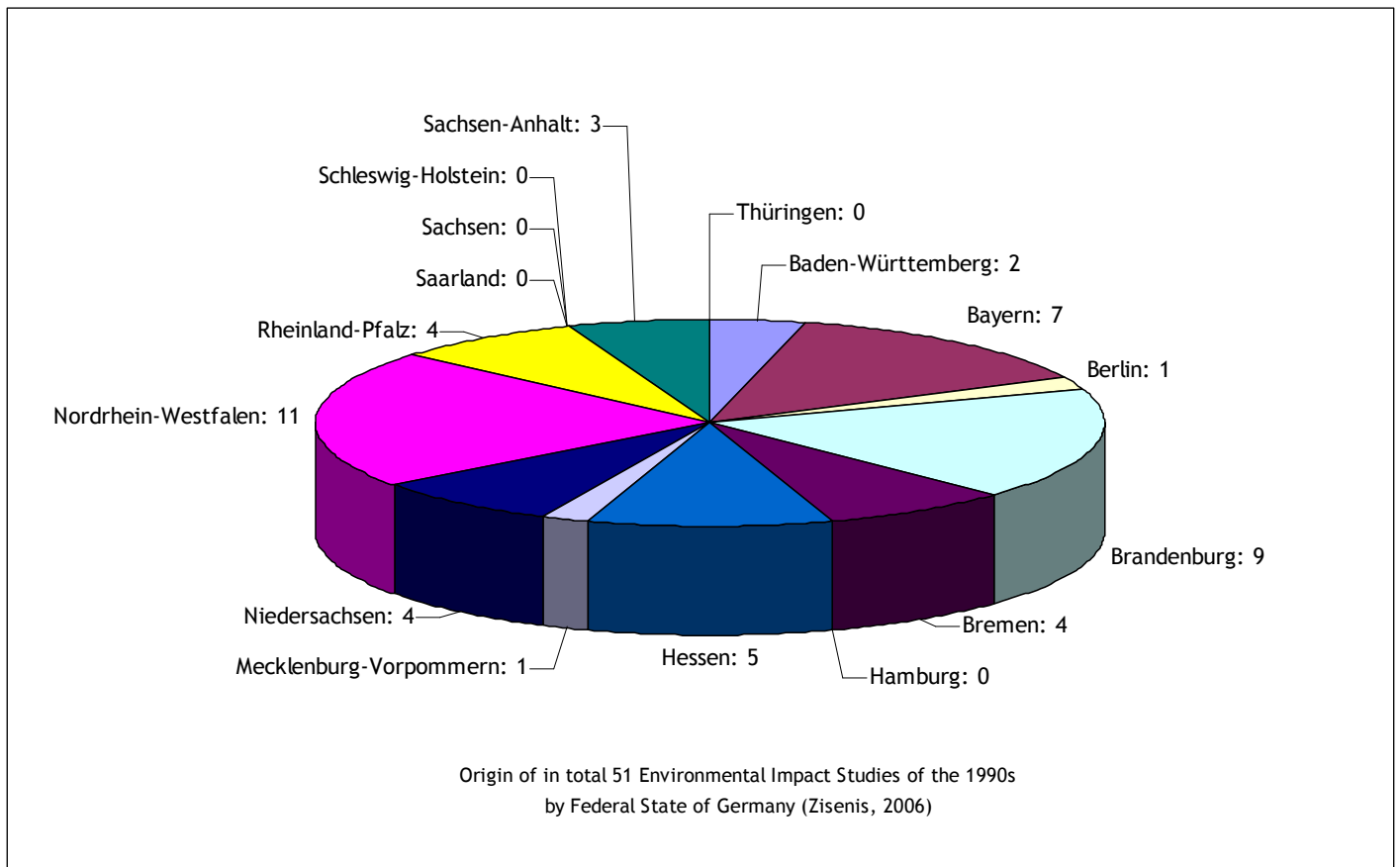




A critical analysis of the quality of Environmental Impact Studies in Germany



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Introduction

Nature conservation in the modern sense is an integrated spatial planning process of all demands of our society (Zisenis, 1998, 2005, 2006). People and the environment are closely connected and depending on each other. We need to make decisions with an impact on nature and landscapes every day, especially in planning processes and project evaluations. The society itself decides how it wants to develop the future of our nature and landscapes as a result of more or less democratic processes. Clear decisions are required, which are not only determined by scientific facts, but are results of public debates of the different values of nature and landscapes in our societies.

