexico, Brazil, Chile and Argentina up to Turkey or Morocco.

Basic structure of ŽS Brno, joint-stock company:



The plants are professionally oriented:

Plants of *transport construction:*

Railway Construction *Plant*: railway and tram lines, construction of railway corridors, technology in the field of transport infrastructure - converter stations, feeder stations

MOSAN *Plant*: land roads, bridges, maintenance of concrete constructions

Building Construction *Plant*: building and engineering construction, but also underground construction (sewerage network, sewers), production and erection of steel constructions, monolithic concrete constructions, environmental structures - waste water treatment plants, boiler houses for burning biomass.

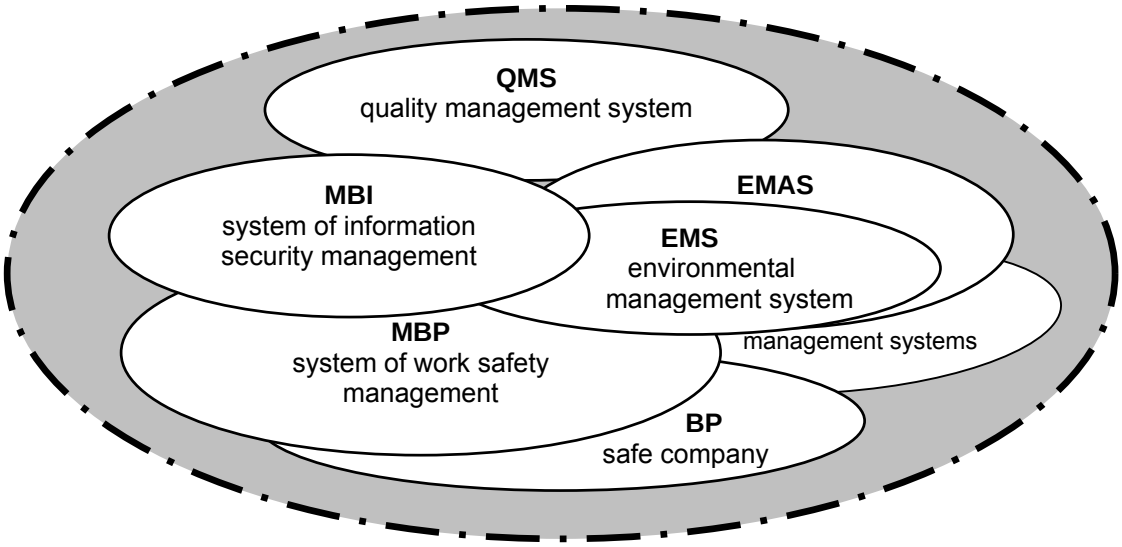
2 SUSTAINABLE DEVELOPMENT AND INTEGRATED MANAGEMENT SYSTEM

2. 1 Integrated management system

In management of our company, we use fully integrated management system based on certified management subsystems in these fields:

- quality management according to ČSN EN ISO 9001 - **QMS**,
- environmental management according to ČSN EN ISO 14 001 - **EMS** expanded by the **EMAS** programme
- management of safety and health protection at work according to OHSAS 18001 – **MBP** and the **Safe company** programme,
- system of information security according to BS 7799-2 - **MBI**.

Figure No. 1: Structure of the integrated management system of ŽS Brno, joint-stock company



Integrated management system is one of the elements of identity of ŽS Brno, joint stock company.

2. 2 EMAS

On the basis of requirements of the EMAS programme, each of our plants drew up a report - Environmental Statement. Subsequently, these reports were validated by accredited authorities. Plants are registered in the national EMAS REGISTRY (www.ceu.cz / EMAS) and in EMAS registry in Brussels under the following codes:

Railway Construction ..... CZ - S - 015

MOSAN ..... CZ - S - 014

Building Construction .....CZ - S - 016

EMAS

VERIFIED ENVIRONMENTAL MANAGEMENT

In the registry, also the EES (Power and Environmental Construction) plant is mentioned under CZ-S-012. This plant was, effective from January 1, 2005, transformed into the Railway Construction plant under name „Technology Division".

The Environmental Statement concerns the localities where, due to our activity, environment may be endangered - these are premises of the plants (building yards) and constructions. (The construction works are carried out in localities not owned by our company, but we undertake to apply sound approach to the environment there.)

The possible significant environmental impacts include, most often: release of hydraulic oil into soil (rupture of a pressure hose of a construction machine), dustiness, noise etc. According to location of the construction, used technologies, and further requirements of the customer, „environmental programmes“ are drawn up, specifying measures to prevention or minimisation of the possible impacts.

For example: In the environmental programme of construction of corridor Studénka - Ostrava (the construction was carried out, partially, in Poodří Protected Landscape Area), substitution of mineral oil in hydraulic systems of the machines by biologically degradable oil was laid down for the construction machines. This is neither simple nor cheap measure, because such oil exchange can be carried out only in the case of machines that are not under warranty any more. In the environmental programme of the commission for „Reconstruction of Hamza children sanatorium" in Luž-Košumberk, which was carried out „in operation" (a part of the pavilion was in normal operation), minimisation of impacts of unavoidable noisy construction works was solved by setting certain minimum time expositions for which a programme minimally disturbed by noise was prepared for the patients by the sanatorium management.

The effort to eliminate negative environmental impacts of construction work is also put into practice by using the best available techniques - BAT. The result of this is, for example, our co-operation on development of maintenance complex SK 120 (a special technology for reconstruction of the railway body without removal of the track grillage). By using this technology, devastation of the neighbourhood of the railway by trucks is prevented. Otherwise, temporary roads for transport of materials from and to the site would have to be constructed for the trucks. Further, fuels are not consumed, emissions and noise are not produced etc.

Since 2004, we have also taken part in an important pan-European project REMAS. Its purpose is to quantify benefits of environmental management systems (EMS) for the business sector and for the state administration.

The purpose of the project is to show which measures and elements of EMS ensure, by the most effective way, good environmental profile of the company.

Output: We will obtain a detailed benchmarking report, providing comparison of ŽS Brno, joint-stock company, with other companies of the given sector from the whole Europe. This would enable us to obtain (and, naturally, also share) information on the best practices and to improve our profile and productivity. (For the present, the output is not available.)

2. 3 EFQM Excellence Model

In order for us to be able to improve the management process, it is necessary to monitor and measure it. There exist several methods of measurement of the management process - four years ago, we have chosen measurement by means of self-assessment according to the EFQM Excellence Model (by the *„pro-forma“* method).

The self-assessment is not a process of a few employees of the quality department; it is a very demanding team work - the team must consist of employees who do not directly participate in the top management of the company, have current information - both positive and negative - and have sufficiently dispassionate point of view, in order that the self-assessment does not lose in unimportant details.

The self-assessment is not an end in itself - its main purpose is to specify strong points of management, but, especially, places for improvement. This is closely connected with benchmarking - without comparison with the best, it is not possible to achieve excellence.

The self-assessment is carried out:

- From the point of view of management tools (methods and means);
- From the point of view of application (implemented partially, or fully);
- From the point of view of evaluation of the used tools (feedback).

These three points of view correspond to the principle P-D-C-A- (plan - do - check - act) - representing a development spiral, defined by the quality guru Mr. Deming. The latest item of this principle - „act“ - is contained in the output of *self-assessment*, which is „action plan of improvement“.

As already mentioned above in this chapter, we have carried out self-assessment according to the EFQM model for four years. The main purpose is not to win awards and prizes, but this is also an important „by-product" from the point of view of image of the company in relation to customers and further interested parties.

The Technology Division (in 2003 under the name EES - Power and Environmental Construction) won, on the basis of the Self-assessment Report and subsequent inspection on site, the National Quality Award of the Czech Republic for 2003 in the category „part of company - plant". The award was presented by the then premier Vladimír Špidla in Spanish Hall of the Prague Castle.

In 2004, our biggest plant - Railway Construction - won, on the basis of the Self-assessment Report and audit carried-out by an international team of EFQM assessors, the second level of prestige award „Recognised for Excellence" from the EFQM Foundation in Brussels.

2. 4 Sustainable development

In accordance with the updated version of „Policy for the period 2004 - 2006" of ŽS Brno, joint-stock company, we gradually apply the principles of sustainable development. This is in accordance with the philosophy of the owner of our company, the OHL group.

Sustainable development - it is a synthesis and balance of three fields of our activity:

economic development, sound approach to the environment, and social responsibility (social progress).

Within the framework of economic development, the elements are, in particular: implementation of the system of proper company management (for example, according to OECD principles), codex of behaviour of the company managers (or ethical codex)[1], refusal of corruption etc.

Social responsibility of the company is defined as a balance of working and personal life of the employees, equal opportunities, diversity at the workplace (ethnical minorities, handicapped and older people), ensuring of retraining of the dismissed employees etc.

The European Commission defines Corporate Social Responsibility (CSR) as a conception under which the company integrates the social and environmental points of view into its business and into communication with the interested parties.

In the Czech Republic, CSR is a phenomenon of the latest years. Especially after accession of our country to the European Union, this activity, connecting business with social values, gains much higher importance, because our companies are obliged to show the same social and environmental awareness as shown by the companies of the older EU Member States for a number of years already. Essentially, it is possible to say that this is a trend appealing to a change of orientation of companies from short-term goals to long-term ones, from maximum to optimum profit. Plainly - it is a voluntary effort of companies to behave in a better way to people, as well as to the surrounding environment (customers, investors etc.), to not concentrate solely on economic profit, but also on environmental and social aspects of their business activities.

[1] In the Czech Republic, the association **BLF** (Business Leaders Forum) has been established. The mission of this association is „to associate business entities acting on the territory of the Czech Republic with the purpose to foster ethics in the business practice". BLF closely co-operates with the organisation „The Prince of Wales International Business Leaders Forum“ and other ethically oriented organisations. Within the framework of CSJ, also association **„Correct business“** with similar mission has been established in December 2003.

The goal for the period of 2005 - 2006 is to apply CSR in the conditions of our joint-stock company as one of the principles of integrated management. The project will be implemented in direct co-operation with Mr. Pier Zana (EFQM Business Excellence Director) who is responsible author of so-called Framework for CSR programmatically based on EFQM Excellence Model.

3 ENVIRONMENTAL MANAGEMENT ACCOUNTING

One of requirements of the EMAS II programme is implementation of the environmental management accounting (EMA). In our case, the structure of this management tool must correspond also to requirements of the owner - OHL - who uses the data to draw up reports „On Sustainable Development in the OHL Group“.

Environmental costs:

- Investment costs (own environmental investments);
- Operating costs - they are formed during activities other than production ones (they are not anticipated in the construction project).

Example of an environmental investment in 2004: During demolition of temporary housing facilities an old environmental burden was discovered - under the boiler room burning light fuel oils. A project was prepared on decontamination of the soil pollution - removal of the environmental burden. Its budget exceeded 1 million CZK.

Environmental consequences of effects of the company activities on the environment are subject to regular assessment. Information obtained in this way is important also for external interested groups, especially for customers (in the case of tenders) and the state. We are interested in monitoring environmental costs, and, optionally, revenues, in the individual plants, as well as in the company as a whole.

In this connection, co-operation with external experts - Ing. Jaroslava Hyršlová and Ing. Vojtěch Vaněček from Pardubice University - has been established. They have co-operated with ŽS Brno, joint-stock company, especially concerning selection, defining, and subsequent reporting of activities connected with the protection of the environment. We highly appreciate their help during introduction of EMA in our company.

On the basis of their recommendation, types of accounting cases accounted on the selected accounts of the financial accounting system were unified, and, with effect from January 1, 2004, amendment of the accounting system was issued. The amended system comprises accounts containing unequivocal information for necessary environmental reporting.

On the basis of costs and revenues accounted on these selected accounts, there is possible to draw up reports according to the requirements of "Regulations concerning introduction of the Eco-Management and Audit Scheme".

List of analytical accounts containing information for environmental reporting

518.18 – Recycling of Materials from Construction Wastes

- Exclusively for accounting for services connected with recycling of aggregates and construction debris bought from specialised companies - specific construction waste is returned, after carried-out recycling, to further use.

On this account, in the previous periods entitled Recycling of Used Raw Materials, services connected with removal of waste produced during construction have been accounted for - this concerns use of wastes through recycling.

The recycled material is not returned to the company ŽS Brno. The company can purchase it in the case of need (for sub-bases etc.) - this purchase is accounted for on account 501 (selected materials are accounted for by the method B).

Since January 1, 2004, these cases are accounted for on account 518.22 Waste Management.

Note:

Costs on this account are not operating costs. Services connected with „recycling of used gravel" are subject to costing in the construction projects, and form part of the production costs.

This account is chosen in order to enable provision of information on this type of production cost, corresponding to the sound environmental approach used in our company.

518.19 – Services Connected with Measurement of Environmental Characteristics

Costs for measurements of noise and vibrations, analysis of waste waters, measurements of emissions from chimneys, checking of combustion gases ways, etc., are concentrated on this account.

Measurements of emissions from means of transport do not belong on this account - these measurements cannot be regarded as an environmental cost, because they are compulsory according to the law.

518.22 – Waste Management

Costs for separation, storage, collection, and deposition of all wastes are accounted for on this account. Also utilisation of wastes by means of recycling is accounted for on this account.

In any case, costs caused by carrying out the construction works connected with all kinds of pollution - for example soiling of roads etc. - must not be incorporated into this account. Removal of pollution caused by carrying out the construction works cannot be regarded as environmental cost!

Note:

Also on this account, information on production and operating costs are mixed, and it cannot be used for environmental reporting without subsequent analysis of the individual operations. When accounting for costs, the accountants do not have, at their disposal, sufficiently accurate information concerning the point of view from which the cost connected with waste will be assessed.

518.28 - Handling of Water (Sewage Charges)

518.39 – Services of Environmental Monitoring

This account was newly introduced into our accounting system for the purposes of monitoring of costs connected with pollution prevention and protection of the environment. The following services are accounted for on this account:

- Costs for education within the framework of the environmental management system (ISO 14001 and EMAS);
- Advisory activities connected with introduction of environmental systems;
- Internal project and research works pursuing protection of the environment;
- EMS certification, validation of Environmental Reports for EMAS;
- other services connected with environmental management systems, pollution prevention, and protection of the environment.

In any case, services connected with emission measurements, measurements of noise and similar measurements within the framework of protection of the environment do not belong on this account. (A separate account 518.19 Services Connected with Measurement of Environmental Characteristics was created for services connected with the measurements.)

538.20 – Fees for Protection of the Environment

Payments imposed, for example, by a municipality for pollution of the environment (for example of air or water) are accounted for on this account.

More specifically: Fee for waste water discharge into surface watercourses or fee for air pollution, fees for deposition of wastes, if the fee is separately stated on the tax document - it can be recognised according to the 0 % VAT rate.

545.20 – Fines for Environmental Damages

This account comprises all imposed fines for pollution and damaging of the environment - the repressive item. Fines for felling of trees, for soiling of roads by construction works and for other damages, which are not directly connected with protection of the environment, must not be included into fines relating to the environment.

548.39 – Operating Costs for Environmental Monitoring

Newly introduced account for monitoring of other operating costs connected with waste disposal that cannot be accounted for on accounts 518.18, 518.19 or 518.22

548.49 – Compensations for Caused Environmental Damages

Newly introduced account for monitoring of payments to other entities for caused environmental damages.

548.50 – Surcharges to Basic Rates of Fees for Environmental Pollution

This is an account separated, for tax reasons, for monitoring of possible payments exceeding the bounds of the law.

549.70 – Disposal of Useless Stocks

Stocks accounted for on this account show the characteristics of waste - they do not serve to their purpose any more. Purchase prices, or, optionally, own costs of useless stocks are accounted on this account. Costs for disposal of the stocks (their liquidation) may be accounted for, according to their nature, on account 518.18, 518.22, or, optionally 538.20 or 548.39.

648.19 – Revenues from Disposal of Useless Stocks

The account serves to monitoring of receipts for disposed useless stocks or other possessions, monitors revenues obtained by sale of these stocks or possessions - bought-out paper, bought-out iron scrap etc.

This list provides the company management with the possibility to be informed of the actual state of costs and revenues connected with protection of the environment.

4 CONCLUSION

Sustainable development, as a philosophical view of the world, should create conditions for life of future human generations in the community of relative sufficiency - concerning either energy, food, water, safe nature (warming of atmosphere, ozone hole), or social justice. This is a global point of view which must be, however, supported by active approach of each company, each person. Because of that ŽS Brno, joint-stock company, and our strategic partner - the OHL group - formulate and implement the Policy of Sustainable Development.

During the first year of monitoring of environmental costs according to the EMA methodology, we have obtained some data, however, a manager needs to know for his/her decision-making, in particular, trends of development and further relationships from carried-out analyses. We will come nearer to it during the next years of monitoring - however, already according to the first results of EMA, we have to revise the contents of some accounts, and, possibly, to introduce a more detailed specification of some costs - this concerns mainly wastes. For example, we do not have specified the wastes sufficiently according to the place of their formation. Because of that, wastes from the production and the non-production spheres are summed on some accounts, and this distorts the total result. We consider this as the place for further improvement of the introduced environmental management accounting.

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EMISSION ALLOWANCES IN FINANCIAL ACCOUNTING

Anna Fedorová

This year, a new phenomenon enters the activity of certain companies - greenhouse gas emission allowances. They are a completely new tool which should ensure fulfilment of obligations of the Czech Republic ensuing from the Kyoto Protocol under the United Nations Framework Convention on Climate Change, and implementation of the Directive of the European Parliament and of the Council No. 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community. The existence of emission allowances and trading with them is based on the idea to use an economic tool to reduction of greenhouse gas emissions in the nation as a whole. It should contribute to reduction of emissions by the companies to the set level. In the case that they deviate from the limit, then this fact results in an economic impact. The prices of allowances and transactions with allowances will enter the economic results, they will become part of the company effectiveness, and it will be necessary to incorporate this environmental aspect distinctly into decision-making in the company. In the Czech Republic, the greenhouse gas emission allowances will apply to ca 450 sources in the first period.

1. Characteristics of transactions connected with emission allowances

Definition of emission allowances, and regulation of the process of transactions connected with them, are important for their processing in accounting.

In the Czech conditions, transactions with emission allowances are regulated by the Act No. 695/2004 Coll. on conditions of trading with greenhouse gas emission allowances, and on amendment of certain acts.

In Section 2, paragraph (1) of the Act, definitions of terms are stated, among others also the definition of emission allowances: an allowance shall mean **property value corresponding to the right** of an operator of an installation to emit to air, in the given **calendar year**, an equivalent of a tonne of CO_2.

In order that an operator obtain the allowances, it is necessary:

- To file an application for permit of greenhouse gas emissions and trading with them;
- To obtain a permit which subordinates greenhouse gas emissions to a set regimen (ability to monitor emissions, maintain their records, and ensure verification of the reported amount of emissions). The permits shall be issued by the Ministry of the Environment in agreement with the Ministry of Industry and Trade;
- To be incorporated into the national allocation plan which sets the total quantity of allowances that will be issued for the trading period, and also how many allowances will be allocated to the individual operators to be taken over from the administrator of the allowance trading registry. The regimen of trading with the allowances is, with regard to time, defined by trading periods. These periods are five-year ones, with the exception of the first period which is three-year one, and is under way in 2005 to 2007. The time interval which is worked with is a calendar year.

Possibilities of handling of the obtained allowances are important. In Section 11 of the Act No. 695/2004 Coll., these possibilities are defined as follows:

1) The operator may sell the allowances or transfer them in another way to another person;
2) Allowances may not be an object of mortgage right;
3) Allowances may not be a non-monetary contribution to the basic capital of a society;
4) Allowances shall descend to the legal successor of the operator of an installation in the case of its liquidation or death.

Naturally, the possibility of sale or transfer of allowances to another person does not cancel the original purpose of this tool - the right to produce the set quantity of emissions, but it creates, in addition, elements of economic influence. This can be in a positive role, i.e., in the case of lower production of emissions than allowed, when the operator can sell the unnecessary allowances, or in the contrary negative role - in the case of higher production of emissions the necessity to buy further allowances is formed.

After a lapse of the calendar year for which allowances were obtained, the operator:

- Submits report on the quantity of greenhouse gas emissions from its installations. The deadline for submission of the report is February 28 of the subsequent year.
- Submits documents proving verification of the quantity of the reported emissions. The verification shall be carried out by an authorised person, and it shall be submitted by March 31 of the subsequent year.
- By April 30, it removes from trading the amount of allowances corresponding to the quantity of emissions measured and verified in the previous calendar year.

2. Conclusions for financial accounting

For accounting cases connected with emission allowances, the following conclusions may be drawn from the Czech legal regulations:

- The allowance is identified as a property item having character of an obtained right, i.e., as an intangible asset;
- The duty to surrender, by April 30 of the subsequent year, the amount of allowances corresponding to the quantity of emissions measured and verified in the previous calendar year, may be identified as a liability item of the balance sheet, having the character of obligation;
- In view of the fact that all processes of settlement of the allowances proceed, and can proceed, only after the end of the calendar year, they will be present, on December 31, i.e. on the usual balance sheet date, in the balance sheet characteristics of assets and liabilities of the company, and this fact will be also reflected in economic result operations of the company.

3. Accounting concerning allowances according to IAS/IFRS

It will be necessary to observe several accounting standards in accounting concerning allowances according to international standards of financial reporting. The International Financial Reporting Interpretations Committee issued separately and specially concerning allowances the interpretation IFRIC 3 - Emission Rights, which entered into force on March 1, 2005. In May 2005, this interpretation was not recommended for the European Union because it was not in accordance with the principle of true and fair representation and did not meet the criteria of understandability, relevance, reliability, and comparability, and in the time of preparation of this text, the interpretation was cancelled. It may be assumed that some approaches will be accepted into the new solution. Because of that, we will mention them.

From IFRIC 3, there follows that:

- Allowances are intangible assets that are reported according to IAS 38 - Intangible assets. Their primary evaluation is carried out in fair value, they are not subject of depreciation, and change of their prices is expressed either
  a) by means of a rectifying item in the case of decline of price, or
  b) by means of revaluation to real value;
- Difference between payment for allocated allowances (if they are paid for), and their fair value, is reported as a government grant according to IAS 20 - Accounting for Government Grants and Disclosure of Government Assistance. The difference is entered in the books as accrued income, and systematically dissolved into income;
- Obligation of the company to surrender allowances to the government is recorded according to IAS 37 - Provisions, Contingent Liabilities and Contingent Assets. It is evaluated in market value of produced emissions (tonnes x price).

4. Examples of impacts of transactions with emission allowances

In order to find out impacts of this approach to accounting representation, we will start from the following assumptions:

- the company obtained 100 emission allowances;
- price in the time of their allocation was 10 EUR, what, for the purpose of simplification, will be converted by the exchange rate 30.000;
- on the balance sheet date, the price of the allowance was 15 EUR (converted by the same exchange rate).

Situation according to item a), i.e., accounting without revaluation

The emission allowances are kept in the books in the purchase price, and only in the case of decline of prices the reality will be reflected in the accounting.

Impacts on balance sheet, and on profit and loss statement, in the case that the company will not trade in emission allowances, because real emission in the period corresponded to the scope of allocated allowances, and was 100 tonnes:

BALANCE SHEET

	date of issuance of allowances	balance sheet date 31.12.xxx1	surrender of allowances max. 30.4.xxx2
Assets			
allowances	30 000	30 000	-
cash			
total assets		30 000	-
Equity and liabilities			
provision for allowances		45 000	-
government grant	30 000		
accumulated result		- 15 000	-
total liabilities		30 000	-

PROFIT AND LOSS STATEMENT

return from grant	30 000	
formation of provisions - cost	45 000	
cancellation of provisions		15 000
result of the period	- 15 000	15 000

In this most simple situation, and, naturally, more markedly in the case of sale and purchase of emission allowances and fluctuation of their prices, the fact that the allowances will be surrendered after the balance sheet date only will influence economic results of two accounting periods. It is possible to try to find solution of this situation in IAS 10 - Events after the Balance Sheet Date. However, there follows from this standard that retirement of assets after the balance sheet date is just the transaction in the case of which accounting statements are not amended, and nature of the event, and estimation of value impact of the transaction, are only disclosed.

Situation according to item b), i.e. accounting with revaluation

This means, in the accounting, to increase the price of allowances in the case of increase of prices above their real value, and to reflect this revaluation in the equity.

Impacts on balance sheet, and on profit and loss statement, in the case that the company will not trade in emission allowances:

BALANCE SHEET

	date of issuance of allowances	balance sheet date 31.12.xxx1	surrender of allowances max. 30.4.xxx2
Assets			
allowances	30 000	45 000	-
cash			
total assets		45 000	-
Equity and liabilities			
equity			
revaluation fund		15 000	
provision for allowances		45 000	-
government grant	30 000		
accumulated result		- 15 000	-
total liabilities		45 000	-

PROFIT AND LOSS STATEMENT

return from grant		30 000	
formation of provisions - cost		45 000	
cancellation of provisions			-
result of the period		- 15 000	-

In the case of this solution, transactions with allowances will be reflected in accounting statements of the accounting period when they happened. The problem is misinformation concerning the economic result, although the equity remains unchanged.

5. Assumed future development in accounting concerning emission allowances

Up to now, two possibilities of solution arise from the discussion concerning interpretation IFRIC 3:

1) To create, for the allowances, a new category of intangible assets in which it would be possible to place increase of real value on return accounts. This would rectify the inconsistency of the present model of the real value of the allowance, where revaluation of the real value of the allowance is reflected in the equity, and increase of the provisions value to the real price is reflected in results.
2) Accounting of emission rights within the framework of hedge accounting.

Reflection of the increased real value of the allowances on result accounts would result in the following situation in accounting statements on the day xxx1:

BALANCE SHEET

	date of issuance of allowances	balance sheet date 31.12.xxx1	surrender of allowances max. 30.4.xxx2
Assets			
allowances	30 000	45 000	-
cash			
total assets		45 000	-
Equity and liabilities			
equity			
provision for allowances		45 000	-
government grant	30 000		
accumulated result		-	-
total liabilities		45 000	-

PROFIT AND LOSS STATEMENT

return from grant	30 000
return difference from revaluation	15 000
formation of provisions - cost	45 000
result of the period	-

By means of this solution, even debit of the profit and loss statement would be achieved, and it would contribute to meeting of the principle of true and fair representation, as well as of understandability and comparability of accounting statements.

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ENVIRONMENTAL MANAGEMENT AND FINANCIAL MARKETS

Miroslav Hájek

In the Czech Republic, increased interest exists concerning introduction of environmental management systems in the last years. The amount of companies having certification ISO 1400/EMAS exceeded the number of 1000 this year, and it has grown more than four times in the last three years. In particular, lasting interest in protection of the environment, and effort to maintain, or, optionally, improve their market position, belong among the main reasons leading the companies to introduction of environmental management systems (Hyršlová 2003). The companies are aware of a growing pressure on responsible approach towards the environment and sustainable development (from the side of state authorities, the public, and business partners). This manifests itself, apart from other things, in utilisation of environmentally friendly technologies, implementation of which a number of states, including the European Union, regards as a way to increase of competitiveness and to sustainable development. Demand of customers also has been changing. The customers are willing to pay more for environmentally friendly products, or, optionally, do not want to be environmentally responsible for their suppliers.

In comparison with other tools and approaches supporting sustainable development, the environmental management system is usable in almost all fields of activity of a company (accounting, financing, marketing, production, sale, strategic planning etc.). From the point of view of its wide effectiveness (Schaltegger 2002), it is the priority tool which founds broad use and shows important impact on achieving sustainable development.

On the basis of practical experience and questionnaire investigations, it is obvious that, in the certified companies, organisation of work has improved, important environmental aspects and impacts of the company activities, products and services has been monitored, and main attention has been paid to ensuring compliance with the valid laws and regulations, although this aspect has been often criticised from the point of view that the compliance should be ensured in all companies. The companies adopt their own environmental policies, and achieve improvement of their environmental profiles. Thanks to better information system, it is assumed that the companies will manage to adapt quickly to new regulations in the field of environmental protection. Introduction of environmental management systems should contribute also to permanent economic growth, prosperity of companies, and increase of competition advantage. It manifests itself also in better position for negotiations with financial institutions, state authorities, and the public.

Benefits from introduction of environmental management systems

As indicated above, benefits from introduction of environmental management systems may bee seen in a number of fields. The key approach to assessment of benefits is the point of view of society as a whole, and the company point of view. From the point of view of the society as a whole, benefits are assessed, for example, up to the level of global problems of environmental protection, such as climate change, protection of the Earth‘s ozone layer etc.

From the company point of view, assessment of benefits is based on standard methods of assessment of effectiveness, and level of achievement of benefits on the level of society as a whole depends, to a large extent, on internalisation of external costs from the side of state, but also on sufficient information on the level of companies, which can be ensured, for example,

through introduction of environmental management accounting. From this point of view, it is important what kind of environmental policy approaches, methods and tools, enabling companies to actively contribute to protection of the environment, is implemented (Hájek 2003).

During assessment of benefits, inputs and outputs on the level of companies are usually taken into consideration, assuming that external costs are, to a larger extent, internalised, i.e., that it is possible to expect that the companies will behave in the way to maximise benefits for the society as a whole. At first, it is assessed whether the ISO1400/EMAS certification itself shows economic return, and what is the level of this return. However, according to information obtained from some companies, such analysis was not carried out there, because they expect benefits in the future, and, at present, they are not able to quantify them, or take into consideration incalculable benefits, such as improvement of image, higher change to succeed in tenders, higher loyalty of customers. In the case of use of the Methodical Instruction of the Ministry of the Environment for introduction of environmental management accounting (2002), economic return is about 2 years (Krčma 2003).

Environmental technologies

Assuming that environmental management systems result in sustainable business, it is possible to find out the basis of successful business in the use of „sustainable innovation“. In this sense, it is possible to define a new trend of business - sustainable business - which incorporates personal policy, profit, and protection of the environment (Schaltegger 2003).

In defining sustainable innovation, it is obvious that essential difference in comparison with other innovations does not exist. However, there exist specific problems in their implementation. Because of that, the role of state is important, especially in introduction of these innovations to the market. This is caused by certain level of risk connected with innovations. In addition to this general characteristic of innovations, sustainable innovations, when supported, show positive impact on the environment. To a certain extent, this is also an obstacle in use of the innovations, because, in addition to benefit for the company, it is necessary to count with benefit for society as a whole, which is not fully reflected in the economic situation of the company.

Sustainable innovations are closely connected with environmental technologies. Technologies, use of which is less harmful for the environment than comparable alternatives, are regarded as environmental ones. This concerns technologies that, in comparison with alternative variants, produce less pollution and wastes, enable higher level of recycling and reuse of waste, use energy, raw materials and other resources more effectively, or are destined directly for protection of the environment. The concept of environmental technology is, usually, understood in broad sense. It means that it comprises the overall know-how, methods and processes, goods and services, equipment, and also organising and management procedures. Their benefit resides in high potential for reduction of operating costs, increase of production effectiveness, and, through this, increase of competitiveness.

It is necessary to continuously monitor the level of use of natural resources, and damaging of the environment connected therewith, in view of the principles of sustainable development. In many areas, negative impacts on the environment, health, and life quality of people are still increasing. Investments into development and use of environmental technologies are one of possibilities for reversing this unfavourable trend. Their broad implementation will be promoted also by the fact that consumers are, to higher and higher extent, aware of the necessity to protect the environment which significantly influences their health and overall

life quality. Because of that, there increases demand of environmentally sound products and services, for the production of which up-to-date environmental technologies must be used.

