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INSIDE TO THE PROBLEMATIC OF ENVIRONMENTAL ACCOUNTING AS A PART OF BUSINESS ACCOUNTING

The term Environmental Accounting refers according to the Czech measure to **the environmentally oriented entrepreneurial information system (PIS_{env})**. Its structure can be perceived via the figure 1 presented below.

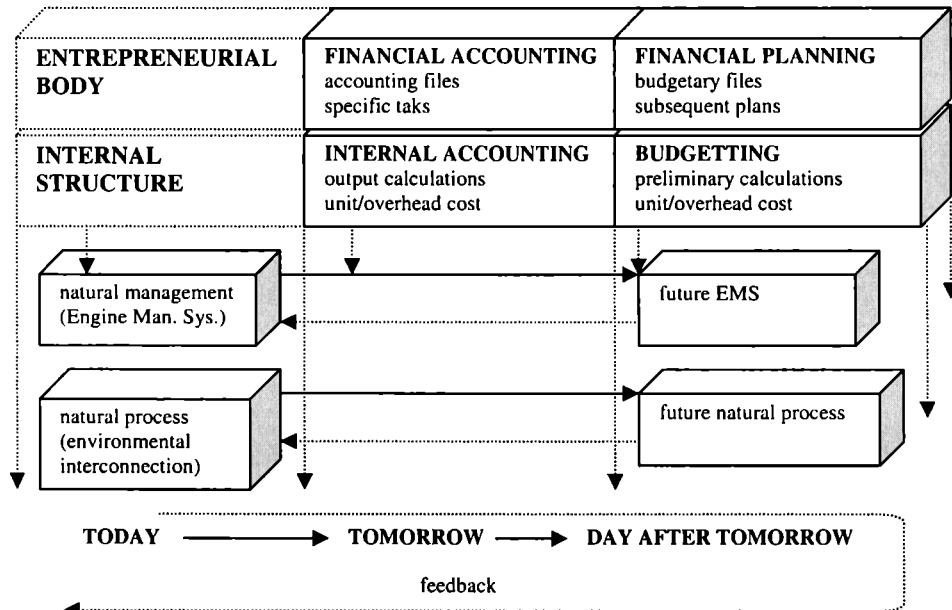


Fig. 1. Entrepreneurial information system

The above scheme shows that environmental accounting isn't a structural part of the business accounting system. Maintaining of the environmental aspect within the PIS_{env} framework means that company management will be able to specify and assess a real processes, i.e. it will have clear evidence about **energy and material flows** within a physical units, which a financial count will be referred to. This presumption is a part of a processed understanding towards the entrepreneurial problematic.

An environmental approach puts the emphasis on internal accounting (IA) that leads to the unity between (IA) and financial accounting (FA) as shown in the schema. It is based mainly on a non-compulsory monitoring of the environmental cost on a company level, which become only an internal issue during a decision-making process of a company's management. Internal accounting usually includes:

- **Cost accounting** (more specific approach that usually refers only to accounting the real cost).

- **Managerial accounting**¹ (more broader approach that usually refers to accounting as the management tool, and concerns the cost, return, and sometimes even the cash flow).

The main objective of the Cost accounting is to analyze the Ex-post strategic factors referring to the company positive, but also negative factors, i.e. to find out the intensity of operational, departmental and processing influence on a declared output. **The tasks** of the Cost accounting perceived from the environmental point of a view, can be characterized by the following standpoints:

- **How much** is the cost of a company's concrete output (products, services) and how much represent the environmental costs; which operations are the most effective ones and what is the impact to the environment?

- **How to assess** the contribution of company's departments to the overall results and how to assess the impact of the environmental measures that they applied?

- **How to get involved** particular departments, so that they behave according to the common entrepreneurial manners furthering the overall company results, i.e. to get them involved even in the environmental effectiveness issue?

- **Which customer groups** are within both interests, economic and environmental?

- **Where is the cause of discrepancies** between the real economic and environmental figures, and those preliminary set ones? Who is the responsible?

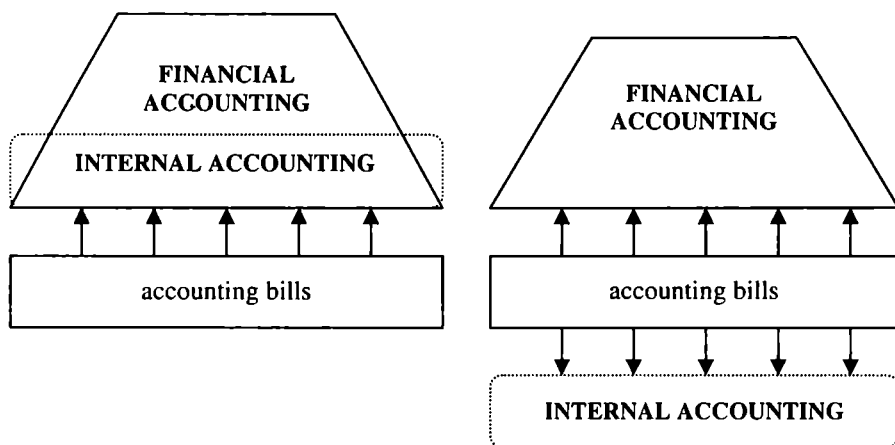
The main objective of the Managerial accounting is mainly to look for and provide information for optimal solutions of strategic management. It primarily concerns the decision-making process and involves the choice between the "positive" (e.g. how much would be to launch a new environmentally safe product, or attract a new environmentally oriented category of a customer, or to purchase some new technology, etc.) and "negative" solution (e.g. how much would be to discon-