However, there are several different evaluation systems applied for evaluations of nature and landscapes in Germany in practice, which cause different results of the same subject (Dierßen, 1999; Runge et al., 1999). So far, there are no methodical guidelines for the selection of evaluation criteria, value relations, and scales (Müssner et al., 2002). Several authors conclude the general need of specific minimum requirements and conventions of practical methods of evaluations of the environment (Dierßen and Reck, 1998; Bernotat et al., 1999; Plachter et al., 2002; Appel-Kummer et al., 2003; Jessel, 2003). On the other hand, there are grave implementation and acceptance problems of environmental measures in Germany (e.g. Beirat für Naturschutz und Landschaftspflege, 1997; Stoll, 1999; Der Rat von Sachverständigen für Umweltfragen, 2002; Stoll-Kleemann, 2002). Social sciences and humanities are considered to be underrepresented in evaluations of the environment, which are mainly based on natural sciences (Kruse-Graumann, 1997; Schramm, 1999; Erdmann, 2002; Theobald, 2003).

There is a necessity of an interdisciplinary exchange between natural sciences and humanities (Kals, 1996). Scientific evaluations of nature and landscapes are based on values and norms according to conventions, which cannot directly be verified by methods of natural sciences (Dierßen, 1993). Currently there has no general evaluation method been developed, which integrates comprehensively and equally natural sciences, as well as, humanities to reflect all demands of the society and the value of nature and landscapes on their own. Moreover, there is no interdisciplinary evaluation method, which systematically and clearly allows applying the various commonly used criteria for evaluations of nature and landscapes to certain values. Despite the different scientific disciplines of certain values have very well developed their own survey and analysis methods.

The precautionary concept of nature conservation in practical planning procedures and project decisions is theoretically most comprehensively expressed in Environmental Impact Studies (EIS) to evaluate and to minimize impacts on the environment. Project orientated Environmental Impact Assessments (EIA) and planning focused Strategic Environmental Assessments (SEA) in Germany intend to cover impacts on the human being, including human health, the fauna, flora, and biological diversity, soil, water, air, climate, and landscapes, cultural heritage, and other material goods, as well as, the interactions between the mentioned protected goods. In addition, they have to be carried out under participation of the public according to § 2 paragraph 1 of the German Environmental Impact Assessment Act (Bundesministerium der Justiz, 2005).

The following study shall reveal a tendency to which extent EIA in Germany consider the different values of the environment for our society and on its own, as well as, to which degree a selected amount of common evaluation criteria is used. Furthermore, the research shall prove, whether German EIS provide the minimum quality of general and ecological components of evaluations.

1. Methods

1.1 Surveyed database

After an exemplary pre-study, 51 Environmental Impact Studies (EIS) (Table 1) were selected by chance for examination of a representative sample of 145 EIS from different Federal States in Germany dating from the 1990s (Wende, 2001; 2002).

This smaller research sample is statistically not representative any more, but it shall reveal a clear tendency of EIS in Germany in practice. Therefore, the 51 EIS were surveyed according to their qualitative and quantitative consideration of the different values of nature and landscapes and a condensed amount of commonly used criteria of an interdisciplinary evaluation framework (Zisenis, 1998, 2005, 2006) by using ordinal evaluation classes (Table 2).

This interdisciplinary evaluation framework allows comprehensive, transparent, and comparable evaluations of the biotic and abiotic parts of nature and landscapes in urban and rural areas (Table 3). Therefore, its components are used as indicators of the quality of the surveyed 51 EIS. However, the quality of the applied condensed amount of evaluation criteria revealed as being too low. Therefore, the intention to use these criteria in the EIS was surveyed instead of their practical application in quality and quantity to gather significant application differences between them.