Measures implemented by a company within the framework of environmental management systems may be of very diverse nature - beginning from small organisational measures, up to technical and technological changes requiring considerable investments. However, in its final consequence they always lead to more effective use of resources, more environmentally sound processes, lower production of emissions and wastes etc. - i.e., to results supported by application of up-to-date environmental technologies.

Financial markets

The level of reflection of use of environmental technologies and environmental management systems on financial markets is important from the point of view of economic evolution and attainment of sustainable development, in addition to facts stated above.

In financial market, supply and demand of money and capital is concentrated. The financial market may be divided into the following parts (Jílek 1997):

- debt markets (credits, loans, debt stocks)
- stock markets
- commodity markets (market with precious metals)
- currency (exchange) markets.

Especially debt markets and stock markets are important in relation to environmental management systems.

Credibility of the client plays an important role in providing credits and loans. This credibility should be strengthened in the case that the client is certified according to ISO 14 000/EMAS. As stated above, this certification ensures prosperity together with positive impact on the environment and social sector. The extent to which the individual financial institutions consider the above-mentioned facts is an issue of their policy.

The Ministry of the Environment has been developing an initiative towards the banking sector from the beginning of 1990s. At first, the approach of financial institutions was reserved, without interest in more detailed information concerning environmental management systems and relation of companies towards the environment. However, in the period of privatisation of banks the situation was opposite in the sense that the banks were interested in obtaining as much information as possible concerning assessment of environmental impact of companies (eco-audit, environmental management systems etc.).

The insurance companies have similar approach as banks. The problem in the case of insurance does not reside in the fact that something cannot be insured, but in the amount of the insurance rate. Use of the environmental management systems should result in reduction of risk of events insured against, and, therefore, also in reduction of the insurance rate.

In the case of stock markets, it is proceeded from the assumption that joint-stock companies certified according to ISO 14 000/EMAS are more successful, and prices of their stocks are increasing. However, in practice, a number of factors influences the price.

For example, if we look at Dow Jones Sustainability World Index, representing joint-stock companies from the point of view of achieving sustainable development, the development of the yield on shares from the time of establishing the index was as follows:

1999	2000	2001	2002	2003	2004
29.70 %	-17.50 %	-15.44 %	-21.26 %	36.41 %	12.84 %

This index embraces 318 joint-stock companies.

From the opposite point of view, if we assess usually used stock market indexes, it is obvious that majority of companies have not introduced an environmental management system. From these analyses, it follows that representation of companies in these indexes is incomplete (Sutherland 2005).

Introduction of an index based on introduction of environmental management systems or sustainable development in the Czech Republic is obstructed, especially, by the problem of marketability of stocks (stocks of majority of joint-stock companies having ISO 14 000/EMAS certification are not marketable) and the number of suitable joint-stock companies.

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USE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN INTRODUCING EMS AND EMAS

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The article deals with the state of using information and communication technology in the implementation of the Environmental Management Systems in Czech Republic.

Key words: Environmental Management Systems, Environmental Management and Audit Scheme, Integrated Management Systems, Total Quality Management Systems, Occupational Health and Safety Management Systems, Human Resource Management Systems, Small and Medium Enterprises, Environmental Profile, Information and Communication Technology

Introduction

An important role within the process of globalization of production and markets is currently played informatization of society, as well as by research and scientific findings which are required to ensure sustainable development of society, based on three basic principles of sustainable development: *economic growth, environmental balance and social progress.* After accession of the Czech Republic to EU, international standards for control of the environmental impact of companies and their technologies, products and services were introduced to every-day practice. In this business environment, a necessary precondition for success of a company on the market consists in creation of positive relations between environmental and economic efficiency, as well as creativity in development of new products and technology. The current global market which is entered by both transformed domestic enterprises and newly established companies, and particularly the market and trade within the European Union, can be characterized by the following conditions:

- *it requires high quality of products and services oriented on satisfying the needs of customers;*
- *it reflects environmental costs of production, e.g. in recovery, recycling and disposal of waste, etc.;*
- *it also requires safety and protection of health in manufacturing products and providing services;*
- *it supports good corporate culture and also begins to support business ethics.*

The satisfaction of these requirements in practice requires maximum utilization of the existing data sources and ICT, both at public and corporate levels.

1. Role of the Environmental Management System in companies

The Environmental Management System (EMS) pursuant to the ISO 14000 standards and pursuant to Regulation (EC) No. 761/2001 of the European Parliament and of the Council (EMAS II) processes information from both external and internal stakeholders. Its role within

a company lies in providing for communication, keeping records and documentation, as well as reporting to all stakeholders, both within EMS (ISO 1400 and EMAS II) and within evaluation of the corporate environmental profile (EP). Introduction of EMS facilitates, e.g.:

- *demonstration of fulfillment of obligations in environmental protection;*
- *limiting the interest and issues related to unfavorable environmental aspects and concentrating attention at implementation of environmental policies, objectives, target values and environmental programs;*
- *improving knowledge of the corporate environmental management system;*
- *improving efficiency and substantially reducing the time (by up to one half compared to standard introduction without IS EMS) required for introduction of EMS*
- *increasing the level of information on the corporate environmental profile.*

2. Conditions for introduction of information support for EMS and EMAS

The conditions for information support for EMS (including EMAS II) can be divided to two basic areas. The first, the external area, provides for communication of the organization as a whole with its neighborhood. The second, the internal area, ensures communication between the implemented information subsystems and employees within the company itself.

2.1 External area

The external area related to introduction of information support for EMS and the EMS program is based on the legislative conditions following from the Czech and international standards for information technologies, and also from the standards concerning environmental protection, consumer protection and quality of products and services, protection of health and safety at work, and also the position of employees within the organizational structure of the given company. The new environmental legislation (e.g. Waste Act, Packaging Act, Water Act and Clean Air Act) is often considered to be a tool for ensuring transparency of the process of providing environmental information to the government and, at the same time, a means for control of EMS communication and reporting on the corporate EP. However, on the other hand, clear and unambiguous procedures for providing environmental information to the following entities must be drawn up with respect to communication and keeping records in EMS:

- *the government and self-governing bodies in whose territory the company operates (prevention and accident plans, etc.);*
- *cooperating organizations (customers and suppliers, financial institutions);*
- *the general public and NGOs (non-governmental organizations).*

The procedure for evaluation of the corporate EP should be published and should be comprehensible and usable for both the customers and the general public. One of the potential means of employing ICT within the introduction of EMS consists in utilization of the Internet technology and introduction of publicly accessible website of the company, providing information on its EP, as well as decision-making and other documents concerning the environmental impact of the company in the given region, affecting the sustainability of the region.

The basic part of EMS in this area consists in *environmental reporting* by the company. To this end, an EMS information subsystem enabling regular collection, analyses and processing of relevant environmental data according to the requirements of ISO 14001:2004, ISO 14031 and draft ISO 14063 must be drawn up to ensure the preparation of regular reports on EP of the company.

While the area of corporate environmental information concerned with EMS of the company is a privileged and protected special area with respect to the nature of business secrets and know how of the company, nevertheless, it is a special part of the overall subject of sustainable development of the company, region and the entire Czech Republic. However, access of the general public to environmental information collected by the company within EMS plays an important role in EU. Provision of information on EP is voluntary; nevertheless, it can substantially support environmental democracy and competitiveness of the company on the market.

The EU policy in the area of ICT is formulated in the EU action plan entitled "eEurope 2005 – An Information Society for All". This plan, which is known as *eEurope*, is disclosed, together with the action plan of the Czech Republic for development of information society, on the Government website at *http://www.vlada.cz*. It follows from the above-described trends that, in the framework of development of information and knowledge society, the current ICT (particularly Internet and Intranet) will need to be used as much as possible and standard information subsystems of EMS will need to be introduced in companies, facilitating the determination and evaluation of suitable EP indicators, constituting, e.g., an input for the management subsystem of the given company. This will enable the management of the company to ensure better fulfillment of the EP criteria and continuously improve environmental performance of the company. Access of customers to environmental information on the company, its services and, if appropriate, its products should not be limited so that the customers can freely choose the given company on the market, not only on the basis of the lowest price of its products or services, but also on the basis of its EP.

2.2 Internal area

The basic requirement for implementation of an EMS information subsystem in a company is *maintaining balance between credibility of environmental information and allowing access to information* on EP of the company, based on the requirements of standards of the ISO 14000 series, particularly draft ISO 14063 for environmental communication, and also on the requirements of EU Regulation No. 761/2001, Commission Decision and Recommendation (EC) 680/2001 on EU Regulation No. 761/2001 for environmental reporting within the EMAS II program (see http://www.cenia.cz/www/webapp.nsf/webitems/home_EMAS) and, implicitly, also Act No. 123/1998 Coll., *on provision of information on the environment.*

Generally, information related to the subject of future decision-making is the most important for any decision-making processes in a company. After obtaining, this information is evaluated and the management makes the actual decision within the continuous process of the "Deming Cycle" (Plan – Do – Check – Act). If inadequate credible environmental information is available at the given moment, the management of the company makes a decision with substantial uncertainty; where there is adequate information which, however, cannot be evaluated, the uncertainty in decision-making by the management is also high.

This information is usually obtained from the following areas belonging to EMS: *waste management, water management, air protection, management of nature and the landscape, emergency planning, protection against chemicals, protection against noise, heat emissions,*

emissions of ionizing radiation, and energy production. The list of these areas is not entirely exhaustive, as a number of other categories are directly or indirectly related to corporate EMS while others are interconnected with this subject (e.g. *occupational safety and protection of health, fire protection*, etc.).

3. ICT used to support introduction of EMS

Use of *ICT* that supports the introduction of integrated management systems (*IMS*) still does not correspond to the use of *ICT* in other areas of corporate management and particularly management of small and medium-sized enterprises (*SME*). EMS is becoming part of the new global trend of introducing IMS systems which also include Total Quality Management Systems (TQMS) pursuant to revised ISO 9000:2000 standards, Occupational Health and Safety Management Systems (OHSMS), e.g. pursuant to CSN 18000, and Human Resources Management Systems (HRMS) which have not been standardized to date. This system will soon include business ethics.

Only isolated information systems oriented at implementation of *TQMS* and EMS are mostly implemented in the framework of the structure of corporate IS in the Czech Republic; within these management systems, EMS is oriented particularly at:

- *management of documentation and workflow;*
- *basic environmental monitoring;*
- *recording and documenting the results of measuring environmental indicators in waste and water management and in air protection.*

There is still a legislative gap which includes absence of standards compatible with EU for collection of information on EP from corporate information systems (i.e. subsystems for EMS, *TQMS*, *OHSMS*, *HRMS*, etc.) and their use for standardization in evaluation of the ability of large companies and SMEs to enter EU and OECD markets and also for evaluation of the significant impact of *SMEs* on sustainable development of the region. Particularly in *SMEs*, a simple meta-information managerial system will need to be introduced, together with the methodology of its introduction, within application of information technologies, as a new effective management tool for implementation of EMS. This meta-information managerial system for IMS will be able to employ indicators from EP, as well as the Czech and international standards for information technology, the European meta-data environmental catalogue, and also the standards for EMS, *EMAS*, *TQMS*, *QHSM* and *HRMS* which it will combine in a single integrated unit.

ICT that are used in the framework of the current *intranet network of companies* should become a basis for creation of an EMS information subsystem of the companies. The EMS information subsystem should be installed on one of the servers of the company within this intranet network (e.g. on a high-performance personal computer). An *application server*, running the modules of the EMS information subsystem which send requests and process responses from the part where the environmental database is located (the *data server*), should operate on the server. Its task is to maintain the current data warehouse of the entire corporate EMS with the use of modern data warehousing technology, i.e. maintain all environmental data and information on the aforementioned areas belonging to EMS in temporal series that enable monitoring of the trends in selected EP indicators. In order to reduce the costs of software, it is suitable that both servers work, e.g., within a Linux or Windows operational system and utilize the following basic software: WWW server (e.g. Apache, Windows2000

server), object-oriented script language (e.g. PHP, ASP), together with other libraries of functions, e.g., for processing charts, etc. and auxiliary means for automatic backup of data on both the aforementioned servers. On the other hand, the system of database management that is already being used in the company can be employed as a data warehouse (from, e.g., Access, MS SQL, to Interbase, Oracle, Progress, or Informix).

An EMS information subsystem adapted to the specific conditions of implementing ICT in the given company must be introduced from the beginning of introduction of EMS and the currently used environmental accounting system must also be employed. Our experience from the Czech Republic indicates that it is advisable to keep all EMS documentation, as well as the prescribed records for waste and water management, air protection and chemical substances and preparations, interconnected with environmental accounting of the company within such EMS information subsystem. This substantially facilitates automated communication within EMS, both with internal and external stakeholders.

Another step in introducing an EMS information subsystem in EU consists in support for decision-making by the management of the company at all its management levels. Standard *ICT* for automation of decision-making, such as MS Office Professional (particularly MS Excel) are used to this end. It has been documented that only in this manner the EMS information subsystem can become a true instrument, both for the management and for the employees of the company who can influence implementation of the corporate environmental program and policies.

4. Conclusion

Use of *ICT* in EMS is generally becoming another necessary step for the top management of companies in EU within modification of their information strategy. Improved competitiveness of Czech companies can be facilitated by introducing EMS into their IS structure. Rather than the technical level of the *ICT*- hardware or basic software, the lack of high-quality application program equipment can be a limiting factor for implementation of EMS. This shortcoming follows from legislation which currently inadequately covers this issue and, thus, insufficiently stipulates the environmental conditions in the business environment of the Czech Republic, which in turn results in postponing the introduction of EMS in companies. It can be stated, for example, that the main criterion in a majority of tender procedures is the price of the product or service and consideration of the corporate EP is currently very rare within such procedures.

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METHODS OF ENVIRONMENTAL COST ACCOUNTING

Jaroslava Hyršlová

In the conditions when the company approach to the environment represents a factor influencing business success, it is purposeful to use corresponding methods also within the framework of cost accounting. Methods used within the framework of environmental cost accounting (ECA) may be divided into groups based on the definition of environmental costs and on methods used in cost accounting. The paper discusses use of calculations of environmental costs, the Full Cost Accounting method, as well as process costing.

Introduction

Environmental cost accounting (ECA) as considered to form part of environmental management accounting. IFAC defines ECA as „identification and evaluation of costs (including environmental costs) and their allocation to processes, activities, products or centres“ [9]. Methods used within the framework of ECA may be divided into groups based on *the definition of environmental costs* and on *methods used in cost accounting* (see Table No. 1). Within the framework of the approach based on interpretation of environmental costs as *environmental protection costs*, it is necessary to distinguish among past, present, and future costs. The approach oriented on *costs of material and energy flosw* is based, especially, on past results.

Table No. 1: Overview of basic methods used within the framework of ECA [16]

	ENVIRONMENTAL PROTECTION COSTS		**COSTS OF MATERIAL AND ENERGY FLOWS**	
	Past and present costs	**Future (potential) costs**	**Past and present costs**	**Future (potential) costs**
SEPARATE CALCULATIONS	Costs on reduction of wastes, waste waters and emissions to air	Environmental budgeting		
FULL-COST ACCOUNTING	Full costs of environmental protection	Costs connected with environmental risks	Costs of remaining material	
DIRECT COSTING	Environmentally oriented direct costing Multi-stage direct costing	Costing of future environmental costs		
PROCESS COSTING	Activity-based costing	Activity-based budgeting	Costing oriented towards material and energy flows Activity-based costing oriented towards material flows	Activity-based budgeting oriented towards material and energy flows

In the following chapters, attention is paid to the individual methods.

1 Calculations of Environmental Costs and Full-Cost Accounting

The first approaches within the framework of calculations of *environmental costs* concentrated on costing of end-of-pipe technologies. Protection of the environment was considered as a necessary condition for carrying out a business activity. While Verein Deutscher Ingenieure (VDI) pointed out the need of separation of environmental costs from the other cost elements and of their separate monitoring [20], other approaches, to the contrary, aimed to incorporate tracing of costs connected with environmental protection measures into the systems of management accounting by means of methods such as, for example Full-Cost Accounting [3; 23], direct costing [10; 15; 18] or activity-based costing [5].

The *Full-Cost Accounting method* concentrates on tracing direct costs and on allocation of indirect costs to the individual products, product groups, activities, processes or services [22]. IFAC understands Full-Cost Accounting and ECA as synonyms [9]. As follows from the definition, the aim of the Full-Cost Accounting method is to allocate, to the individual subjects (products, services, activities, processes, departments, centres), the full cost - i.e., both the costs connected directly with the individual subjects, and a part of indirect costs allocated to the individual subjects[2].

Direct costing is concentrated on direct costs, i.e. on costs that can be allocated and measured in relation to the relevant subject of costing.

Process costing is used in the cases when products or services are formed in a sequence of continuous or repeated operations [4].

All the various approaches within the framework of ECA have their advantages and disadvantages.

One of the advantages of *separate costing* connected with end technologies consists in that no changes are necessary within the framework of existing management accounting systems used in the company [6]. Information obtained within the framework of costing can be compared, for example, it is possible to assess costs of various end technologies used in various industrial sectors. On the contrary, the fact that only costs of end technologies are, usually, regarded as environmental costs may be considered as a disadvantage of this approach. It means that attention is paid neither to cleaner technologies (for example, to new non-waste production processes), nor to company costs formed in the case that environmental protection is neglected. Therefore, this is a reactive approach concentrated solely on additional costs produced by the effect of environmental protection acts. Although it is purposeful to monitor costs of end technologies and allocate them, in a corresponding manner, to the cost subjects, the problems of environmental protection are not integrated into the management accounting system, and information that would contribute to looking for the measures resulting in increase of economic productivity, and in mitigation of environmental impacts of the company activities, products and services, is not available, within the framework of this approach.

The advantage of use of the *Full-Cost Accounting method* in connection with the environmentally caused costs consists, in particular, in the possibility to allocate costs on the basis of activities causing these costs - it means on the basis of their relational quantities [16].

[2] The term Full-Cost Accounting is not used uniformly by all authors. Some authors consider as „full“ only that cost items that originate in the company - it means the ones that influence its economy result [22]. Further authors include costs originating within the framework of the whole life cycle of the product - i.e., beginning from obtaining raw materials, up to disposal of the product [19] - into the „full“ costs.

A relational quantity of costs is a factor causing a change in costs of the activity (for example, quality of semi-product produced by the given activity is the main factor for determining how much work will be required by the activity, and, at the same time, influences also the other required sources). The basis for allocation of costs is definition of cost subjects, cost centres, and responsibilities. Within the framework of this approach, protection of the environment forms an inseparable part of business activities - the approach enables search for potential cost savings, and market opportunities. The disadvantages of use of the Full-Cost Accounting method within the framework of ECA include, in particular, the fact that protection of the environment is not regarded as opportunity, but as a factor causing costs. This can result also in negative understanding of pollution prevention. Again, the main attention is concentrated on costs connected with end technologies. Information on environmental costs connected with the individual production processes and products is not regarded as purposeful. Operation of end technologies is, usually, connected with high fixed costs; the costs of end technologies per a unit of product are highly influenced by the level of use of the capacity. If environmental costs are allocated to the individual products under these conditions or as a part of overhead costs, then the obtained information may, in a significant manner, reduce transparency of environmental costs, which is considered necessary for their management. It means that costing is distorted, and does not provide support for decision-making processes in the company. Also within the framework of this approach, the company costs formed in the consequence of non-carrying out environmental protection measures are not taken into consideration.

The main advantage of use of the *direct costing* method consists in that it is possible to monitor direct environmental costs connected with the individual products. The procedure is based on causal links of costs to performance, exactly specified. Within the framework of direct costing, it is possible to separately monitor fixed and variable costs. It means that it is possible to pay attention both to information important from the short-term point of view, and from the long-term point of view. By using the approach of M. Schreiner, it is possible to identify environmental cost centres. This could help significantly in finding the places where cost savings may be achieved by means of environmental protection measures [18]. M. Schreiner was also the first person who pointed out the need of management of environmental costs by means of material and energy flows. In a number of cases, the problem of the direct costing method is difficult identification of the environmental costs and their separation from the other cost items (for example, in the case of costs connected with cleaner technologies). Also within the framework of this approach, the company costs formed in the consequence of non-carrying out environmental protection measures are not taken into consideration.

One of the main advantages of use of the *activity-based costing* within the framework of environmental cost management (in addition to the above-mentioned advantages in connection with the Full-Cost Accounting method) is integration of ECA into strategic management, and its link to process management. Further, there may be regarded as a benefit of the method that it, by means of the provided information, strengthens the managers' opinion that it is purposeful, for management of the company, to monitor environmental costs connected with the individual outputs (products). However, experiences of US companies show that implementation of the method may be very expensive for certain companies [5]. Also within the framework of this approach, the future environmental costs are not taken into consideration.

2 Environmental budgeting and assessment of potential environmental costs

Generally, budgeting is a process of formulation of aims in monetary units, and of ways to achieving these aims [11]. A budget is understood as a system-drawn, tactically and operatively oriented tool of specification of these aims, or, respectively, of means for their achieving. It is expressed in the form of standards oriented on the value aspect of the business process. The main aim of the system of budgets and plans in the company is to make the decision-making processes within the framework of the company more effective through reduction of uncertainty [11]. The means for achieving this aim include analysis of possible future complications, assessment of the variants of their solution, and support of the measures that optimise the activity of the company from the long-term point of view. The whole system has also the functions of communication, control, and motivation.

Conventional accounting is criticised for the fact that it is too much oriented into the past instead of focusing, in particular, on the current and future activities. Management accounting must provide information for the company planning processes. Also the questions of environmental approach of the company, and the field of protection of the environment, influence the systems of plans and budgets in the company. For the first time, the term *environmental budgeting* was used for a method usable for budgeting of environmental costs by G. Wagner and H. Janzen [21]. The need to take into account, within the framework of the Full-Cost Accounting method, also future costs connected with protection of the environment, was pointed out by J. Neumann-Szyszka and R. Harding [8;13]. In professional literature, the need to evaluate future costs ensuing from environmental problems, and to incorporate them into decision-making processes, is discussed [2; 10; 15].

Assessment of future costs connected with prevention of pollution and environmental obligations is very difficult, especially for the reason that development of future technologies, as well as requirements of the interested parties, can be hardly estimated. It means that within the framework of budgeting of these items, it is always necessary to start from the concrete situation of the company, and to take into consideration the individual problems and projects for protection of the environment [21]. L. Parker [14] recommends also changes in the existing management systems by means of budgets[3], that should be based on:

- Processes within the framework of environmental management which are regarded as substantial for the activity of the organisation;
- Needs of the management within the framework of operative decision-making and management;
- Level of ensuring of information on environmental inputs and outputs and on costs;
- innovation of accounting systems that can be carried out within the framework of the organisation.

It means that it is necessary to focus attention on the key problems and processes (and, within their framework, in particular on strategic management) that can include setting of budget aims, for example in the field of projects connected with decontamination of the polluted land, with systems of pollution control, with waste management, with recycling processes etc. On condition that methods and procedures enabling provision of purpose-oriented information to the management will be used within the framework of management accounting, then it is possible to propose and carry out the measures that will be in accordance with the company

[3] Within the framework of management by means of budgets, responsibilities of managers for fulfilment of the required results are set, and continuous comparison of the real and the budgeted results is carried out, either by ensuring harmony of the individual steps and aims, or by providing a basis for their revision [4].

aims in the field of improvement of eco-efficiency.

3 Costs connected with material and energy flows

Methods concentrating on monitoring of costs of end technologies, or, optionally, further considering, as a part of environmental costs, also costs connected with cleaner technologies (see methods in Table No. 1 based on conception of environmental costs as environmental protection costs) result, undoubtedly, in recognition that protection of the environment causes increase of costs (for example, if the company operates a waste water treatment plant, then its operating costs increase). As stated above, the aim of the management is to increase the company eco-efficiency. In order to achieve this aim, it is necessary to assess economic productivity of the company and its environmental profile in mutual relations. Methods of cost accounting concentrating on environmental protection costs only, without regard to environmental benefits, do not provide the management with necessary information that would contribute to increase of eco-efficiency.

It means that for the needs of management (cost) accounting, it is necessary to adjust the basic definition of environmental costs. Environmental costs are all costs caused by material and energy flows having environmental impacts. It other words, environmental costs are created by each procurement and processing of material and production of waste connected therewith. It means that costs for procurement and processing of materials causing environmental impacts form a part of environmental costs. If waste were not produced within the framework of the production process, then the material forming part of waste could be used in a purposeful way (for formation of outputs), or it would not be necessary to procure it at all. It means that costs connected with its procurement and processing are environmental costs from the point of view of material flows. Within the framework of this approach, it is further necessary to regard the following costs as environmental ones (without creation of problems with separation of environmental costs of, for example, cleaner technologies):

- Costs connected with processing (treatment) of input materials by end technologies or cleaner technologies; as well as
- Company costs spent for disposal of wastes (for example, costs connected with waste dumps).

It is obvious from the approach that environmental costs may be reduced through „rectification" of energy flows, because they cause environmental impacts. Thus, protection of the environment includes all activities reducing material and energy flows. In this connection, it is necessary to mention that costs connected with installations for treatment of wastes are not, in reality, *environmental protection* costs, but, unequivocally, *environmental* costs. Environmental protection costs (i.e., costs reducing material and energy flows) may be, in fact, regarded as costs *causing reduction of environmental costs*. Opportunity costs of environmental protection are created if difference between environmental costs and environmental protection costs is positive. This conception is in accordance with the aims of the management to improve eco-efficiency of the company, because reduction of environmental costs is connected with mitigation of environmental impacts.

For the first time, this conception of environmental costs, based on material and energy flows, was used within the framework of the Full-Cost Accounting method [1; 7]. Further approaches were based on process costing [6; 12; 17].

One of the main advantages of monitoring of material and energy flows by means of the Full-Cost Accounting method consists in that each reduction of these flows and environmental

impacts connected therewith is accompanied by reduction of environmental costs. This strengthens the tendencies of the company environmental management to concentrate, in particular, on prevention instead of on mitigation of pollution only. It means that information provided by the system contributes to improvement of eco-efficiency of the company. Management looks for ways to cost savings by means of environmental protection, because costs caused by neglecting prevention form part of the system. The approach confirms that it is easier to identify costs connected with material and energy flows than to separate costs of cleaner technologies from the usually monitored cost items. Integration of the above-mentioned processes into the systems of cost accounting is simpler if the identified material flows are connected with cost centres and further cost subjects. The problem of this approach consists in that it is necessary to know all material and energy flows in the company. It means that implementation of this system may be very expensive for the company. It is necessary to monitor separately the individual materials and their flows through the company, to propose a method of allocation of the common costs, and to define cost allocation bases. It means that, for setting of the new system, it is necessary to have at disposal a high quantity of new information.

Within the framework of process costing oriented towards material and energy flows, main attention concentrates on environmental costs connected with material and energy flows. This is just the approach providing the best information basis for improvement of eco-efficiency [16]. *Also within the framework of this approach, pollution mitigation costs (i.e., costs of end and cleaner technologies) form an inseparable part of environmental costs. Pollution mitigation measures are always connected with reduction of material and energy flows (changes of amounts of produced wastes occur; another types of waste substances may be also produced). Information on possible pollution mitigation measures, on their impact on material and energy flows, and on their economic consequences, is very important for management of material and energy flows. This information should be taken into account within the framework of the company decision-making processes.*

4 Activity-based budgeting oriented towards material and energy flows

Activity-based budgeting is a method of drawing up a budget on the basis of a conception based on recognition of relation of costs to activities [4]. Information on relational quantities are used during drawing up the budget, as well as within the framework of the feedback during detection of deviations.

Information on material and energy flows characterising the current production process functional in the company may significantly contribute to recognition of potential cost savings. Therefore, it is obvious that potential environmental costs connected with material flows, resulting from investments, proposed production processes or further measures, should be also taken into consideration. These costs should be confronted with environmental costs of the current processes. By means of this approach, potential for significant cost savings may be recognised. It means that proactively oriented environmental management should pay increased attention to activity-based budgeting oriented towards material and energy flows [16].

Within the framework of this approach, potential future costs connected with all material and energy flows are determined. It means that there are budgeted values of all materials supposed to be procured within the budget period, costs of their processing, salaries of employees working with the given materials, as well as expected costs of disposal of the produced wastes. The same approach is applied in the case of energy flows. It means that the whole process of budgeting is based on *expected future material and energy flows*. By means of

changes of the starting assumptions (growth or decline of material and energy flows resulting from the expected sales) it is then possible to demonstrate also changes in costs. The obtained information has high informative power, and may be used to support decision-making processes in the company.

Conclusion

In the conditions when the company approach to the environment represents a factor influencing business success, it is purposeful to use corresponding methods also within the framework of cost accounting. Methods used within the framework of ECA may be divided into groups based on the definition of environmental costs and on methods used in cost accounting. The used cost analysis always depends on the problem being solved, and, for different purposes, it is necessary to start from different approaches to cost breakdown.

Methods of cost accounting concentrated solely on environmental protection costs do not provide the management with necessary information. For the needs of the management (cost) accounting, it is necessary to adjust the basic definition of environmental costs. Environmental costs are all costs caused by material and energy flows having environmental impacts. This concept of environmental costs enables identification of activities and places where losses and wasting, and production of low-quality products and wastes, occur. On the basis of this information, there may be proposed measures resulting in better use of materials and energy, mitigation of environmental impacts of the company activities, products and services, reduction of environmental risks, and, finally, also in improvement of economic results of the company.

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QUANTITATIVE METHODS AND THE MAPLE SYSTEM IN DETERMINATION OF MICROECONOMIC CHARACTERISTICS FOR ENVIRONMENTAL MANAGEMENT

Zuzana Chvátalová

The article describes use of quantitative methods and the Maple computer system in identification of atypical demand for a specific commodity and determination of its price elasticity as an important aspect for management decision-making in relation to the environment.

1 Introduction

The general development of the society in the second half of the 20th century brings about important changes, and requires transformation of economic environment of the Czech Republic. Basic characteristics of each economic society are provoked by needs connected with time acceleration of the development: position of the customer on the market, consumption, investment business, information, but also the environment, lifestyle, preferences of values, time, as well as free time, and a modern trend of the society - prolonging and improvement in the quality of human life - which can be understood as a consequence of many developmental tendencies closely connected with the environment.

Globalisation trends on the one hand, and specificity of environment of the Czech Republic on the other hand, result in assumptions of standard characteristics, but also of non-standard characteristics, of certain features of economic environment of the Czech Republic. Identification and characterisation of such facts is beneficial both for the company management, and, on general level, for understanding of economic phenomena, also in education process. It is not possible to take over passively already known facts of market-oriented developed economics of other territories. It is necessary to study parameters and characteristics of the present Czech Republic which are still lacking. In the first years after the 1989 revolution, attention had been paid rather to research of macroeconomic environment, however, later there became obvious that information obtained by research of microeconomic environment is also necessary, especially in the context of the social development as a whole. Social trends significantly influencing demand include individualisation of demand, internationalisation and globalisation, development of transport and telecommunication, progress in information science and technology, but also progress in environmental awareness. Identification of demand, including its atypical manifestations, belongs to pillars of economic considerations and decision-making. An essential microeconomic parameter is demand elasticity.

Preconditions of long-term success of company management, in the conditions of developing market economic environment and overall social development of the Czech Republic, include obtaining of relevant starting information, ability to process them correctly and transform them into outputs for subsequent interpretation and use by the company management, in particular taking into account environmental consequences. Economic disciplines are in the process of transformation from standard disciplines of social sciences, measured, in particular, by socio-economic methods, to disciplines that can be, and preferably are, investigated by quantitative methods based, especially, on mathematical outputs. Quickly developing ICT

information and communication technologies are a remarkable support for processing and assessment of data obtained by these methods.

