

**An integrated model of a decision making basis for  
environmental impact assessment (EIA)  
of transport infrastructure investments**

by

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## **1 INTRODUCTION.**

For an increasing number of legal systems, Environmental Impact Assessment (EIA) is an obligatory and central part of planning and decision-making of important transport infrastructure investments. (E.g. Nijkamp & Blaas 1994, Lamure 1992, Lee & Lewis 1991, OECD 1994, Therivel 1993.) The ambitions with this instrument have been enormous. It has been introduced in order to make possible the reliable assessment of the total effect of a project on both non-human nature and people. However, the EIAs so far carried out are much more restricted as to their ability to yield a sufficient and satisfactory basis for environmentally sustainable decision-making on transport infrastructure investments. Among the shortcomings, the following four issues are of particular importance.

Firstly, current EIAs lack the interdisciplinarity necessary for a comprehensive analysis and assessment of the expected impact on man and nature. In particular, the exclusive focus on technical indicators gives little room for the contributions of the social sciences and humanities and for the non-scientific, but still highly relevant experiences of ordinary people. Secondly, to the extent that soft values (e.g. psychological factors and ethical issues) are taken into consideration, they are usually disregarded in the final assessment due to their incompatibility with “hard” scientific data. This incompatibility is also pronounced in other assessment procedures such as SIA, TA, PA and EMAS. Thirdly, there is a widespread disagreement on the nature and range of environmental problems. While people may share a particular terminology and rhetoric, methods and goals can still be quite different due to basic disagreements on how to perceive and experience the world. Fourthly, there are different suggestions as to the role of the public in planning and decision-making. It has been largely ignored that these issues are decisive also for the material questions at stake and their ethically acceptability.

On the basis of these problems, an integrated model for impact assessment is needed. Such model must be based partly on conceptual analysis, partly on empirical evidence. For empirical research, new methodological instruments should be considered, such as “phenomenological experiments”, to serve the demands on integrative modelling.

In this paper, a discussion of methodological issues is central. It will focus on the substitution of quantitative data with qualitative, existential considerations and on the nature of phenomenological experiments and their significance for integrative assessment procedures. Next, the vital role of the public has to be established. Finally, a new model for impact assessment is outlined which is designed to solve the compatibility problem between soft and hard scientific data and ordinary experiences. The proposed model is also constructed to deal with cultural differences in our perception and handling of environmental problems.

## **2 THE TRANSFORMATION OF QUANTITATIVE INTO QUALITATIVE, NORMATIVE RESEARCH.**

The attempt to avoid subjective, non-controllable statements and to secure uniformity in method and comparability of data has given quantitative research a central place in science. Social science has largely assimilated objectives and techniques from natural science and

made it a specific goal to transform qualitative information into hard-core data, programming the computer to process these data in an algorithmic way. Questionnaires, interviews and observational results are given mathematical expression in statistics, geometric models and tables.

Transport and environmental research and planning is heavily relying on quantitative analysis too, which is particularly manifest in impact assessment, cost-benefit analyses, economic research and technical planning. It is the intention of this paper to question this use of quantitative data and methods, in particular in relation to impact assessment of physical transport infrastructure (although the following discussion may hold true in other fields of research as well). A basic assumption in this paper is the fact that quantitative analysis suppresses important normative features and prevents meaningful integrative analysis. By “meaningful integrative analysis” I mean analysis which yields practical knowledge suitable to decision-making, which implies (1) that the decision-basis is inherently normative and (2) that different technical languages are translated into discourse language which is trans-sectoral and related to concrete contexts of existential meaning. I shall shortly explain the character and implications of these demands.

(1) The demand that knowledge in order to be practical has to be “inherently normative” means that one’s investigation must reflect the challenges given with the interaction between human and other natural beings. No social and natural circumstances are “neutral” in character. To the contrary, they challenge a moral being insofar such a being has the capacity to respond more or less adequately to a given challenge. For example, the description of a traffic accident can never be “neutral with respect to responsibility”, as occasionally claimed (e.g. Schofer et al. 1995, 317). A proper description of such an incident, i.e. a description which has practical significance, must use value-laden concepts, such as “careless drivers”, “unattentive cyclist” and cannot be reduced to pure physical and causal descriptions without loss of meaning. The careless driver and unattentive cyclist constitute a challenge to which “response-able” people have to respond in a way which may be characterised as more or less adequate. This normative language is also necessarily constitutive of an environmental discourse. “Pollution” is a normative concept indispensable for environmental analysis and cannot be substituted without considerable loss of meaning and loss of practical significance. Impact assessment presupposes a qualitative description of the particular normative character of impact which makes an investigation situative and interpretative. (Cf. Denzin and Lincoln 1994, 2-4.)

