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### Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics  
Düsternbrooker Weg 120  
24105 Kiel (Germany)  
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)  
<https://www.zbw.eu/econis-archiv/>

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## MANAGEMENT OF ECOLOGICAL INFORMATION

**Agnieszka Galka**

*Wroclaw University of Economics*

**Anetta Zielińska,**

*Wroclaw University of Economics*

**Magdalena Zug**

*Wroclaw University of Economics*

### Abstract

*Ecology information means all the information types which identify problems emerging at the point of contact of the natural environment versus man and society and all forms of his activities. Ecology information allows to find out about natural environment and existing dependencies.*

*The aim of present study is to explore the problem of environmental information identity in terms of the information management. The paper focuses on three aspects of the environmental information identity: (1) clarifying the concept of environmental information benefits and expenditures, on the basis of the relevant literature review, (2) theoretical framework pertaining to the analysis of the environmental information efficiency, and (3) diagnosis of the optimal environmental data collection.*

*The assessment of the gained information usefulness has to be connected with the expected effects of implying this information. In the case of ecological information, such effects will be present in various periods, from immediate effects up to the effects which are postponed in time.*

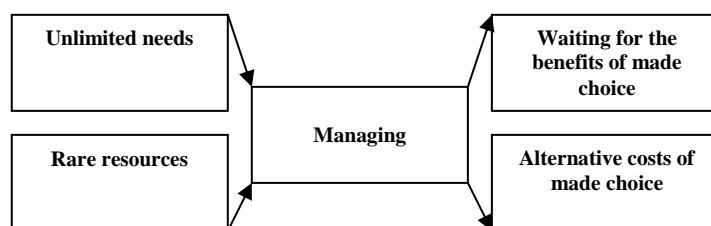
**Keywords:** sustainable development, benefits and inputs, effectiveness

**JEL classification:** Q01, Q51, Q52, D61

### Introduction

The notions of management and managing belong to the basic science categories on management and economic education (on the basis of tBecla et al., 2010, pp. 91-101, 120-121). Management is most often understood as the realization of the set of action timing to a certain goal in the following sequence - planning, organizing, leading and controlling. While managing should be treated as the process of making decisions concerning the ways of using economical resources or as the process of the accomplishment of transformations of these resources into useful good (services) from the people's point view of satisfying their needs. It means that it is able of possessing the ability to satisfy these needs (Star and Ruhleder, 1996; Ives and Kendal, 2014).

The process of management and managing the processes described above can be well described thanks to the following scheme (see Diagram 1 that follows).

**Diagram 1:** Determinants and criteria of managing process

**Source:** Becla et al. (2010)

This scheme shows the issues of economic effectiveness, socio-economical optimum, rationality, appropriateness or competence – statistical and dynamic. These problems refer to managing as a whole, more theoretically viewed process as well as to particular kinds of economic resources.

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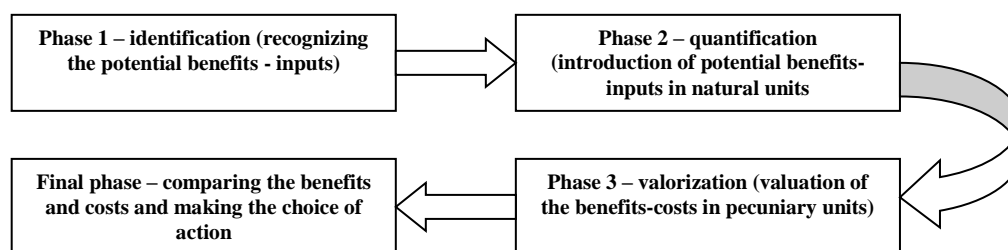
The aim of present study is to explore the problem of environmental information identity in terms of the information management. The paper focuses on three aspects of the environmental information identity: (1) clarifying the concept of environmental information benefits and expenditures, on the basis of relevant literature review, (2) theoretical framework pertaining to the analysis of the environmental information efficiency, and (3) diagnosis of the optimal environmental data collection (i.e. favorable balance between expenditures and benefits of obtaining such data collection).