For identification of an atypical demand for a specific commodity with respect to the environment, the article concentrates its attention on demand for natural mineral water (the unit of demanded amount is a litre, the unit of price is CZK, the monitored price range is <1.9; 13.9 CZK>). Statistical data were obtained by the interviewing method. The target group of respondents was formed by students of universities in the Czech Republic[4]. Analysis of demand models in relation to price elasticity of the demand was carried out. For determination of demand, mathematical modelling was used. In doing this, it was necessary to take into account the atypical features of the demand curve, and to adapt its further investigation to this in order to enable correct interpretation of the results back to the relations of microeconomic environment. Subsequently, similar investigation is described in the case of change of the level of income of the respondents (influencing their social status), on the one hand to significantly lower level than the real one, and on the other hand to significantly higher lever (method of comparative statistics). Again, functions of demand, and elasticity corresponding thereto, are modelled[5].

Quadratic model (simple to use, and, simultaneously, effective in modelling the supposed atypical behaviour of demand) is chosen as starting one for mathematical modelling of demand. As inputs of the model, only price and demanded amount are endogenous variables, the other variables are understood as exogenous ones - ceteris paribus. The model is constructed as regression model by the method of the smallest squares. Mathematical models, in relation to atypical demands, are expressed in order to maintain functional relation of endogenous variables - by interchange of the dependent and independent variables in comparison with the custom practice in economic literature - i.e., the demanded amount is the dependent variable depending on price as the independent variable. In graphic outputs, price is plotted on the horizontal axis, and the demanded amount on the vertical axis. Dependence expressed in this way offers also practical advantages. The model respects usual expression of demand formulated by natural language and results (mathematically) more easily in determination of price elasticity of demand, which is, by definition, function of price. To ensure accuracy of use of the given model from the point of view of primary statistical diagnostics, computer system Statgraphics was used. The Maple system of computer algebra was chosen for graphical interpretation of demand, and for subsequent investigation of its characteristics.

The Maple system was developed by the Canadian company Maplesoft (http://www.maplesoft.com/). It provides environment for investigation and deeper understanding of the given field of problems, visualisation of results, presentation of simulation of the considered phenomena, approximation and interpolation of dependencies, it enables solving of geometrical, numerical, combinatorial, and statistical problems, as well as of tasks from the field of differential and integral calculus, important from the point of view of application, in relation to practice. Apart from other things, an important advantage of the system is the possibility of linking of all necessary components for extensive applications of

[4] The paper uses some facts found out within the framework of Research Task of the Czech Science Foundation No. 402/00/0499 solved in co-operation of Faculty of Business Administration of the University of Economics in Prague and Faculty of Business and Economics of the Mendel University of Agriculture and Forestry in Brno: *Research of basic characteristics of microeconomic environment in the Czech Republic by non-standard methods of computer simulation,* and within the framework of (3).

[5] For the reasons of economic interpretation of quantities in Tables Nos. 4, 8, and 12, we take into account only highlighted intervals.

mathematical modelling on-line, i.e., solving of technical and economic problems, without the necessity for the user to separately develop special programs.

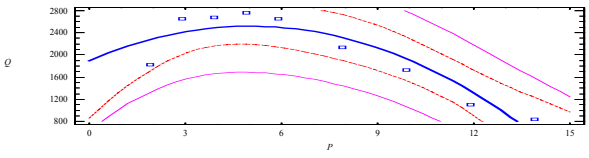
2 Model of demand for natural mineral water at the real income of the respondents

Through evaluation of the visual model of demand obtained from empirically found data (dot diagram - Figure No. 1), there is possible to deduce an atypical curve of demand for prices at low (up to border) levels, demand in the upper part of the price spectrum seems to be almost linear.

Selection of the regression (quadratic) model of demand

$$Q = - 24.689\ P^2 + 247.816\ P + 1899.14 \qquad (1).$$

Figure No. 1: Curve of demand, confidentiality and predictability range, dot diagram



	Sum of squares	*Number of degrees of freedom*	*So-called average square*	*F-test*	*P-value*
Theoretical	3.55328E6	2	1.77664E6	18.29	0.0028
Residual	582882.0	6	97146.9		
Total	4.13616E6	8			

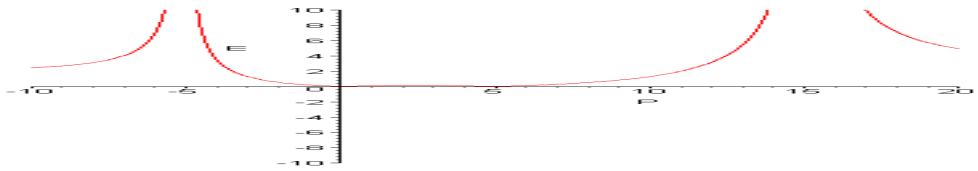
Table No. 1: Distribution analysis

Table No. 2: Determination index

Determination index
85.9077 %

Price elasticity of demand $$E(P) = \left| \frac{49.378P^2 - 247.816P}{-24.689P^2 + 247.816P + 1899.14} \right| .$$

Figure No. 2: Curve of price elasticity of demand (for $P > 0$)



Tables Nos. 3 and 4: Price elasticity of demand

	PRICE	***CORRESPONDING AMOUNT***
UNIT PRICE ELASTICITY *E(P) = 1*	9.415057395	2043.827287

	PRICE RANGE
ELASTIC DEMAND *E(P) > 1*	**(9.415057395;15.12372240)**; (15.12372240; ∞)
NON-ELASTIC DEMAND *E(P) < 1*	**(0;9.415057395)**

In the further text, we will model demand for natural mineral water with a change of an exogenous variable: the real income of respondents will be, initially, significantly reduced, and then significantly increased.

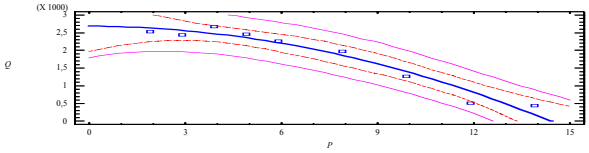
3 Model of demand for natural mineral water in the case of reduction of income of the respondents

Through evaluation of the visual model of demand obtained from empirically found data (dot diagram - Figure No. 3), there is possible to deduce a typical curve of demand, although the demand for natural mineral water is „fluctuating“ and relatively high in the lower half of the price spectrum.

Selection of the regression (quadratic) model of demand

$$Q = -12.5049\,P^2 - 5.8674\,P + 2687.13 \qquad (2).$$

Figure No. 3: Curve of demand, confidentiality and predictability range, dot diagram



	Sum of squares	***Number of degrees of freedom***	***So-called average square***	***F-test***	***P-value***
Theoretical	5.86593E6	2	2.93297E6	62.68	0.0001
Residual	280753.0	6	46792.2		
Total	6.14669E6	8			

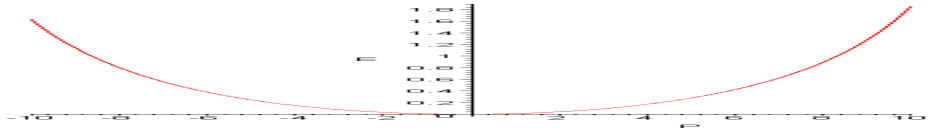
Table No. 5: Distribution analysis

Table No. 6: Determination index

Determination index
95.4324 %

Price elasticity of demand $E(P) = \left| \frac{25.0098P^2 + 5.8674P}{-12.5049P^2 - 5.8674P + 2687.13} \right|$.

Figure No. 4: Curve of price elasticity of demand (for $P > 0$)



Tables Nos. 7 and 8: Price elasticity of demand

	PRICE	***CORRESPONDING AMOUNT***
UNIT PRICE ELASTICITY $E(P) = 1$	8.308417647	1775.170397

	PRICE RANGE
ELASTIC DEMAND $E(P) > 1$	**(8.308417647;14.42626919)**; (14.42626919; ∞)
NON-ELASTIC DEMAND $E(P) < 1$	**(0;8.308417647)**

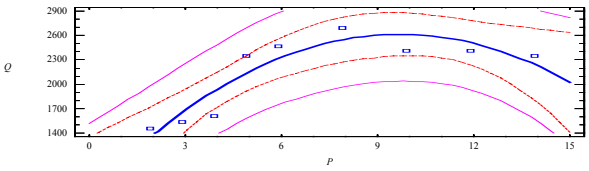
4 Model of demand for natural mineral water in the case of increase of income of the respondents

Through evaluation of the visual model of demand obtained from empirically found data (dot diagram - Figure No. 5), there is possible to deduce an atypical curve of demand.

Selection of the regression (quadratic) model of demand

$Q = -20.8496\,P^2 + 404.045\,P + 656.493$ (3).

Figure No. 5: Curve of demand, confidentiality and predictability range, dot diagram



	Sum of squares	***Number of degrees of freedom***	***So-called average square***	***F-test***	***P-value***
Theoretical	1.48308E6	2	741542.0	17.06	0.0033
Residual	260794.0	6	43465.7		
Total	1.74388E6	8			

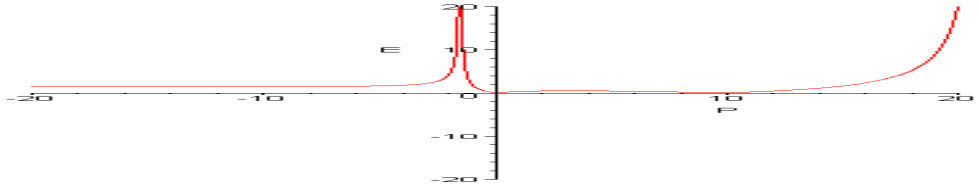
Table No. 9: Distribution analysis

Table No. 10: Determination index

Determination index
85.0452 %

Price elasticity of demand $E(P) = \left| \frac{41.6992P^2 - 404.045P}{-20.8496P^2 + 404.045P + 656.493} \right|$.

Figure No. 6: Curve of price elasticity of demand (for $P > 0$)



Tables Nos. 11 and 12: Price elasticity of demand

	PRICE	***CORRESPONDING AMOUNT***
UNIT PRICE ELASTICITY $E(P) = 1$	13.68623222	2280.946565

	PRICE RANGE
ELASTIC DEMAND $E(P) > 1$	**(13.68623222;20.88655728)**; $(20.88655728; \infty)$
NON-ELASTIC DEMAND $E(P) < 1$	**(0;13.68623222)**

5 Comparison of the three variants described above

Selection of a quadratic model of demand according to primary statistical diagnostics is possible in all three cases.

A) In the case of the real income of the respondents, the quadratic function (model of demand (1)) is concave in the monitored price range, and it changes the quality of monotony, it reflects the assumption of manifestation of atypical demand curve at the low levels of price. The demand for natural mineral water is relatively stable at lower price levels, readiness to buy it for higher prices is low. This confirms logical assumption that, for higher price, the respondent would probably buy a „better“ non-alcoholic drink.

UNIT ELASTICITY OF DEMAND	*P = 9.415057395*	*Q = 2043.827287*	*TR(Q) = 19 242.75121*

B) In the case of reduction of the income of the respondents, the quadratic model (2) did not confirm atypical demand curve in the price range monitored by us, the quadratic function of demand is concave, decreasing, in the monitored price range. In the monitored price range, natural mineral water is demanded in accordance with the law of decreasing demand. Because of that, linear function is sufficient for modelling of demand. Unit elasticity in the case of

reduction of the income will arrive at lower price level, and the total income will be lower than in the (A) case.

UNIT ELASTICITY OF DEMAND	*P = 8.308417647*	*Q = 1775.170397*	*TR(Q) =14 741.32824*

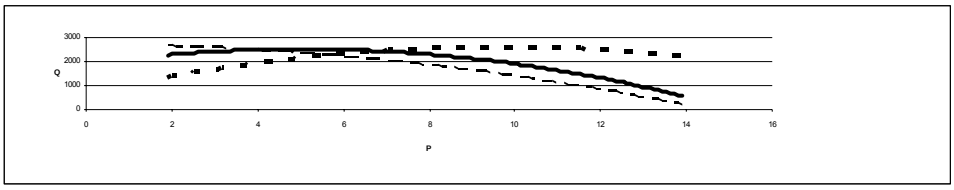
C) In the case of increase of the income of the respondents, the quadratic model (3) reflects non-standard nature of demand, function is concave in the monitored price range, the monotony changes its quality. The interest in natural mineral waters having higher price grows markedly, however, it falls with decrease of price, atypically, already at the medium price levels. The unit elasticity in the case of increase of the income will arrive at higher price level, and the total income will grow rather markedly (in spite of not too high interest within the whole price spectrum) in comparison with the (A) case.

UNIT ELASTICITY OF DEMAND	*P =13.68623222*	*Q = 2280.946565*	*TR(Q) = 31 217.56437*

6 Conclusion

Demand for the given commodity was modelled at three different levels of income of the respondents by means of the regression quadratic model (using methods of mathematical modelling and Maple and Statgraphics computer systems). After evaluation of their graphical, as well as analytical, outputs, it is possible to state that in each of the cases the demand for natural mineral water shows different characteristics, similarly as elasticity of the corresponding demands obtained by subsequent investigation. Except for the case of reduction of the income, the demand for natural mineral water is atypical (at the level of higher and lower prices, the interest in natural mineral water falls). In the case of increase of the income, low prices divert interest of the consumers („the rich people“ buy more markedly for higher prices; their interest is comparable with the interest of the other groups at the medium price level). In the case of reduction of the income, the demand shows the typical nature (close to linear); the consumers behave in accordance with the law of decreasing demand in the whole price spectrum; at the highest price levels, the interest is very low.

Figure No. 7: Comparison - demand for natural mineral water in the case of the real income (solid line), in the case of reduction of the income (dashed line), as well as in the case of increase of the income of the respondents (dotted line)



Generally, demand is influenced by a whole number of economic and social factors ensuing from the trends of the development of society as a whole. Its identification belongs to important information sources of each company management taking into account relation to the environment. This is even more true if it concerns a commodity directly linked to natural resources. However, characterisation of demand is not simple from many aspects. Because of that, correct use of uncomplicated and clear means of quantitative methods should be a popular instrument of each manager. The manager should not resist understanding and

acquisition of „user“ methods, in spite of the fact that their nature resides in theoretical disciplines. Obviously, use of the Maple computer system is a marked means for support of management decision-making.

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SYSTEM OF ENVIRONMENTAL CONTROLLING ORIENTED ON WASTES

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Keywords: Environmental management system, waste management, small and medium enterprise, environmental accounting, environmental waste balance, MS Excel

Systems of management from the environmental point of view gain constantly higher importance as an auxiliary means to attain complex requirements of an enterprise on organisation, strategic and normative levels. This paper describes an environmental management system from the point of view of waste management using environmental accounting. Waste management in the enterprise played a key role in achieving efficient effects in relation of costs to benefits. Implementation of the emergent concept of environmental accounting, concentrating on ensuring transparency of material and energy flows and their allocation to originators in the company production processes within the framework of accounting, is considered as an instrument of environmental protection management in small and medium enterprises. In order to integrate company structures, a special software solution was developed. By means of this solution, concept of environmental accounting oriented on wastes has been implemented.

1. IMPORTANCE AND CONCEPT OF CONTROLLING IN THE CASE OF WASTES

Waste management of an enterprise represents only a partial field of management in the institutional system of management from the point of view of environmental protection. It deals with organisational, planning, source and responsibility oriented, methodical, procedural, and progress oriented measures to eliminate and reduce wastes in the enterprise. Within this context, the term wastes is understood to mean all movables which the owner disposes of, wants or must dispose of.

It is obvious from the facts mentioned above, that in order to achieve functional ability of environmental accounting oriented on environmental protection in the field of wastes, it is necessary to establish a number of specific elements, which are further, also in view of requirements of environmental management system, specifically proposed and verified, defined and put in concrete terms on the example of waste.

The field of waste disposal is closely connected with management of raw materials, water, and energy, with waste waters, and air protection. Within a company system, it represents only a partial component of products and processes in environmental protection management. From the practice, it is obvious that waste management plays a dominant role in environmental management of an enterprise (according to ISO 14001, as well as according to EMAS), both in the field of environmental burden and in the field of efficient effects, i.e. positive relation of costs and returns (BURGEL et al. 1996). Also empirical research in German enterprises proved that:

- Majority of qualitative savings can be found in the field of waste, further followed by the fields of water/waste water and energy
- Almost a half of enquired enterprises achieved cost savings in the field of waste management, and about 1/3 of enterprises in the fields of energy, water/waste waters

and recycling. Smaller savings show, for example, measures in the fields of hazardous substances, raw materials, and emissions (POLTERMANN, BERRET 1998).

Orientation on the field of waste management, i.e. waste, often including also the problems of water/waste water and energy, is rational, because short depreciation times may be utilised through implementation of measures oriented on efficient use of sources and reduction of wastes, emissions, and waste waters. Because of that, HAMSCHMIDT (1998) attributes operative function to management systems from the point of view of environmental protection in the beginning of implementation, with a view of cost reduction and rationalisation. On the contrary, change of products and processes requires extensive investment planning, or adaptation of the company profile, respectively (STEGER 2003).

Quantification of costs and returns during implementation of environmental management systems is necessary for the reasons of monitoring of success, beginning with planning, through implementation, up to maintenance of the system. For that purpose, environmental cost accounting represents an auxiliary means. In order to achieve permanent integration of the concept, a special software solution was developed. Its units and use opportunities, particularly in the field of waste management, were tested specially in a medium textile enterprise.

Certainly, numerous conceptions of environmental cost accounting have still weak points, and they are rarely put into practice, or are implemented only sporadically, respectively. Especially small and medium enterprises (smaller enterprises having less than 500 employees) still widely neglect such systematic instruments to achievement of potential environmental savings.

Especially EIFLER and KRAMER (2003) deal with the concept of environmental accounting as an instrument to detecting all costs connected with environmentally relevant material and energy flows in an enterprise, or with its production processes, respectively. In addition to cost accounting, also further instruments of environmental controlling, such as environmental balance and environmental indicators, are used in the conception. This conception may be included into the group of environmental cost accountings oriented on material and energy flows, as well as on processes.

Starting points relate primarily to processes and materials. Further, it is necessary to prepare adaptation in the field of software, organisation of construction and process of the controlling system, as well as assessment of investments and productivity. In the last phase of implementation, it is necessary to put the conclusions of the company specific conception into practice. In an enterprise, the conception of environmental accounting may be implemented as a sporadic special accounting, attached to emergent structures, or as a permanently integrated solution. The importance resides:

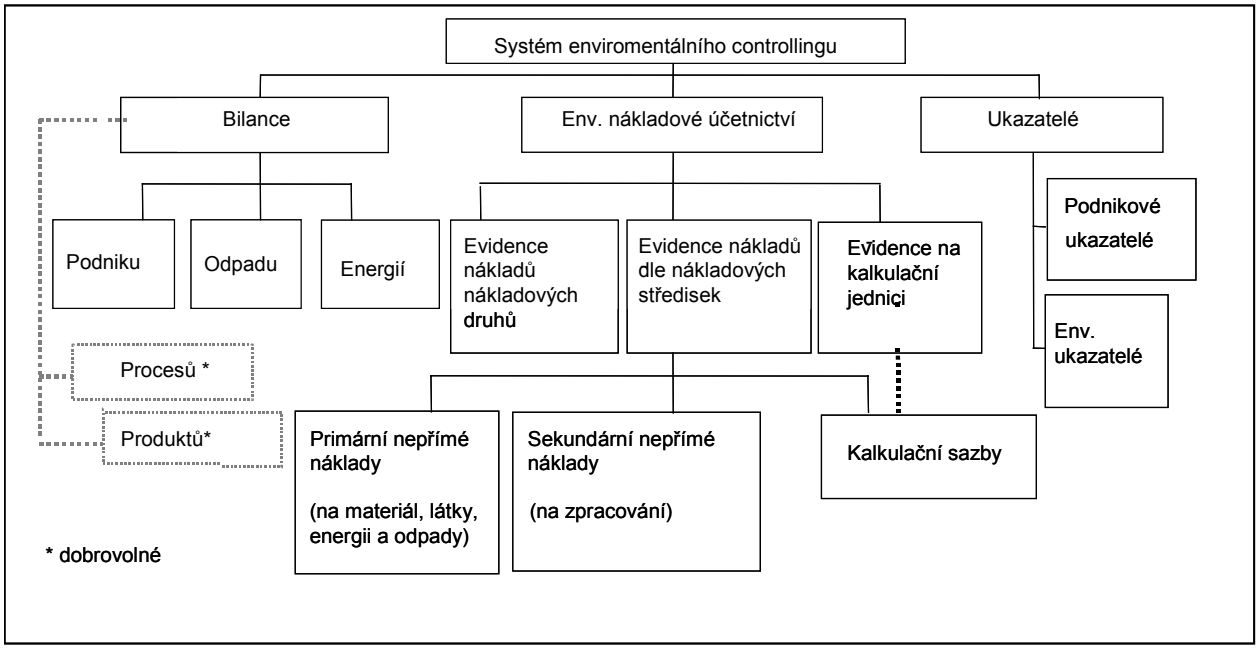
- in merger with the other instruments of environmental controlling (environmental balance, environmental indicators, waste balance, field of emissions etc.); and
- in separate analysis and interpretation of results of the individual phases, enabled by the modular solution.

2. SOFTWARE SOLUTION OF THE ENVIRONMENTAL ACCOUNTING CONCEPTION WITH WASTE BALANCE

In order to implement the accounting conception in smaller enterprises, a solution was prepared within the framework of environmental controlling. It consists of three main

components: environmental balance, environmental cost accounting and indicators (see Figure No. 1).

Figure No. 1: Program structure



Source: KRAMER et al. (2003).

The database consists of the following three categories of data:

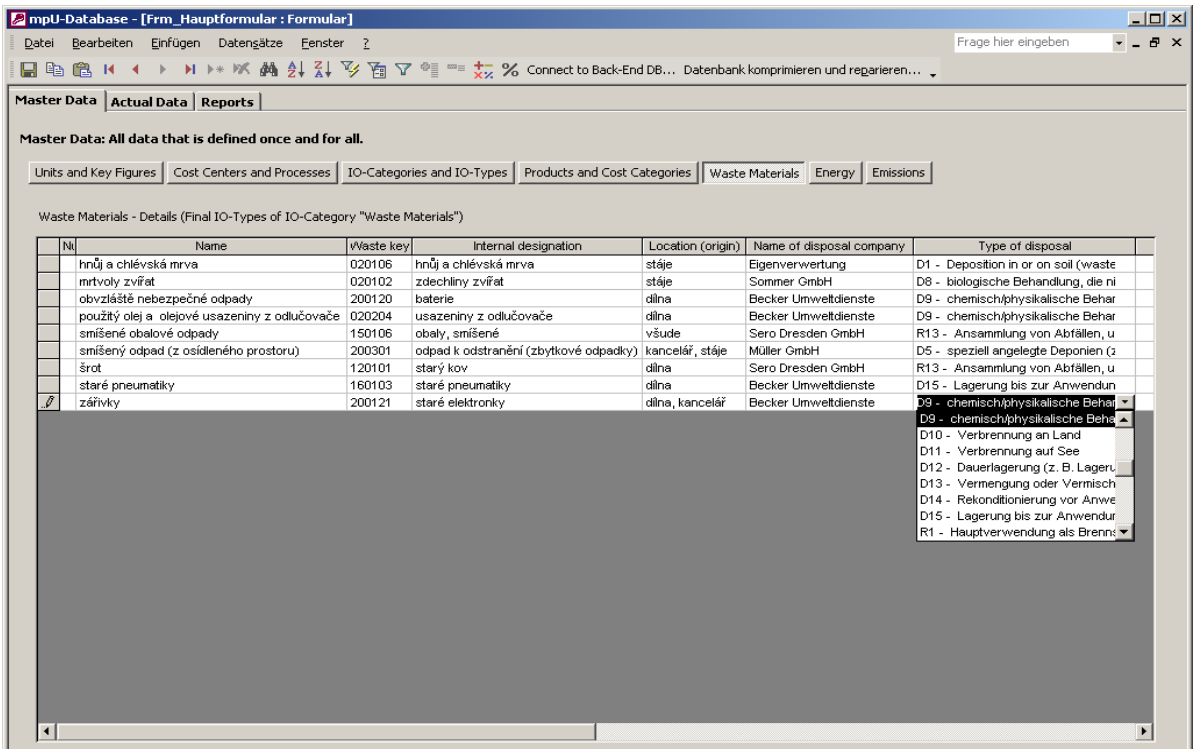
- **Basic data** for single input data (for example, units, company data, data of cost accounting, environmentally relevant information);
- **Input of data** with continuous inserting of data (for example, reported periods, amounts, costs, procedural data);
- **Assessments and reports** with testing of results (for example, reported periods, balance limits, company environmental balance, waste balance, environmental cost accounting, product balance).

Inserting, processing and management of data is carried out in MS Access databases. The output of data is partially carried out in MS Access, but, preferentially, also in MS Excel tables, which offer the advantage of simple and flexible repeated use of the output results (for example, for reports and analytical assessment).

Work with the database is documented on the following example of storage of data concerning waste. All wastes that are found in the company (for example, in view of waste designation, physical unit, in the given case conversion coefficients) are defined in a single operation on the sheet with data **Basic data: input-output data**. In the data input, corresponding amounts of wastes and incurred costs are continuously monitored according to selection of the time and field of observation.

In addition to that, there exists a sheet with data **Basic data: Waste**. It corresponds to regulations that have to be complied with during preparation of the company waste balance as an element of the waste management conception. For that purpose, there is necessary a single input of important data, such as waste categories, waste codes, and identification data of the authorised person to which the waste is handed over for its further use or disposal (see Figure No. 2).

Figure No. 2: Sheet with data "Basic data: Waste"

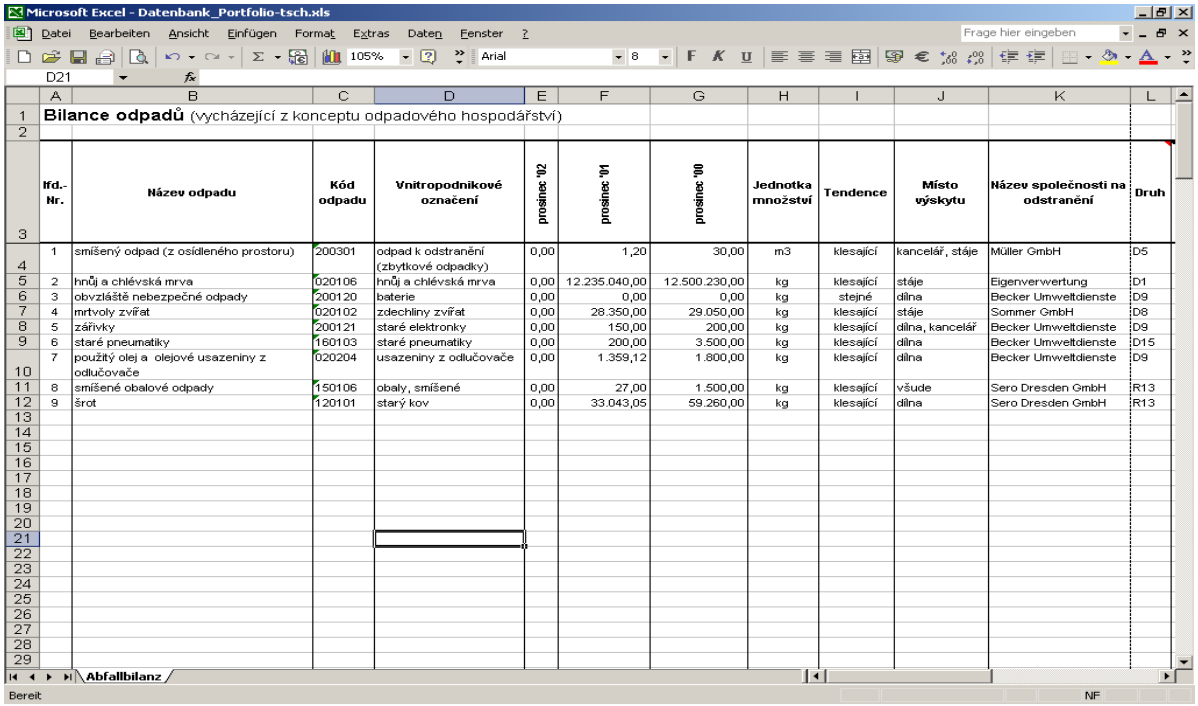


Source: Own representation

Data on wastes - depending on the time and field of observation - are stored both in an MS Excel table "Environmental balance", and in a separate MS Excel table "Waste balance". The MS Excel table "Waste balance" is oriented on requirements of the German law on wastes (BRAUWEILER, SOMMER 2003). The representation comprises the corresponding required categories (see Figure No. 3).

In addition to that, the software solution enables, thanks to linking of calculations, communication of absolute and relative indicators (for example, costs on waste from the product, quota of waste removal) in MS Excel working sheets. The indicators may be confronted and compared in numerical series (for example, in the successive periods).

Figure No. 3: Table sheet "Waste balance" (example)



Microsoft Excel - Datenbank_Portfolio-tsch.xls

Bilance odpadů (vycházející z konceptu odpadového hospodářství)

lfd.-Nr.	Název odpadu	Kód odpadu	Vnitropodnikové označení	prosinec '02	prosinec '01	prosinec '00	Jednotka množství	Tendence	Místo výskytu	Název společnosti na odstranění	Druh
1	smíšený odpad (z osídleného prostoru)	200301	odpad k odstranění (zbytkové odpadky)	0,00	1,20	30,00	m3	klesající	kancelář, stáje	Müller GmbH	D5
2	hnůj a chlévská mrva	020106	hnůj a chlévská mrva	0,00	12.235.040,00	12.500.230,00	kg	klesající	stáje	Eigenverwertung	D1
3	obvzláště nebezpečné odpady	200120	baterie	0,00	0,00	0,00	kg	stejné	dílna	Becker Umweltdienste	D9
4	mrtvoly zvířat	020102	zdechliny zvířat	0,00	28.350,00	29.050,00	kg	klesající	stáje	Sommer GmbH	D8
5	zářivky	200121	staré elektronky	0,00	150,00	200,00	kg	klesající	dílna, kancelář	Becker Umweltdienste	D9
6	staré pneumatiky	160103	staré pneumatiky	0,00	200,00	3.500,00	kg	klesající	dílna	Becker Umweltdienste	D15
7	použitý olej a olejové usazeniny z odlučovače	020204	usazeniny z odlučovače	0,00	1.359,12	1.800,00	kg	klesající	dílna	Becker Umweltdienste	D9
8	smíšené obalové odpady	150106	obaly, smíšené	0,00	27,00	1.500,00	kg	klesající	všude	Sero Dresden GmbH	R13
9	šrot	120101	starý kov	0,00	33.043,05	59.260,00	kg	klesající	dílna	Sero Dresden GmbH	R13

Abfallbilanz

Bereit

Source: Own representation

3. USE OF THE SOFTWARE SOLUTION IN WASTE PRACTICE

Suitability of the conception and the software solution of the environmental accounting was tested, in practice, in small and medium enterprises. The main shortcomings in the enterprises are:

- high losses, for example cuttings,
- frequent or insufficient cycles of replacement of the used substances or tools (for example, degreasing bath, fuels),
- unnecessary mixing of the waste fractions (wastes are not sufficiently separately collected according to the individual types, i.e., according to the catalogue numbers),
- insufficient treatment of the produced waste.