¹ It is hard to determine, where is the border between Cost accounting and Managerial accounting. Moreover, also the terminology concerning Internal Entrepreneurial Accounting isn't uniform /27/.

tinue some particular, environmentally ineffective production, or what would be the loss of a certain customer, or what would be the environment-economic impact of a change of some technology etc.) Its **main task** is to assess various future developments and look for answers to the question: “What will happen, if?”.

To fulfill these requirements means to create a coherent organic system of Accounting, Cost Management and Budgeting that isn't yet common in the Czech entrepreneurial practice. Moreover, the role of the Managerial accounting is perceived as to serve as an information source for the Financial accounting.

Accounting for the internal company use can be organized via two ways: Either as broadening of analytical accounting books within the Financial accounting frame, or as an independent accounting scheme – see Fig. 2.



INTERNAL ACCOUNTING as a part of a company accounting (i.e. analytic accounts under the obligatory categories 0 to 7)

INTERNAL ACCOUNTING as an independent accounting system (i.e. use of the accounting categories 8 and 9 that are not under the obligatory structure)

Fig. 2. Scheme of an internal accounting

The fundamental problematic, if the entrepreneurial information system is oriented towards the environment, is the **running evidence of assets**. Environmental concern is possible to classify with accordance to the European guidelines describing the standards for environmental audits (No.: 1836/93). The entrepreneurial activities are listed in following categories:

I. Category – entrepreneurial activity:

- food, textile, leather, timber, glass, paper and printing industries,
- chemical industry,
- production and processing of metals,
- machinery and automotive industry,

- production of heat and energy,
- processing of mineral oils and coke,
- mining,
- production of consumer goods and clerical machines, rubber, and plastics,
- recycling and disposal of waste.

II. Category – entrepreneurial activity:

- production of electrical energy, gas, steam, hot water,
- recycling, treatment, liquidation or storing of liquid or gas waste,
- energy, water supply and sewerage,
- transport (railroad, motor-road, water and air),
- banking,
- laboratories,
- trade,
- public administration.

System of Running accounting (evidence) of production company assets reflecting the environmental approach is shown in Fig. 3.

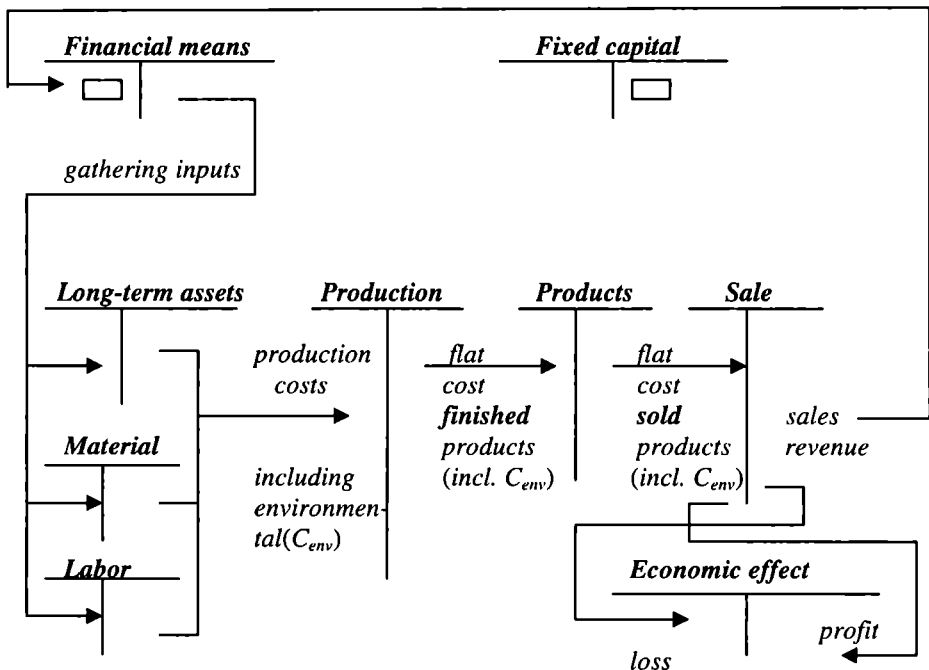


Fig. 3. Cycle of assets in a production enterprise

The task of the PIS_{env} is a provision of such internal evidence in order to set a value to all **inputs** (long-term assets, material, labor) that reflect some environmental aspect

and **outputs** (sales) with a possible differentiation of the environmental side-product. Collecting input data means always calculating the **costs** in projection to the accounting activities. Accounting is just monitoring of such costs according to variety of criteria.

The problematic of environmental cost, efficiency, and profitability is an intricate task for an enterprise, where the obstacles are mainly:

- **Unclear terminology** and many different approaches towards estimating the environmental costs and its content.