(2) The demand on trans-sectoral, integrative research implies that any appropriate investigation must find a proper discourse language which is able to function as a common denominator of basic existential concerns. This means, unless it reveals the nature of actual challenges within a context of complex interaction of demanding natural beings in an integrative way, the language is unfit for practical research. Fortunately, ecology, economy, engineering science, geography, sociology, biology and ethics share a common concern for the well-functioning of living beings and natural systems which motivates and directs their research and forms the basis of interpretation. However, this concern for life and well-being is more often about statistical relations than about real-life or existential matters. Practical knowledge as searched for in transport and environmental research must be based on a common normative denominator which reflects a true existential concern. It is the idea of the model for impact assessment proposed below to elaborate such a denominator as common guiding principle.

The turn to qualitative, normative analysis is motivated by the following considerations. Firstly, while avoiding dependence on particular researchers and on the situational constraints that shape inquiry, quantitative research is explicitly designed in abstraction from the social, subjective and contextual features. In this respect its approach aims at value-freeness and objectivity. However, for research aiming at practical knowledge, the abstraction from social, subjective and contextual features in the name of objectivity is unwarranted (Bastian & Schreiber 1994, 367). In qualitative, normative research, objectivity is redefined as the participatory grasping of concrete interactions. To this purpose I shall recommend the use of so-called “phenomenological experiments”. (See below.)

Secondly, although in particular social scientists are very creative in transforming qualitative information into numerical data, there are numerous cases where this strategy has to be given up. For environmental research, Goudie observed that “primary impacts give rise to a myriad of successive repercussions throughout the ecosystems which may be impracticable to trace and monitor. Quantitative cause-and-effect relationships can [therefore] seldom be established” (Goudie 1986, 294). Moreover, though the valuation of people’s life or health can be expressed in market prices on the basis of insurance amounts, these valuations will never reflect the true moral feelings and perceptions of those who are affected. If we regard life and health conditions as unvaluable, those existential questions cannot be integrated into quantitative evaluation models at all. Another example is the estimation of people’s attitudes to the establishment of traffic-intensive, arterial roads. Neither willingness-to-pay approaches nor cost-risk-benefit analyses will ever reflect the significance and actual impact of a road and road traffic on actual people affected. Only those feelings and other subjective features will normally be taken into account in an impact assessment which fit pre-given, rational standards. Thus, focusing on quantifiable data will exclude at least some, and probably the most important features from investigation and any assessment on this basis is very likely to be insufficient.

Thirdly, the recent focus on threshold values raises problems not only related to the question of whether it is possible at all to identify objective natural limits for environmental load, but also problems of their actual practical effect. In general, it can be claimed that the legitimate exploitation of threshold values is hardly compatible with a cautious environmental strategy.

To avoid these problems related to quantitative research, only qualitative, normative models have a chance to promote sustainable solutions. (Cf. also Bastian & Schreiber 1994, 38)

### **3 THE ROLE AND NATURE OF PHENOMENOLOGICAL EXPERIMENTS IN IMPACT ASSESSMENT.**

To gain *integrative* knowledge, new trans-disciplinary methods have to be considered. Various theories have been proposed to back up qualitative research. The present approach is based on a combination and qualification of in particular three of these methodologies: phenomenology, ethnomethodology and participatory research.

Phenomenology explicates how objects and experiences are meaningfully constituted and communicated in the world of everyday life. (Holstein & Gubrium 1994, p.264) Phenomenologists have been reluctant to present particular methods for use in practical research. Phenomenology is regarded to be a theory of knowledge. However, any theory of knowledge has methodological implications. Basically, phenomenology makes use of audiotaped conversations, but also written anecdotes of personal experiences. Other sources of phenomenological research are poetry, art (including photography and drawings) and phenomenological literature (i.e. analyses of basic social phenomena such as confidence, love and responsibility). The aim of ethnomethodology is not to provide causal explanations of patterned behaviour, but to describe how members recognise, describe and account for the order of their everyday lives. Participatory research includes participation observation and action research, which is based on the living experiences of other people and the researchers' normative commitment in connection with particular case studies. Its aim is ultimately the transformation of social practices. (Reason 1994; Atkinson & Hammersley 1994)

The combination of ethnomethodological descriptions, participation observation, action research and phenomenological analysis provide the framework of *phenomenological experiments*.