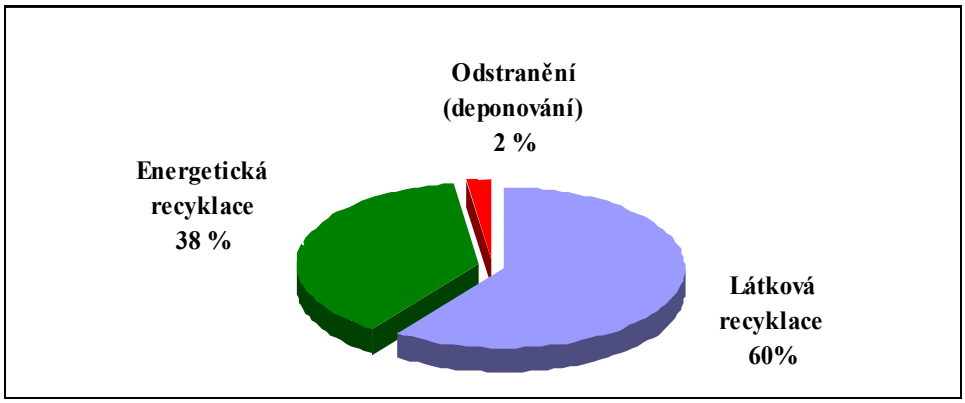
There was beneficial that, by means of the conception and software solution of the environmental accounting for the sector of wastes and further fields, it was possible to ensure transparency in the companies first, and, in further progress, it was possible to identify weak points with potential to improvements, and, subsequently, corresponding possibilities of improvements could be drawn up.

Example of a medium enterprise

In a textile company with about 300 employees, waste is categorised into three categories according to method of handling: material recycling, energy recycling, and disposal through deposition (see Figure No. 4). The amount of wastes that have to be specially controlled is more than 20 tonnes per year. In the system of management from the environmental point of

view, waste balances are regularly carried out, analysed and used in waste management reports.

Figure No. 4: Categorisation of waste and its division according to method of disposal in the exemplary company



Energy recycling 38 %; Removal (deposition) 2%; Material recycling 60 %

Source: Own representation

The highest amount of waste is produced in the production process. Especially threads and residues of fabrics contribute to its formation. Their recycling is carried out materially through production of non-woven textiles - flees, or energetically through their use as alternative fuel in industry. Waste similar to municipal waste is removed by landfilling (only 2 % of waste).

Therefore, an exemplary behaviour in the field of waste can be attributed to the company. This behaviour developed in the latest years within the framework of the system of management from the environmental point of view. Although packaging of raw materials does not represent a significant amount of waste, the company will, in the future, pay attention to replacement of disposable packaging by returnable packaging in growing proportion. In addition to that, it is important to motivate each employee to conscientious selection of waste.

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NATURA 2000 IN MILITARY DOMAINS - SOCIAL, POLITICAL AND ECONOMIC PROBLEMS

Petr Kozel

Introduction

The qualitative and quantitative ratio of three key pillars of the sustainable development in military domains differs in many aspects from other parts of the Czech Republic. The reason is first of all the way such domains are used as it is connected to a number of specific social, political, environmental and economic problems. What has played and still plays a very important role in the preparation of some military domains or their parts for the inclusion to the system NATURA 2000 and, above all, the very implementation of protective measures after the declaration are the above mentioned differences.

1. Military Domains

Pursuant to the Act No. 222/1999 Coll. on the Defence of the Czech Republic, a military domain is a defined part of the territory of the country reserved for the purpose of the defence of the country and training of armed forces.. A military domain is a territorial administration unit and it is established, altered or cancelled by a special law. At the time being, there are five military domains in the territory of the Czech Republic:

Military domains in the Czech Republic Table 1

Military domain	Total area (ha)
Brdy	26 034
Boletice	21 949
Hradiště	33 162
Libavá	32 580
Březina	15 818
T o t a l	129 543

The state administration is executed in the territory of the military domains by the domain authority (UUVU) at the head of which is the administrator of the military domain, a professional army officer. There is not any self-governing administration structure as we know it from other communities. Any assets located in the territory of the military domain (except for any assets brought to such a territory) may be only state-owned assets. Any stay and movement throughout the military domain is limited.

The military training itself takes place at training facilities that are subjected to the command of the administration of the service teams of training systems (SOVZ), formerly military training areas (VVP). Such training areas occupy just a part of the territory of the military domains, altogether 33.5 % of the area of the military domains whereby such an area varies in individual military domains ranging from 12 % (Brdy) to 40 % (Libavá). The differences between individual military domains are determined both by the nature of the trained combat activities and local physical and geographical, forest husbandry and geometric conditions. Training areas cannot be in an immediate vicinity of civilian areas and, therefore, mainly for safety reasons, they are enclosed in other plots as a natural protection.

Any economic activities are performed in the territory of the military domains by the state enterprise Vojenské lesy and statky ČR (VLS) (Military forests and farms) founded by the Ministry of Defence of the Czech Republic (MoD).

2. Value and Function of Military Domains

Military domains have a unique value resulting first of all from relatively simplified landscaping processes taking place on relatively large territorial units. What gives these units a unique hallmark in addition to the size and limited accessibility are their values in terms of landscape and environment. These are given first of all by the method of the use of the potential of the landscape. After the establishment of the military domains by the Act No. 169/1949 Coll., a part of landscape forming activities has been discontinued in the domains. Such activities were replaced by activities that used to form the territory in a way that cannot compare to landscape units showing similar natural and social and economic conditions. What has been changed at the same time, is the scope of most traditional landscaping activities some of which have fully disappeared. The military use as a dominant human activity saw a number of qualitative and quantitative changes since the foundation of the domains resulting (in combination with the effects of other landscaping factors and activities) not only in the degradation of the target areas and some former settlements but also a development of a harmonic farming and forest landscape and, in some cases, even localities the development of which was effected less than the development of compared (even preserved) areas.

Despite their relatively limited total area, military domains involve a considerable economic and landscape ecology potential, i.e. an enormous wealth including not only productive values comprising first of forests, farming land, water courses and natural and artificial fishing areas, possible mineral resources, recreation and tourism potential, some buildings and artefacts but also values that are not so easy to quantify including first of all the environmental value of the landscape.

Military domains have a number of important functions the key ones of whom include the military function (training, accommodation, warehousing), bio-production function (farming, forest husbandry), water management function, genetic functions (direct and indirect protection of the gene pool) and landscape aesthetic function. The above mentioned three entities closely cooperate in the fulfilment of the above functions. In fact they cover needs of the state (Ministry of Defence) and military domain residents (UUVU), they execute the state administration on the territory of the domains (SOVZ) securing training activities and individual detached departments of the VLS responsible first of all for the bio productive function.

An auxiliary landscaping function is the settlement function. It is limited to several localities the residential and aesthetic function of which has deteriorated during four decades of the second half of the century 20 due to an insufficient maintenance of the housing fund and due to the former chaotic development of structures built by the Soviet Army. After the Soviet Army left, the situation has improved gradually thanks to the elimination of former loads and thanks to higher investments to real estate on the territory of the military domains.

The transportation function is limited to the transportation service to settlements and training facilities. What is important are mostly local roads and military roads (tank taxiways).

Except for some isolated locations, there are not any mining sites, industrial plants and tourist facilities in the territory of the military domains that belong to the basic landscaping elements. The zero industrialisation, absence of tourism and most recreation activities and a limited quantity of energy resources in the territory of the military domains are facts that are not

present in other comparable areas. They create almost ideal conditions fro the protection of larger landscape units and for the manufacture of environmentally clean respectively bio-food.

3. Pressures upon the Territory of the Domains

The change of the political conditions in 1989 brought an unseen discussion on military domains that persist by now with a varying intensity. What has been added to many realistic requirements to an optimising of their use and elimination of damage caused first of all by the Soviet Army was a pressure on significant changes of the boundaries of the domains or the entire cancellation of the domains. Such pressures had a political, economic, social and environmental backgrund and, very often, it was a combination of such incentives. Who contributed to the discussion on a relatively complex problem of the military domains in media and other forums were people of a varying level of knowledge starting from individuals who knew thoroughly the issue to biased people and dabblers. Those who may represent a threat for the objective awareness of the society out of such a range of people are those with very selfish interests, people having distorted or limited information and people biased against the Army of the Czech Republic (ACR) and its activities. A shared argument used by them against the military domains is the quantity and size of such areas in the context of the planned size of the Army of the Czech Republic and abuse of the environmental sentiments of the members of public in the discussion on such questions.

It is not very rare when the military domains are described as an hang-over from the past, an unnecessary anachronism and the like. What has been experienced in addition to acts of political, anti-militaristic and environmental naivety were open or hidden tries to enforce personal or group interests. In the first event, it was a consequence of the fact that issues related to the condition of environment damaged by activities of the army used to be tabooed, concealed or kept secret. In the other event, it was an effort to exploit a military domain or its parts for economic or recreation activities often hidden by an “environmental camouflage”.

4. Protection against the Current Political, Economic, Social and Envuironmental Discreditation of Military Domains

From the political point of view, some people cannot accept the management and economic use of the territory by the only department, a limitation of some rights of residents living in the domains (no self-governing authorities, limitation of mobility, ownership rights of the state) and the ban on or a restriction of the admission to the territory of the military domains. All the way round, in several opinion polls, military domain residents presented their contentment with the given status and most of them opposed the contingent cancellation of the military domains. On the other hand, the fact that the domains are controlled by a single department gives the possibility of complex and quicker implementation of proposed measures that is, of course, subject to the availability of sufficient funds. The check of environmental aspects of individual activities is less complex for the above reason if compared to other regions. Should basic environment protection principles be adhered to, many areas become an example of a conflict-free use of partial landscape potentials. A restriction of or full ban on the admission to the domains together with the way the domains are exploited is one of main reasons of the excellent condition of the ecosystems in the domains. Those who criticise the existence of the military domains point out for these reasons to an uncontrolled behaviour of troops in the domains. However, the defence department disposes of their own inspection mechanisms that are given to a number of internal standards

in addition to the generally binding legal regulations including first of all the Order of the Minister of Defence No. 24/2002. The environmental consequences of training activities in the military domains are made good as a part of rescue and reclaiming measures funded every year by several tens of millions of CZK. A major part of the areas of the military domains is used first of all for the forest husbandry. A minor part is used for farming in compliance with principles of environmental friendly farming pursuant to the Act No. 2242/2000 Coll. The methods of the exploitation of the territory together with the ban on admission of civilians are the reason for the condition of the landscape units that does not compare to anything in the Czech Republic including state preserved areas. The current condition of the former military domain Dobrá Voda in the National Park Šumava or the former military zone Ralsko almost sixteen years after their opening to the public should be a very serious warning.

5. Preparation of the System NATURA 2000 in the Territory of Military Domains

The above mentioned condition of military domains is one of key reasons for the support of the Ministry of Environment (MoE) that was agreed by an agreement between the MoD and MoE on the cooperation in the preservation of nature and landscape in military domains entered into in August 2003. The parties to the said agreement jointly stated that military domains belong to the best preserved parts of the Czech Republic from the point of view of the condition of nature and landscape and such a condition is a result of both the method of the exploitation of the territory and the attention the Ministry of Defence pays to the training areas themselves in the framework of the rescue and reclaiming measures and other areas in the framework of their farming and forest husbandry exploitation. The preservation of the existing method of the exploitation of the military domains is necessary for the preservation and possibly further improvement of the condition of the nature and continuous effects of landscaping factors and processes. The priority exploitation of military training areas in the territory of military domains for activities necessary for the defence of the country in compliance with the Act No. 222/1999 Coll. must not be restricted or disturbed in any case according to the agreement. The agreement stipulated content, organisational, personal and financial conditions for the mapping of chosen localities for the purpose of their contingent inclusion to the national register of significant European localities and the roles of AOPK and VLS in such activities. A contingent proposal by the MoE to establish bird preservation areas or other preserved areas must be in compliance with the priority exploitation of the military domains and must not restrict or disturb training and other military or economic activities and must be consulted with the MoD in advance. No such areas and preserved localities may be established without an agreement with the MoD.

NATURA 2000 is a system of localities preserving the most endangered wildlife species and natural stations in the territory of the EU. It includes bird preservation areas and preserved areas of an European significance. All four military domains were mapped in the course of the period of 2003 – 2004 and in 2004, the MoE and MoD addressed preliminary conditions for the establishment of bird preservation areas and inclusion of some localities to the national register of significant European localities on the land reserved for the purpose of the defence of the country.

The parties discussed the establishment of bird preservation areas in the territory of the military domains Hradiště, Libavá and Boletice as defined by respective government ordinance in 2004 and 2005.

Bird preservation areas in the territory of military domains Table 2

Military domain	Bird nestling area	Subject matter of the protection
Hradiště	Doupovské hory	Black stork (Ciconia nigra), honey-buzzard (Pernis apivorus),eagle-owl (Bubo bubo), harrier (Circus aeroginosus), corncrake (Crex crex), nightjar (Caprimulgus europaeus), grey-headed woodpecker (Picus canus), great black woodpecker (Dryocopus martius), warbler (Sylvia nisoria), red-backed shrike (Lanius collurio), red-breasted flycatcher (Ficedula parva) and their biotop
Libavá	Libavá	corncrake (Crex crex) and his biotop
Boletice	Boletice	corncrake (Crex crex), little plover (Glaucidium passerinum), hazel ben (Bonasa bonasia), three—toed woodpecker (Picoides tridactylus), wood-lark (Lullula arborea) and their biotop

The following significant European localities were included to the national register:

Significant localities on the territory of military domains Table 3

Military domain	Number of significant locality in the national register	Name of the significant locality
Brdy	CZ0213818	Octárna
	CZ0213052	Padrťský stream
	CZ0213783	Felbabka
	CZ0213787	Hrachoviště
	CZ0213814	Ledný stream
	CZ0213817	Obecnický stream
	CZ0323812	Klabava
	CZ0213050	Ohrazenický stream
Boletice	CZ0312045	Polná
	CZ0314123	Boletice
Hradiště	CZ0414127	Hradiště
	CZ0424125	Doupovské hory
Libavá	CZ0714133	Libavá

6. Compliance of the System Natura 2000 with the Requirements to the Defence of the Country

The inclusion of the above localities to the system NATURA 2000 is in compliance with requirements to the national defence and to the preservation of the nature and landscape. The Government stipulates in its Resolution No. 1320/2004 on the Government Ordinance that sets out the national register of significant European localities a.o. the following:

„II. 2. respective nature preservation authorities shall take into consideration economic, social, cultural and recreational requirements and regional and local conditions in the preparation of future contracts or regulations and setting condition of the preservation of significant European localities,

II.3 Environment Minister and Defence Minister shall ensure that the localities in territories of relevance for the national defence will be further exploited in compliance with and the conditions of their preservation will be subjected to the needs of the national defence in a way to prevent any disturbance of the activities of armed forces and other related activities performed by the Ministry of Defence in such localities in the preparation of future contracts or the publishing of regulations."

The item II.3 of this Resolution stems from a requirement raised by the MoD during the inter-ministerial discussion on objections raised to the government ordinance. Such a legislation frame is sufficient for the preservation of the unique nature of the localities in military domains and it does not restrict their exploitation according to the Act No. 222/1999 Coll. However, the other condition is the very preservation of the military domains as it cannot be excluded that they might be reduced in future among other in connection with a growing pressure to do so. What is a fact is that the intensity of the exploitation of the military domains increases despite the dropping count of armed forces and combat technique first of all as consequence of joint exercises with armed forced of NATO respective EAPC member countries and as a consequence of the decommissioning of garrison training areas. Also the anticipated modernisation of armament will bring elevated requirements to training. All these facts will be taken into account in the current preparation of a thorough analysis of problems related to military domains.

7. Conclusion

The decision on the future of military domains and their irreplaceable natural and landscape values will not be based only on landscape ecology principles. What will be of key importance are social and political and economic and political aspects.

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AGRICULTURAL OUTPUTS AND THEIR VALUATION

Enikő Lőrinczová

Agriculture and the environment

Agriculture is one of the main pollutants of the environment, mainly if considering nitrogen pollution. By-products in the animal production are different types of manure, in dependence of the kind of animals, the way of lairage, amount of bedding and a way of treatment. These by-products are manure, dung-water, stale, sewage and it is straw and green fertilizers in the plant production.

From the point of influencing the environment is very important their correct storage and application. The most significant pollutants of the surface and ground water are the solid and liquid by-products of agriculture – wastes from the concentrated breedings of livestock. Main reason of pollution is the unsatisfactory storage space, from the capacity and the technical point of view as well. At the maturing of the manure ammonia and sulfur is releasing. Eventually, patogenical organisms in manure may soak trough to the soil and water and may cause infection spreading. Harmful gases may escape from the cisterns. The source of the nitrates in the soil may be the subsequent transformation of the nitrate organical substances (after-harvest remains, organic manure) in the autumn.

Wastes in the agriculture are mainly wastes from the animal (meat wastes, tallow, fat, viscera, bones, egg and poultry wastes, unused organical manure, excrements) and plant textures and remains, silage, sewage sediments. Among the hazardous wastes belong oil filters, absorbents, metallic bins, battery lead, fluorescent tubes and other wastes containing mercury, accumulators, brake fluids. Dead animals or animal products unfit to use are wastes of animal origin according to the veterinary Act number 166/1999 Col.

Agricultural sources of air pollution are facilities for poultry, pigs and cattle breeding. Other possible sources can be petrol stations and heating boilers. Improper lairage increases ammonia production, hazardous are also the technologies used at fertilizer application, the ways of ventilation, technologies used at the manure dumps, the type of fuel used (lignit,coal slurry).

Water contamination is caused by unsecured dung-yards, unsatisfactory silos and washer installations, old sewerages and basins, oil spillings, unsuitable fertilizer and pesticides application. It is estimated, that about 40 % of pollution (for example by nitrogen) is caused by agriculture. The agricultural farm is obliged to control the level of pollution at the waste water disposal. The Nitrate Directive aim to reduce and prevent the water pollution by nitrates from agricultural sources (mainly caused by manure application) to ensure the quality of drinking water and surface water protection. The basic tool of the Nitrate directive is the implementation of the Priciples of good farming practice (government regulation number 505/2000 Col.), which have been published and distributed to farming public. Observance of these principles is voluntary, but it is required, when applying for subsidies.

Under the force of the Directive of IPPC nr. 76/2002 Col. fall all categories of concentrated livestock production, food-processing factories, rendering plants.

From the countryside point of view, the agricultural farm have to avoid harming the wood species and have to respect the principles of the agricultural soil fund protection and prevent the erosion by appropriate measures.

Agricultural outputs

When calculating the balance of material and energetic flows, it is important to monitor the inputs and outputs in natural and financial expression as well. The following chart shows the outputs of agricultural activity.

Chart nr.1: Outputs of agricultural activity

Output	Units	Place of storage	Way of treat	Measurement	Valuation	Document
Main product						
animal production	livestock units, kg l	shelter slaughter pasture	sale processing	weighing, technical calculation, numeration	internal transfer price	chart of livestock
plant production	t	storage of corns,	sale feeding	weighing	internal transfer price	receipt card, stock cards,
By-products						
manure	t,l	dung-yards, pools, cisterns	application in plant production, disposal	weighing, calculation	transfer price, according to nutriments and org. substances	manure production record
straw	t	store	Application in plant & animal production	weighing estimation	purchase price, according to nutriments	stock cards
Waste Common waste (utilizable waste in %)	t	predefined place	dumping place, recycling, burning, return	weighing	fees for using the dumping place, waste transport fees	waste production record
Waste water	m^3	sewerage, drainage to pools, sludge management sewerage plants	drainage, sewerage cleaning,	measuring calculation, estimation, water analysis results	fees paid for sewerage, fees paid for cleaning, fees paid for water analysis, fees paid for pollutin	Invoice of sewerage, contracts, waste water records, invoice of analysis, results of water analysis,
Amount of waste water CHSK BSK fat						
Air emissions Ammonia Carbon dioxide sulfur	kg t	diversion to air	diversion to air	authorized measureming, calculation,	fees paid for authorized measuring, fees paid for air pollution	reports of authoriz. measuring, summaries given to authorities

Outputs calculation and their valuation

Production of farm manure – Storage kapacity of the dung-yard is calculated from the amount of produced manure, assumed reserves and the manure consumption in the plant production. Its production and quality depends on various factors, such as the quantity and category of the cattles, the way of the lairage and feeding, amount and type of bedding material used, the method of storing the manure in the dung-yard, treatment during the storing and the period of storing.

Chart nr. 2: Farm manure production

Consumtion of the bedding material per year	Production of the farm manure per year in t	Production of the farm manure per year in t, at losses		
		30%	40%	50%
0,7	11,7	8,2	7	5,9
1,1	13,1	9,2	7,9	6,6
1,5	14,6	10,2	8,8	7,3
1,8	16	11,2	9,6	8
2,2	17,5	12,3	10,5	8,8
2,6	19	13,3	11,4	9,5
2,9	20,4	14,3	12,2	10,2

Source: Tesař, Vaněk, 1992

Gross estimated production of farm manure per year is calculated by this formula:

Hn = hz * 20 Where: **Hn** is the weight of the manure and **hz** is the weight of the livestock in t.

Valuation of the farm fertilizers – it is possible at their relative purchase value, which is expressed by the estimated expense, which would arise, if the nutriment of the same efficiency in fertilizers and the the same amount of organical substances in straw and peat, would be bought. Valuation includes the level of mineral nutriments and organical substances (this valuation is not complete, because does not includes the bactercal value of the manure and other factors, which is difficult to valuate). Other problem is, that farm manure from individual types of livestock has different content of nutriment and is influenced by feeding and by the way of treatment. The valuation assumes, that nitrogen of the manure is 40 % of the saltpeter purchase price, phosphorus 100 % of the price of phosphorus acid in superphosphate and potassium 100 % of the price in the potassium salt.

Chart nr. 3: Valuation of nutriments in the farm manure

Type of manure	Content of nutriments In %	Price in Kč of 100 kg manure/kg nutriments	Purchasing price of Nutriments in farm manure
Saltpeter	15	700/46,7	18,68
Superphosphate	18	1400/77,7	77,7
Potassium salt	60	1600/26,6	26,6

source: Neplechová, Novák, 1996,according to current prices

With these prices is valuated the avarege amount of nutriment in the farm manure and is possible to calculate the price of mineral nutriments in 100 kg of the farm manure.

Valuation of organical substances in farm manure – for the organical substances it is possible to use a measure of purchasing price of these substances in the straw.

There is a similar process at the dung-water, but for the valuation of the nitrogen is used a 100 % of purchasing price of ammonia in the sulphate nitrat, in which the level of the nutriment is N 21%.

Chart nr. 4: Relative purchasing price of nutriments in 100 kg of farm manure

Nutriment	Amount of nutriments In 100 kg of manure	Price of 1 kg in Kč	Total Price
N	0,48	18,68	8,96
F	0,11	77,7	8,55
K	0,52	26,6	13,83
Total			31,34

Source: Neplechová, Novák, 1996, according to current prices

Fees of air pollution

Releases of ammonia and methan,rising as a by-product at agricultural activity are free of charge.

The amount of ammonia emission in natural expression is calculated by using the total pollution factor and the actual avarege numbers of livestock per year (according to the Government Regulation nr. 353/2002 Col.)

Chart Nr. 5: Emission factors for agricultural sources (kg NH3/animal/year)

Animal cathegory	**shelter**	**manure**	**slurry**	**application in fields**	**pasture**	**Total emission**		**Factor**
						shelter + dung-yard	**shelter**	**+ pasture**
Cattle								
Bedding lairage								
Milk cow								
Optimal way	10	2,5	0	12	2,4	24,5	24,4	
Old way	12	2,5	0	12	2,4	26,5	26,4	
Calves, bulls,heifer								
Optimal way	6	1,7	0	6	1,8	13,7	13,8	
Old way	9,5	1,7	0	6	1,8	16,7	16,8	
Non-bedding lairage								
Calves, bulls, heifer	5,5	0	2,5	5	1,8	13	12,3	
Pigs						**Total emission**		**factors**
sucking pigs	2	0	2	2,5	0	6,5		
pigs	4,3	0	2,8	4,8	0	11,9		
In-pig	7,6	0	4,1	8	0	19,7		
Pigs for fattening	3,2	0	2	3,1	0	8,3		
poultry								
layers	0,12	0	0,2	0,13	0	0,27		
broilers	0,1	0,01	0	0,1	0	0,21		
Goose, ducks	0,35	0,03	0	0,35	0	0,73		

Source: Government Regulation nr. 353/2002 Col.

By the optimal way of lairage of the cattle is considered when the milk-cows have a free bedding lairage with intense natural ventilation and at the other cettle, as heifers and bulls at average weight of 350 kg, it is cots with natural circulation. The old way of lairage is stanchion housing with bedding without natural ventilation.

Calculation examples of the amount of ammonia:

When considering cattle with optimal way of lairage and using pasture, if the average number of animals is 20, then ammonia production is calculated as: total emission factor 24.4 * 20 animals = 488 kg/year, 0,488 t ammonia released to air per year.When considering poultry (broilers) at the average number of 30 000, then ammonia production is calculated as:

emission factor 0,21 * 30 000 animals = 6300 kg/year, 6.3 t ammonia released to air per year.

When considering fattening pigs, at the average number of 100 animals, then ammonia production is calculated as:

total emission factor 8.3 * 100 animals = 830 kg/year, 0.83 t ammonia released to air per year.

The total ammonia released to air per year in this case would be 7,618 t for the agricultural farm.

Calculation of pollutants and fees for pollution at petrol stations:

In case there is no authorized measureing taken, the calculation of the pollutants is calculated by the emmision factors according to the Code nr 356/2002 Col. With this, for the filling of cisterns and storing the half of the emission factor value is used. Calculating the emmision at LPG emission factors based on professional estimation are used: for filling and storing 0,5 kg for one filling and 1,62 g for one output of LPG.

Example of emission calculation at received and released petrol:

Emission factor for petrol is 1400 g VOC/m^3, 1,4 kg VOC/m^3. If the amount of received petrol is 1000 m^3/year and the amount of released petrol is 990 m^3/year, then the emission of the received petrol is

E = 1000*1/2 of emission factor (0,7) = 700 kg VOC

and of the released petrol is E = 990 * ½ of the emission factor (0,7) = 693 kg VOC.

The total emission of VOC from petrol per year is in this case 700 kg + 693 kg = 1393 kg VOC/year.

The fee for the pollution is calculated by using the rate for the tonne of VOC (2000 Kč) and the calculated emission which is 1,393 t. Then the fee would be 1,393 t * 2000 Kč = 2786 Kč.

It is the same process by calculating the fuel oil pollution (where the emission factor is 20 g VOC/m^3) and at LPG (emission factor for one filling is 0,5 kg VOC and for one release 1,62 g).

Fee calculation at the medium source of air pollutant:

It can be a heating boiler at the rated thermal output from 0,2 MW to 5 MW including. The process of calcutation is the followin:

1. by authorized measuring is found out the content of pollutants (solid pollutants, sulfur dioxide, nitrate oxides, carbon dioxide, organical substances),
2. type of fuel used and its consumption (gas, consumption in m^3)

3. the emission is calculated by multiplying the amount of emission with the consumption (Nitrate oxides 2000 kg, gas consumption 200 000 m^3, then 2000 * 0,2 MW is 400 kg of nitrate oxides release)
4. multiplying the amount of emission by the rates according to the Act nr. 86/2002 Col. (Kč/t), which would be 0,4 t * 800 Kč = 320 Kč.

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OBLIGATIONS OF COMPANIES IN THE EXECUTION OF THE VALIDATED EMAS IN PRACTICE

Petra Mísařová

INTRODUCTION

GM, spol. s.r.o. was founded in October 1991 by the privatisation of the state enterprise Vyškovan. After the privation, the new company followed up a more than forty year tradition of the processing of plastic at Vyškov and joined major manufacturers of plastic products and moulding tools and plastic injection moulding. What the company offers to its customers including such companies as SIEMENS, VSM Production (Husqvarna holding), JOHANNES BUCHSTEINER, TRW-DAS, ETA and many others, is a complete range of services in the field of plastic products starting from product design, construction, manufacture of tools, manufacture of plastic parts to the final finish and assembly operations.

In a long-term perspective, the company top management seeks not only profitable, competitive and safe management of the enterprise but it does business that will be environment friendly and responsible. This was not the only reason for the company management to implement in 2004 a system of the environmental care to ISO 14001 : 1996 and the Directive of the European Parliament and Council (EC) No. 761/2001 – EMAS These environment protection systems are based on a voluntary respecting of all principles of a responsible business and environment protection management.

Early in 2001, the company came up with a draft plan for the implementation of an environment protection system. According information available to me, the starting incentive was, first of all, an endeavour to keep pace with competitors in this area, too. However, what the company missed was necessary knowledge and experience concerning the implementation of such a system. Therefore, the company accepted the offer of DHV CR to get voluntarily subjected to an audit and have the corporate environment protection system standards assessed in the framework of the "EMAS Supporting Programme in the Czech Republic". A key impetus was the inclusion of the company to chosen enterprises enrolled to the project ENV/1/SER/2000/0017 and these enterprises were offered an assistance.

Following the execution of the contract on cooperation with DHV CR, spol.s.r.o. in the autumn 2001, the company launched an intensive development of the environmental management system subject to the Directive of the European Parliament and Council (EC) No. 761/2001 – EMAS. The company started to develop the system in a way to meet requirements of ČSN EN ISO 14001:1996, too, from the very beginning. At the time being, the company has the system implemented and certified to ČSN EN ISO 14 001 and validated to EMAS II.

RESPONSIBILITIES OF GM, spol.s.r.o.

1. ENVIRONMENT MANAGEMENT SYSTEM MANUAL

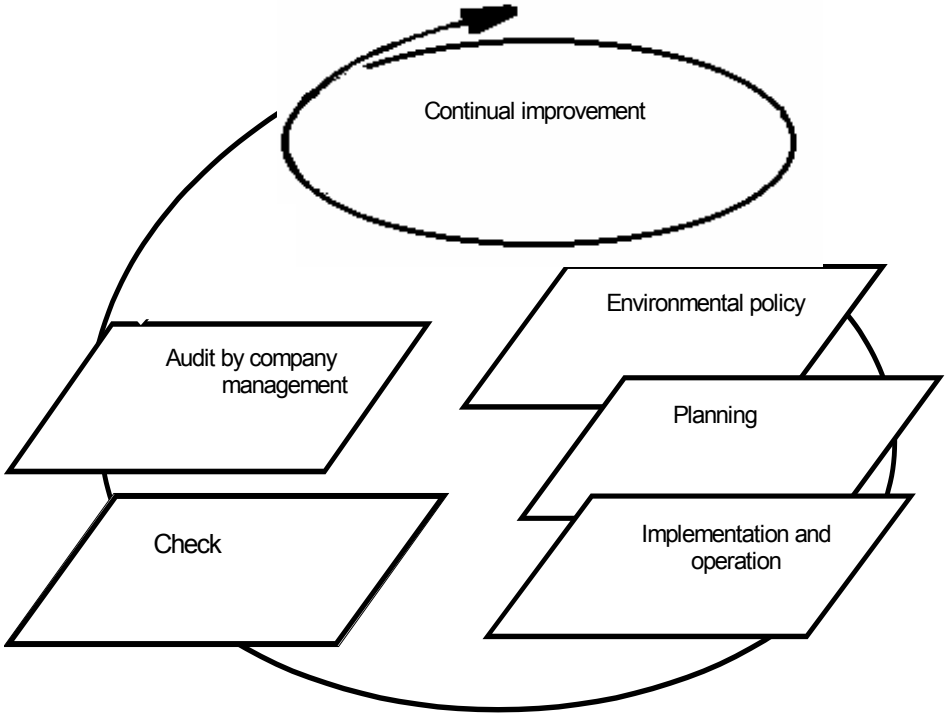
The responsibilities the company collects in connection with the environmental management system are given in the Environmental Management System Manual. The purpose of the corporate Environmental Management System Manual is the presentation of the corporate environmental management system in activities, products and services within the defined scope.