Project type	Number	Relative amount
Military facilities	0	(0 %)
„Ambient environmental quality projects“ ¹	2	(3.9 %)
Nuclear power facilities	0	(0 %)
Facilities for the deposition of nuclear wastes	0	(0 %)
„Waste disposal“	1	(2.0 %)
Sewage treatment facilities	0	(0 %)
„Waterways, expansion of waterways, dikes, etc.“	10	(19.6 %)
„Open cast mining“	5	(9.8 %)
„Road construction“	13	(25.5 %)
„Railroad installations“	1	(2.0 %)
Research facilities (also traffic)	0	(0 %)
„Tramways, subways“	3	(5.9 %)
Airports	0	(0 %)
„Facilities defined in the Land Consolidation Directive“	4	(7.8 %)
„Holiday villages, hotels, recreational facilities“	6	(11.8 %)
„Pipelines“	1	(2.0 %)
Magnetic railways	0	(0 %)
„Power supply lines“	3	(5.9 %)
„Industrial, shopping, and service centres“	2	(3.9 %)
Construction and land use planning	0	(0 %)
Others	0	(0 %)
Total:	51	(100 %)

Table 1: Absolute and relative amount of different project types of the 51 Environmental Impact Studies of Federal States in Germany¹

Ordinal classifications of the selected evaluations	
Degree of application	Classification marks
Extensively	5
A lot	4
Moderate	3
Low	2
Very little	1
Invaluable	

Table 2: Ordinal classification classes of the selected evaluations of nature and landscapes (Zisenis, 2006)

¹ Classification names in inverted commas according to the definition and English translation by Wende (Wende, 2002).

Moreover, a range of relevant general and ecological components was investigated for a qualitative methodological analysis to which extend they are applied in the 51 EIS (Table 4).

Thus, 41 variables (values, criteria, general and ecological components) of the 51 EIS were examined, i.e. the empirical data is based on 2091 single classifications in total. There was about one hour necessary at an average to survey each of the 51 EIS. Apart from the numerical ordinal classification of the quantitative application of the 41 variables, a verbal-argumentative methodological approach is used to present the qualitative results of the survey and analysis parts of the investigation. This methodological approach allows clearly and transparent distinguishing the different qualitative aspects of the 51 EIS, and prevents to reduce the information or even to mix up different aspects in a purely schematic presentation as often found in the investigated EIS itself.

Values of nature and landscapes	
<ul style="list-style-type: none"> • ethical 	<ul style="list-style-type: none"> • economic • psychological • culture-historical • social • educational • scientific
Condensed criteria	
<ul style="list-style-type: none"> • rarity and endangerment • typicalness • vulnerability • usability 	<ul style="list-style-type: none"> • naturalness/degree of human impacts • re-establishment ability • ecological functions

Table 3: The different values and condensed criteria for interdisciplinary evaluations of nature and landscapes (Zisenis, 1998, 2005, 2006)

General components	Ecological components
<ul style="list-style-type: none"> • verbal-argumentative • mathematical • participative • separated parts of survey, analysis, and evaluation • pre-studies • reference scales • model guidelines • functional relations • visualizations • alternatives • future projections • public relations • encouraged actions • interdisciplinary professions 	<ul style="list-style-type: none"> • (meta-) population sizes • (meta-) population fluctuations • minimum areas • development times • dynamic processes • keystone species • indicator species • habitat structures and qualities • trophic levels and interactions • genetic base • monitoring data • abiotic resources • current land use

Table 4: General and ecological components investigated in the research of 51 Environmental Impact Assessments in Germany of the 1990s

2. Results

2.1 Values and criteria

There is a tendency that EIS in Germany mostly focus on ethical and psychological values of the environment. Ethical values are not expressed directly, but it can be assumed that they are intended to be considered, for instance, when rare and endangered habitats and species are mentioned or impacts on the human being shall be minimized.