### The benefits and inputs with information

Managing as the process of necessary decisions is determined by unlimited, needs or rare economical resources. These two determinants give the managing the feature of necessity. Limitlessness of the needs results from, as mentioned above, overlapping on each other the effects of genre diversity of man's needs, their individual and group magnitude and changeability in time and space. Rarity of economic resources means the relation between the needed quantity of resource and the available quantity of resource. If it exceeds the unity, then a certain resource has an attribute of rarity. Available quantity of resource is physically limited, whereas needed quantity of this resource illustrates the level of the needs satisfaction, socio-economic development and even the range of waste in using a certain economical resource.

Made decisions use two basic criteria – benefits and inputs. The first ones in the phase of making decisions are of the character of expected ones benefits. Whereas, the inputs can be actual, real quantities which are necessary to accomplish a chosen decision or potential ones connected with each possible to accomplish alternative. There is one more approach which seems to be a better one; it is the analysis of alternative costs, understood as the qualities of lost, potential possibilities for the application of certain economical resources.

The benefits as well as inputs regardless of the ways of interpretation are analyzed in four-step procedure (Diagram 2).

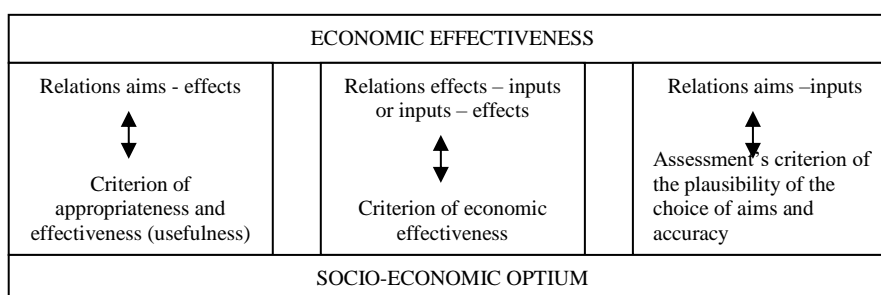
**Diagram 2:** The procedure of the analysis of potential benefits and inputs

**Source:** Becla et al. (2010)

The first phase requires significant knowledge, because its effect should be identification (recognition) of all significant, potential benefits and inputs. In the case of, taking place in the edge of the man and his economy, and society, on the one hand, and natural environment, on the other, it is not an easy task, just because of inefficient information (knowledge). One should also remember that the more precise the identification will be done, the more, the whole analysis of the benefits and inputs will be useful in a decision-making sense. The second phase includes the procedure of introducing the recognized benefits and inputs in terms of quantity in natural units. Quantitative point of view prevents from aggregation and comparison. To aggregate quantitative variables and then to compare them, the form of unification is necessary. In the case of the process of managing and connected with it the benefits and inputs, it takes place in the third phase, in the form of financial valorization, what gives for physical inputs and benefits the shape of the costs and economic benefits. After accomplishing this procedure both values can be compared with each other, what allows to define economic effectiveness of a certain venture (decision). It is done through a classical method of the combination of capitalized benefits and costs. This choice does not settle other problems, such as: appropriateness of already made choices or the effectiveness of the ventures' accomplishment. At the moment, more useful methods are used in management. In the comparison with managing, it is of rather more "technical" dimension character and it involves present ventures' accomplishment. From the management's point of view economic effectiveness is a supporting criterion. The effectiveness of performance is of greater significance (see e.g, Zielińska, 2013, pp. 158-160).