The area of the validity of the EMS manual is binding for the entire company GM, spol.s.r.o. Vyškov and the manual features a top document of the environmental management system.

2. ENVIRONMENTAL MANAGEMENT SYSTEM MODEL

The company has implemented, maintains and continuously improves the environmental management system in compliance with the methodology Plan-Do-Check-Act (PDCA) Such a corporate methodology may be visualised as an EMS graphic spiral.

Fig. No. 1 – Model of the environmental management system of GM, spol.s.r.o. Vyškov.



Source: Documentation of GM, spol.s.r.o.

The PDCA methodology may be briefly described as follows:

- Plan: set out objectives and processes necessary for the achievement of results in compliance with the environmental policies of the company
- Do: implement processes

- Check: monitor and measure processes in relation to the environmental policies, objectives, target values, requirements of legal regulations and other requirements and report on results
- Act: implement measures for a continuous improvement of the performance of the environmental management system

2. 1 ENVIRONMENTAL POLICY

Environmental policy is a written statement of the company on the environment and corporate principles of environment-friendly behaviour and resulting general conclusions. In combination with the overall business strategy, this policy forms up a framework for all activities and further elaboration of environmental objectives and target values. The policy has to be compatible with other organisational policies for instance, quality assurance, labour safety and health protection at work etc.

2. 2 PLANNING

Within the framework of the published environmental policy, the company business concentrates on a continuous improvement of the environment. Environmental aspects and impacts upon environment are defined for activities, products and services that have or may have a significant impact upon the environment. Such environmental aspects are included to a register of environmental aspects including the level of their relevance. The register of environmental aspects is one of underlying documents for the formulation of the environmental policy, identification of environmental objectives and target values. The environmental objectives and target values are set once a year and included to the financial plan for the given year. The objectives are detailed in implementation programmes.

2. 3 IMPLEMENTATION AND OPERATION

The company management shall provide for the availability of resources necessary for the creation, implementation, maintenance and improvement of the environmental management system including human resources, corporate infrastructure, technology and funds.

Job descriptions include differentiated powers and responsibilities of employees relating to the environment.

Every employee of the company shall undergo a training and schooling including staffs implementing for the company or at request of the company such activities that may have significant environmental impacts. The environmental awareness of employees is encouraged pointing out to the impacts of the condition of the environmentupon the good name of the company. The training is executed by company lecturers and outsourced training companies.

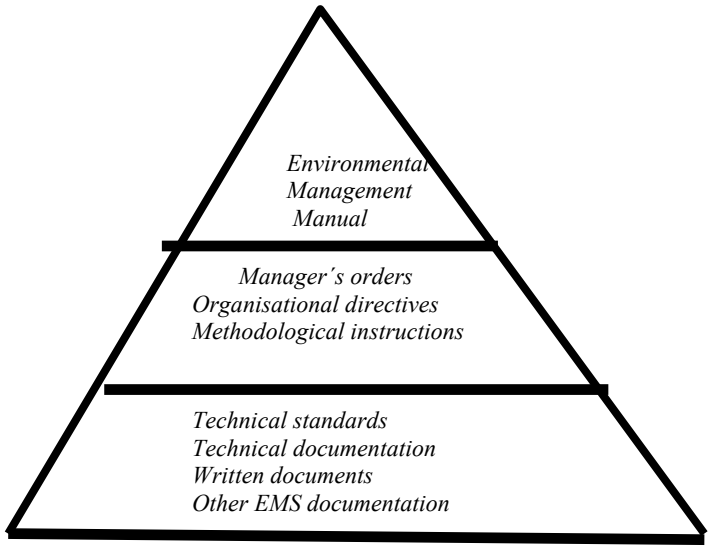
The environmental communication is meant to be a controlled and documented exchange of relevant information on the environment protection against effects of activities, products and services of the company and related data.

Organisations having a validated EMAS prepare a full statement on the condition of environment once in three years and a brief (updated) statement in the following two years is to be published. Such a statement is always forwarded to an auditor for the validation. The statement in the form of a hard copy or in an electronic format is provided to stakeholders and all those who care for the impacts of the organisation upon the environment.

Structure of the EMS Documentation

The EMS documentation is published as controlled documentation and it is subject to the alteration proceeding.

Fig. No. 2 Structure of the documentation at GM, spol.s.r.o. Vyškov



The preparation, authorisation, distribution, maintenance, review or discarding of the corporate documentation is governed by the controlled documentation directive that sets out principles of the method of the creation and maintenance of the documentation. The company does it best to create and maintain management procedures for all documents in a way to keep them easily accessible from all points where necessary in connection with the operation of the EMS either as a hard copy or in an electronic format. Detailed and specified directives are available for details on the documentation management.

2. 4 OPERATION CONTROL

Te company has defined operations and activities related to the defined significant environmental aspects in compliance with the policy, objectives, target values in the process of the creation of the register of environmental aspects. The management of operational procedures is executed subject to exactly defined conditions for instance in the field of marketing, projects and technologies, acquisition, transportation, warehousing, manufacturing processes, maintenance processes, purchase of machines, monitoring of emissions to atmosphere, wastewater, waste, packages, emergency response etc.

2. 5 CHECK

The company monitors and measures adherence to limits set out in the legislation, by administration authorities, based on contractual relations and for the check of the compliance with the target values.

The assessment of the compliance with legal regulations and other requirements is done once in a quarter by a responsible offices (ZEMS). Results are reported to the company management.

Any lack of conformity with the defined environmental requirements is called non-conformity. A directive has been prepared for the prevention and elimination of consequences of environment non-conformities.

The conformity with the environmental policy is monitored and evaluated on a regular basis by means of internal audits. An internal audit is supposed to check the correct function of the environmental system management.

2. 6 COMPANY MANAGEMENT AUDIT

Once a year, the company top management audits the environmental management system. The audit of the system is an assessment of the condition and adequacy of the system in relation to the policy of the environmental management and objectives of the environmental management. Any materials necessary for such an audit are submitted to the top management by the EMS authorised officer as appointed by the company and responsible for this area.

The subject-matter of the audit is to ensure the efficiency of the environment management system and its compliance with all requirements set out for it. The objective of the audit is to identify any contingent alterations necessary to keep measures taken in the field of the environmental management compliant with all requirements and let them respond to the results of internal audits.

An outcome from the audit is an audit protocol including but not limited to an evaluation of the following:

- current condition of the environmental management
- environmental management system
- adequacy of the environmental policy and a need to change it based on many criteria
- need of a change of and amendment to the documentation of the environmental management system

CONCLUSION

The administration and documentation aspect of the validation or certification of the environmental management system is very demanding. GM, spol.s.r.o. provided necessary assistance to the author of this paper. Thanks to the assistance, I could figure out the entire scope of aspects involved in this issue.

The environmental management manual is a key document of GM, spol.s.r.o. Vyškov in the given area but it is just the tip of the iceberg of the corporate administration. This article addresses only some parts of the manual. The manual contains much more data than I could describe in this paper. All areas are detailed in directives. All such documents have to be in line with other corporate regulations and, above all, they have to be in compliance with the laws of the Czech Republic. The said manual places emphasis on the monitoring and keeping informed all employees on the current legislation, filling the register of legal and other requirements, it updating and evaluation in compliance with the reality.

I believe it is quite clear that requirements to companies who have a validated environmental management system based on the EMAS programme II are very demanding in terms of time and funding.

In 2005, the corporate environmental system to ČSN EN ISO 14001:1996 should be re-certified and the EMAS II programme revalidated. According to information provided by the company, it will seek the renewal of the certificate of the environmental management to ČSN EN ISO 14001:2004 in September.

However, the company top management decided not to revalidate the system according to the EMAS II programme with regard to considerable time and funding requirements. The company keeps improving the efficiency of the manufacturing process and entire corporate business that should improve the efficiency and profitability of the company. This is why the company keeps on a "slimming diet" and the system validated based on the EMAS II programme is very demanding in terms of the administration as apparent from this paper. For these time-related and personnel reasons, the company will not seek the revalidation of the certificate in September 2005. According to information available, the company will keep the current administration as it is, it will only reduce it to include only such information and requirements as required by ČSN EN ISO 140001:2004.

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Courtesy to GM, spol.s.r.o. Vyškov and first of all Ing. Stanislav Wasserbauer for the willingness, cooperation and all information provided.

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ENVIRONMENTAL ACCOUNTING AND COMPETITIVENESS OF SMALL AND MEDIUM ENTERPRISES

Ilona Obršálová - Marcela Kožená - Simona Munzarová

This article deals with the selected problems of the relation of competitiveness of small and medium enterprises (SME) and utilization of environmental accounting for the formulation of strategies, as well as for the influence of SME behaviour in the short term perspective. In the following article, the approaches noted in the literature are analyzed and the results of the empirical research into the application of environmental accounting on the micro level (conducted within the grant of the Ministry of the Environment) are summarized.

1. Introduction

Environmental problems have direct and indirect impact on the economic subjects company. The limitation of natural resources leads to a new orientation of company's management practically in all sectors of economy. Therefore in the future, must the management have an interest to ensure, that the economic activities comprise relevant environmental efficiency.

Another limitation to economic activities is the necessity to respect so called "social legitimacy". The society determines, through the range of direct and indirect instruments of environmental protection, certain framework within which the companies have to operate in order to ensure their prosperity in the long run. The accordance of companies´ behaviour with the beyond-economical society's values becomes the pre-requisite to assurance of long term existence of any company.

Hence the environmental protection has the increasing importance for the competitiveness of companies. For the support in decision making process there needs to be relevant information system available, in this case the system including information about the impacts of a company on the environment, including both financial measures as well as alternative indicators. In this article we focus particularly on the problems of competitiveness of small and medium firms from the perspective of relation to the environment and environmental accounting.

2. Competitiveness of SME and the need for environmental accounting

Companies` attitude to the environmental protection, expressed in the business plans and strategies, will be more and more significant for the ensuring of competitive position of a company, and this especially because of following reasons:

- Companies will have to consider the matter of environmental protection more thoroughly as a strategic competitive problem. They will be requested to contribute to the environmental protection independently and on their own will, so that the protection shall be perceived not only as a factor limiting the growth but more as a precondition to the growth. According to Merffert [1996, s.322], the most significant conflict in environmentally focused management is the contradiction between the environmental protection while managing resources and environmental protection as a society's demand.

- The limitation of natural resources will lead to the situation when the business activities will have to demonstrate relevant environmental efficiency in order to ensure existent and obtain new potential profit and perspective company's profile. Innovative companies will have new market opportunities.
- Consumers will increasingly demand the "environmentally friendly" goods, they will more frequently disclose simplified and pseudo environmentally oriented strategies.
- In order to effectively establish the environmental protection as an idea of companies` behaviour, it must become a goal in course of all decisions. Environmental aims must therefore be an integral component of strategic goals of a company. Inclusion of environmental aims into the company's goals means to conform all business activities with the environmental aspect.

The respect to the environmental approach in the business strategy can contribute to the achievement of competitive advantage of a company, when:

- it is acknowledged integrally in all company's functions,
- measures oriented inwards to a company are integrated with measures oriented towards a market,
- a company gains a time advantage by concerning the environmental protection in time, ahead of its competitors. [6,8]

The decision about which of the elemental environmental strategies to realize depends on the specific conditions in which the company occurs. Generally it can be said, that the *strategy of differentiation* (ensuring environmentally oriented competitive advantages) can improve the competitive position of a company, because the customers increasingly value the goods and services with characteristics positive to the environment. The success of the *strategy of the price leader* depends on the level of optimalization of production and processes, which enables to offer the products with lower price than the competition. This concept is suitable for companies whose products are aimed at the standard customer who does not expect the product with extra utility or quality. Strategically significant profiling in the competition can happen only when better environmental characteristics of the product are accompanied by lower production costs in comparison with the conventional products (for example the substitution of precious raw materials with the recycled inputs, which often happens at the expense of higher utility and esthetical appearance).

The way to the achievement of cost advantage is rigorous and consistent production and process optimalization, which enables the company to realize (in comparison with the competition) lower costs per product (service) and offer the production at lower price at the market. How successful a company with such a strategy will be depends on whether the company would manage to achieve the comparable market share to the competitors, and so benefit from the degressive costs effect[6]. The condition of implementation of this strategy includes: the wide baseline of consumers, relatively small product range, the expectancy of customers´ standard utilization and the exceeding price arguments over the expectation of distinctive utility of the product. Generally it can be stated, that substitutive cost advantages of the production innovations can be expected only in exceptional cases. In majority cases, the production innovations are connected with the increase of costs which is contrary to the requirements of the strategy of a price leader.

[6] Degressive cost effect (that means effect, or more precisely benefits from scale of production)

Thus, it is not possible to trace any notably significant relationship between environmentally oriented profiling within the strategy of a price leader and an improved competitive position. On the contrary, the significantly negative impact on the target measure of "increase of growth potential" is indicated. Therefore, the environmentally oriented profiling within the strategy of a price leader is possible to observe apparently only in marginal market segments, which usually have less promising perspective of growth.

The reason is primarily the elimination of the market risk and that is why especially *defensively and selectively oriented companies* prefer this approach.

On the other hand, it is important to notice that in the context of continually more and more rigorous law and increasing environmental protection costs, it is possible that the cost advantage of the company, which in the long term refuses the measures towards the environmental protection (e.g. ecologization of the production, improvement of environmental characteristics of the product and other), will be suppressed. Therefore the companies have to consider the risk (in the form of temporary increase of costs) when undertaking voluntary (that means early) measures of the environmental protection and also the risk of increase of costs which will happen under constrain of time and standards (if they implement the measures not sooner than they are forced by legislation).

It shows that the impact of costs when implementing the environmental protection measures progresses with time. This problem can be solved by the *timing* of environmentally oriented strategies. H. Meffert states that the impact of *timing* on the improvement of competitive position in the form of significant linear correlative relation cannot be proved in the research.

The success of the *pioneer strategy* depends mainly on the cooperation with the trade and on the increase of image of environmentally innovated products with the public as consequence to the time head-start upon the implementation. Generally it can be said that the "pioneer position" does not bring along any significant increase in customers` acceptance of environmentally oriented production innovations, which is explained especially by the fact, that these products can be affected by the "image of limited consumer competence". Nevertheless, it is not possible to say that in the timing of environmentally oriented strategies the *strategy of the follower* would be more suitable; on the contrary, it was found that the very successful production innovations are introduced on the market in advance to the competitive products. Unsuccessful environmentally oriented products were being introduces with the delay of two years. Very effective, in respect to the introduction of environmentally innovative products seems to be the *cooperative strategy.* It was found that not less than half of the companies operating on the market with environmental products cooperate with competition.

Some companies, which in the role of followers focus on the selected market segment, can in certain cases realize a competitive advantage. But usually they do not attain long lasting advantage due to the "green image" as their predecessors. Particular group of "followers" can realize the competitive advantage even with the time delay of the entry to the market, if it focuses on economically profitable segments, or if it learns from the mistakes of its predecessors, or more precisely if it cuts down the costs of entering the market.

In order to achieve the environmental strategies to be successful in the long term, it is necessary the aim of the environmental protection to project into all business functions and the results of the environmentally oriented measures to assess on the basis of cost-benefit analysis. They must be examined from the perspective of their effect on factors determining the profit figure (sales price, costs according to company's divisions, public funding and other). The merit of large-scale analysis of value chain of all company's activities can be seen above all in the opportunity to assign the cost reduction and revenue increase to the individual

measures. This analysis is beneficial especially when the management of a company respect the environment as a ground of the strategic aspect of competitive advantage.

The fundamental part of the environmental aims comprises of *heteronymous goals* that means the goals originated externally. The changes in the external setting (for example in the legislation, public attitudes, customers´ and consumers´ demand and other) can provoke the necessity of adjustment of the environmental goals. *Autonomous goals* reflect the attitudes, approaches and values, which are preferred by the owners and management of a company. The inclusion of the environmental protection aims into the business goals means, according to H. Meffert, to conform all company's activities to the environmental aspect in the way that the idea of environmental protection is to be respected in all the decisions made and so is to be perceived as "shared value" of the business.

The results of the research focusing on ranking of companies´ goals were as follows [Meffert, H., 1996, s. 49-51]:

- ensuring of competitive abilities,
- long-term profits,
- productivity,
- cost savings,
- motivation of employees,
- image,
- entry to new markets,
- environmental protection,
- sustained employment,
- market share,
- cooperation with trade,
- business return,
- short-term profit.

The list shows that the aim for the environmental protection is inferior to the goal of ensuring the competitive advantage and long-term profit. The analysis of conflict of the aim for environmental protection against the other "classical business goals" was carried out, which indicates that the aim for environmental protection (as a factor of business success) is in positive relation with other long-term goals of a company (for example: long-term profit, entering new markets, competitive ability, image,…). On the other hand, the aim for environmental protection is in conflict with short-term business goals (short-term profit, cost savings, short-term increase in productivity, etc.). Arising from what is stated above, it can be according to H. Meffert deduced that the "conflict of business versus environment" is reduced to relation of short-term economical prosperity versus environmental aims.

To successfully achieve the strategic business goals, which as an integral part should, following the sustainable development strategy, include also environmental goals, it is important to accept and implement the optimal strategical policy. These approaches are theoretically presented in a range of publication. The mentioned attitudes of companies prove that the implementation of environmental aspects in the business strategy can contribute to the achievement of competitive advantage if:

- the environmental protection is implemented integrally in all business functions of a company,
- the measures directed inwards company are related to the measures oriented towards the market,
- a company gains the time advantage by considering environmental protection matter early, in advance to its competitors.

There has been undeniable positive shift in the companies` behaviour towards the environment in the context of conditions of our economy. Nevertheless, it was important to complete the knowledge resulting from previous research carried out especially at companies certified with environmental management standards, and supply the information about the situation in small and medium enterprises.

From the research results at companies with EMS certification nationally as well as abroad [e.g. 1,3,4,5 and other], it is apparent that majority of these companies evaluate implementation of EMS positively. The advantages being seen especially in these fields:

- improvement of intradepartmental (in-house) system,
- decrease of material costs, fuel and energy costs, decrease of operational costs,
- decrease of emissions and resulting decrease in environmental emission charges,
- improvement of supplier-customer relations and achievement of competitive advantage on the market,
- improvement of communication with relevant stakeholders, and other.

But not always is the EMS implementation beneficial to SME.

Our department has carried out the research (in May, 2005), whose aim was to verify the selected issues of implementation of environmental protection strategy as a competitive factor, and further to investigate the opportunities of companies in respect to needed and desirable information (especially about the environmental protection costs).

The survey was carried out in companies in the Czech Republic, focusing on small and medium enterprises. The initial hypotheses were formulated. Then, in cooperation with Labour offices the companies to be addressed were selected, the questionnaire prepared and pilot-tested. Our interviewers have collected the sample of 128 companies representing the selected economy fields according to the OKEČ classification. There were only 30 companies with implemented EMS in compliance with ISO in this sample. The questionnaires were statistically analyzed. The results complement the information derived from literature sources in our country and abroad and also other research results.

The survey focused on questions of perception of competitiveness in the context of environmental protection in respect to the presented theoretical hypotheses and identified problems in fulfilment of information needs in the area of environmental information. The survey was concerned especially with the relation to entrepreneurs` needs and with burden connected with documentation and control obligations which SME face.

The questionnaire consisted of a range of questions: identification of an economic subject (firm, company, enterprise), relation to the competitiveness and strategies, awareness and preparedness of in-house information system for the assessment of behaviour sustainability and possibilities of concessions for companies with certification. The results show the similar conclusions which were reached in the research abroad, with the difference of the fact that our companies appear in this context as more passive.

84 companies did not have a strategic policy / concept elaborated. As for the external driving forces for environmental protection behaviour, the impact of legislative measures explicitly prevails. Nearly half of the companies rank the environmental protection to 4. – 6. position in the list of priorities; similarly is environmental protection appraised as a competitive factor. Also the knowledge of strategic aims of competitors in environmental protection is marked as no or do not know in 2/3 of companies of the sample.

Preference for the environmental strategy complies with is also – mostly the strategy of follower is indicated or they do not monitor the relevant costs at all. The compliance of product parameters with environmental requirements is viewed only in respect of compliance with legislation. Imbedded processes for monitoring of company's impact on the environment in its information system have only 43 companies from the researched sample, quantification of material and energy consumption was stated by 45 companies, the others only estimate or do not monitor these characteristics at all. Similarly, the ability to allocate the environmental costs per product (service) is very limited too.

3. Conclusion

The results demonstrate the permanent unsatisfactory knowledge of SME about the advantages of quality information monitoring which environmental accounting presents. The research also shows fundamental differences between the types of companies. The development of environmental accounting information system is certainly not simple and inexpensive matter and it must be customized according to the specific needs of a company. SME sector requires in this respect a specific support especially in the area of consultation (methodology) and rationalization of monitoring and controlling processes.

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DIRECTIVE 2003/96/EC RESTRUCTURING THE COMMUNITY FRAMEWORK FOR THE TAXATION OF ENERGY PRODUCTS AND ELECTRICITY AND ITS IMPACT ON COMPANIES

Jarmila Ottová

1. Introduction

Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity imposes on all EU Member States the mandatory minimum rates of excise duties on consumption of individual types of fuels and energy. The objective of the Directive is to harmonize the amount of excise duties on fuels and energy in the framework of the European Union.

As stipulated in the preamble of the Directive – proper functioning of the internal market and the achievement of the objectives of other Community policies require minimum levels of taxation to be laid down at Community level for most energy products, including electricity, natural gas and coal. The Directive stipulates the minimum excise duty for petrol, diesel, heavy fuel oils, petroleum, LPG, natural gas, coal, coke and electricity.

The Directive came into force on January 1, 2004 and, for the Czech Republic, on the date of its accession to the European Union, i.e. on May 1, 2004.

The Directive imposes the minimum levels of taxation according to the purpose of use of energy – different rates of excise duties are stipulated for propellants, heating fuels and electricity.

Propellants are further divided to 2 categories, namely motor fuels and special-purpose motor fuels. For the purposes of the Directive, special-purpose motor fuels mean motor fuels used in agricultural, horticultural or piscicultural works, and in forestry, stationary motors, plant and machinery used in construction, civil engineering and public works, vehicles intended for use off the public roadway or which have not been granted authorisation for use mainly on the public roadway. The minimum levels of taxation valid for this category are much lower than the minimum levels of taxation for other purposes.

The minimum rates of excise duties for heating fuels and electricity are divided to business use and non-business use; for business use, certain minimum rates are lower.

The Directive provides for a number of exemptions, depending on preferences of individual countries. In principle, exemptions are "offered" which promote the use of renewable energy sources and cogeneration in energy production, and use of biofuels in transport. As set forth in the Directive, certain exemptions or reductions in the tax level may prove necessary; notably because of the lack of a stronger harmonisation at Community level, because of the risks of a loss of international competitiveness or because of social or environmental considerations.

2. Relation of Directive 2003/96/EC to businesses

On the one hand, Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity stipulates the minimum rates of excise duties on fuels and energy, while, on the other hand, it enables the Member States to introduce a

number of exemptions and reductions. In relation to businesses, these exemptions should be a clear indication of what the Government promotes and what are its interests.

2. 1 Article 15 of Directive 2003/96/EC

Article 15 of the Directive lists energy products, with respect to which full or partial tax exemptions may be applied. The following energy products are included:

a) taxable products used under fiscal control in the field of pilot projects for the technological development of more environmentally-friendly products or in relation to fuels from renewable resources;

b) electricity:

- of solar, wind, wave, tidal or geothermal origin;
- of hydraulic origin produced in hydroelectric installations;
- generated from biomass or from products produced from biomass;
- generated from methane emitted by abandoned coalmines;
- generated from fuel cells;

c) energy products and electricity used for combined heat and power generation;

d) electricity produced from combined heat and power generation, provided that the combined generators are environmentally friendly. Member States may apply national definitions of "environmentally-friendly" (or high efficiency) cogeneration production until the Council, on the basis of a report and a proposal from the Commission, unanimously adopts a common definition;

e) energy products and electricity used for the carriage of goods and passengers by rail, metro, tram and trolley bus;

f) energy products supplied for use as fuel for navigation on inland waterways (including fishing) other than in private pleasure craft, and electricity produced on board a craft;

g) natural gas in Member States in which the share of natural gas in final energy consumption was less than 15 % in 2000;

h) electricity, natural gas, coal and solid fuels used by households and/or by organisations recognised as charitable by the Member State concerned. In the case of such charitable organisations, Member States may confine the exemption or reduction to use for the purpose of non-business activities. Where mixed use takes place, taxation shall apply in proportion to each type of use. If a use is insignificant, it may be treated as nil;

i) natural gas and LPG used as propellants;

j) motor fuels used in the field of the manufacture, development, testing and maintenance of aircraft and ships;

k) motor fuels used for dredging operations in navigable waterways and in ports;

l) products falling within CN code 2705 used for heating purposes (including coal gas, water gas, producer gas and similar gases, other than petroleum gases and other gaseous hydrocarbons).

Member States may apply a level of taxation down to zero to energy products and electricity used for agricultural, horticultural or piscicultural works, and in forestry

2. 2 Article 16 of Directive 2003/96/EC

Article 16 of the Directive lists energy products, with respect to which exemption or a reduced rate of taxation may be applied. Member States may apply an exemption or a reduced rate of taxation under fiscal control on the taxable products where such products are made up of, or contain, one or more of the following products:

Products falling within CN codes 1507 to 1518:

- CN 1507 Soya–bean oil and its fractions, whether or not refined, but not chemically modified
- CN 1508 Groundnut oil and its fractions, whether or not refined, but not chemically modified
- CN 1509 Olive oil and its fractions, whether or not refined, but not chemically modified
- CN 1510 Other oils and their fractions, obtained solely from olives, whether or not refined, but not chemically modified, including blends of these oils or fractions with oils or fractions of heading 1509
- CN 1511 Palm oil and its fractions, whether or not refined, but not chemically modified
- CN 1512 Sunflower–seed, safflower or cotton–seed oil and fractions thereof, whether or not refined, but not chemically modified
- CN 1513 Coconut (copra), palm kernel or babassu oil and fractions thereof, whether or not refined, but not chemically modified
- CN 1514 Rape, colza or mustard oil and its fractions, whether or not refined, but not chemically modified
- CN 1515 Other fixed vegetable fats and oils (including jojoba oil) and their fractions thereof, whether or not refined, but not chemically modified
- CN 1516 Animal or vegetable fats and oils and their fractions, partly or wholly hydrogenated, inter–esterified, re–esterified or elaidinised, whether or not refined, but not further prepared
- CN 1517 Margarine; edible mixtures or preparations of animal or vegetable fats or oils or of fractions of different fats or oils of this chapter
- CN 1518 Animal or vegetable fats and oils and their fractions, boiled, oxidised, dehydrated, sulphurised, blown, polymerised by heat in vacuum or in inert gas or otherwise chemically modified

All these products may be added as a bio-component to PETROL.

Products falling within CN codes 3824 90 55 and 3824 90 80 to 3824 90 99 for their components produced from biomass:

- CN 3824 90 55 Mixtures of mono-, di- and tr-, fatty acid esters of glycerol (emulsifiers for fats)
- CN 3824 90 80 Mixtures of amines derived from dimerised fatty acids, of an average molecular weight of 520 or more but not exceeding 550

- CN 3824 90 85 3–(1–Ethyl–1–methylpropyl)isoxazol–5–ylamine, in the form of a solution in toluene
- CN 3824 90 99 Other

All these products may be added as a bio-component to DIESEL.

Products falling within CN codes 2207 20 00 and 2905 11 00 which are not of synthetic origin:

- CN 2207 20 00 Ethyl alcohol and other spirits, denatured, of any strength
- CN 2905 11 00 Methanol (methyl alcohol)

Products produced from biomass, including products falling within CN codes 4401 and 4402

- Fuel wood, in logs, in billets, in twigs, in faggots or in similar forms; wood in chips or particles; sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms
- CN 4402 Wood charcoal (including shell or nut charcoal), whether or not agglomerated

2. 3 Article 17 of Directive 2003/96/EC

Article 17 of the Directive permits the application of reduction of excise duties for businesses on the consumption of energy products used for:

- heating
- for stationary motors
- for plant and machinery used in construction, civil engineering and public works;
- electricity

in the following cases

- in favor of energy-intensive business
- where agreements are concluded with undertakings or associations of undertakings, or where tradable permit schemes or equivalent arrangements are implemented, as far as they lead to the achievement of environmental protection objectives or to improvements in energy efficiency.

For energy-intensive businesses, the level of taxation may be reduced down to zero.

For business entities which are not considered to be energy-intensive, the tax rate may be reduced down to 50 % for the purposes of business use.

The reduced or zero rate may be employed only by those businesses that are registered within the tradable permit schemes or have concluded an agreement with the Government on reduction of pollution.

The Directive permits the provision of specific reductions for business, in certain cases down to zero. However, this reduction is conditional.

3. Implementation of the Directive in the Czech Republic

In relation to the implementation of the Directive, the Czech Republic has agreed on a transitional period until the end of 2007.

Excise duties on petrol, diesel, natural gas, LPG and heating fuels have already been provided for in Act No. 353/2003 Coll., on excise duties, as amended. No excise duties on electricity and solid fuels have been introduced in the Czech Republic to date.

Two new laws on excise duties, namely the Act on Excise Duties on Solid Fuels and the Act on Excise Duties on Electricity are being prepared in connection with the implementation of Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity in the legislation of the Czech Republic. The Ministry of Finance, Ministry of the Environment, Ministry of Industry and Trade and Ministry of Transport are involved in preparation of the two laws.

4. Directive 2003/96/EC and environmental costs of businesses

With respect to a business and its potential to mitigate its unfavorable impact on the quality of the environment, we must first consider the manner of decision-making by an entrepreneur. The economic viewpoint is always decisive, namely the costs, revenues and profit. More specifically, this includes comparison of the costs of environmental measures and comparison of investments with "revenues" incurred by the entrepreneur.

Two main categories can be distinguished in the framework of environmental costs:

- costs directly incurred by the business – the corporate environmental costs;
- costs for which the business is not liable and does not bear them; however, these costs are borne by individuals, society and the environment as "negative externalities".

The above-described approach may be employed for a process, system, facility or the entire business.

The concept of environmental costs must be understood to mean environmental costs incurred by a business in connection with its business activities that are borne by the business, particularly those for which it is liable. The amount of these costs affects the performance of the business.

From the viewpoint of the business, negative externalities are costs that are related to the impact of the corporate activities, products and services on environment and society; however, the business is not liable for these costs, i.e. it does not bear the externalities.