However, psychological values are mainly limited to landscape scenery and recreation. Economic values do not play a significant role in EIS in Germany either. Very rarely, there is a rough estimation of the profitability of the private project investment, but no calculation of the public short-term and long-term costs. Culture-historical values are almost exclusively concentrated on mentioning historical monuments protected by the cultural-heritage laws of the different Federal States of Germany, but culture-historical land uses are neglected. Very little studies briefly mark the benefits for the employment market of the particular project as the only expression of social values. Moreover, educational and scientific values are not considered at all in the EIS (Figure 1).

Most common criteria for assessments of environmental impacts in Germany tend to be rarity and endangerment, naturalness/degree of human impacts, vulnerability, ecological functions, and usability. However, typicalness and even less re-establishment ability of environmental elements are hardly considered. In particular, rarity and endangerment are almost only applied by using Red Data lists of species and habitats. Naturalness/degree of human impacts is just referred to historical occurrence of species, but not to natural distributions under current circumstances. Moreover, there is no clear concept of spatial and time related model guidelines for determining historical naturalness (Figure 2).

The criterion vulnerability dominates many EIS, but without sufficiently analysing and evaluating the particular impacts of the project on the environment in quantity and quality. Ecological functions are mostly limited to general qualitative descriptions without quantifying them and only very briefly considering their interactions. Usability is of high importance for EIS, but it reveals only rough estimations of area sizes of different

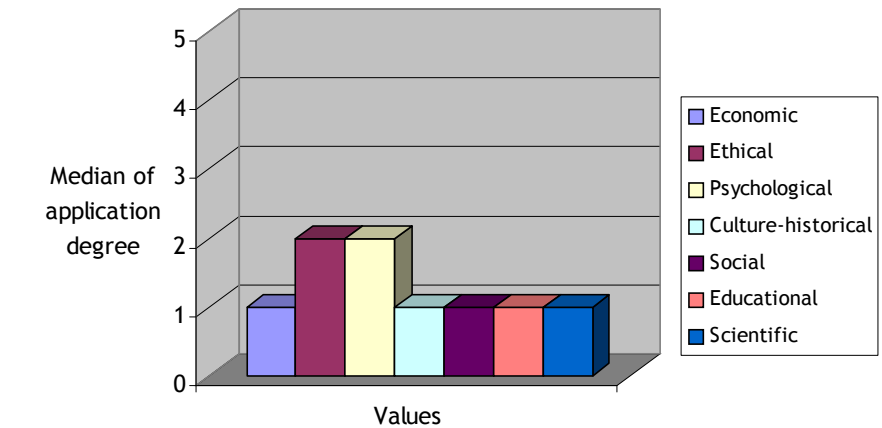


Fig. 1: Median of the classified application degree of values in 51 Environmental Impact Studies of Federal States in Germany (Zisenis, 2006)

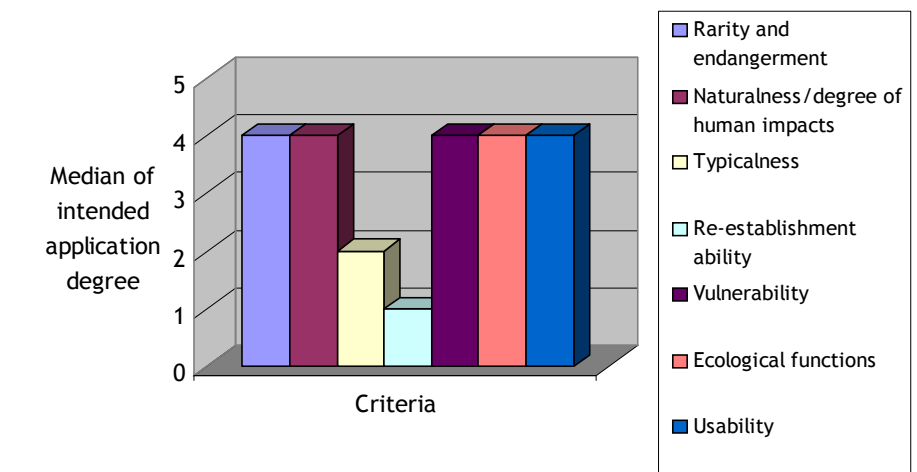


Fig. 2: Median of the classified intended application degree of criteria in 51 Environmental Impact Studies of Federal States in Germany (Zisenis, 2006)

land uses. Typicalness is superficially and often unrelated applied to some abiotic and biotic components, but it does not provide us with information on a sufficient scale for evaluations. Also, re-establishment ability is just schematically applied for some habitat developments, but it does not tell us, if it would be possible and how long it would take to get similar specified conditions of the environment in the particular case.

