

Use of Methods and Evaluation Systems of the Impact Mitigation Principle in German EIA

Wolfgang Peters

Institute of Landscape Economy, Technical University of Berlin

Abstract

Before the EIA was established in the Federal Republic of Germany, the impact mitigation principle - a planning instrument, which has its legal foundation in the German nature conservation legislation - already had (and still has) the function to value environmental impacts.

The valuation principles and methods which have been developed in correlation to this instrument are now also used in the EIA. Particularly for the valuation of alternating effects on the different ecological landscape functions and for the valuation of ecological mitigation and compensation measures this valuation methods are used.

These methods base on a special kind of modelling nature and environment. Following the aim of the nature conservation act, which is to save the capacity of the landscape to perform its essential functions, not the ecological factors (soil, water, air etc.) itself are evaluated but the ecological functions of the landscape, which are based on the ecological factors.

keywords : EIA-methods, evaluation procedures, impact mitigation principle, landscape functions

I. Introduction

Already before the EIA was established in the Federal Republic of Germany as a legal procedure, there has been another, still existing planning instrument in the Federal Republic of Germany, which has the function of assessing and evaluating impacts on the environment. This instrument could be translated as impact mitigation principle.

The impact mitigation principle has its legal basis in §8 of the German Federal Nature Conservation Act. The planning instrument is an expression of the polluter should pay principle, which is one of the German environmental policy principles. The polluter who causes an impact has clearly defined responsibilities: unnecessary impacts should be avoided, other impacts have to be mitigated, and compensation measures have to be implemented for impacts which cannot be mitigated.

However, the term compensation must be seen as a strictly legal one since from a scientific point of view a complete compensation is not possible.

The intention of the impact mitigation principle is the making good of an impact within the bounds of what is feasible.

Nearly similar to the formulation of the impact mitigation principle the German EIA Act (§6 (3) 3.) demands to describe the measures to avoid, reduce and mitigate environmental damages, and also to describe the compensatory measures of nonmitigatable impacts on nature and landscape.

This explains why there is a large conformity as regards content and methods between EIA and the impact mitigation principle. So in practical work on projects where an EIA has to be carried out the examinations which are demanded by the impact mitigation principle become part of the environmental impact examination.

The consequence of the conformity of the two instruments is the fact that the valuation principles and methods which have been developed in correlation to the impact mitigation principle and other instruments of nature conservation and landscape planning are now also used in the EIA or better EIS. In my opinion this leads to a higher

Table 1. Goals of Nature Conservation and Landscape Management

Federal Law of Nature Protection and Landscape Management (announced in 1987)

§ 1 Goals of Nature Conservation and Landscape Management

(1) Nature and landscape in populated and unpopulated areas are to be protected, maintained and developed so that:

1. the capacity of the landscape to perform its essential functions,
2. the usability of the natural resources,
3. the plant and animal kingdom and
4. the variety, special characteristics and beauty of nature and landscape

are to be preserved in an enduring way to function as a source of life for man and as a provision for his recreation in nature and landscape.

quality of the environmental impact analysis, because these methods are based on a special kind of modelling nature and the environment.

There are at least two fields in German EIA, where methods and valuation principles of landscape planning and mitigation principle are (can be) used:

1. Identification and evaluation of the present environment.
2. Evaluation of mitigation and compensation.

II. Identification and Evaluation of the Present Environment

The goal of the German nature conservation legislation is not in the first place the protection of the natural factors soil, water, air and flora/fauna but the conservation and developing of the capacity of the nature and landscape to perform their essential functions (Table 1).

Following the aim of the nature conservation act, the landscape planning methods deal with a special kind of modelling nature and the environment. Not the ecological factors (soil, water, air etc.) themselves are evaluated, but the ecological functions of the landscape, which are based on the ecological factors.

So to identify the present environment in the EIA-process one question which has to be answered is : What is the concrete capacity of the landscape or, in other words, which Landscape Potentials are realized.

Accordingly, Landscape Potential is defined as

qualities of nature or capacity of the landscape which are necessary as the natural foundation of life (Bierhals, 1978). They have to be evaluated based on human measurement and goals. The term "landscape potential" has to be used in a broad sense. It means material benefits from water and soil as well as immaterial qualities, suitability for recreation and nature experience. Even plants and animals which have the innate right to live, independent of utility and yield, are ultimately evaluated by a man-made scale. Also the number and kind of landscape potentials to be protected against impacts are not only depending on the provisions nature, but also on human needs and demands.

In Table 2~6 you find the landscape potentials, which are normally identified and evaluated in landscape planning and now frequently also in environmental impact assessments. For the most part the potentials can be divided into several partial functions, which should be all separately identified and evaluated.

In addition to the description of the potentials and the partial functions in Table 2~6 those indicators are enumerated which are most important for distinguishing the separate landscape potentials (Bierhals, 1978, Marks et al., 1989, Kiemstedt, 1992). Different methods for the evaluation of the separate partial functions, sometimes imply other indicators. Beyond this, the separate indicators have a different weight in the various methods.