Experiments are at the core of any scientific enterprise. The function of experiments is partly the corroboration and falsification of theories, partly the prognosis of single data. Not all experiments aim, however, at the determination of laws of nature and other causal phenomena. They may just be concerned with the characteristic of single, unique events and they may show the possibility of particular behavioural changes without committing to statements about outcome probabilities. In this sense they contribute to what has been called a phenomenological description. Making people familiar with particular scenes or events by the help of "phenomenological descriptions" (which partly are based on phenomenological experiments) is motivating and contributes to the change of social practices. Phenomenological descriptions yield practical knowledge of particular contexts of action.

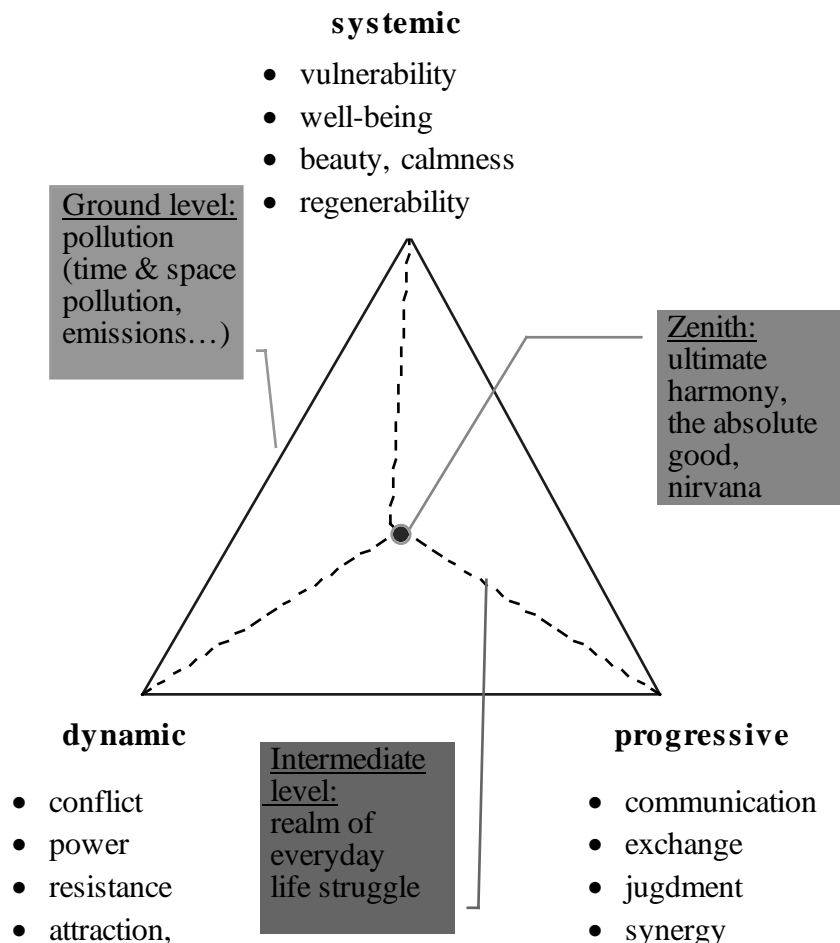
The aim of phenomenological experiments is to provide experiences which motivate behavioural changes (or confirm and strengthen those attitudes and practices which already are largely in agreement with the particular experiences). These changes are changes of the participants or - through phenomenological descriptions - of other actors. Phenomenological experiments are designed to involve both mental and bodily functions, i.e. they try to comprehend the participant as an interactive being, whose behavioural features cannot be reduced to observational data or subjective representations. Performing phenomenological experiments, the investigator has to involve himself in the experiential situation of the investigated agent and use a wide range of methodological approaches to secure a comprehensive data collection. Actually, he has to share the experiences of the testee. Probably, the most appropriate way to register and present these shared experiences will not be by tables and numbers, but by making *committed* and *committing* descriptions of the phenomenal experiences.

The role and nature of phenomenological experiments is to provide comprehensive knowledge of particular normative facts. Phenomenological experiments and phenomenological descriptions form part of a knowledgebase which includes, besides what

might be called “knowledge of special experiences” (German: “Erfahrungswissen”), “knowledge of everyday experiences” (German: “Alltagswissen”) and “scientific knowledge” (German: “ExpertInnenwissen”). With increasing public participation the knowledge of everyday and special experiences obtain increasing significance. (Rüede et al. 1997.)