2.2 General components

Verbal-argumentative parts of the EIS tend to dominate mathematical calculations, but they do not allow concluding concrete measures, because they are too general and schematic. Thereby, a high content of descriptions in the survey part is not equally reflected in the analysis and even less in the evaluation part. Furthermore, survey, analysis, and evaluation parts are biased due to a lack of participation processes of the public to gather information and to contribute to the evaluation results. Analysis and evaluation parts are mixed together as a signal for the unclear evaluation guidelines. Pre-studies have almost not been carried out to determine the necessary qualitative and quantitative survey efforts. Very few reference scales have been used for some abiotic impacts on human health. The EIS are almost entirely missing model guidelines as a basis, which ought to be developed in co-operation with the public. Functional relations of biotic and abiotic components are just superficially explored (Figure 3).

In addition, the applied visualizations are not sufficient to experience and to understand the conditions of the environment of the particular area, and to imagine future changes, because they are mainly limited to maps and diagrams, instead of using all media. Moreover, alternatives to reject the project for other higher values do not play a role in nearly all cases. Future projections and encouraged actions are also rather limited to the established insufficient legal standards of the German Environmental Impact Assessment Act. They seem to be only cosmetics of the impacts of the undertaken projects due to their superficial scientific and participatory basis. Public relations have almost not been applied in the EIS. Therefore, project implementation deficits and resistances of the public indirectly and directly concerned become very likely. Just 26 of the 51 EIS have noted the profession of the authors. These 26 EIS indicate different professions to a low extend, almost exclusively restricted to natural sciences (Figure 4).

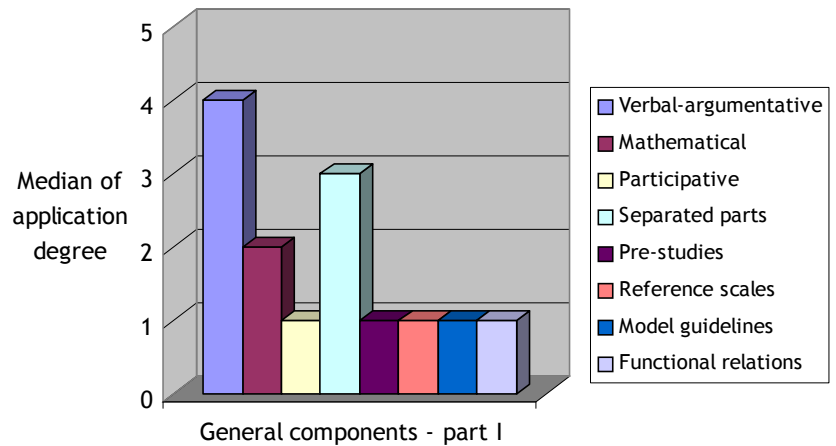


Fig. 3. Median of the classified application degree of general components in 51 Environmental Impact Studies of Federal States in Germany - part I (Zisenis, 2006)