- **Absence of a conceptual legislative framework** in a present Czech accounting. As a consequence, the Czech accounting doesn't have generally declared terms for obligations, external sources, actives with passives and costs as a result, not to mention the environmental costs.

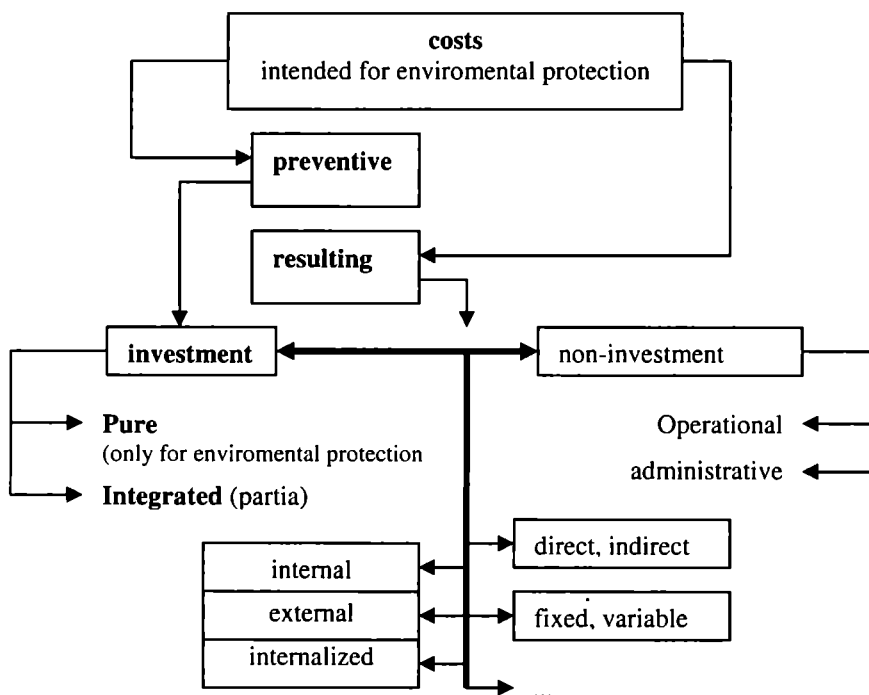


Fig. 4. Structure of the environmental cost – variable approaches

- **Mixing of many approaches** towards the cost structure, where some costs may overlap, or a gap between them may be created, e.g. it is possible to monitor the same costs according to the following criteria:

- **Sorting** (= operational, financial, miscellaneous – as it is specified in the accounting schema of the class 5 without mentioning about the causes for its expenditure); this assortment isn't searching directly for the reason of the exhaustion of

the costs, i.e. their relation to the activities performed on their account. Therefore, it is necessary to combine this criterion with the other cost structures.

- **Purpose of spending** (= concerning the production phase as for example technology, service, provisional and managerial costs); this perspective towards the cost assortment enables having some control over the adequate spending regarding the unit and overhead costs.

- **Prime assortment** (= primary, i.e. external, which reflects upon an external interaction with the company's environment; secondary, i.e. internal, which is based on interactions between company subjects, where in order to rid of the duplicities, the costs should be in the Internal Business Accounting extracted.

- **Way of calculating** (= direct, i.e. directly connected to a concrete activity and therefore directly measurable with the number, weight or time regarding the product; indirect, i.e. those that aren't bound towards a particular activity and ensure the production in a broader way. They may be common for more products, departments or processes and they should be calculated afterwards in regard to the unit of performance).

- **Way of appraisal** as in

- real production cost ($RPC_r = \text{direct material} + \text{direct wages} + \text{other direct cost} + \text{production cost}$),

- real performance cost ($RPeC_k = RPC_r + \text{administrative cost}$),

- real cost ($RC_d = RPeC_k + \text{distribution cost}$).

- **Place of the origin/liability** (= branch, e.g. cost of company's division), the basic assumption is that the branch is set up the way that a) it represents a self-content technological process with measurable expenses; b) partial performances were identifiable; c) these partial performances were able to be appraised according to the company's internal system of appraisal.

- **Relation to the volume of outputs** (= variable, i.e. dependant and variable upon the volume of production – proportional, progressive, digressive; fixed, i.e. in certain defined time interval stable and independent from the volume of production); this classification facilitates a) to perform an analysis of a break-even point, i.e. cumulative cash flow gets even with expenses b) to perform an analysis of a margin, i.e. volume of production that provides some needed level of sales revenue.

- **Influencing by quality of management** (= controllable, non-controllable).

From the point of environmental requirements, it is necessary to define the content of environmental cost.

Environmental cost (C_{env}) is usually perceived as a cost of inputs that was allotted on integrated (preventive) or additive (end-point) solutions. In this sense it **concerns** those company expenses that are aimed to diminish negative environmental impact caused by the company's entrepreneurial activity.

Nevertheless, it doesn't **concern those expenses** that occur on the account of non-renewable resources (public estate) or on the account of harming the environment by company's operational activities².