### **Effectiveness and the rational management of ecological information**

The subjects accomplishing the sustainable development strategy are interested in information which decides about economic - praxeological side of their business (Diagram 3). That is why they have to behave as typical market managing and be guided by the criteria leading through economic competence towards economic effectiveness. Such requirements are merged into each national development's strategy – their accomplishing must be economically effective, while they in their own must lead to the growth of the effectiveness of mega system: economy – society – environment (see e.g. Lisin and Strielkowski, 2014).

**Diagram 3:** Assessment's criteria of effectively – operational managing

**Source:** Becla et al. (2010)

People and groups interested in the sustainable development strategy's accomplishment, beginning from local, ending up on global scale, often do not remember about the above mentioned attributes. Rationality has to be accompanied by less transparent cognitively social usefulness. The usefulness of particular ventures lies in the assessment but not only a scientific one but first of all in axiological one. The systems of values are more difficult for an objective assessment, similarly, as moral and ethical systems or esthetic criteria.

Rationality and usefulness influence on two extremely important for each development strategy attributes-criteria, which are economic effectiveness and praxeological efficiency. Economic effectiveness plays particularly significant role in economic resource managing, whereas efficiency in the management of strategy's accomplishment and the activities creating them.

The attribute of effectiveness and efficiency connected together with rationality decide about the efficiency of action (strategy as the set of actions), within the accomplishment of particular ventures and functioning of created institutions and regulations. On the other hand, effectiveness and rationality joined together with usefulness decide about the performance plausibility and acceptability, of course if we say that unreal ventures will be eliminated.

The analysis of information layer's strategy of sustainable development allows to notice that many of its elements do not fulfill the requirements required by the above set of attributes. From the perspective of our dissertations, one should emphasize information basis of all mentioned attribute of correct civilization development's strategy. Without specific sets of actual, relevant, complete and trustworthy information, possibilities of taking into account requirements applied by rationality, economic effectiveness, efficiency or usefulness are significantly limited and lead to inappropriate (often undesirable) financial effects or total lack of them.

Therefore effectiveness this is a relation, described in time and space, between obtained results and incurred inputs in the context of the action's aims, measures and conditions necessary to their achievement. That is why, it is a feature of human activity, which in favor of the accomplishment of an intended aim. This action therefore, is intentional and effective. Effectiveness introduces full relation of the effects towards incurred inputs, at the same time, it is subjected to the structural and dynamic assessment. These are useful indicators while making decisions *ex ante* and the assessment of the decision *ex post*. The effectiveness indicators counted for potential, decision-making alternatives (*ex ante*) give a decision –maker a possibility to make the best choice from the criterion's solution point of view. Obviously, it is one of decision-making criteria. The same indicators counted for the ventures already accomplished (*ex post*) allow to assess the correctness of made choices and decision accomplishment, and also to formulate conclusions which will improve future choices. The criterion of economic effectiveness is one of a few, very universal criteria giving the processes of managing (decision processes) the feature of temporal continuity, in the line of past-present-future (to find out more on this issue, please see Zielińska (2011), p. 113).

In economic dimension effectiveness is treated as a criterion, measure towards economic ventures, allowing for the choice one of them and defining alternative costs. In this function, effectiveness takes the form of appointed indicator or not. In the appointed form, effectiveness is a quantity which shows absolute amounts of income, profit or cost. They are introduced in a natural (subject) view or valuable (financial). In the non-appointed form it is most often the relative relation of two defined quantities: inputs and effects. In the case of the first formula, we get the indicator which informs us what income of each unit's inputs is. In the second case, it is an indicator showing input-absorption of each unit's income. Inputs as well as effects can be characterized thanks to various measures (costs – incomes, profits) introduced in natural units or valuable ones (financial). Defining and measurement of effectiveness stand for specific problems.