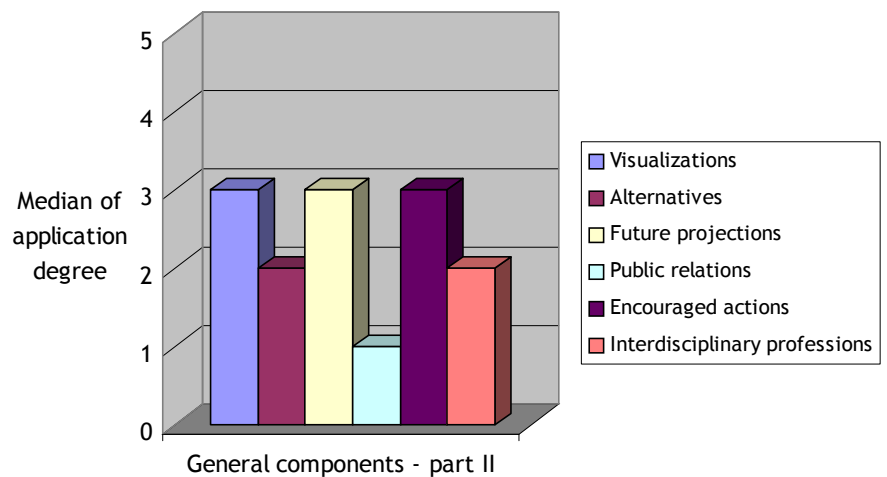


Fig. 4. Median of the classified application degree of general components in 51 Environmental Impact Studies of Federal States in Germany - part II (Zisenis, 2006)

2.3 Ecological issues

The EIS reveal the tendency that biological components are almost not considered for evaluations of the environment in Germany. There are mainly general assumptions of habitat values based on flora and vegetation surveys and habitat type mappings. The EIS do not allow statements of the living conditions, structures and developments of animal species and their (meta-) populations, because they generally lack of quantitative, as well as, monitoring data for developing or applying reference scales. Flora and vegetation surveys include quantitative data by density, but there is no analysis and evaluation on (meta-) population level.

Moreover, trophic levels and interactions of fauna and flora stay unclear, as well as, mostly their relations to the human species are unrevealed. In general, the different biodiversity levels are indistinct and not examined. Genetic aspects have not yet been part of the EIS. Very little monitoring data has been applied in the EIS, if so, just for abiotic resources. Abiotic resources are generally considered to a low extend, mostly in the survey part, but less in the analysis and the evaluation part, respectively. As an exception, current land use has been surveyed, analysed, and evaluated a lot, but just quantitatively by mapping, not qualitatively by sociological methods. However, interactions between biotic components and abiotic resources, as well as, the human species have not particularly been investigated (Figure 5).

(Meta-) population sizes of species have been determined to a very little extend, almost exclusively in the survey part of flora and vegetation densities to determine plant communities. (Meta-) population fluctuations were not considered, as well as, minimum areas have been of almost no importance for the surveyed EIS. The latter refers to all abiotic, as well as, biotic components. Dynamic processes and development times are nearly out of consideration. Also, the concept of keystone species was not applied. Indicator species appear especially in the survey part, but it is generally unclear for which particular condition of the area concerned they might indicate a certain qualitative and quantitative value of the environment (Figure 6).

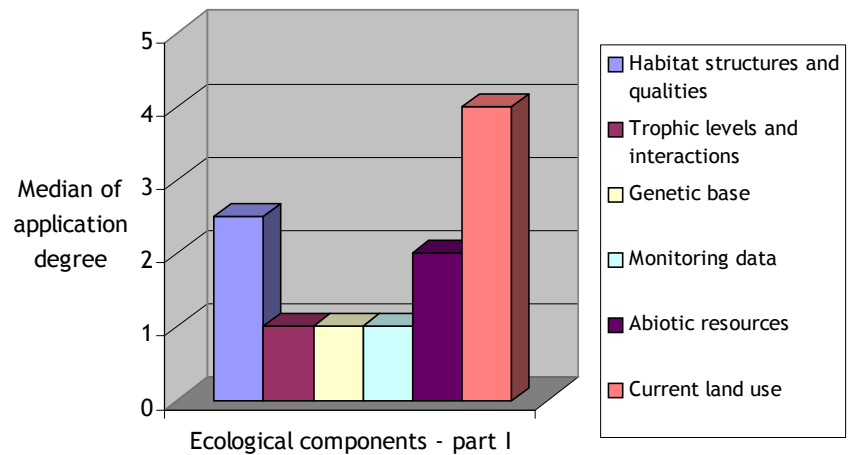


Fig. 5: Median of the classified application degree of ecological components in 51 Environmental Impact Studies of Federal States in Germany - part I (Zisenis, 2006)