Some other approaches, on the other hand, recognize expenses on achieving compliance to the environmental law exclusively as environmental expenses. In this case, the assortment of environmental cost according to the accounting class No.: 5 as follows:

- **Consumed purchases**

- material consumption that occurs on account of the operation of environmental apparatuses³,
- consumption of fuels and electric power, water, steam, and chemicals during main production on environmental apparatuses,
- use of a safety aid equipment,
- use of promotional materials,
- use of office equipment, booklets, books, magazines, etc. concerning the environmental issue,
- consumption of spare parts for repairs and maintenance of environmental apparatuses.

- **Services**

- expenses for repairs and maintenance of environmental technological as well as construction equipment, transport equipment, SW, HW etc. , that was performed by subcontracting subject,
- expenses for an external chemical analysis of waste,
- travel expenses concerning some environmental interest,
- transfer fees (e.g. waste manipulation),
- renting of environmental equipment,
- expenses for approvals and certifications,
- promotion and advertising that concerns environmental aspects of production or products,
- expenses for dismantling or demolition of non-functioning or old estate,
- expenses for external ecological audit, expertise, assessment, studies, or technical help concerning ecological issue,
- expenses for research and development.

² It means fees, penalties, taxes, but even payments in a way that they are in the CR being paid. In a such sense, they don't represent an environmental cost. It means e.g. only expenses for decreasing a waste production, betterment of the air quality, liquidation of pollutant substances, research and development of ecologically sound products etc. It is desirable **to monitor the amount of environmental expenses on charges**. It is usually the determining standpoint of a company to decide about so called ecological investment. Provided that these expenses (determining the value of a public environmental estate) are only a fraction from the realized return, we can't anticipate that they will function as an economic tool for environmental protection and therefore motivate to proceed with integrated environmental solutions.

³ An environmental apparatus is a set of equipment that serves the purpose of the environmental protection forwarding recycling or cleans gas, liquid or solid materials in such a form and volume that represents the remains from the main production.

- **Personal expenses**

- wages and salaries of environmentally involved workers and managers,
- social benefit fees paid for the same group of workers,
- food vouchers or other contributions for the same group of workers,

- **Taxes and fees**

- fees for use of public water,
- fees for use of surface and underground water,
- fees for the disposal of waste water,
- basic fees for air pollution,
- fees for the disposal of solid substances,
- arbitrary, court and administration fees (including label fees).

- **Other operational costs**

- contract, interest, penalty fees from the delay or other sanctions defined by a contract stipulation concerning the environment issue,

- cost of old waste yard liquidation,
- cost of non-approved existing waste yard,
- cost of old ecological bear,
- cost of waste treatment and its liquidation,

- fines and penalties in an area of water industry, air pollution, waste industry, nature, landscape and land-ground, noise level, vibrations, and other criteria being set by ecologic stipulations of a given legislature,

- loss compensation due to the environmental liability towards other legal bodies, e.g. health problems caused by a job activity etc.

- **Depreciation, reserves and adjusting entry of the operational cost**

- depreciation of environmental equipment in the category of a long-term tangible and intangible property and long-term sundry property,

- creation of statutory reserves for repairs of environmental equipment and waste yard recultivation,

- elaborating of adjusting entries towards environmental investment,

- cost of inception testing of integrated technologies, technical development, long-term promotion, preliminary supplies concerning environment etc.

- **Financial cost**

- environmental securities sold,
- cost of bank guaranties for ecologic investment,
- deposit fees etc.

- **Reserves and adjusting entries of a financial cost**

- reserves for exchange rate losses incurred on behalf of foreign environmental activities,

- adjusting entries towards deposits on an environmental action etc.

- **Additional (extraordinary) cost**

- deficit and damages on environmental equipment,
- adjusting entries towards chemical supply,
- work injury compensations etc.

To assort the cost structure is a way out to regulate and maintain account of quantitative proportions in an enterprise as a whole. It provides information about resources and their disposability, but nothing about the efficiency of employing of such resources. A top management should respect general rules of financial accounting, for which the assortment of cost is quite dominant:

- financial accounting lists only costs that are carried by the entrepreneurial body, i.e., it does not provide information about all externalities,
- it accounts only for environmental cost (C_{env}) that concerns the relevant accounting period,
- this C_{env} is structured in sorts, which without analytical accounting provides only little information to the management (e.g. none about the share of an environmental cost on the entire business cost).

The imperfection of the above mentioned way of monitoring costs is that it doesn't define **who or what** influenced these costs (i.e. which subsidiary was their origin), **which product** they belong to (i.e. which product is „dirty“ and which is „clean“), if the costs relate to the additive (end) ecological solutions that only lower the bad ecological impact, or to the integrated (preventive) ones that focus on „clean“ products. These circumstances, on the contrary, takes into account the special-purpose cost classification.

The special-purpose cost classification monitors primarily the cause of costs (i.e. towards the final outputs), their indirect objects (i.e. the company subsidiaries) and their direct objects (i.e. products, activities, goods, etc.). Their determination assumes a concrete *allocation of the overhead and indirect costs* to the company's business departments or particular performances respectively. In order to monitor the production process of some particular product, it is necessary to identify an organizational structure and define relation to the structure of company's subsidiaries. Only after that, it is possible to approach an **audit of processes**, i.e. the classification of particular activities, their consolidation into processes and cost delimitation.