In the theory of economics, the problem of effectiveness directly refers to the issue of rational managing. Rationality should be in the light of modern economics, management or praxeology, the feature of human performance. If we assume that this sentence is true, then it is essentials to realize that one requires from a rational subject (human being) the ability of logical thinking and using right sets of information. These last ones should be complete (should include all essential, from the made decisions point of view, elements), adequate (describing real state of decision-making situation) and present (should include important information from present and future point of view). In another case, the problems of effectiveness' performance and later usefulness and plausibility, and the accuracy of aims' selection, and the means of realization. As it is easy to notice, these challenges are especially emphasized when human being's action takes the form of socio-economic strategy.

Direct and indirect beneficiaries of action within sustainable development strategy and the strategy itself will expose these sets of information which characterize its benefits and threats for those groups, resulting from the accomplishment of the same strategy. However, these sets of information which decide about the efficiency of the action of the subjects accomplishing the strategy will be unimportant for them. The assessment of the actions is for beneficiaries more significant than economic effectiveness.

### **Optimal set of information**

Optimal set of information means a maximum magnitude of net benefits which should be understood in this case as a surplus of valorized effects of accomplishment of this set of information over the costs of gaining such set. Finding an optimal size of information set is extremely desirable from a theoretical point of view, but it is very difficult in practice. It means the necessity of existence and knowledge of the function, describing the relation between the quantity of information included in the set and the benefits (income) on account of the use of this set. Similarly, there should be known the function of social costs including the information quantity in a set with the inputs in a financial form, in other words the costs of gaining this set. In the first and second case the problem is extremely financially complicated.

This notion refers to a certain set of information which fulfills the conditions defined by following criteria (Becla et al., 2010):

- 1) criterion of legal-institutional necessity,
- 2) criterion of action's effectiveness,
- 3) criterion of not creating an information noise.

First from the above criteria shows that acceptable set of information includes all this information which is required by already existing legal solutions. This information is treated like a set available in the form of public welfare for every citizen. This is information which is

under the aegis of public sector in accordance with Aarhus Convention, the solutions of the European Union and Polish. They constitute a set necessary to proper functioning of local community and every citizen within this community. This set can be called minimal information transparency from the range of the environmental problems in a certain community. Defining sources of such set is easier thanks to legal articles.

The second criterion – action's effectiveness – outlines this source of information which is essentials to accomplish a certain venture. Using the clues concerning the managing rationality, it is a set of information Essentials for subject rationality. Defining the capacity of this set in practice is more difficult than defining the capacity of the previous one, but possible. An important problem is the relations among both of these sets. In most cases, in these sets there will be ecological information repeating certain news. That is why in accordance with the third criterion – not creating an information noise – acceptable set of information should include all information which belongs to the sum of the two above mentioned sets, after eliminating one version of common part.

An acceptable set creates one set and that information of second set which are not a common part of those both sets. Understood in such a way, an acceptable set will not constitute an optimal solution but only the *second best* solution. It does not copy information, in other words it does not create an information noise, fulfilling the condition of national managing information without a waste of this source. The proposition of such set can be treated as a try of operationalization of the optimalization problems of the ecological information set.

Public goods cause discrepancies between private and social costs. This phenomenon means the need of resolving these crucial issues (Becla et al., 2010, p. 99):

- internalization of external effects,
- phenomenon of a “prisoner's dilemma”,
- a problem of “free rider”.

A phenomenon of a so-called “prisoner's dilemma” is a well-known issue of games theory (Malawski et al., 1997). For public goods it takes the form of common production of such good, investing own resources. Marginal income from such investments is less than all marginal costs. In other words, the price of public good does not equal the sum of marginal benefits resulted on the account of its consumption by all users. It means external costs for the producers. When the production of such good is desirable also for the producer (for example a district), then it finds itself in the position of a prisoner. Moreover, there are not known any other producers' behaviors.