In a particular case it may be convenient to subdivide the partial functions once more as is

Table 2. Characteristics of the Species and Ecotop Potential

Species and Ecotop Potential
Capacity of the landscape for the maintainance, management and restoration <ul style="list-style-type: none"> - of living processes - of biotic diversity and complexity - and the stability of ecosystems
Indicators : <ul style="list-style-type: none"> - diversity of plants and animals(number of species, biodiversity) - closeness of vegetation to natural vegetation(degree of naturalness of vegetation) - rareness of species → Red Lists

Table 3. Characteristics of the Recreation Potential

Recreation Potential
Capacity of the landscape for recreation based on qualities of the landscape image
Indicators : <ul style="list-style-type: none"> - diversity of landscape structure - closeness to nature - identity

Table 4. Characteristics of the Climatic Potential

Climatic Potential
Capacity of the landscape for climatic improvements, such as <ul style="list-style-type: none"> ◦ particle filtration ◦ moderation of temperature extremes ◦ increase of humidity ◦ improvement of air circulation
Indicators : <ul style="list-style-type: none"> - structure and kind of vegetation - topography(gradient of slope) - distribution of temperature

Table 5. Characteristics of the Water Potential

Water Potential
Capacity of the landscape to supply usable surface and ground water <ul style="list-style-type: none"> ◦ recharge of ground water ◦ retention of water in the landscape ◦ filtration of water pollutants
Indicators : <ul style="list-style-type: none"> - amount and distribution of precipitation - soil texture - gradient of slope - kind of vegetation

Table 6. Characteristic of the Biotic Yield Potential

Biotic Yield Potential	
Capacity of the landscape for	
<ul style="list-style-type: none"> ◦ sustained production of biomass, esp. in agriculture and forest ◦ erosion prevention ◦ decomposition of organic substances 	
Indicators :	<ul style="list-style-type: none"> - soil texture and soil types - amount and distribution of precipitation - gradient of slope - kind of vegetation of agriculture production

Table 7. Differentiated preparation of the landscape function filtration of water pollution(Scharpf et al., 1992)

Filtration of Water Pollution	
partial functions/ parameter	indicators
mechanical filtration - water permeability - share of self draining pores	<ul style="list-style-type: none"> - soil texture and organic matter - length of filtration stretch - climatic water balance
physical and chemical filtration - absorption capacity	<ul style="list-style-type: none"> - soil texture and organic matter - length of filtration stretch
filtration of heavy metals	<ul style="list-style-type: none"> - pH value - content of soil organic matter - content of clay
decomposition of organic substances	<ul style="list-style-type: none"> - soil texture - climatic water balance - depth of ventilation

shown in the example of the function filtration of water pollution in Table 7.

with the help of the so-called Potential Approach several natural factors can be evaluated with regard to their importance for performing one special function. In this way a lot of the alternating effects of environmental impacts can be identified and evaluated, as demanded by the German EIA act.

So what does this indicate for the prediction and the assessment of environmental impacts?

The federal conservation act defines an impact as "an alteration of the form and use of areas which causes the capacity of the landscape to perform its essential functions and the scenic value of the landscape in a significant and lasting way" (§ 8 BNatSchG).

So to assess an environmental impact in EIA, it has to be determined, how the capacity of landscape towards the identified function will change. For this, first the change of the different indicators has to be predicted and then they have to be evaluated with regard to the several landscape functions.

III. Evaluation of Mitigation and Compensation

As I have already explained, the German EIA act (§ 6 (3) 3.) demands to describe and evaluate the measures to mitigate and compensate the environmental damages.

When the environmental impacts have been predicted and assessed in the explained way

("Potential Approach") it has to be asked with the help of which measures the environmental damages could be compensated. That means of which kind should the measures be, where should they take place and what extent should they have.

Generally the compensatory measures should restore all essential functions of the landscape which have been damaged—if at all possible in the same kind, in the same region and to the same extent.

However the practical use of the impact mitigation principle and the EIA shows that there are a lot of problems in dealing with these demands. Even though the environmental impacts and damages may be very similar, the compensatory measures which have been demanded by the environmental governments are very different. Especially on the part of the initiators of the impacts this unequal treatment often causes insecurity. This dissatisfaction leads to a call for accurate methods and principles of evaluation of compensatory methods.

For a few years now several formal quantitative evaluation systems have been developed in the states of the Federal Republic of Germany. These systems shall help to find more accurate ways to determine the kind and extent of the necessary compensatory measures in particular cases. At the same time, the steps necessary to evaluate the impact shall be structured and made more transparent to reach more objectivity and security in terms of the administration procedure.

The systems developed and used in the different states of the FRG are all based on a similar methodical model (compare diagram 1, Peters, 1993). By means of fixed evaluation criteria the ecological situation without the impacts is compared with the predicted situation with the impacts. Thus the decrease in value caused by the impact can be found out. This decrease in value will now be multiplied with the size of the concerning areas. This abstract amount has to be balanced with the amount which can be calculated within the predicted increase of value and size of area resulting from the compensatory measures.

The formal quantitative evaluation systems are

based on the assumption that the compensation measures are adequate if the increase in value resulting from the the measures is as high as the decrease in value resulting from the environmental impact of the project.

Summarizing, the following demands have to be made on formal quantitative evaluation procedures:

- the landscape potentials and ecological functions have to be identified, evaluated und balanced as differentiated as possible
- the amalgamation of values should only be carried out within the separate landscape functions
- the environmental damages and compensatory measures should only be balanced within the same landscape functions
- balancing the value and the extent of areas must be function-specific.

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