Environmental costs consist of costs for environmental protection and costs related to environmental damage. It is suitable to further classify environmental costs in the following categories:

- costs related to waste management, management of wastewater and emissions into the air. These include all costs of treatment, trapping and purification of the generated wastes, wastewater and emissions into the air and costs for elimination (disposal) thereof;
- costs of management of the environment and pollution prevention. These include costs for prevention of waste, wastewater and emissions into the air;
- the price of wasted materials, i.e. the price of materials leaving the business as a non-product output;

- the costs of processing non-product output. These include costs of work, wear of machinery, consumption of operational substances and financing costs that are wasted for the non-product output.

Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity introduces two new items to the Czech tax system, namely excise duties on solid fuels and excise duties on energy. From the viewpoint of a business, these new excise duties can be classified as environmental costs constituting part of the price on input. Externalities will be partly internalized, i.e. negative externalities caused by production and consumption of solid fuels and electricity will be partly included in their price.

From the viewpoint of environmental accounting, the new excise duties on solid fuels and electricity constitute an increase in the environmental costs of a business.

5. Conclusion

Directive 2003/96/EC stipulates the minimum rates of excise duties on fuels and electricity that apply to all Member States of the European Union. As a consequence of implementation of the Directive, the Czech Republic must newly introduce excise duties on solid fuels and electricity from January 1, 2008.

For businesses, introduction of new excise duties will result in an increase in their environmental costs.

The actual magnitude of this increase is disputable, as Directive 2003/96/EC permits a number of exemptions from taxation which will also affect the business sphere.

The resulting increase in corporate environmental costs will be ultimately based on prolonged negotiations accompanying the preparation of new laws on excise duties on solid fuels and electricity.

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SYSTEM OF ECONOMIC, SOCIAL AND ENVIRONMENTAL INDEXES FOR SUSTAINABLE DEVELOPMENT

Panagiotis Vlaxos

INTRODUCTION

One of the primary results of the development of industry, which began about 150 years ago and is commonly referred to as the "Industrial Revolution", is the marked improvement in the prosperity and quality of living of people.

Our modern industrial society is essentially comprised of a complex and diverse scope of activities, known as the "industrial social-economic system". This system provides economic and social benefits to its participants, individually or collectively; yet on the other hand, the system relies on obtaining large amounts of various non-renewable resources from the natural environment, while at the same time expunging a large array of waste materials that inflict damage in various degrees, from moderate negative effects in the natural balance, up to its total destruction.

A proposition for contending with this problem is to develop a new type of social development, which would guarantee economic growth and social well being, while preventing the aforementioned ecological repercussions. This type of development is known as "sustainable development".

DEFINITION OF SUSTAINABLE DEVELOPMENT

The term "sustainable development" refers to that type of development that aims to ensure continually increasing human wealth, while preventing at the same time any degradation of environmental conditions and if possible, improving them.

In order to promote this type of development within a completely new social-economic system, one should consider the feasibility of evoking structural changes to this system.

One should keep in mind that the two concepts of economic development and environmental preservation are basically incompatible with each other; this incompatibility is due to the basic structure of the development strategy that characterizes a social-economic system.

Under certain conditions, economic development and the protection of natural resources can become compatible with each other. This is the main goal of a sustainable development strategy within a development system.

This means that one should design suitable actions and production procedures, for ensuring compatibility between the two aforementioned goals. Such a strategy, fully implemented, can lead to economic development that is also environmentally friendly.

USE OF INDEXES FOR MEASURING SUSTAINABILITY

Measuring environmental, social, economic and administrative parameters is among the first steps in studying the subject of sustainable development.

The goal of this quantification is to determine in numerical format a series of different factors, which can determine the environmental behavior and general way of life of people as individuals and as a whole.

The content of these indexes is condensed data in an easily understood format.

Sustainable Development indexes are a series of factors that provide useful information pertaining the status of a social-economic, environmental or institutional system.

This status usually refers to a numerical expression, which is derived from a percentage of figures, or a variation from a nominal value.

The main feature of these indexes is their ability to combine a methodological approach with a collection of arithmetic data, in such a way as to allow the comparison of results that are derived from different fields of study.

The indexes amass a wide range of information from different but related phenomena (economic, institutional, environmental, etc.). Several researchers have also discussed the creation of composite indexes. This is a rather complex task, because it requires combining data from studies of different fields, with different units of measurement.

In order to overcome this hurdle, we should determine a suitable system based on a series of criteria with the following features:

a) Accurate description of quantities.

b) Flexibility in the variation of data.

c) Ability to compare and relate with each other or with other units of measurement.

d) Ability to perform arithmetic functions.

e) Ability to construct mathematical models.

USE OF MATRIXES

The use of matrixes as mathematical tools for recording the evolutionary progress of various values provides several advantages that facilitate the development of mathematical models.

Various values from different fields (environment, economy, society etc.) are recorded in their respective matrixes, which are suitably designed for this recording.

The evolution of these values or conditions is described as a chronological series of matrixes as follows:

[ ]m∗n t1 , [ ]m∗n t2 , [ ]m∗n t3…….. ……. [ ]t∗n

and summarily

[ ](m∗ n)t

where m = lines

n = columns

t = time

For the four main areas of interest that require the construction of appropriate indexes, we have:

A) Environmental features are described by Environmental Matrixes that form a continuous index

E1, E2, E3 ……En = Ei

with Ei being the series of matrixes that describe the evolution of environmental features.

B) Social features are also described as a series of Matrixes that form a continuous index

S1, S2, S3 ……Sn = Si

with Si being the series of matrixes that describe the evolution of social parameters.

C) Economic features are described as a series of Matrixes that form a continuous index

EC1, EC2, EC3 …… ECn = ECi

with ECi being the series of matrixes that describe the evolution of economical parameters.

D) Institutional features are described as a series of Matrixes that form a continuous index

I1, I2, I3 …… In = Ii

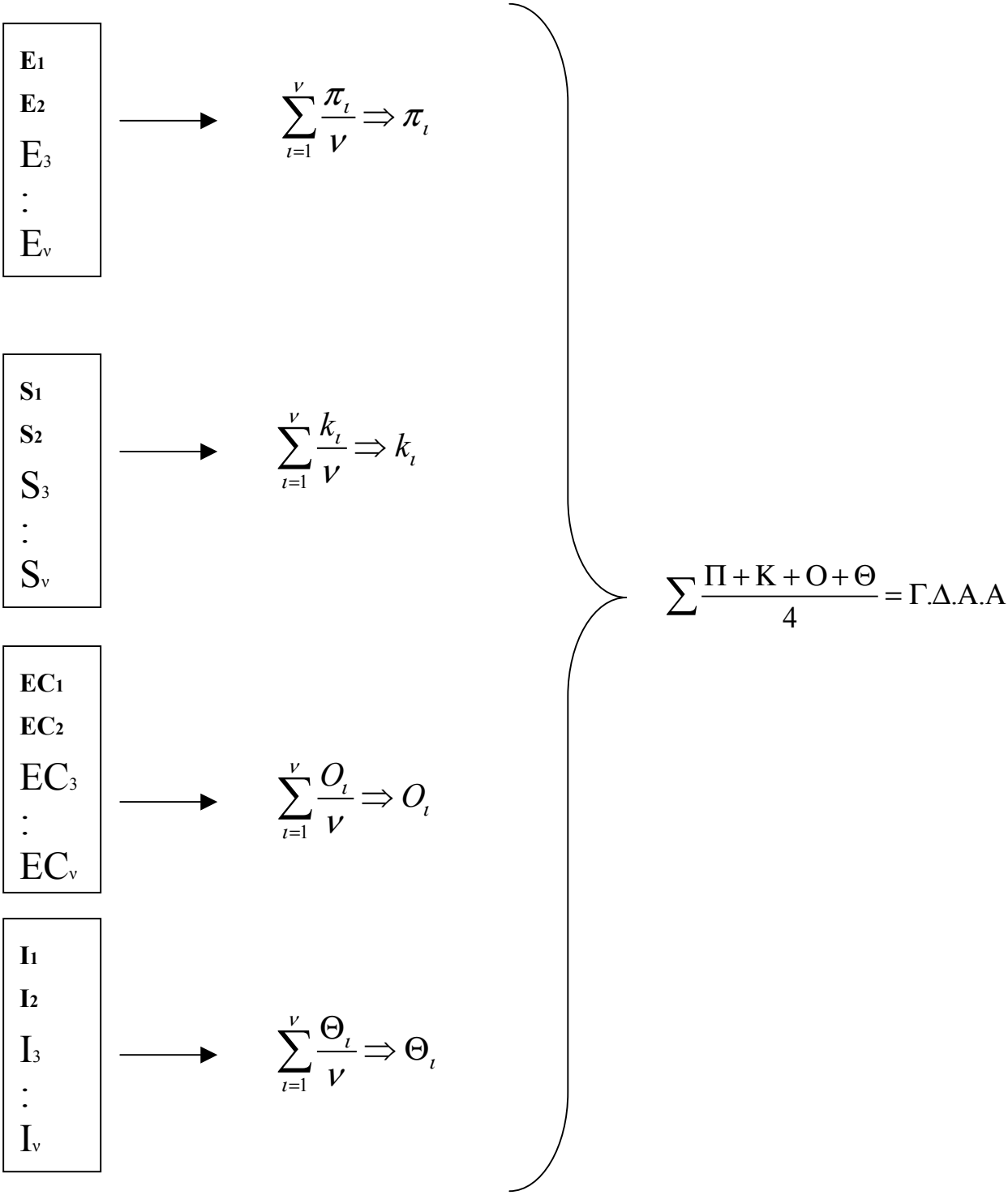
for a time period of t

with Ii being the series of matrixes that describe the institutional status of a society within a time period of t.

COMBINATION OF MATRIXES

The following diagram shows the procedure for combining individual matrixes, in order to come up with a general index of sustainability, otherwise known as a general index of sustainable development for a country.

SCHEMATIC DEPICTION OF THE COMBINATION OF INDIVIDUAL FACTORS IN SUSTAINABLE DEVELOPMENT



THE ENVIRONMENT AT MICROSCOPIC AND MACROSCOPIC LEVELS

Most statistical indexes in use today are not able to describe in full the true status of the phenomena they refer to. Specifically, the economical indexes used today cannot describe the actual economical parameters, or the relations between these values and respective environmental or social sizes.

On the other hand, the environmental indexes can record the evolutionary progress of ecological factors, but these are also unable to accurately describe the reasons that cause such phenomena, or to associate this progress with other factors (economic, cultural, social etc.).

Another weakness that statistical indexes show is their difficulty in developing suitable territorial relationships between various factors, as they form within certain territorial levels.

In general, the use of indexes as statistical tools for describing and quantifying various phenomena is an inherently difficult and complex task, with several weaknesses as described above. In order to resolve these problems, the theory of integrated territorial management was formulated as a basic methodological tool for studying environmental changes.

THE THEORY OF INTEGRATED TERRITORIAL MANAGEMENT

The practical application of the theory of integrated territorial management begins with a systematic recording of national territory where countries-nations have sovereign rights.

The term “national territory” includes the land, sea and sub-sea territory, and the airspace overlapping the above. Any existing islands or other territory (natural or artificial) that belong to the exclusive sovereign of one country are also included in its national territory.

Several countries use various systems of administrative division, which are also used when collecting relevant statistical data. All member states of the European Union have adopted the NUTS territorial unit system.

According to this system, national territory is subdivided into various territorial levels (NUTS-I, NUTS-II, NUTS-III etc.) In the case of Greece:

1. NUTS-I Geographical provinces
2. NUTS-II Districts
3. NUTS-III Prefects
4. NUTS-IV Municipalities

All human activities that increase or decrease sustainability take place on various areas of the national territory, which is subdivided into relevant NUTS sections. This allows the NUTS territorial system to provide an accurate tool for forming sustainable development indexes in microscopic and macroscopic levels.

SUSTAINABILITY DEFINITION MODEL

The model for forming a series of matrixes, which will comprise an evolving index for sustainable development, is based on the following two main principles:

- Numerical expression of individual elements of sustainability
- Ability to add and synthesize individual data

This allows all individual data that define sustainability to be quantified by type of component, grouped and added, resulting in a composite index of sustainable development. Sustainability is itself a composite concept, being the result of all complex human activities.

In the last few years there have been efforts at an international level in order to create suitable models for evaluating sustainable development. At the Johannesburg conference in 2002 the "Dashboard of Sustainability" model was presented. This model is based on a series of correlations, which refer to economic activities and derived economical results expressed in monetary units, as well as environmental repercussions expressed in relevant units, such as tons etc.

According to this model, a series of basic factors are selected, which are used to determine the relevant indexes. These factors are:

- Enviromnent
- Economy
- Social system
- Institutional system

This model is considered quite reliable today, since it was created with the cooperation of the European Environment Committee, the United Nations and the Secretariat General of the European Commission.

PRACTICAL APPLICATION OF DEFINITION MODEL

In the previous chapter we saw that National territory is divided according to the NUTS territorial unit system. Using this system, we have begun to determine the basic factors of sustainable development at a NUTS-III territorial level (Prefects).

INDEX DIAGRAM

All individual indexes are grouped into the following four categories:

A) Environmental indexes

1. CO2 emissions from use of fuels
2. Emissions of other greenhouse gases
3. Areas covered by forests
4. Lumber activities
5. Areas of cultivable land as % of total land
6. Use of pesticides
7. Use of fertilizers
8. Quality of water supplies

B) Economical indexes

1. Per Capita National Gross Product per prefect (NUTS-III)
2. Per Capita investments per prefect

C) Social indexes

1. Urban population per prefect (NUTS-III)
2. Literacy levels
3. Rate of population increase per prefect (NUTS-III)
4. Unemployment per prefect (NUTS-III)

D) Administrative and institutional indexes

1. Amount of telephone lines per prefect (NUTS-III)
2. Expenditures for Research and Development per prefect (NUTS-III)
3. Amount of Internet users per prefect (NUTS-III)
4. Amount of civil servants per prefect (NUTS-III)
5. Amount of doctors per prefect (NUTS-III)

Using the above indexes per prefect and subject, a composite index for sustainable development is calculated at prefect level. This index describes the degree of sustainability for each prefect, and by adding the indexes from all prefects we can arrive at a total index for each province and eventually the whole nation.

This adding function of individual territorial data can determine the evolution of composite sustainability indexes from a microscopic towards a macroscopic level.

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EFFECTIVENESS OF CHARGE INSTRUMENTS FOR ENVIRONMENTAL PROTECTION FROM ADMINISTRATIVE DEMANDINGNESS POINT OF VIEW

Jan Pavel

Using of charge instruments for environmental protection brings up additional costs not only to public, but also to private sector. According to small fiscal significance of many charges, it comes out a question, to what degree are this instruments effective from administrative costs point of view, so that means from the public sector costs point of view. This paper analyses the value of this costs for charges made in the Czech Republic and identifies factors, which can affect their amount. The basic method for the analysis of administrative costs amount is so called „adjusted worker" method, application of which enables to make comparison to „other" tax instruments within the whole tax system, which are not intent on protection of the environment.

Key Words: administrative costs, charges for environmental protection, public sector.

INTRODUCTION

Protection of the environment is ensured by many instruments, which can be divided into two basic groups: administrative and market. To market instruments, which in last decades gain the upper hand of administrative instruments, we can include charges for environmental protection. Those charges are also marked as charges for pollution or „emissive"charges. They are tolled for tolerable (allowed) draining of pollution to the environment (to the air, water or soil). Their amount is inferred and calculated in connection with their amount and drained pollutants characteristics. The aim of their existence is the increase of private marginal costs and at least a partial elimination of negative externality, which results from the pollution of the environment. (Jilkova 2004).

Another type of market instrument, which has a character of charges or taxes, is so called ecology taxes. They differ from charges mostly by that, that the purpose of their implementation is primary fiscal and mostly it concerns selective consumer taxes. The object of the taxation is the consumption of products, where we can identify low demand elasticity (e.g. energy, hydrocarbon gas, act.). Their possible disadvantage is the elevation of taxation of necessities of life (within energies), which has negative distributive impacts mostly on poorer households. From this reason it is used, in case of implementation of this taxes (so called ecology tax reform), the principle of compensation, when the elevation of indirect taxation should be compensated by reduction of direct taxation, mostly on labour.

Effectiveness of economic instruments for environmental protection is possible to assess from some points of view. OECD (1977) defines next five sections:

- Economical effectiveness
- Environmental effectiveness
- Administrative and chosen costs
- Ability to generate public incomes

- Wider economical effects

The aim of this paper is to analyse the effectiveness of charges for environmental protection in the Czech Republic from administrative costs point of view.

CHARGES FOR POLLUTION IN FISCAL SYSTEM OF THE CZECH REPUBLIC

Charges for environmental protection don't represent, with exception of some selective consumer taxes, an expressive source of income side of public budgets. If we wouldn't take into account charges for communal waste disposal (collected at the level of municipalities) and contributions to so called nuclear account, there would be in year 2002[7] collected only 2,5 mld. CZK on these charges. From the total value of public incomes, which in year 2002 was 903 mld. CZK, this would be only 0,3%. Also in next years this rate has not changed a lot.

It is impossible to underestimate the significance of charges for income side of public budgets, because they in their majority provide functioning of the State Environmental Fund of the Czech Republic. Here they form the majority of its incomes and possible changes in rates and structure of the charges have significant impact on its budget balance.

MEASUREMENT METHODOLOGY OF ADMINISTRATIVE COSTS

Collection of majority charges for environmental protection is entrusted to territorial financial authorities (TFA), who subsequently transfer the revenue to legal recipient (it means to the State Environmental Fund of the Czech Republic, to municipalities and regions). Costs connected with collection of this charges are allocated at the level of this offices. It is possible to estimate their amount on the basis of so called „adjusted worker" method, which was used by quantification of administrative costs of Czech Republic tax system. (see Pudil 2004).

Higher mentioned „adjusted worker" method is based on the division of workers TFA according to content of their activity, and on next construction of count coefficient for organisation total costs division to costs, which are connected with collection of charges and the leftover.

Financial offices and financial management use „Codebook of activities (agendas)", which divides workload of workers TFA to more than 100 groups. With help of this codebook it is possible to classify all activities, which are rendered within TFA. Territorial financial authorities use the programme of personal management VEMA. In this programme are estimated rates of work dimension for work force of each office department, which are from each worker devoted to agendas. Neither capital nor current non-wage expenses can be tacked on each tax in other way than with help of workload coefficient for each taxes or charges.

Following the data from VEMA it is possible to make division of work force TFA into three groups: connected with collection of charges, not connected with collection of charges and other workers. On the basis of the relationship of these three groups it is possible to construct count coefficients. When we apply them on the amount of annual costs TFA, we gain absolute value of administrative costs. Relationship between absolute value of administrative costs and income from charges gives us the ratio of relative administrative costs and we can use this ratio by the comparison with data measured in other taxes.

[7] Year 2002 was chosen according to data availability from personal system of TFA. Preliminary outcomes of calculation in years 2003 and 2004 indicate, that the value of administrative costs have not changed significantly.

MEASUREMENT RESULTS

Following the data ascertained within VEMA programme, it is possible to claim, that in years 2001 – 2003 on the average 135 „adjusted workers“ TFA have dealt with collection of charges for environmental protection and related fines. After making the calculation we can find, that the costs spend on their collection move around 2,8 % of their revenue.

CONCLUSION

But higher mentioned number doesn't give us an answer to the question, if the charges for environmental protection from the administrative costs point of view are effective or not. The answer can be gained with comparison of the value of administrative costs with other values of this, by other taxes. The value schedule of the Czech tax administrative costs in year 2002 shows the next table.

Table 1: Administrative costs of tax collection in Czech Republic to tax yield in year 2002

Tax	Administrator	Administrative costs/yield in year 2002 (%)
Personal income tax	Tax Offices	1,15
Corporate income tax	Tax Offices	0,66
Value added tax	Tax Offices + Customs Administration	2,21
Excises taxes	Tax Offices + Customs Administration	0,64
Road tax	Tax Offices	6,47
Real estate tax	Tax Offices	17,37
Inheritance tax	Tax Offices	203,06
Gift tax	Tax Offices	36,47
Real estate transfer tax	Tax Offices	6,01
Customs	Customs Administration	0,91
Health insurance contribution	Health insurance companies	2,24
Social insurance contribution	Czech Social Security Administration	0,42
Total relative administrative costs		1,37

Source: Pudil 2004

From the table it is obvious that the charges for environmental protection are less effective than tax system of the Czech Republic as whole (2,8% x 1,37%). But on the other hand the value of their administrative costs is lower than in case of majority property taxes and it is approaching the value measured in health insurance contribution.

Higher value of administrative costs in case of charges for environmental protection can be cleared up referring to their low yield. Office work connected with their collection is first of all formed by fixed number of actions, it means, that it is not possible to suppose expressive correlation between chosen tariff rates and administrative costs values. In other words, increase of charges tariff rates ceteris paribus lowers relative administrative costs and evaluates their effectiveness.

From actual state in area of administrative costs collection of charges for environmental protection point of view, it is possible to say that after comparing with values of

administrative costs of other taxes, their values don't seem to be too high. Obversely, from the low yield taxes point of view charges seems to be as one of most effective.

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UNIFIED CATEGORISATION OF ENVIRONMENTAL POLICY TOOLS

Květoslava Remtová

Introduction

Together with efforts to implement sustainable development in practice, there takes place, naturally, intensive development of environmental policy and high increase of the assortment of its tools. In view of the fact that no unified categorisation of these tools exists, and the published overviews always deal with a very narrow partial group of tools only, it is, for an interested person, always more difficult to orient himself quickly and well in the continuously growing number of these tools, to understand their principle, purpose, and possibilities of use.

The situation is made more difficult by the fact that an official definition of an environmental policy tool does not exist. Because of that, this term is often used in a very broad sense, sometimes even completely inappropriately for designation of environmental policy means such as, for example, strategies, plans, conceptions. This inconsistency may not possibly matter to specialists who work in this field in the long term and who are able to understand, from the context, what is actually meant, however, in any case, it extremely hinders all other interested persons in quick and good orientation in the given problems. This slows down application of environmental policy tools in practice significantly.

In order to gain quickly the necessary orientation in extensive assortment of environmental policy tools, there could help their unified categorisation described in the present article together with definition of the most important relevant terms.

Brief definition of basic terms

Very briefly, environmental policy may be defined as a policy the aim of which is protection and care of the environment. From the point of view of the range of effects, there exists environmental policy on international, multinational, state, regional, as well as local level (this includes, for example, the often mentioned company environmental policy).

In each environmental policy, certain partial goals are set out, fulfilment of which is achieved by means of various environmental policy means, such as conceptions, strategies, plans, tools and institutions established within the framework of the environmental policy.

Very briefly, it is possible to say that conception defines the goal of the given environmental policy, strategy specifies the basic method to be used to achieve the goal, and plans describe in detail, and include, all necessary activities in a certain time schedule.

Environmental policy tools may be defined as formalised environmental policy means (methods, processes, programmes worked out in detail etc.), the aim of which is to act on the entities degrading the environment, and to influence its/their environmental behaviour in order to achieve the defined goals in the field of environmental protection.

It follows from the definition that environmental policy tools do not include technical devices, such as, for example, fly ash separators or waste water treatment plants, because their work does not influence entities, but material and energy flows having negative influence on the environment.

There is also inappropriate, as is sometimes done, to rank among the environmental policy tools also environmental policy institutions, i.e. controlling, conceptual, managing and other

authorities that ensure implementation of the environmental policy in various ways, for example control, assess or mediate action of existing tools, or directly create suitable tools. Similarly as conceptions, strategies, plans or tools themselves, also institutions form only one of the many environmental policy means.

Originally, the term environmental policy tools was understood to include only state environmental policy tools, i.e., orders, bans, and other measures following from legislative regulations, the purpose of which was to influence environmental behaviour of the relevant entities. However, with certain decentralisation of environmental policy, and also with growing environmental awareness of the entities, there was growing also a number of tools the use of which was not ordered by legislative regulations. In the beginning of 1990s, following various declarations or sets of principles concerning protection of the environment, a group of so-called voluntary tools began to form.

Voluntary environmental policy tools may be generally defined as such environmental policy tools which are deliberately used by entities degrading the environment in order to reduce their negative influence on the environment, without being forced to use them by any legislative regulations.

From the point of view of practical use, voluntary tools are divided into two groups, namely into tools requiring certain external co-operation, and tools not requiring any external co-operation.

Voluntary tools requiring certain external co-operation are tools that may be used by the entity only after certain external basic conditions, independent on the entity, have been created for their use. In most cases, this concerns existence of independent authorities which are, depending on the nature of the tool, charged with performing certain functions ensuring the necessary basic conditions. Most often (for example in the case of introduction of environmental management systems) this concerns control functions, such as certification, audit, or, optionally, registration, but this can concern also determination of basic requirements, such as, for example, selection of production categories and their environmental criterions (in the case of marking of environmentally friendly products) etc.

Voluntary tools not requiring certain external co-operation are tools implementation of which does not require creation of any special conditions, and a company may apply them immediately at any time and anywhere, only on the basis of its own decision. They include, for example, ecodesign (design and construction of a product in view of the environment), assessment of the possibilities of cleaner production, or LCA method (assessment of the life cycle of a product from the point of view of its environmental impact) etc.

Simple and complex tools, tool mix

Similarly to the situation in technical practice, where simple, as well as more complex, tools exist, there exist simple tools (for example, various bans and orders) and complex tools, for implementation of which certain simple tools must be used (for example in implementation of ecodesign, the LCA method is used), also in environmental policy. However, the last mentioned case, which, in fact, represents a "toll in tool", must not be confused with the case when one and the same environmental policy conception, strategy, or plan may be, in practice, implemented by means of several different tools, the choice of which may significantly influence success of the given conception, strategy, or plan. This case, when either use of one tool increases efficiency of a second tool, or several tools simultaneously may be used, in order to achieve the given goal more quickly, efficiently, or effectively, is designated as "tool mix", and it does not concern a complex tool, because a fixed link among the tools does not exist here, but, to the contrary, there is a possibility of choice.

Unified categorisation of environmental policy tools

The presented unified categorisation of tools is based on the difference in purpose which should be achieved through the use of the relevant tool. From this point of view, all environmental policy tools, including voluntary ones, may be divided into three groups, namely:

- regulatory tools;
- information tools;
- educational tools.

a) Regulatory tools

The function of regulatory tools is to force an entity to take action, implementation of which will result in reduction of negative impact on the environment. Depending on the level of freedom left by the tool to the entity in this acting, the regulatory tools may be divided into: directive tools, economic tools, and co-operation tools.

Directive tools (in the past, the term direct management tools was also used) are such environmental policy tools that do not left, to the entity, any possibility of choice during deciding on its behaviour in relation to the environment. The entity must accept the orders of directive tools, or, otherwise, it would be sanctioned for non-compliance with them. This concerns, in most cases, orders, bans, commands, and certain analogous measures following from legislative regulations.

By means of directive tools, it is possible to achieve the required environmentally friendly behaviour in comparatively reliable and relatively quick way. On the other hand, this represents a static regulation, demanding from the point of view of information and control. In the case of most directive laws, it is also necessary to set out sanctions for non-compliance with them, and to ensure their application in practice. From the economic point of view, directive tools are not considered to be the most suitable ones, because they do not achieve the required goals with the highest possible economic efficiency.

However, directive tools are very widespread, for example, in the European Union countries, and the biggest part of environmental protection measures belongs to them. The most often used form is permitting of activities, which specifies requirements on industrial plants in relation to the individual components of the environment.

Economic tools (in the past, the term indirect management tools was also used) use financial interesting of the involved entity, and they try to force it to take the required action resulting in reduction of its negative environmental impact through influencing its economic position.

Entities degrading the environment (to certain level permitted by the law) must pay for this degradation, either directly or indirectly (for example, through loss of markets). On the other hand, entities which are willing to reduce degradation of the environment, will be rewarded, again either by certain financial contribution or indirectly, by improving their position on the market.

Depending on the method of influencing the entity, the economic tools may be divided into financial tools which may be, from the point of view of the entity, either negative (various kinds of fees and payments) or positive (various grants, subsidies, preferential loans etc.), and market-oriented tools, i.e. tools which form various kinds of substitute markets (for example,

markets with environmentally friendly products or markets with marketable emission allowances or markets with deposits etc.).

Environmental insurance, or insurance of responsibility for environmental damages, will have a special position among the market-oriented tools. This insurance is still in the beginning of its development, however, it is supposed that the amount of insurance premium, which will form a part of operational costs of the polluter, will stimulate companies to implement measures in order to increase safety, and, through that, also to reduce use of harmful and hazardous substances.

In total, the economic tools should perform three basic functions:

- to stimulate entities to reduce their negative environmental impact;
- to create pressure on introduction and development of environmentally friendly and economically more advantageous technologies;
- to create sources of financial means for the protection of the environment.

Practical experience shows that, within the last 15 years, the economic tools performed the third function best. In the first two functions they were less successful, probably because the tariffs for negative effect on the environment were set out too low.

In contrary to directive tools, which order the entity how to behave, and do not left any possibility of choice to it, economical tools offer certain possibility of choice. The entity may decide whether it will degrade the environment and pay for this degradation (for example, fees for emissions into the air), or whether it will invest into necessary measures (it will update the plant and prevent formation of emissions) and then it will not have to pay for the degradation of the environment.

In some cases, economic tools are considered to be better than direct management tools. They are more suitable in the cases when stress is put on introduction of preventive measures and in the fields where direct regulation is not feasible (for example, in the case of diffuse pollution sources). The general advantage of economic tools in comparison with directive tools is their higher economic efficiency.

Co-operation tools are tools effects of which are based on co-operation of the entity, i.e., on its voluntary active engagement in actions or programmes resulting in reduction of negative environmental impacts.

At present, there exists a significant number of co-operation tools, and their systematic division is rather difficult. It is possible to demarcate certain limits between co-operation in which governing authorities participate, and co-operation more or less unilateral which regards voluntary engagement of companies in certain programmes or voluntary creation of certain system.

In the first case, concerning co-operation with governing authorities, conditions of co-operation are, from case to case, precisely set out by a contract, and, in most cases, also sanctions for non-compliance with them are defined. Examples of tools from this group are international treaties and environmental voluntary agreements.

In the second case, concerning voluntary engagement of companies in certain actions resulting in reduction of negative environmental impact, governing authorities do not directly participate in the co-operation. Their possible interventions may be limited only to creation of certain regulation, through which they support the given system or programme, or define its scope. Into this group, there belong various programmes of industrial associations, for

example, programme of responsible care in chemical industry (Responsible Care), or voluntarily created systems of environmental management of a company.

There is typical for co-operation tools that their use is not always universal. In the case of treaties, it is logical that they apply to their signatory parties only, however, even programmes and systems usually are not universally usable.

Some programmes and systems have even very limited scope of use, for example, Responsible care programme in chemical industry, as follows from its name, is designed for chemical companies only. Other tools (for example, EMAS I) had broader scope of use, however, they also were not universal (EMAS I applied to certain selected sectors only, and newly introduced EMAS II, which is, from the point of view of the entity, already universally usable, is, essentially, limited to member states only). Relatively small percentage of co-operation tools is universally usable, such as, for example, introduction of EMS according to ISO 14000.

However, it is possible to say, generally, that co-operation tools are developing highly, and their number is constantly increasing. Recently, OECD has been working, rather intensively, on mapping out and analysing use of co-operation tools.

b) Information tools

The function of information tools is providing of various environmental information, both to the entity, and by the entity. This concerns data, figures, information, both concerning the state of the environment, and size of impacts that act on the environment and influence it, whether of natural or anthropogenic origin.

Although information tools of themselves may not change the state of the environment or size of impacts that act on the environment, they are very important and show the broadest spectrum of usability, because they represent a source of necessary information for all sectors, both on micro-level, and on macro-level.