The presence of external costs leads to non-optimal allocation of resources in the sense of Pareto, in other words non-optimal quantity of public goods production. The existence of the external effects on the side of consumption, not able to internalize, evokes the limitation of public goods supply. This is what the problem of “a prisoner” and “free-ticket rider”. The presence of external costs which are not able to internalize evokes too much supply of public good, certainly while referring to the optimal quantity. Internalization of the external effects next to public goods is not an easy one. That is why, one calls for the limitation of public goods supply. However, on the other hand, public goods can be considered as desirable public goods. To such class, the goods which the society thinks that they should be consumed by people, regardless of the level of their incomes, are included.

Estimating the balance conditions is connected with the problems concerning, from the one side defining the level of the value of expected result usefulness, on the other it is connected with the range and the methods of evaluation of considered costs. A simple statistical formula on an expected value requires the knowledge of basic elements (Becla et al., 2010, p. 100):

- the usefulness of gained information,
- the schedule of probability of decision-making states, where specific information will be used.

The assessment of the gained information usefulness has to be connected with the expected effects of implying this information. In the case of ecological information, such effects will be present in various periods, from immediate effects up to the effects which are postponed in time. In such a situation one cannot use a homogeneous method of valorization of these effects from the boundary condition point of view. Immediate effects are able to identify and assess, thanks to known methods of valorization. Future effects require implying close methods of capitalization and discounting.

As it is known these methods are based on the knowledge of actual value of ventures or future value, and using a discount coefficient or a capitalization coefficient. In the first and second one the interest rate, which is the indicator of the pace of values' change of venture in time, plays a significant role. In the case of expected effects, because of implying ecological information, the astral value of venture can be measured by inputs on spreading a specific information. Such value can be capitalized through implying as a capitalization coefficient, so called a durable coefficient of acquiring information. This coefficient should be understood as a percentage of durably remembered ecological information. Durable remembering information lies in remembering and using in action, behavior, attitudes in a longer priori assumed period. Then such a coefficient will allow to estimate the value of future, an expected effect from specific information in accordance with a classical formula of capitalization.

If the value of future effect is known in advance, then using discounting procedures one can define essential, minimal level of actual inputs on wide spreading ecological information in order to achieve this effect.

On the basis of empirical observations one can also define the probability of the presence of these decision-making situations, where information data will give an expected effect. More complex methods of estimating the function of the probability schedule can be used in that purpose, as well as some simpler solutions based on the frequency analysis of the existence of particular situations.

The responsibilities of authorities connected with gathering and publicizing information (Poskrobko, 1998) concern involvement in particular (Zielińska, 2016):

- information about threats,
- information about planned and run projects which have influence on the environment,
- reports about the condition of environment,
- texts of legal acts,
- directives in politics, plans and programs,
- international conventions, treaties and agreements.

## Conclusions and final remarks

Gained results allow to formulate few conclusions: First and foremost, it appears that the effectiveness of managing resulting is difficult to measure, because most of the benefits coming from these areas is deprived of the price (financial value).

Furthermore, the strategy of sustainable growth is based on very wide sets of information. It need to be taken into account that this information should be useful from the strategy creating point of view, its realization and creating favorable conditions of the surrounding (background). This information cannot consume too many economic unless it is an essential element of broadly understood quality of life conditioned by the strategy of sustainable growth.

Finally, it seems that the future is the approach of new era, in which the economic value and non-economic value of natural environment is visible, and becomes an important element of the policy, and influences on taking business decisions.



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## Information about authors:

Anetta Zielińska (anetta.zielinska(at)ue.wroc.pl) is a Professor at Wrocław University of Economics, Faculty of Management, Computer Science and Finance, St. Komandorska 118/120, 53-345 Wrocław, Poland.

Magdalena Zug (magdalena.zug(at)ue.wroc.pl) is a Master student at Wrocław University of Economics, Faculty of Management, Computer Science and Finance, St. Komandorska 118/120, 53-345 Wrocław, Poland.

Master Agnieszka Gałka (agnieszka.galka(at)ue.wroc.pl) is a Master student at Wrocław University of Economics, Faculty of Economic Sciences, St. Komandorska 118/120, 53-345 Wrocław, Poland.