The audit of processes helps in the accounting to particulate identifying the over-head cost. It means to set the distinction between the environmental over-head cost and other over-head cost (see Fig. 5) and, in the second phase, to set the clue of how to relate some particular environmental cost to the product (service) or subsidiaries, respectively. The special-purpose classification approach is a prime target for internal management of the environmental cost.

In a real practice, the environmental cost stays unrecognized together with the common over-head cost. It is desirable to itemize it not only in regard to its function in the transformation production process (i.e. over-head cost of material, production, administration, marketing), but also to the concrete performance. Such

disclosure would help distinguish so called “dirty” and “green” products. Present practice hasn’t yet specified any standard procedure and it utilizes different methods with different approaches:

- **Activity Based Accounting** allocates the over-head cost in proportions to the sequential activities that relate to the product or a group of products.
- **Full Cost Accounting** allocates the environmental direct and indirect to the product, production line, process, service or activity.
- **Life Cycle Costing** takes into account all costs linking to the product over the lifetime of the product, i.e. from the raw material through its production to product liquidation.
- **Total Cost Assessment** counts all costs including the investment savings.

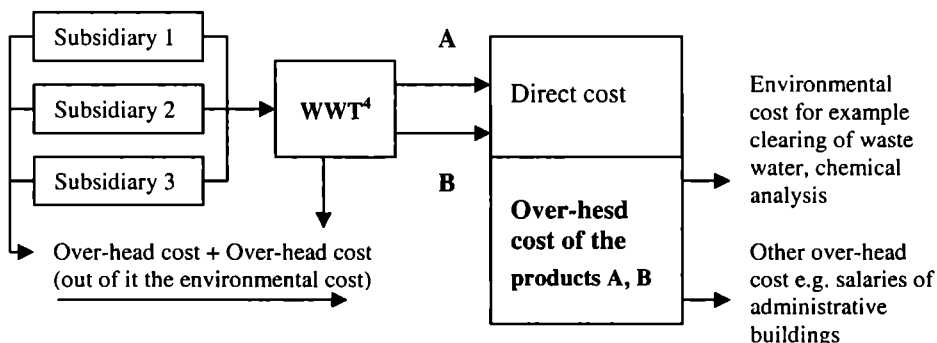


Fig. 5. The distinction of the environmental cost from the other over-head cost

The above-mentioned methods are possible to combine. It is necessary to perceive these methods as an aid tool for decision-making even in case of environmental cost. The Activity Based Accounting and Full Cost Accounting have different relation of cost and output to the price, as well as variety approach to the structured cost of the performance. Such approach is possible to undertake to define the equation separating the fixed and variable cost. The above-mentioned approaches are generally described by the further calculations:

Calculation of variable cost

Cost (after alterations)

- Variable cost of a product
(out of that the environmental cost)
- Direct (unit) material
- Direct (unit) wages
- Variable overhead ...

Contribution (for payment of the fixed cost and profit formation)

- Average fixed cost per product
(out of that the environmental cost)

Average profit per product

Dynamic calculation

Direct (unit) material	
Direct (unit) wages	
Other direct costs	– variable
	– <u>fixed</u>
Sum of the direct cost	
Production overhead	– variable
	– <u>fixed</u>
Manufacturing cost	
Administrative expenses	– variable
	– <u>fixed</u>
Manufacturing cost	
Direct (unit) distribution cost	
Distribution expenses	– variable
	– <u>fixed</u>
Summary manufacturing cost	

Calculation of the fixed cost with a gradual structure

Cost (after alterations)	
– Variable cost of a product	
(out of that the environmental cost)	
Direct (unit) material	
Direct (unit) wages	
Variable overhead ...	
Margin I	
– Fixed cost of a product	
(out of that the environmental cost)	
Margin II	
– Fixed cost of a group of products	
(out of that the environmental cost)	
Margin III	
– Fixed cost of affiliated branches	
(out of that the environmental cost)	
Margin IV	
– Fixed cost of the entrepreneurial body	
(out of that the environmental cost)	
Average profit (loss) per product	

The value of both methods arises from knowledge of the processes that are linked to production of each product in a particular company's departments. Without such knowledge, it isn't possible to make an estimate, not even rough calculation of the overhead cost of the department or final product.

The major point of the purpose cost classification is the linkage between costs and performances. The **Direct cost** that is usually set by consumption normative

per product (i.e. accounting calculation unit), aren't the problem issue. Environmental cost that is an object of our interest usually falls among the joint, **Overhead costs** that are connected with a variety of produced performances. Their classification as a calculation unit is difficult and depends on the way of calculation. The overhead cost, on the top of it, is possible to sort on fixed and variable (e.g. variable overhead cost is overhead material contained in the product, technological energy, overhead salaries linked to the production activity, licenses for the number of products, provision, discounts, rebates and transport insurance). Their assortment on variable and fixed will differ according to the company and pragmatic analysis of the cost.

The quality of how to assign the overhead cost is always influenced by setting the **budgetary foundation** that serves the purpose of calculation of the overhead cost via calculation units. The rule is that the **budgetary foundation** should have an essential relation to the real environmental cost. In reality, the selection of a budgetary foundation is influenced by the following measures:

- Volume of (i.e. volume of emissions, solid waste and waste water).
- Intensity of contamination (i.e. toxicity of emissions, solids and waste water).
- Additional cost to get rid of a variety of other waste.