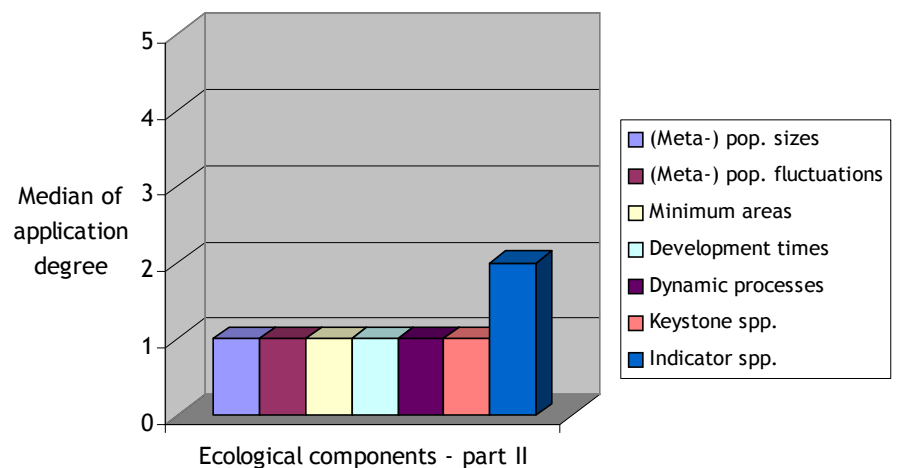


Fig. 6: Median of the classified application degree of ecological components in 51 Environmental Impact Studies of Federal States in Germany - part II (Zisenis, 2006)

3. Discussion

EIS in Germany tend to apply to a very limited extend the mentioned criteria to analyse and to evaluate circumstances and relations of the environment in practice. There is above all a connection missing with their leading background of the different values of the environment, but also with reference scales, model guidelines, functional relations, and dynamic processes. Moreover, the criteria are commonly mislead as values themselves. Each author seems to select and to apply the criteria more or less how he/she wants, apart from some rather limited specified requirements according to § 1 of the German Federal Nature Conservation Act (Bundesministerium der Justiz, 2002).

Economic values are just of importance for rough estimations of the economic benefit of the particular project of the investor. Ethical values seem to be of importance for the rest, apart from some psychological values reduced to landscape scenery and recreational uses. Culture-historical, social, educational, and scientific values, respectively, are almost not represented. It becomes apparent that humanities do not sufficiently participate in the evaluation process in Germany. This is no wonder, because the reporting authors originate from natural sciences, and they are directly entrusted and paid by the investors, who are interested to limit impeding and cost-intensive influences of the EIS.

The examined EIS leave especially unclear, how the different values are weighed up against each other, which should be a normal and necessary process of evaluations of the environment. The red line between measurements, determining criteria, and their leading values has not been drawn. It becomes obvious that is necessary to establish a comprehensive evaluation system that relates the criteria with the different survey parts in accordance with the leading values.

4. Conclusions

EIS in Germany are essentially missing a comprehensive evaluation system to integrate all demands of our society for an interdisciplinary assessment approach to the environment. For practical planning decisions, there is a comparable and transparent evaluation system of the different values necessary, which are

applied by the same condensed criteria (Figure 7).

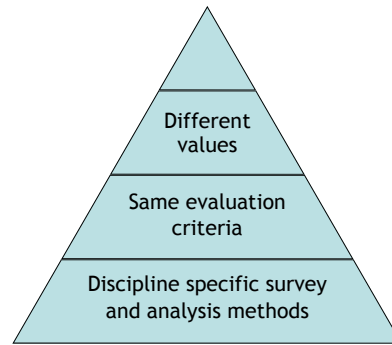


Fig. 7: Levels of interdisciplinary evaluations of the environment (Zisenis, 2005, 2006)

A comprehensive assessment of the environment should involve an interdisciplinary team of scientists. Each discipline must develop its own appropriate methods to measure their value part of the environment based on the same framework of values and criteria to be comparable and comprehensive. Contradictory values and criteria must then be weighed up against each other for political decisions and practical implementations.