They are used to control the work of responsible authorities, to detect achieved change of the environment, to asses impact of intended action, to define a development plan etc. Their use is very important from the point of view of prevention, especially in decision-making processes concerning preparation of future conceptions, orientation of environmental policy, character of production processes, character of products, i.e., goods or services, etc.

According to the nature of data provided by information tools, it is appropriate to divide them into documentary tools and analytical (assessing) tools.

Documentary information tools are various databases providing specific data obtained by calculations or by processing of data from monitoring devices. They are of various nature and depend on quality of the base data, i.e., on accuracy of calculations, accuracy of carried out measurements, and on design, quality and state of the used measuring devices. If the documentary tools are to be used to mutual comparisons of the individual components of the environment, all parameters that can influence it, for example, type of the measuring device, measurement procedure, as well as calculation processes, have to be identical.

Documentary tools may be divided, according to the subject they inform about, into:

1. Tools informing about the state of the environment and its components (for example, immission maps, data on cleanness of rivers, state of forests, ecostability of the area);

2. Tools informing about specific impacts of some existing system (company, production process, device etc.) on the environment. For example, all kinds of environmental reporting, own environmental declarations, or environmental statements, can be ranked among these tools.

Analytical (assessing) information tools are methods or systematic procedures used to determine impacts that some action or activity of the entity has or will have on the environment, and also to find out reasons of formation of these impacts, as well as their effects on the environment, i.e., to determine changes which they can cause in the environment.

The most known analytical information tools include:

- assessment of possibilities of cleaner production
- assessment of life cycle
- ecodesign

c) Educational tools

The function of educational tools is education of entities towards protection and care of the environment. They differ from information tools (with that they are incorrectly confused sometimes) by the fact that their function is not only to provide information, but also to produce, in the entity, the awareness of its own responsibility for the state of the environment. This responsibility is based on knowledge and internal conviction resulting therefrom, i.e., on conviction about necessity to reduce, and, in particular, to prevent formation of impacts having negative effects on the environment.

Educational tools are very important, and they cannot be replaced by any other type of tools. They are the only tools creating not only responsible relation of people to the environment, but also providing the necessary scope of knowledge for creation of a good basis for solving the environmental problems.

The educational tools include all educational courses, educational programmes, books, publications, demonstration projects etc. Educational tools are demanding concerning time and quality of realisation, however, they are very successful, as follows from practice. If they are accepted by the entity, they are, paradoxically, much more effective than directive tools.

Conclusions

In the present article, the concept of environmental policy tool is defined, and the main kinds of these tools are mentioned here. Simultaneously, a system of unified categorisation of environmental policy tools is proposed. The system is based on the purpose which should be met by the tool in practical use, and it enables quick orientation in rather extensive assortment of environmental policy tools from the point of view of their practical use.

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METHODOLOGICAL PROBLEMS CONNECTED WITH „ECO-INDUSTRY“ IDENTIFICATION

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The emphasis that society puts on environmental protection finds its expression in the continuous elaboration of a stronger system of environmental tools (economic and normative) that contribute to the development and production of environmental goods and services. The eco-industry is a rapidly growing sector, and this has important consequences for the social and economic development of society, with implicit impacts on economic growth, as well as on labour markets. The aim of the paper is to characterise the development of the general methodological approach of the EU and the OECD to the identification of the eco-industry. This is followed by a description of the basic methodological problems that are related to the identification and quantification of this specific sector. Lastly, the problems related to the quantification of variables that express – at least approximately – the contribution of this industry to the economic growth of society are mentioned.

Keywords: Environmental industry, eco-industry, statistics, methodology, sustainable development.

Klíčová slova: Environmentálně orientovaný průmysl, eko-průmysl, statistika, metodologie, udržitelný rozvoj.

Introduction

The emphasis laid on environmental protection, that is being permanently reflected in an ever developing and tightening system of tools (both economic and legislative) for environmental protection, results in a relatively dynamic development of services and products for the protection of the environment. The environmentally-orientated industry, called the „eco-industry“ has become a rapidly expanding industrial „sector“, undoubtedly having certain influence on the socio-economic development of society.

This is why a political interest in these problems is also increasing. The interest is primarily focused on the determination of the eco-industry’s impact on the dynamics of labour market development (i.e. on job creation), on the monitoring of foreign trade, etc. When evaluating this influence, at the very beginning we face an essential methodological problem concerning the statistical specification of this „sector“.

The paper briefly characterizes the development of EU and OECD activities concentrated on eco-industry methodological problems. The basic methodological problems connected with the identification and quantification of the variables of this specific „sector“, as well as the problems associated with the quantification of variables that at least approximatively express its contribution to economic growth, are also characterised in the paper.

1. Development of an approach to the problems of the eco-industry in the EU and OECD countries

Current interest in eco-industry problems is not a new phenomenon. As early as in 1986, a document of the European Commission (EC) called „Industrial Competitiveness and

Protection of the Environment“ stressed the importance of the environmental protection industry, whose significance could not be underestimated. It is obvious that such a view was connected with an increasing interest in environmental problems. Politically, this interest was focused particularly on certain aspects of the eco-industry, e.g. on the potential of its growth, creation of new jobs, possible export of environmentally-orientated technologies, scope and success in the sphere of environmentally-orientated research, and development etc.

In addition to the EC, the OECD also started to be increasingly interested in these problems. During the 1992-1996 period, two OECD[3] reports were published that were aimed at a presentation of environmentally-orientated services and products to a wider public. In general, one could say that the OECD[8] continues in the monitoring of the eco-industry at the level of individual member countries by means of the so-called „EPR – Environmental Performance Review“.

Long-term joint cooperation between the OECD and the European Statistical Office (Eurostat), over several years, has resulted in a common manual for collection and analysis of eco-industry related data: „The environmental goods and services industry – manual for data collection and analysis“. (Eurostat & OECD, 1999)

An important element of this manual was the fact, that a consensus was achieved, and a mutually acceptable definition of eco-industry was adopted:

The environmental goods and services industry (eco-industry) consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use.

Shortly after the publication of the manual, a study was prepared for DG Environment (DG XI): „The EU eco-industry’s export potential“, whose aim was to map the situation in the field of eco-industry[9] export activities. Inter alia, the study zeroed in on the possible increase of employment due to export activities in a given sphere. Analyses then carried out resulted in political recommendations supporting the eco-industry in the EU countries and the employment connected with it.

Three years later – in 2002 – a report based on a DG Environment requirement was published: „Analysis of the EU Eco-Industries, their Employment and Export Potential“. which describes the economic significance of a given sector, again (among other things) in connection with employment.

Both of the above-mentioned studies were based on an approach from the demand-driven side of the problem, i.e. data on environmental protection expenditures were used for the description of a sector in question.

As far as present activities are concerned, one of the most important of them is the preparation of the most extensive analyse of the eco-industry that has ever been realised at the international level. At the beginning of this year - in February 2005 – the DG Environment organised the first meeting of consultants whose task was to prepare the third study in succession devoted to the eco-industry, having a working title: „Eco-industry, its size,

[8] OECD (1992), The OECD Environment Industry: Situation, Prospects and Government Policy, Paris.
OECD(1996), The Global Environmental Goods and Services Industry, Paris.

[9] The EU eco-industry’s export potential. European Commission, 1999.

employment, perspectives and barriers to growth in an enlarged EU". (Environmental Industry, Eurostat, 2005).

2. Methodological approach to identification and description of the eco-industry

The available analyses of the eco-industry are based to a large extent on the above-mentioned basic definition and classification of the eco-industry as prepared by OECD-Eurostat[10].

It is a relatively wide definition showing that the eco-industry is not a clearly defined industrial branch or sector, but rather a set of providers of numerous kinds of goods, services and technologies. In addition to this, many of these providers are integrated into a manufacturing process, and very often it is difficult (or even impossible) to separate one from another, and to monitor them individually. Nevertheless it is evident that in the case that one wants to cover and characterise the eco-industry to its full extent, it would be necessary to identify all activities and goods connected with environmental protection. This means that in addition to the activities of specialised producers, activities of non-specialised providers in other industrial branches, and activities of producers carrying out such activities for their own use, would be also need to be identified. Another significant problem is the fact that many products intended for environmental protection are multipurpose use, and some of them cannot be considered as environmental.

Current work on the classification of the eco-industry carried out within the structure of the OECD and Eurostat are aimed at harmonisation and comparability of the outputs of analyses of eco-industry development in individual member states. The objective is, inter alia, to create a flexible classification system that could be easily adapted in connection with expected future development.

In recent years, the eco-industry sphere has undergone significant structural changes comprising integration processes, privatisation and a departure from the manufacture of end-of-pipe technologies in favour of a creation of new integrated and cleaner technologies, as well as a shift to utterly new activities.

For the time being, OECD/Eurostat identifies and classifies the eco-industry by means of the matrix given in the following Table no. 1. This matrix provides a flexible framework for mapping the eco-industry by way of a combination of different types of entrepreneurial activities (columns), and types of environmental goods and services connected with them (lines).

The table shows that activities comprised in the eco-industry are arranged in three main groups of entrepreneurial activities:

Pollution management comprises goods and services supplied only for environmental purposes that have a significant impact on the reduction of emissions, and can be easily identified statistically. In practice, it comprises services for environmental protection and products that are specifically used for environmental purposes, e.g. creation of fixed capital for providers of environmental protection services.

In addition to it, the group of **cleaner technologies and products** contains goods and services that decrease or totally eliminate negative impacts on the environment, but that are often provided for other than environmental purposes, and whose statistical quantification is problematic, difficult or cost intensive.

[10] See "The Environmental Goods and Services Industry, Manual for data Collection and Analysis", OECD, Eurostat, Paris 1999.

Table no. 1: Mapping environmental activities[11]

Environmental goods and services **Entrepreneurial activities**	**Manufacture of equipment and specific materials**	**Provision of services**	**Construction and installation of equipment**
Pollution management			
Inspection of air pollution			
Wastewater management			
Solid waste management			
Soil and water treatment and rehabilitation			
Reduction of noise and vibrations			
Environmental monitoring, analyses and evaluation			
Cleaner technologies and products			
Resource management			

The third group – **resources management** – comprises goods and services that are typically for the management of natural resources. The management of natural resources forms a part of a more extensive definition of environmental protection activities, as these products are not directly connected with environmental protection, and environmental protection is not their primary purpose. They are, for example, goods and services being used for management and conservation in the sphere of energy, renewable energy sources, etc. The problems of data collection for this group have been addressed the least so far.

In the cases that we have the „eco-industry" identified/defined, it is necessary to choose a methodical approach to enable a statistical description of a given set of data. The selection of methodical approach is derived from the kind of outputs expected, on the one hand, and naturally from the availability of basic data on the other hand.

In the OECD/Eurostat[12] manual, four types of alternative approaches to the statistical description of the eco-industry are recommended:

I. A supply-side approach.

II.A demand-side approach.

III. Integrated supply/demand approach.

IV. Other methods.

I. A supply-side approach

The **supply-side approach** that is used by most national statistical offices is based on information about goods and services offered for environmental protection**.** In particular, selection inquiries about the producers are used for this purpose. Experience obtained dictates use of questionnaires requiring a lot of data (the minimum required comprises data on turnover, employment and export). Requirements for any other information must be carefully considered with regard to the cost of selection procedure and to the probability of a decrease in rate of return. The data obtained in this manner can be complemented with the data from

[11] See "The Environmental Goods and Services Industry – manual for data collection and analysis", OECD, Eurostat, 1999.

[12] See e.g.. "The Environmental Goods and Services Industry – manual for data collection and analysis", OECD, Eurostat, 1999.

the register of economic subjects (RES), lists of specialised industrial associations and, various company catalogues, etc.

In case selection inquiries are not feasible, either due to the lack of time or a limited budget, usable but limited information about the eco-industry can be obtained from existing basic economic classifications. Nevertheless, the existing statistical classification does not allow separate identification of all items characterising the eco-industry.

Basic economic classifications that can be used for the identification of certain parts of the eco-industry include particularly the „Sectoral classification of economic activities" (SCEA) that has been created according to the EU rules for sectoral classifications NACE rev. 1.1. Up to level 4, the classification was practically taken directly from NACE rev. 1.1: only on the 5th place were more detailed items expressing some specific national features created.

The Netherlands is probably the country having the most extensive long-termed experience with the use of NACE classification. When implementing NACE rev. 1.1 at the national level, the statistical office had to solve a number of definitional and classification problems, and accurately specify the codes of the most important activities carried out by specialised environmental manufacturers[13]. This wide methodological construction is an inspiring source for the determination of environmental activities.

Some of the eco-industry analyses available are not based on the wide version, but are concentrated only on so called „**core industries**". This „core" of the eco-industry can be defined by means of those NACE groups that can be as a whole covered by the definition of eco-industry. This group usually comprises:

NACE	
2512	Tyre retreading
3700	Recycling of secondary raw materials
4100	Water collection, treatment and distribution
5157	Wholesale trade with waste material and scrap
9000	Wastewater and waste materials disposal, city cleaning, rehabilitation and similar activities.

Of course, one can have a number of comments and reservations about this choice of main sectors. Probably the most important of them is whether to include water production and distribution into eco-industry.

Another general statistical classification that can be partly used for eco-industry classification is the „**Standard classification of production**" (SCP). This classification system, in the Czech Republic, was innovated into a form suitable for the needs of a market economy, and its international comparability was also ensured by the fact that it was prepared on the basis of European CPA standards (Classification of Products by Activities). It is essential for the estimation of eco-industry exports and imports that the CPA classification was formed from the segments of the harmonised system[14] used for international trade and for customs purposes. Nevertheless the CPA classification also includes goods and services that are neither exported nor imported.

[13] More details see "The Environmental Goods and Services industry, manual for data collection and analysis, annex 4.

[14] or Combined nomenclature /HS/CN/

The outputs of given approach from the supply-side comprise particularly types of indicators: the number of companies and their structure, production, gross turnover, value added, trade balance, employment rate, geographical distribution of companies, etc.

II. A demand-side approach

One of the main differences between the estimates based on the supply-side and demand-side approaches is the way in which the main, secondary and ancillary products are taken into consideration. The supply-side approach comprises only the production of environmental goods and services that forms the core production of a given company. In this approach, not all of the environmental goods and services will be covered, and there will probably always be certain goods and services not covered by this system. In addition to this, there is a considerable risk that the data will also include production of goods and services for other than environmental purposes. Particularly in the case of multi-purpose goods, accurate identification will be very difficult.

On the other hand, the demand-side approach comprises expenditures on all goods and services for environmental protection regardless of their source. The approach does not take into consideration production of goods and services for non-environmental purposes to any extent, even in the case they are provided by major producers of environmental goods and services. This method enables one to also quantify secondary and complementary activities, preventing problems connected with the estimation of the environmental portion of goods with a multi-purpose use, and eliminating the problems of double accounting.

The demand-side approach is characterised by a collection of information about the demand for environmental goods and services, and uses particularly the data on expenditures on environmental protection. The eco-industry is therefore recorded by means of expenditures on environmental protection, i.e. expenses spent on preventive measures, on pollution and its control, etc. The aim of quantification of environmental expenditures is to identify and measure environmental problems by way of supply and use of services and goods for environmental protection.

One of the environmental satellite accounts is used for this purpose – EPEA Environmental Protection Expenditures Account.

The EPEA system is used for the calculation of national expenditures on environmental protection and for the analysis of the structure of financing these expenditures. The methodology differs according to sectors being analysed.

From the data on environmental protection expenditures, the variables derived include, for example, employment in the eco-industry (some studies use the data on the number of jobs that falls to an expenditure unit, etc.), turnover, etc.

III. Integrated supply/demand side approach

The integrated supply/demand side approach combines available information from the demand and supply sides, and tries to enter them into a consistent accounting framework. This effort is reflected in the national accounts system (NAS). The most important component in this context is „Integrated Environmental and Economic Accounting (SEEA)“, which tries to achieve supply and use balancing in the environmental sphere. That is why, for the time being, attention is being paid to the preparation of „supply and use table“ that help to identify goods and services for environmental protection.

In the preparation of **supply and use tables** for environmental protection goods and services, the following procedure is used:

The first step in the compilation of the supply segment of the table consists of the determination of products and the corresponding industry producing them. What role secondary production plays in the eco-industry, and what services and goods are by-products of other industrial sectors, can be seen only after the construction of this table.

Services and goods for environmental production are usually provided by domestic suppliers. Nevertheless, imports and exports of some products of the eco-industry, e.g. equipment for environmental protection, can also play an important role.

The production of market services is valued in terms of basic prices, and non-market production is valued in terms of production cost. The quantification of the total supply necessarily requires the addition to domestic production of import fees and taxation, trade margins and transport costs to be paid by the buyer to accept delivery of products. The total of these items gives the value of the entire supply through the prices offered to the buyer.

As far as the use segment of the table is concerned, for each type of product given in the table, it must be determined for which purpose it is intended, i.e. as intermediate consumption (e.g. production units buying services for processing of waste), as fixed capital, which are used by companies or by government in general, or as a final consumption of households or the government.

Non-market services provided by the government (by the state) can be classified as either for collective or individual consumption. Individual consumption relates to services that are useful for some individual households at the expense of others, and in principle are beneficial for given households. Collective consumption is of benefit to the whole community, and the quantity consumed by a given household does not influence in any way the quantity of service available to others. Typical services of the type of individual consumption are the collection of domestic waste and wastewater collection, discharge and treatment. On the other hand, the cleaning of public areas and streets is a typical example of expenditures on collective consumption. Very often, it may happen that the total sums of some individual expenditures are very low or there is no satisfactory basis for allocation to individual households. In these cases, such services remain under the heading of general „environmental protection“, and are handled as non-market services of environmental protection.

It is typical that the method used for the estimation of expenditures connected with the use of cleaner technologies and products is based on physical information about the size of market (quantity of desulphurised fuel, the number of newly registered cars equipped with catalytic converters, the number of newly built houses equipped with a septic tank, etc.). These estimates are then valued by a market price or by extraordinary costs connected with the use of such products in comparison to traditional products.

The integration of information from the supply-side with expenditures/demand for environmental goods and services enables one to obtain a more general and aggregated image of the eco-industry. Its weak point is the fact that it does not allow one to provide a more detailed description, and further systematic research will be necessary. One of the ways to do this is to use data on environmental expenditures, and to link them to available data on the supply–side, as well as with engineering data and data from case studies both at the demand and supply sides.

IV. Other methods

In the case that economic data related to the eco-industry are not available, other ways must be searched for. For example, the turnover of the eco-industry can be estimated on the basis of the combination of data on physical output of a company (e.g. tons of waste or cubic metres of wastewater) and average price. This approach can be applied only to the provision of services and results obtained are always only approximate.

Another information source that can provide information about the eco-industry is selected information from the field of science and research, e.g. domestic and international patents granted in this area. Also, data on government assistance supporting industry and export, as well as data on mergers and acquisitions, can be considered. Another potential source of statistical information is the data on organisations collected by agencies within the framework of established programmes that regularly collect certain types of environmental information. There are, for example, environmental protection agencies gathering data within the framework of their own monitoring or regulatory programmes, or government organisations responsible for employment and training programmes that have at their disposal data from programmes for creation of jobs in environmental protection, etc. Various trade or specialised entrepreneurial associations have their own databases, though these usually cover only a part of the industry.

A good recommendation is to base the most suitable method on criteria such as:

- Size of entrepreneurial activities that form the basis of the eco-industry.
- Availability and effectiveness of data acquisition for individual entrepreneurial activities.
- Chosen economic variables, and the quality of information about these.

Conclusions

It is obvious that interest in the eco-industry will continue to grow in the coming years. There are numerous reasons why national and multinational organisations require data on the eco-industry, its structure, foreign trade, and innovation capacity. Nevertheless, the most important factor is undoubtedly a need to assess the competitiveness of the sector and its economic „capacity for actions“ over the medium term perspective, and on this basis, to formulate conclusions and policy recommendation for the support and further development of this „industry“.

For this reason, greater attention should be paid to this topic in the Czech Republic from the side of the central government (Ministry of the Environment, Ministry of Industry), as well as from the side of the unions (Industrial union…). Last, but not least, it is important to have the active participation of the Czech Statistical Office.

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METHODS OF VALUATION OF ENVIRONMENTAL COSTS AND THEIR USE IN PROJECT ASSESSMENT

Jana Soukopová

Efficiency, as one of the key economic concepts, means "the absence of waste, or using the economy's resources as effectively as possible to satisfy people's needs and desires". Samuelson and Nordhaus (1995). Measuring efficiency is one of the most complex issues in the public sector. This follows from the fact that the general indicator used for measuring efficiency in the private sector – profit – cannot be used under the conditions of the public sector.

The methods of analyzing public projects encounter, particularly in the area of assessment of environmental projects, a difficulty related valuation of environmental costs and benefits. In the area of valuation of environmental damage and environmental benefits, economists and environmentalists have had the greatest difficulty, for a prolonged period of time, in finding common language within the substantive discussion on environmental protection. Economists were criticized for "conceiving the world as goods" and attempting to "label a price tag on everything including natural assets". This approach, which negates the application of economics, as a scientific area, or rather its basic category – the price, in the sphere of environmental protection, has been more or less overcome.

Valuation of goods and services concerning the environment requires special techniques, particularly due to difficult specification of their market price. While market valuation methods can be used to express direct utility values, other values can be expressed only through non-market valuation. These methods, concerned with valuation of non-market resources and individual environmental aspects, have developed in major market economies only under the influence of growing environmental issues, approximately since the 1960s and 1970s.

1 CLASSIFICATION OF NON-MARKET VALUATION METHODS

Under the influence of the neo-classical economics, two different approaches were newly employed, in principle, to determine the economic values of environmental assets and services:

1. by means of ascertaining the willingness of individual persons to pay for maintaining or improving the quality of the environment or on the basis of the willingness to accept compensation in case of deterioration of the environmental conditions. Thus, these **methods are based on individual preferences – preference methods.** Sometimes, this approach is also called the demand curve approach, i.e. an approach based on measuring utility. This approach is based on the neo-classical economic utilitarism, according to which the economic value is determined subjectively on the basis of individual preferences, where society is no more than a sum of individuals. These methods include:
    - expressed preferences methods (e.g. the contingent valuation method)
    - revealed preferences methods (e.g. the travel cost method, Hedonic valuation, averting expenditures method)

2. through **expert** (non-preference) **approaches** (ecosystem method, method based on ascertaining costs and risks) which are based primarily on expert determination of ecological values of the various parts of the environment (biotopes), costs and risks connected with externalities (including methods based on costs of recovery, opportunity costs and prevention costs, and the method of function of damage).

2 METHODS BASED ON THE PREFERENCE APPROACH

In accordance with the postulates of the neo-classical economy, the methods where measurement of benefits is based on the subjective concept of a monetary value expressed in categories, such as consumer preferences and individual benefits, constitute an important non-market valuation methods.

2.1 Expressed Preference Methods

Contingent Valuation Method

The contingent valuation method (hereinafter CVM) responds to the absence of market information on consumer preferences in the area of environmental protection in that it develops hypothetical preferences on the basis of analysis of the willingness to pay and the willingness to accept compensation. Consumers express their assessment of benefits or costs directly, however, not in a realistic situation. In response to the questions contained in a questionnaire,[15] they express the degree of their willingness to pay for specifically determined increase in the environmental benefit or they state the amount of compensation they would require for a loss of environmental benefit (cost). Thus, a simulated market is created where the response of consumers to a hypothetical situation substitutes their conduct in a real market. This is subjective assessment which has a direct relationship to budgetary limitations of an individual or household.

According to the theoretical assumptions, quantification of benefits on the basis of WTP and WTA should be comparable. However, in practice, there are considerable differences between the two approaches whose causes are subject to discussion.[16] At the present time, substantial efforts are aimed at systematic elimination of the sufficiently established types of distortion of the resulting valuation.

A major advantage of this method lies in the fact that it enables, not only to quantify the loss of current benefits, but also to express the sum that an individual would be willing to pay for maintaining the defined environmental benefit for future generations, which is especially important in the context of sustainable development. From theoretical and methodological viewpoints, it must be emphasized that CVM can be used for valuation of a wide range of

[15] Provided either in writing or during a personal interview.

[16] This issue can be have the following answers:
- evaluation of profits and losses is asymmetrical;
- the willingness to accept compensation also includes non-monetary valuation
- lack of information, etc. (see e.g. Tošovská 1997, Seják 2001)

benefits provided by natural assets,[17] however, not for valuation of natural assets as an intermediate product. The manner of processing data on WTP into information enabling decision-making on the choice of alternatives is also important for the decision-making process.

2.2 Revealed Preference Methods

Hedonic Valuation Method

The Hedonic valuation method is not based on a hypothetical preference, but rather on actual behavior of consumers. Utilization of Hedonic valuation in environmental protection requires a market with a certain other type of goods (substitute market) which, however, is affected by a non-market environmental asset.

Two markets could be used with respect to environmental public assets:

1. the market in real estate where the quality of the environment, as a public asset, affects the price of a private asset;
2. the labor market which presumes that the health risk connected with the low quality of the environment is included in the salary.

The real estate market where a specific environmental benefit (e.g. high quality of the air) constitutes one of the factors affecting the price of real estate is the most classical example. The price of real estate must be expressed as a function of the greatest possible number of its characteristics and, subsequently, it is necessary to ascertain the willingness of the respondent to pay for the benefit acquired by improvement of one of the characteristics. The relationship of the willingness to pay to the characteristic features is established on the basis of a regression analysis and this relationship then enables to calculate the difference caused by a change in the quality of the environment.

Travel Cost Method

The travel cost method which is based on the actual behavior of consumers enables, particularly, to quantify the losses of environmental benefits connected with deterioration of recreational areas, lakes or other attractive natural localities. It is derived from individual travel costs based on analysis of the actual behavior of consumers. The actual aggregate function of the demand for the given locality is determined on the basis of quantification of expenses describing the financial and temporal costs of visiting the analyzed areas.[18]

With respect to their potential use under the conditions of the Czech Republic, the revealed preference methods have more drawbacks than advantages:

- Valuation of environmental costs and benefits through the Hedonic Valuation Method is very difficult in the Czech Republic, as it presupposes, *inter alia*, an effective real

[17] According to the results of a number of studies, application of the contingent method yields the most credible results in relation to public local assets (Tošovská 1997).

[18] Models which also took into account the substitute (or complementary) relations between the individual localities and permitted the quantification of environmental benefits which are assigned to a change in the quality of several localities have been developed. E.g. damage connected with the loss of potential recreational utilization of localities polluted by the Exxon-Valdez accident in Alaska was evaluated on the basis of such a model (Tošovská 1997).

estate market, adequate awareness of individuals of the quality of the environment and a relatively free choice of localities where the respondent would like to live; these preconditions have not been fulfilled in the Czech Republic to date.

- A drawback of the Travel Cost Method consists in the fact that it permits only quantification of the loss of the utility value of a recreational locality, rather than its own existence value or potential value in relation to the interests of future generations. Application of the Travel Cost Method is hindered in the Czech Republic both by the very small area of the country and by the general methodological difficulties connected especially with expressing the category of temporal costs.

3 METHODS BASED ON THE NON-PREFERENCE APPROACH

3.1 Methods Based on Cost Approaches

With respect to the following description of these methods, it should be noted that the given concepts are related to environmental accounting at the micro-level (Hřebíček, Soukopová 2003).

Total Cost Assessment (TCA)

This is a general framework for assessment of environmental projects. The method is based on comparison of investment alternatives. TCA can be defined as a summary financial analysis of internal costs and savings connected with investment. In substance, this is a traditional approach to assessment of investment which processes direct and visible costs. The method is extremely suitable for taking into account environmental aspects (particularly costs). Inventory costs can be extended to include indirect costs (fees, training, decreased quality of materials, etc.), potential liabilities (fees, taxes) and also intangible costs, such as a change in the corporate image. A key aspect is assessment of profitability of investment, taking into account environmental aspects.[19]

Option Value

The option value is based on the net present value (NPV), extended to include the strategic value of investment. In case of projects that do not comply with the criterion of NPV ≥ 0, the decisive factor is the strategic value of investment.

Real options are traditionally traded on capital markets. Strategic investment decision-making based on real options consists in assessment of the potential to obtain certain revenues in the future. E.g. environmental measures that are not currently economically advantageous could have an option value based on the fact that neglecting or omitting such a measure at the present time could create additional costs in the future or result in cessation of the process of creating the utility value. The option value allows the management to assess the relevant strategic context which is always identical with the anticipated financial revenues of the measure.

[19] ČSN EN ISO 14001:2004: Element of activities or products or services of an organization that can affect the environment.

Full Cost Accounting (FCA)

FCA was described by the GEMI business organization (1994) as a tool to identify, quantify and allocate the direct and indirect environmental costs of ongoing company operations. IFAC[20] considers FCA and environmental accounting to be synonymous concepts (IFAC 1998). FCA helps identify and quantify the following four types of costs for a product, process, or project:

- direct costs (e.g. capital, raw materials, etc.),
- hidden costs (e.g. monitoring, compliance reporting),
- contingent liability costs (e.g. liability for damage and costs of remedy),
- less tangible costs (i.e. public relations, goodwill).

Life Cycle Costing (LCC)

The LCC method is based on Life Cycle Analysis (LCA), which is a system-oriented approach to assessment of environmental aspects related to a product, as well as processes and operations related to the product.[21] Environmental aspects are taken into account within the entire life cycle of a product or process and, thus, include both generation of waste or discharge of emissions directly in production and consumption of energy and raw materials, including their processing and generation of waste and emissions. Through LCC, managers assign costs to each impact quantified in the LCA. The sum of these costs then corresponds to the estimate of the net environmental cost from a product, process or investment project. The difference from TCA is that it may include not only private (internal), but also social (external) costs and benefits of an investment project.

Annualized Capital Charges

Annualized Capital Charges are a methodical tool drafted CONCAWE AQ4 for determining the annualized (or related to other periods) costs of environmental investment. The Capital Charge is defined as the annual operational income before taxation which is generated by a certain project with the required level of return. Attaining such operational income and determining the discount rate at the required level means that NPV for the investment project is equal to zero. The Capital Charge is usually calculated as percentage of capital expenditures. Environmental investment then corresponds to the level of capital expenditures where no income or revenues are anticipated. For this reason, NPV of the environmental investment used for project assessment should be modified in a certain way. The draft is based on quantification of a fictitious equalizing annual income from the environmental investment and subsequent derivation of annual costs of the investment from this value. Such annual costs can then be related to a ton of emissions, etc. Such approach presupposes valid allocation of investment expenditures. The ACC method can serve, e.g. to determine the price of a unit of avoided emissions of pollutants. A different manner of modifying the ACC procedure is based on interpretation of the fictitious equalizing annual income from an investment as the limit value of avoided costs.

[20] IFAC – International Federation of Accountants

[21] CSN EN ISO 14041:1999 (01 0941) - Environmental management – Life Cycle Assessment – Setting the goal and scope and inventory analysis

3.2 Methods Based on an Expert Approach

Economic assessment of environmental costs and benefits is often confusing. Some authors use the concept of valuation of the environment, others assessment of nature, etc. However, according to the current mainstream neo-classical economics, it is not nature, but rather human preferences in relation to changes in the state of the environment, that is subject to assessment.