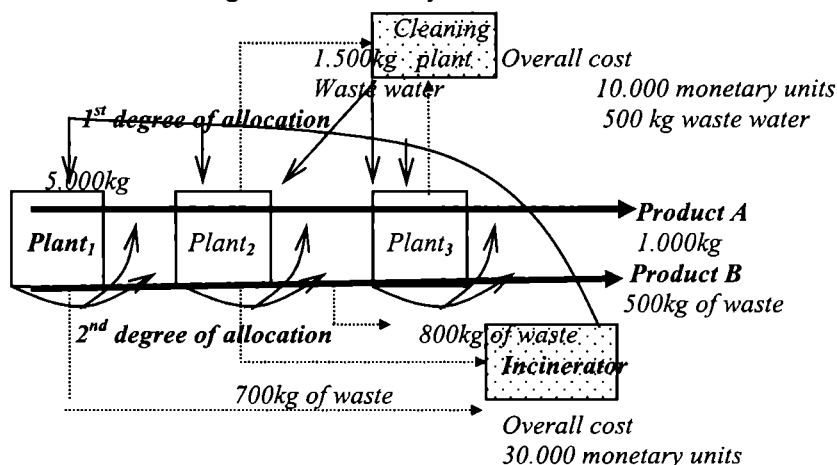


Fig. 6. Allocation of the environmental cost

The difficulty in classification of the overhead cost referring to the site and product is possible to demonstrate on the following example.

Suppose that two products undergo some procedure at three independent facilities. The production generates some waste that is treated by a water treatment apparatus (ČOV) and incinerator. The cost generated by these two pieces of equipment is necessary to assign to production sites and products to which they belong.

In the following case, we suppose 5 000 kg of a certain raw material as an entry. The material is proportionally divided for production of a product A and B. Out

of that, the final products weight 500 kg where the manufacturing in three production plants generates 2 000 kg; liquid waste is also 2 000 kg. An incinerator for burning the waste consumes a cost of 30000 monetary units and cleaning plant 10 000 monetary units. The environmental cost should be divided on:

- the cost of the three production plant facilities,
- the cost of final products.

The 1st degree of allocation refers to the cost of all environmental facilities. It is necessary to consider if variable wastes represent the same or different costs. In our model example, we will suppose the same cost in the first case. Burning of 1 kg of solid waste will then cost 15 monetary units, and it will concern all three production facilities. If we allocate cleaning plant (water treatment) cost, it will influence only the operating cost of the second and third production facility. Under the same supposition of an even cost for liquidation of different liquid waste, the liquidation of 1 kg (1 liter) of liquid waste will represent 5 monetary units.

As a result, the independent production facilities will include the environmental cost to the operating cost according to the Table 1.

Table 1. Environmental cost on account of each unit

	Environmental Cost of Incinerator		Environmental Cost of Cleaning Plant		Overall Production Facility Environmental Cost	
Plant ₁	10.500	35%	—	—	10.500	26%
Plant ₂	12.000	40%	7.500	75%	19.500	49%
Plant ₃	7.500	25%	2.500	25%	10.000	25%
	30.000	100%	10.000	100%	40.000	100%

The 2nd degree of allocation represents the case where we should decide how to distribute the environmental cost between the product A and B. The ratio should be derived from the amount of waste that comes from the production and from the effort spent on its liquidation. The necessary condition is knowledge of the technological procedure that allows identifying the waste channels for each particular product. The example for such case describes the Table 2.

Table 2. The waste channels for production of products A and B and referring environmental cost

	Product A		Product B		Summary
	amount	monetary unit	amount	monetary unit	
Plant ₁	300 kg	4.500	400 kg	6.000	10.500,-
Plant ₂	400 kg	6.000	400 kg	6.000	19.500,-
	1.500 kg	7.500			
Plant ₃	300 kg	4.500	200 kg	3.000	10.000,-
			500 kg	2.500	
SUM	2.500 kg	22.500	1.500 kg	17.500	40.000,-

The above-mentioned environmental cost will appear in calculation for both products as a result. The often-used distribution platform for the *direct cost* is not, in this case, the ideal key to distribute the environmental cost. The differential that appears is possible to demonstrate on an amendment of our case (on the level of a unit cost of the independent production of the two products).

Their pre-assumed structure without withholding (case A) and with withholding (case B) of the environmental cost from the company expenses is in the Table 3. It is calculated all the way down to the sum of the flat cost.

Table 3. Calculation of the A and B products on the basis of the variable distribution platform

	Product A		Product B	
	a)	b)	a)	b)
Direct material	250.000	250.000	250.000	250.000
Direct wages	60.000	60.000	60.000	60.000
Other direct cost	5.000	5.000	5.000	5.000
Operation cost	30.000	10.000	30.000	10.000
<i>Environmental operation cost</i>		22.500		17.500
Production Flat Cost	345.000	347.500	345.000	342.500
Administration cost	50.000	29.000	50.000	29.000
<i>Environmental administration cost</i>		25.000		17.000
Operation Flat Cost	395.000	401.500	395.000	388.500
Distribution cost	20.000	18.000	20.000	15.000
<i>Environmental distribution cost</i>		5.000		2.000
Overall Operation Flat Cost	415.000	424.500	415.000	405.500
Profit (Loss)	10.000	10.000	10.000	10.000
Price of the operation (basic)	425.000	434.500	425.000	415.500

a) The environmental cost are included in the operating cost.

b) The environmental cost is separated from the other operational cost.