Nevertheless, already the selection of comprehensive values and criteria for their measurement is subjectively determined (cf. Schröder, 1996; Schröder et al., 1998). In addition, socialization,

personal experience, and education of the evaluator itself influence the evaluation (cf. Poschmann et al., 1998) as much as economic and other dependences. Therefore, a crucial part of evaluations of the environment needs to consist of participation methods to involve directly and indirectly the public concerned in the survey, analysis, and decision process (cf. Petts 1999, Stoll 1999). Participation processes are essential to gather important information, to provide a legitimated base of the subjective evaluation process, and to establish support for implementations of evaluation consequences. The interdisciplinary evaluation framework allows integrating the different demands, life-situations, and backgrounds of people by systematically considering the different values of the environment to the human being and on their own.

Public consciousness of environmental protection of nature and landscapes has significantly fallen in Germany after reunification in 1990 until recent years (Empacher et al., 2002; Kuckartz et al., 2006) of a former leading country, while unemployment has become the most important feature in public awareness (cf. Haaf, 1997). Nowadays, the four most important problems of German inhabitants are first of all unemployment (63%), then far behind environmental protection (25%), social aspects/justice (20%), and the economic situation (16%) according to a representative survey in 2006 (Figure 8).

Environmental consciousness in Germany 2006

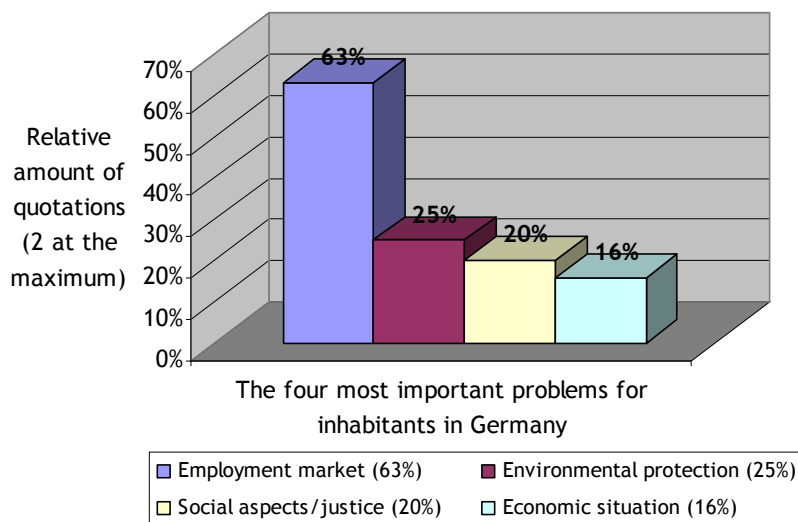


Fig. 8: The four most important problems for inhabitants in Germany in 2006 (adapted from Kuckartz et al., 2006)

An interdisciplinary evaluation of nature and landscapes can help to overcome the mentioned grave implementation and acceptance problems (e.g. Beirat für Naturschutz und Landschaftspflege, 1997; Stoll, 1999; Der Rat von Sachverständigen für Umweltfragen, 2002; Stoll-Kleemann, 2002). It is the author's hope of this research to contribute with a framework of comprehensive values and condensed criteria to this development.

5. Abstract

Several criteria and measurement methods are used for Environmental Impact Assessments in Germany. On the other hand, there are grave implementation and acceptance problems of environmental measures in practice. Therefore, 51 Environmental Impact Studies (EIS) have been investigated from different Federal States in Germany dating from the 1990s to which extend they cover the different values of the environment for people and on its own, as well as, which criteria are commonly used for evaluations. However, it turned out that the examined EIS lack of minimum general and ecological quality aspects. In conclusion, EIS in Germany are essentially missing a comprehensive evaluation system to integrate all demands of our society and the value of the environment on its own. The author provides such a necessary framework of different values and condensed criteria for interdisciplinary evaluations of our environment.

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