As noted by Seják (1999) *"drawing the economic value only from individual preferences is a one-sided view based only on the demand side of the evaluated problem, which neglects the offer (cost) aspect and, for practical valuation, the approach based on individual quantification of the amount and value of environmental services* (as used in CVM, Hedonic and Travel Cost methods) *may be considered to be unsuitable and unfeasible for several reasons:*

- *it is not possible to compile a full list of services provided by nature to man, as humans are currently aware of only a negligible fraction of relations and rules of its functioning,*
- *the total economic value of ecosystems which create the necessary conditions for life is also unlimited,*
- *valuation of services provided by nature to man is, in principle, limiting, as the mutual services within ecosystems are much more important than services for humans,*
- *if services provided by nature are irreplaceable and unlimited in value, there is no sense in attempting their quantification."*

He suggests an approach which binds economic valuation of the environment on the territory, as the biosphere is linked with the surface of the Earth. For environmental valuation, he recommends the "Hessen Method" which enables to extend the concept of an economic value to include the internal value of the environment, which is facilitated by valuation carried out by environmentalists (experts), who have relatively the best knowledge of the internal value (life-supporting functions) of the environment. Other special expert methods include the method of Assessment of Forest Functions developed by Prof. Ing. I. Vyskot, CSc. (2003) from the Mendel University of Agriculture and Forestry in Brno, which is concerned exclusively with forest properties with forest stands. Of course, quantification through these methods can be subsequently supplemented by or compared with the results of preference methods.

Hessen method

The Hessen method is based on the fundamental concept that, in case of continuous damage to the functions of natural assets, society must expend funds for recovery and revitalization of those natural functions that have been seriously damaged by humans provided that this damage can be remedied at a certain expense. The costs of recovery and revitalization of functions of natural assets are confronted with the environmental benefits provided by the valuated natural ecosystem and compared with human preferences for this ecosystem. Thus, valuation of ecological functions of nature is based both on the level of their environmental benefit and on the level of costs for their revitalization.

This approach to economic valuation of the natural capital was employed in the Federal State of Hessen[22] in the Federal Republic of Germany. It takes into account the quality of the natural capital (the value of ecological functions of the territory) in combination with the ascertained costs of actually performed revitalization and the actually implemented compensation measures. The point value for each of the biotopes[23] occurring on the Earth's surface under the conditions of the temperate zone and in the related biospheric vicinity (the natural conditions of Hessen, which are comparable to the conditions in the Czech Republic, are taken into account) is derived from assessment of eight ecological characteristics of each of the biotopes (*matureness, natural character, diversity of structures, diversity of species, rareness of biotopes, rareness of species of biotopes, sensibility (vulnerability) of biotopes, threat on number and quality of biotopes).* Each characteristic is then assigned a point value (1 to 6). The aggregate number of points for each biotope is transformed to a monetary value by multiplication of the aggregate by the average costs for recovery of natural sources.

In order to interconnect the Hessen method with the GIS land cover (LC) approach, the Hessen biotopes were aggregated into land cover items (Seják, 1999). Thus, this method enables to calculate the economic values of ecological functions of the entire territory of the Czech Republic.

The method of monetary valuation of biotopes was recommended for application in EU by the White Paper on Environmental Liability in 2000.

Method of Assessment of Forest Functions

This method developed by Vyskot (2003) concentrates exclusively on forest properties with forest stands. Currently, this is the most comprehensive method of valuation of forest functions. It can be included amongst comparative multi-criteria expert approaches to valuation of environmental services – non-productive forest functions. The method provides quantification of the value of potential forest functions for the Czech Republic according to economic sets and their real types of forest stands. The method is based on an ecosystem approach which follows from mutual comparison of importance of various forest functions. Six functions are specified: *bioproductive, ecological and stabilizing, hydric and water management, edaphic and anti-erosion, social and recreational, and health and hygienic.*

The author admits that it might be possible to allocate monetary units to the individual social functions according to the price of the function with respect to which the price can be expressed (e.g. price of stumpage). The individual indicators are allocated scores, the average number of points is established for the individual functions (values of real potentials) and the number of points is then related to the current price of stocks of stumpage in the given locality. The basic outputs for valuation of comprehensive social forest functions are the values of real potentials of functions of forest stands according to economic sets and types of stands (functional potential of forests under the best possible conditions) and the values of real effects of functions of determined forest stands (functional potential of stands under the

[22] In Hessen, this method has been developed for almost 20 years and has evolved into specific payments for losses (and subsidies for improvement) of ecological functions of the territory. Since 1998, it has been employed at the federal level in the entire FRG within the Construction Act and it enables to assess changes in ecological functions of the territory which are caused by human activities. Most recently, the Hessen method was also recommended by the EC Commission White Paper on Environmental Liability for assessment of damage to biodiversity (for more details, see Seják 2001).

[23] *Biotopes* – territories typical for existence of certain plant and animal species. Thus, a biotope is an environment for functioning of ecosystems.

current conditions depending on the age, density and health condition). Given the need to express non-productive functions by monetary indicators, the author suggests the "factor of social urgency" (intensity of social need) which determines the weight of non-productive forest functions with respect to the current social requirements. In the opinion of the author, the actual coefficient (subjective criterion) on the basis of which the functional potential of the forest stands to fulfill non-productive functions is valuated depends on social customs.

This subject is also dealt with by Šišák (1997, 2002) who bases his considerations on the difference between valuation of renewable and non-renewable sources. However, Vyskot's methodology (2003) has been used since August 1, 2003 by the Ministry of the Environment and an excerpt from the methodology has been used by the "Environment Directorate OECD – Environment Policy Committee" for the "Handbook on Market Creation of Biodiversity" (2003).

4 CONCLUSION

A number of methods can be used for evaluation of public environmental projects. However, these methods encounter a number of difficulties. With respect to the methods using a single criterion (in case of environmental projects, the method of cost-benefit analysis), these difficulties include particularly quantification of environmental costs and benefits in monetary units. There is general agreement that non-existing market valuation in the sphere of environmental protection could be substituted by suitable non-market valuation methods and that economic valuation of environmental benefits is an important step to achieving economic efficiency as it enables their inclusion in the cost-benefit analysis and, thus, substantially improves the choice between alternative projects. The above-mentioned agreement does not extend beyond acceptance of the individual non-market valuation methods. Discussions are concerned both with the theoretical bases of individual methods and with the preconditions for their practical application and credibility of their results. Therefore, a number of authors deal with the issue of non-market valuation methods and new non-market methods of valuation have also been developed in the Czech Republic (see Vyskot (2003)).

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SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL ACCOUNTING

Ladislav Špaček

1. Room for enterprise

In the past millennium, a bipolar relation was typical for relation of industry and protection of the environment (officials dealing with these problems), when permissible emissions were unambiguously set (best, by means of laws). Releases of emissions were monitored and exceeding of limits punished. Through broad implementation of the strategy of control and management under the motto "order and punish", marked decrease of environmental pollution was achieved in Europe in the end of millennium. The strategy of control and management forced the polluters in European countries to invest into expensive end-of-pipe technologies, often without taking into consideration costs of the implemented measures. The state then only controlled compliance with emission limits it had set, and punished the non-compliance. By using this strategy, remedial measures were carried out that significantly reduced acute emissions of pollutants from production plants without essential interventions into production technologies.

However, environmental legislation, whose link with this outdated strategy persists, has much more important and long-term impact. In European environmental legislation, the legal state is regulated by more than 590 legal regulations containing over 100 000 pages of text. This is connected with its unclearness, and with complicated orientation also in national legislation. Because of that, the main task of the European Commission, but also of all member states of the European Union, is to simplify, and make more clear, the conditions for enterprise ensuing from the environmental legislation, and to abandon the old behaviour patterns. To move from intolerance and mutual attacks towards much more effective co-operation on common solution of sustainable development of the individual regions, and of the whole society.

As new perspective approaches there can be designated, in the field of production, integrated prevention (IPPC), and, in the field of products, integrated product policy based on assessment of the product life cycle.

The strategy of integrated pollution prevention is a reflection of a new strategy of environmental protection, consisting in prevention of formation of pollution in its sources, particularly by means of a more effective use of production material and energy inputs. In addition to reduction of the negative impact of the production plants on the environment, this entails higher economic effectiveness of the production. This strategy looks in the production system, is oriented on its input and output flows, looks for reasons of pollution in the source, and proposes measures for its reduction.

It means that it creates, by its nature, a basic change of conditions for communication among an operator, an authority, and the public, which should replace the outdated component approach based on the strategy of control and management, characterised by the motto "order and punish".

In the field of chemical industry, which is, in a way, the most hazardous one, accommodating actions began to form in the 1980s already, in order to increase its safety, and, simultaneously, to increase trust of the public, within the framework of the voluntary programme Responsible Care - responsible enterprise in the field of chemistry. Thanks to this voluntary initiative, the chemical industry companies got, and get, ready successfully to

preparation and implementation of measures which are becoming obligatory for them gradually.

2. Integrated prevention

Directive 96/61/EC on IPPC was transposed into the Czech legislation by the Act No. 76/2002 Coll., on integrated pollution prevention and reduction, on integrated pollution registry, and on amendment of certain acts (Act on Integrated Prevention), amended by Act No. 521/2002 Coll., Act No. 437/2004 Coll., and Act No. 695/2004 Coll.

The Act entered into force on March 1, 2002, with effect from January 1, 2003. From this date, it was possible to file applications for integrated permits. Unfortunately, Decree of the Ministry of the Environment No. 554/2002, laying down a specimen of application for integrated permit, scope and method of its completion, was published in December 2002 only.

Further implementing regulations are Government Order No. 63/2003 Coll., on method and scope of supporting the system of exchange of information on best available techniques, Government Order No. 368/2003 Coll., on integrated pollution registry, and Decree of the Ministry of the Environment No. 572/2004 Coll., setting out the form and method of keeping records of data that have to be communicated into the integrated pollution registry.

Transposition of the Directive into the legal system of the Czech Republic took place with co-operation of professional associations. Since 2000, work on preparation of the list of plants and companies coming under the IPPC proceeded. This list comprises 739 companies operating 1334 plants. In the beginning already, the possibility to request individual transitional periods was offered to the operators. In view of the fact that no company requested the transitional period, the duty ensuing from the Directive, i.e., to obtain integrated permit by October 30, 2007, is valid for operators on the territory of the Czech Republic, equally as for the operators in the old member states. However, they have only half of the time for obtaining the permission.

The willingness of the chemical industry companies may be characterised also by the fact that the first application for integrated permit was filed on January 9, 2003, already.

Chemical productions, operated in the Czech Republic by ca 79 companies, come under the effect of the Directive without capacity limitations. Up to June 30, 2005, only 28 companies did not got specific experience with filing and negotiating the application, 14 of them being members of the Association of Chemical Industry of the Czech Republic.

Especially for these organisations, the Association of Chemical Industry, together with advisory company TECHEM CZ Prague, prepared a manual "IPPC and chemical industry", by means of which we want to contribute to the situation that all companies that want to operate its activity also after October 30, 2007, will have filed applications for integrated permits by the end of 2006 at the latest. To the member companies of the Association of Chemical Industry of the Czech Republic, also free-of-charge advisory services are offered.

3. System of exchange of information on best available techniques

In the Czech Republic, a system of exchange of information on best available techniques has been established. The system has similar structure as the EU information system, and provides sufficient information for negotiations concerning integrated permits on the level of the individual regions. The Ministry of Industry and Trade, in co-operation with the Ministry

of the Environment and the Ministry of Agriculture, is responsible for operation of the system.

The basis of the system is formed by technical working groups, domain www.IPPC.cz, and the Forum for exchange of information on best available techniques.

The technical working groups have been established by the Ministry of Industry and Trade (20), the Ministry of the Environment (7) and the Ministry of Agriculture (3), in accordance with competencies specified by the Act, and they cover all sectors, as well as general questions connected with integrated prevention. All technical working groups have their working room on www.IPPC.cz, where continuous exchange of opinions may proceed among members of the individual groups. 17 representatives of the Czech Republic were nominated into technical working groups at the European Office of IPPC in Seville (TWG), where they take part on preparation of reference documents on best available techniques.

The www.IPPC.cz domain offers, in addition to basic information on best available techniques in Czech and English languages, also current information on the IPPC process and its support. Thanks to accommodating approach of the Ministry of the Environment, and the regions, also a current overview of the status of negotiations concerning the individual applications may be presented here. Topical news are being sent free of charge to over 2500 registered interested persons. Registration, as well as distribution of news, is free of charge.

The Forum for exchange of information on best available techniques is an advisory body of the Minister of Industry and Trade. In the Forum, there work representatives of state authorities and of technical working groups. Each group has a right to have its representative. On invitation, also representatives of professional associations and non-governmental organisations (NGOs) may attend meetings of the Forum.

4. Chemical legislation

In the field of chemical products, the situation is similar. At present, this field is regulated by 60 individual regulations. The chemical companies expect significant simplification and clarification of this field from the regulation of the European Parliament and European Council REACH (Registration, Evaluation and Authorisation of Chemicals), known as new chemical legislation, which is under preparation.

Long-term use of voluntary tools, connected with considerable effort to influence the newly adopted measures, resulted in participation of the individual companies, the Association of Chemical Industry of the Czech Republic, as well as of European federation (Cefic).

Thanks to long-term preparation and use of elements of environmental accounting, it was possible to prepare also common opinion of the Association of Chemical Industry of the Czech Republic, the aim of which is to contribute to rationalisation and efficiency of the prepared regulation.

Since publication of the proposal of REACH regulation on October 29, 2003, the Association of Chemical Industry of the Czech Republic is of the opinion that although this proposal contains positive amendments in comparison with the original text, the proposal itself is still too bureaucratic, unworkable, and non-functional. It is necessary that the proposal respects, especially, the following principles:

1. REACH must be functional, and must not significantly undermine competitiveness of the industrial sector, especially of small and medium enterprises, especially in the field of special (more qualified) chemistry.
2. Registration of chemicals would become cheaper and more simple by introduction of the system "One substance - one registration" ("OSOR") which avoids repeated costly registration of what was already applied for, to enable voluntary participation in consortium (support of the proposal of UK-Hungary).
3. Registration priorities must be set out on the basis of risks in the way that the most hazardous substances will be registered first. Registration on the basis of produced amounts is not a criterion for the scope of obligatorily provided data for evaluation of potential impacts of the substance on human health and the environment. However, setting of priorities on the basis of risks requires that necessary data would be available for all substances in the time set out for pre-registration.
4. It is necessary to radically re-evaluate requirements on substances in objects, because the current proposal of the regulation is not feasible in practice, it overlaps with the existing regulations, and results in unfair competition of producers outside the EU.
5. It is necessary to limit the scope of the REACH regulation to real chemicals (substances), through exclusion of raw materials (substances occurring in nature), and wastes (especially recycled ones).
6. To build registration on clear, broad, simple, and standardised categories of use and exposition, covering all supplier's chains.
7. To ensure that sharing of data will be obligatory on the level of core data of one file, and separated from the remaining part dossier, and that each registrant may submit safety report either separately or in consortium (sharing of data on the basis of voluntary consortia and in accordance with principles and rules of competitive environment).
8. To determine safety sheets as exclusive documents for communication of data in the whole supplier's chain.
9. To use restrictions, and not authorisation, as preferential approach to risk management in the case of substances use of which must be restricted.
10. To extend implementation deadlines from 11 to 18 years, the other adequately.

5. Reduction of risks of chemical productions and products

We already cannot imagine our everyday life well without chemical products. The expansion of chemical industry may be documented, for example, by growth of production between years 1930 and 2000 from 1 million tonnes to 400 million tonnes.

I have already mentioned risks connected with production and products. And significant attention is paid to them in relation to fulfilling of tasks ensuing from the Act on prevention of accidents.

However, I would like to mention here also another voluntary initiative of companies, which concerns safety of traffic. Transport Information and Accident System (TRINS) was established in 1996 as an agreement between Association of Chemical Industry of the Czech Republic and the Ministry of the Interior - General Directorate of Fire Rescue Service of the Czech Republic, with the aim to provide, within the abilities of chemical companies, help during emergency situations connected with transportation or storing of hazardous substances on the territory of the Czech Republic. The system was founded by 9 companies, and, at present, already 27 companies and 34 centres on the whole territory of the Czech Republic participate on it. The help of TRINS is provided by the individual companies exclusively on request of operational and information centres of Fire Rescue Service, or of Integrated Emergency System of the Czech Republic, in three levels:

1. level - provision of information by phone or fax;

2. level - sending of a specialist into the place of intervention (accident);

3. level - sending of forces and means into the place of intervention (accident).

6. Through co-operation to sustainability

If we want to contribute to transition of the society to sustainable way of life, as assumed also by the Strategy of Sustainable Development of the Czech Republic, approved in the last year, we must move from confrontation to co-operation in the whole society. We must look for what links us. Only through this it is possible to ensure long-term sustainable development (or, rather, evolution) of the society effectively, with maximal use of the human potential.

I consider the use of the principles of environmental accounting (which I understand as a hybrid between standard accounting and material balances) as one of the basic elements that can move us to change of our behaviour, to common search for ways to optimisation of our behaviour.

Outputs from environmental accounting could be the main helper also in determining impacts of the individual legal regulations, under preparation, on economy of the companies.

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Association of Chemical Industry of the Czech Republic

MANAGEMENT SYSTEM OF INTERNATIONAL ENVIRONMENTAL REPORTING IN CZECH REPUBLIC

Dr. Jaroslav Ráček, Ph.D.

INTRODUCTION

The project "Analysis and design of environmental data models and external EIS interfaces compatible with the EU" was started at Masaryk University (MU) in Brno in October 2003 with support of Czech Ministry of Environment (ME). Objectives of this three years project are to perform a complete analysis of the current requirements for environmental reporting and for environmental data models and external interfaces, both from domestic and international (especially European) viewpoint, to perform analysis of significant data sources from the point of view of attributing and methodologies, to design and implement an exchangeable central data model (CDM), to prepare conversion of the existing sources of information into the CDM, to integrate the CDM into the existing structures of the information systems of the ME and the public administration and to create conditions for efficient use of data at both the national and international level.

A considerable output of this project is a information system for management of international environmental reporting described in this paper.

ANALYSIS

The analysis of Czech reporting requirements consists from two base parts: analysis of reporting obligation and processes ensued from legislative and analysis of significant national data sources.

The aim of the first part is to identify reporting processes included in legislative regulation, specify data structures of produced reports and then make comparison of identified processes and data structures When analyzing reporting obligations the team have chosen a procedure in the direction: Regulation –> Process –> Data. This procedure respects the basic division of the ROD component, and involves the following three steps: finding the relevant legislative regulations, identification of the reporting processes implied by these regulations, specification of data produced in these processes.

The second part of analysis is oriented to national data sources used for environmental reporting. It means to identify significant environmental data sources (information systems) in Czech Republic, analyze and describe their internal data formats, find their relation with reporting processes and design a data interfaces between data sources and the reporting management system.

The system regards to all reporting activities as to a reporting processes which are described as process definition and stored in reporting process repository. The function of process definition is to describe a reporting process in a form, which supports automated manipulation, such as modelling, or enactment by a workflow management system. The process definition consists of a network of activities and their relationships, criteria to indicate the start and termination of the process, and information about the individual activities, such as participants, associated IT applications and data.

Processes are invoked automatically by system and reporters take information about tasks which he should to do. Finished reports are stored in a special repository. The fact, that data

formats of all reports are described inside process definitions, enables to create the global data model of whole environmental reporting or to create data model only for selected group of reporting obligations. A base structure of system is shown on figure 1.

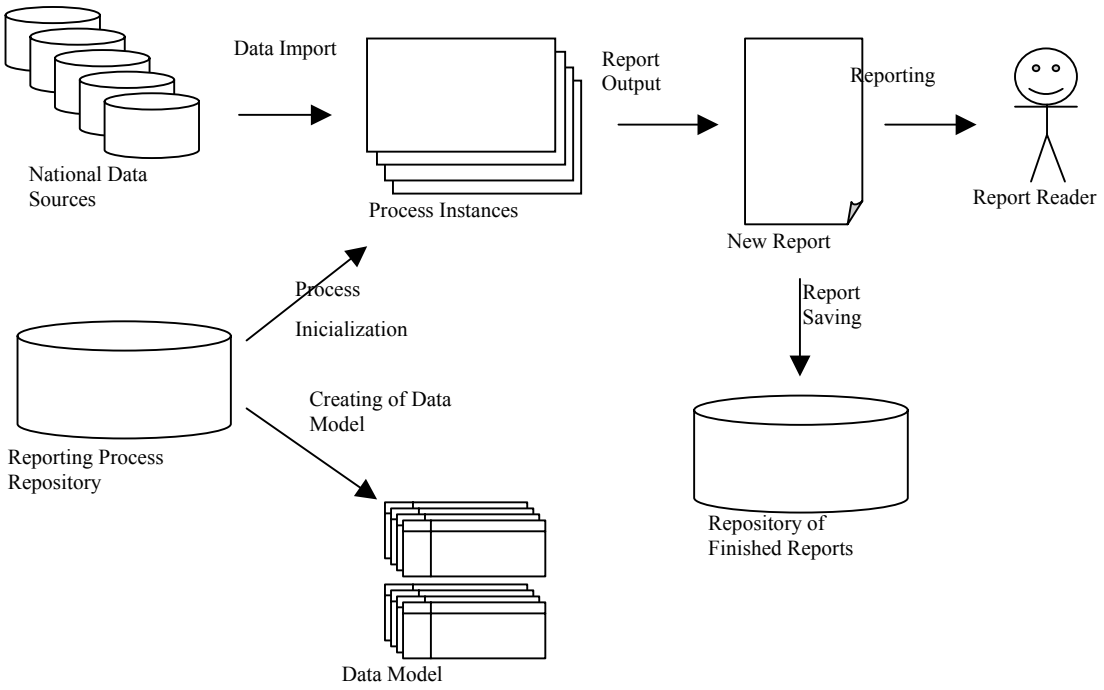

Figure 1. A base architecture management system of international environmental reporting

DATA MODEL

The logical data model of the proposed Czech reporting management system is shown below. It consists of many entities that store metadata about reporting processes, used data sets and their structures, i.e., particular data models of reports. The main task of this information management system is to provide information about reporting obligations. In this case, any reporting obligation in the system is recorded as a description of the reporting process transforming input data from significant national environmental data sources to the output in the form of obligatory international reports. Thus the entity "Obligation" includes attributes giving information about the report dates, periodicity, responsible persons, process scenario, subsidiary applications and tools, report recipients and input and output formats. The basic structure of obligation entity complies with the structure used in ROD but there have been added other attributes respecting the national level.

The main entities describing the national structure of reporting are "Person" including information about all people participating on environmental reporting in the Czech Republic, the entity "Data Source" containing metadata about more then 40 Czech significant environmental information system, and the entity "Application" describing the software tools for reporting. The information about compiled and completed reports is stored in the entity "Report".

The international and legislative context of reporting is stored in the entities "Legal instruments" and "Classification". This part of the data model is fully compatible with the ROD of EEA and is automatically updated from this database.

The information describing the report output data formats is available via the entity "Data Set" and the report data structure is recorded in the entities "Entity", "Attribute" and "Relationship", see Figure 2. This enables the automatic generation of the actual data structure of selected reports within the time period specified.

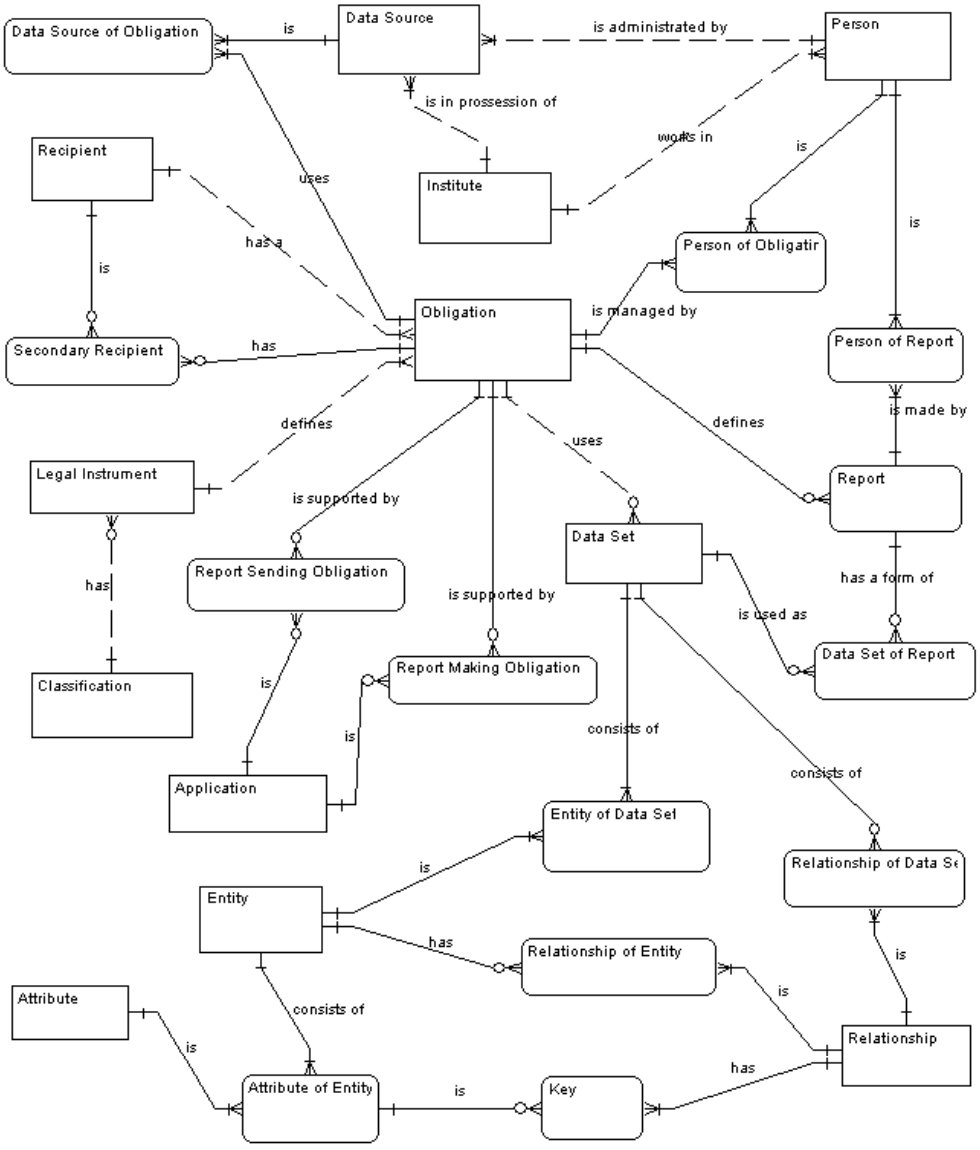

Figure 2. Logical data model of reporting system

IMPLEMENTATION OF SYSTEM PROTOTYPED

The system distinguishes two sorts of users. The first user sort is analyst, which can insert, update and delete data incoming from analysis. He also can create requests and search information in system database. Today the analysts are researchers from Masaryk University in Brno. The second user type are people who can just search and read information from system database, but they haven't permission to change data. Usually it is some officer from Czech Ministry of Environment which supervises the project.

The system works with five basic datastores. Information about legal instrument is placed in datastore "Legislative regulations", information about identified reporting obligations and

their data formats is placed in datastore “Reporting obligation”, information about reports are stored in datastor “Reports”. Data formats of reports are in datastore “Data sets”. The figure 3 shows a form used for editing of a new data set. And finally, descriptions of national significant data sources are placed in datasrore “Significant data sources”.

The system offers two primary processes. The firs process “Editing” inserts, updates and deletes information about reporting obligation and reporting processes from datastores. The second process “Searching” provides search services based on SQL technology.

CONCLUSIONS

The information system of international environmental reporting in the Czech Republic is developed under the co-ordination of the Czech Ministry of the Environment, on standardized internal attributing. It enables to manage and monitor reporting activities in Czech Republic and design the global data model for environmental information exchange and reporting purposes, to perform systematic attributing and thereby provide a basis for a central output data warehouse to meet reporting obligations.

Another field closely related to information/reporting obligations is informing the public, as stipulated by the new European legislative requirements. This solution reflects these requirements too. It has to provide an information base for strategic planning, supra-field information support for public administration, and cooperation with the business sphere.

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THE CZECH ENVIRONMENT WEB PORTAL

Miroslav Kubásek

Abstract

The Environment Web-portal (EnviWeb) is the unique complex environment web-portal in the Czech Internet (it is located on the address http://www.enviweb.cz). It was launched in October 2001 and it became the most visited portal in this branch.

Portal is divided into these sections: Water, Air, Waste, Chemicals, Disasters, Noise, Nature, Soil, Forest, Geology, EIA, EMS and Misc.

EnviWeb is primarily intended for experts, professional public, firms, government and for citizens. It contains most useful directory of companies in Czech Republic, directories of inspections, ministry, regional offices, department offices, branch associations, hygienic offices, organisations which provide business support, etc. EnviWeb offers access to complex environment legislation in Czech Republic. Important parts of this portal are the archive of articles, which is divided into popular, technical and business articles and archive of events.

History

In August 1998 there was an idea to create the waste web-portal, which will provide by testament no. 125/1997 Sb. (laws of Czech Republic) offering waste for further waste utilization. The firms, which work with waste can demand waste on this portal.

On May 1. 1999 was launched the waste server on the address http://www.skladka.cz which provided offer and demand of waste, and offered complex service in the waste management (list of companies, laws in force, technical articles, waste software, literature, advertising etc.).

Main page of www.enviweb.cz

By reason of very small constituency of portal Skladka we decided that on background of our experience we would build new Environment Web-portal. His name is EnviWeb, his location is http://www.enviweb.cz and it was launched in October 1. 2001.

The target group of server visitors are professionals in environment, enterprise ecologists, workers of firms providing

services in the branch and producing or selling products and technology for environmental protection and labour safety, representatives and students of TU focused on environment, representatives and members of professional unions, employees of state administration and self-government, organizers and participants in specialist events, editors and readers of professional publications

Structure of portal EnviWeb

The structure of portal EnviWeb is divide to this interests sections: Water - section devoted to water management, and his aspects; Air - section devoted to problems with air protection, monitoring of pollution sources and their limitation; Waste - section devoted to waste management, demeaning production of waste and waste recycling; Chemicals - section devoted to ecological aspects of treatment with chemicals a their influence on living environment; Disasters - section devoted to prevention of grave industrial accidents, reactions on accidents and removing their consequences; Noise - section devoted to problems with noise, they measurement, reducing, modeling and prevention before abnormal noise; Nature - section devoted to problems with nature protection; Soil - section devoted to soil conservation and ecological agronomy; Forest - section devoted to forest management and forest protection; Geology - section devoted to environment aspects of geologic prospecting, extraction and recultivation; EIA - section devoted to Environmental Impact Assessment; EMS - section devoted to Environmental Management Systems; IPPC - section devoted to Integrated Prevention and Pollution Restriction; Misc - this section contain articles, links, firms atc., which can't be class unique to other sections, or their have universal intent.

Destinations

EnviWeb is primarily intended for experts, professional public, firms, government and for citizens. The primary purpose of EnviWeb is to provide public environmental information and enable freedom access to environmental information.

The second part are services for companies, like providing and upkeeping environmental legislations of Czech republic, providing and managements "The Waste Stock", offers special softwares for companies, providing informations about tenders, atc.

In fine

During four years the portal was visited by more than 550 000 persons who had read about 3 000 000 pages. EnviWeb has thus become the second most visited portal in the field of environment being ever more visited (at present over 850 visits a day).

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ENVIRONMENTAL ACCOUNTING

Katarína Markošová – Eva Krumpová
(Czech Statistical Office)
(see following prezentation)

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