The above-mentioned Table demonstrates that the way of calculation of the environmental cost has a direct influence on management's awareness concerning its volume and origin. At the same time, it contributes to complete the prospect of the lineal management structure of the product, department and customer.

The procedure of the environmental cost allocation is quite complicate compare the above mentioned example. It is because of the financially and time driven requirement for monitoring of a variety of channels, but also because of:

- verification of the accuracy of the waste norms,
- determination of the major connection points to measure pollution (with a fixed frequency of such measurements),
- searching for environmentally incurred costs,
- making decisions about the way and time of eliminating an old ecological bear that isn't possible to differ from the present pollution.

This procedure should be followed by an general algorithm of the following steps:

1. Define the extent of the environmental cost.
2. Identify and quantify the environmental costs.
3. Ascribe the environmental cost to the particular processes, products, or apparatus.

Realization of the above mentioned algorithm creates preconditions for an enforcement of the „eco-efficiency“ in an entrepreneurial practice. It represents a joining point for all consequential economic measures on a micro as well as macro level. It fully concerns the environmental cost having an investment nature.

An assessment of investment projects of an environmental nature should reflect the capital spending, running contribution (expenses), and end of process contribution (expenses). Capital expense assortment, regarding the impact of an allotment of the means is quite difficult to apply in practice. When it is applied, the distribution ratios are set according to the production expenses. More usual method is an assessment „an block“ that is methodically correct only in terms of pure environmental investment with only a single output.

Managers' decisions are mostly based on calculations of the Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI), Pay-back Period (PP), and Accounting Profitability (AP). The following module example can exhibit the way of their application.

An Enterprise is trying to select one of the two ecological investments (without a possibility to include positive externalities that are arising from such investments) that are being assessed on the above-mentioned basis. The profit⁴ seems to be a key aspect to determine the volume of the chosen criteria. The resulting volumes of such criteria depend on the investment assumed for a particular fiscal period of the entire investment. It reflects not only the up-to date savings N_{env} (fines and fees for pollution, waste liquidation etc), but also the growth of the new N_{env} (utilization of a new ecologically sound material, growing cost of ecological monitoring etc.). In order to simplify the comparison of both cases let's suppose that the inception capital expenses are identical, i.e. the same as depreciations.

⁴ Present entrepreneurial management can assess some situation according to a variety of profit (loss) scenarios. Traditionally, generation of some profit is simply linked to sales and it is expressed as a linear function of the volume of sold operations:

$$P = \sum (p_i - c_i) \times q_i, \quad \text{where:} \quad \begin{array}{l} P = \text{Profit (loss) from operations per certain period,} \\ p_i = \text{Sales price of the } i\text{-th operation,} \\ c_i = \text{Full cost of the } i\text{-th operation,} \\ q_i = \text{Volume of products sold } i, \\ i = \text{Sort of the operation.} \end{array}$$

The more contemporary perception of this problem links the profit to the overall entrepreneurial activity in general. It is then related to some particular time period. As a result, the profit calculation is influenced by the necessity to reproduce the fixed cost in time of its occurrence:

$$P = \sum (p_i - v_i) \times q_i - F, \quad \text{where:} \quad \begin{array}{l} P = \text{Profit (loss) from operations per certain period,} \\ p_i = \text{sales price of the } i\text{-th operation,} \\ v_i = \text{Unit variable cost of the } i\text{-th operation,} \\ q_i = \text{Volume of products sold } i, \\ i = \text{Sort of operation that the company sells from its assortment } n, \\ F = \text{fixed cost of the evaluation period.} \end{array}$$

Table 4. Influence of future resources on the Net Present Value of environmental projects

Years of operation	PROJECT A			PROJECT B		
	Investment in year 0 = 1000			Investment in year 0 = 1000		
	profit	deduction	cash flow	profit	deduction	cash flow
1	-100	200	100	100	200	300
2	0	200	200	200	200	400
3	100	200	300	100	200	300
4	200	200	400	0	200	200
5	100	200	300	-100	200	100
	300	1000	1300	300	1000	1300

The Net Present Value (NPV) data relevant to the 10 or 8% interest rate:

Years of operation	A		B		A	
	$(1 + 0,1)^a$	PV	PV	$(1 + 0,08)^n$	PV	PV
1	0,9091	90,91	272,73	0,9259	92,59	277,77
2	0,8264	165,28	330,56	0,8573	171,46	342,92
3	0,7513	225,39	225,39	0,7938	238,14	238,14
4	0,6830	273,20	136,60	0,7350	294,00	147,00
5	0,6209	186,27	62,09	0,6806	204,18	68,06
Σ	-	941,05	1027,37	-	1000,37	1073,89
minus capital cost		-1000,00	-1000		-1000,00	-1000
NPV		-58,95	27,37		0,37	73,89

The above-mentioned documents that the B option is more desirable than the option A (the interest doesn't play any role).

The IRR measure that equals discount contributions from operating an environmental investment to the net present value of a capital investment at a certain discount appreciation, it allows us to quantify the following equation:

$$IRR = i_{(+)} + (NPV_{(+)} / NPV_{(+)} - NPV_{(-)}) \times (i_{(-)} - i_{(+)}),$$

where : $i_{(+)}$ = Interest rate for which the NPV is positive,

$i_{(-)}$ = Interest rate for which the NPV is negative or lower,

$NPV_{(+)}$ = positive NPV at $i_{(+)}$,

$NPV_{(-)}$ = negative NPV (or lower) at $i_{(-)}$.

For the project A is the IRR value close to the level of 8,04% and for the project B, it is 11,26%. From this perspective as well as the perspective involving ČNPV, it is better assessed the project B because the internal rate of its investment return is higher.

B:

PI = PV contributions / PV investment spending,

$PI_A = 941,05 / 1000 = 0,94105$,

$PI_B = 1027,37 / 1000 = 1,02737$,

PP = Investment / average fiscal cash flow (in the case of regular contributions),

$PP_A = (100 + 200 + 300 + 400) = 1000$; i.e. 4 years,

$PP_B = (300 + 400 + 300) = 1000$; i.e. 3 years.

Table 5. Calculation of the A and B products on the basis of the variable distribution platform

	Product A		Product B	
	a)	b)	a)	b)
Direct material	250.000	250.000	250.000	250.000
Direct wages	60.000	60.000	60.000	60.000
Other direct cost	5.000	5.000	5.000	5.000
Operation cost	30.000	10.000	30.000	10.000
<i>Environmental operation cost</i>		22.500		17.500
Production Flat Cost	345.000	347.500	345.000	342.500
Administration cost	50.000	29.000	50.000	29.000
<i>Environmental administration cost</i>		25.000		17.000
Operation Flat Cost	395.000	401.500	395.000	388.500
Distribution cost	20.000	18.000	20.000	15.000
<i>Environmental distribution cost</i>		5.000		2.000
Overall Operation Flat Cost	415.000	424.500	415.000	405.500
Profit (Loss)	10.000	10.000	10.000	10.000
Price of the operation (basic)	425.000	434.500	425.000	415.500

a) The environmental cost are included in the operating cost.

b) The environmental cost is separated from the other operational cost.

Table 6. Influence of future resources on the Net Present Value of environmental projects

Years of operation	PROJECT A			PROJECT B		
	Investment in year 0 = 1000			Investment in year 0 = 1000		
	profit	deduction	cash flow	profit	deduction	cash flow
1	-100	200	100	100	200	300
2	0	200	200	200	200	400
3	100	200	300	100	200	300
4	200	200	400	0	200	200
5	100	200	300	-100	200	100
	300	1000	1300	300	1000	1300

The Net Present Value (NPV) data relevant to the 10 or 8% interest rate:

Years of operation		A	B		A	B
	$(1 + 0,1)^n$	PV	PV	$(1 + 0,08)^n$	PV	PV
1	0,9091	90,91	272,73	0,9259	92,59	277,77
2	0,8264	165,28	330,56	0,8573	171,46	342,92
3	0,7513	225,39	225,39	0,7938	238,14	238,14
4	0,6830	273,20	136,60	0,7350	294,00	147,00
5	0,6209	186,27	62,09	0,6806	204,18	68,06
Σ	-	941,05	1027,37	-	1000,37	1073,89
minus capital cost		-1000,00	-1000		-1000,00	-1000
NPV		-58,95	27,37		0,37	73,89

The above-mentioned example presents different patterns of entrepreneurial behavior that reflects the cost assortment and methodology of its allocation. It also projects the time factor into the volume quantification. If the inception proposal counts

on separating the fixed and variable cost, every increase of the fixed environmental cost will shift the break-even point. This point where the fixed cost is covered, determines the balance between profit and loss of the enterprise. The number of operations, where the profit is equalled zero, is determined by the following equation:

$$x = F / c_j - v_j ,$$

where: F = Fixed cost,
 c_j = Price per operation unit,
 v_j = Variable cost per operation unit,
 $c_j - v_j$ = Unit contribution payable.

Adding the environmental cost to either fixed or variable costs will contribute to either numerator or denominator. As a result, it will increase or decrease the number of operations where the enterprise isn't losing (but it isn't making profit). The management is usually pressured to increase unit prices. It may be one of several ways how to compensate increasing fixed cost.

None information system is valid without any sound information about the causes, quantity and location of the environmental cost or returns (gains). Its credibility on an entrepreneurial, as well as national level will contribute to the overall sustainable development. The basis for applying such information system on a local level can be pursued by any type of an entrepreneurial management in any entrepreneurial activity.

PROBLEMATYKA RACHUNKOWOŚCI ŚRODOWISKOWEJ JAKO ELEMENTU RACHUNKOWOŚCI FIRMY

Streszczenie

Celem tego opracowania jest oddanie istoty rachunkowości środowiskowej jako systemu informacji biznesowej ukierunkowanego na problematykę kar i opłat za skażenia, likwidację odpadów, utylizację ekologicznych materiałów, wzrastających kosztów monitoringu ekologicznego w perspektywie kosztów środowiskowych włączonych do kosztów operacyjnych przedsiębiorstwa.