Beyond the effect on future behavioural patterns of individual actors, there is a need for aggregating results for the purpose of project and plan assessment. This may be done in several ways. Rüede et al. (1997) have developed an interpretation framework which takes its departure in four different perception functions (valuing, anticipating, relating, establishing facts) and two types of attitudes (introverted, extroverted).

Another approach would be to identify basic categories of references which function as common denominators of fundamental life conditions (conditions of co-existence) across scientific terminologies and ordinary language. This approach will be followed here. Fig.1 identifies three aspects of basic life conditions within a pollution - non-pollution framework. Impact assessment has to give up the focus on a few measurable indicators in favour of an effort in struggling pollution in relation to the triad aspects of life conditions.



**Fig.1: Basic existential referents in impact assessment**

On the basis of this interpretation scheme, a projects or plans impact on natural phenomena (including man and society) could be assessed with extensive involvement of the public.

#### **4 PUBLIC PARTICIPATION IN IMPACT ASSESSMENTS.**

This last aspect is important because it is generally stated that the public should be involved to some reasonable degree in the discussion of projects and plans requiring Impact Assessment. (E.g. Elling & Nielsen 1996, EIA Centre 1995.) Although it is repeatedly emphasised that this should take place as early as possible, it has not been claimed that the process should be open for the public in *all* its phases, nor that it should be *governed and controlled* by the public. The focus on conditions of co-existence, however, gives these latter demands a profound importance. Moreover, as far as transport infrastructure is concerned, the consumer perspective has to be subordinated a citizen perspective. The relevant question is not what can society and nature provide for the individual consumer, but rather what are the adequate conditions for citizens to involve in socially and naturally responsible behaviour.

With the focus on public governance of Impact Assessment procedures, demands on participants must be strengthened. At least, two related demands must be made:

(1) Because public participation is related to plans and projects of *public* interest, the most relevant arguments and statements will be those which express common concerns (citizen perspective). This will exclude most instances of nimbyism. In other words, particular interests (consumer interests) have to be subordinated to public interests (citizens interests, shared goals, "the common good").

(2) Public participation is not a non-obligating, purely verbal activity, but a social process with corresponding duties and obligations. Therefore, a demand on participation in impact assessment procedures must be the willingness and commitment of individual agents (citizens) to share experiences, to face particular challenges with an open mind, to respond in a for moral agents adequate and optimal way and to take responsibility for decisions made.

When many survey studies have to face the problem of serious clashes between expressed opinions and actual behaviour, the primary reason for this is the lack of obligations. It is free to express opinions which do not commit to particular behaviour. Therefore, we need empirical studies which have built-in commitments (sanctions).

At least two models could formally satisfy these criteria.

Most popular is the social discourse model which allows access of all citizens but demands the observance of certain rational criteria for what counts as legitimate and significant contributions. Habermas' thought that the best arguments should prevail is typical for this kind of approach. (See e.g. Khisty 1996.) Another model may sort out lack of competences from the very beginning and demand of social discourses that only qualified citizens, e.g. certain experienced, informed and committing people, have actual access to planning and decision procedures. In both models it should be claimed that what must govern the discussions is not the desire of balancing interests and achieving viable compromises, but

the will to reach the right solution to what is identified as the common good. This implies a real synthesis of available competences.

The competences necessary to make assessments and to recommend solutions are primarily moral competences. Moral competences grow with degree and intensity of direct interhuman and man-nature relationships. To the extent people's interactions are (technologically or institutionally) mediated, however, moral judgments are likely to be distorted and may over time degenerate. This is the case where we communicate through computers, laws, cars or within separate traffic lines. (See Zeitler 1997 and Bastian & Schreiber 1994, 384.) Systemic mediation (institutions, technology) is also responsible for time pollution which particularly threatens the time-demanding activities of moral judgments.

It is part of a strategy for impact assessment that complementary steps are taken to promote a policy which develops moral capacities. The success of public participation is dependent on the successful development of moral capacities on the basis of shared experiences. To share social experiences and a communality with non-human nature is an important condition of perceiving the common good and feeling obliged to its attainment. To prevent the danger of "over-planning" (Engwicht 1997), the process has to be open, but must commit the participants.

## **5 IMPACT ASSESSMENT - ABOUT CHECKLISTS AND THEIR INTEGRATION INTO A COMPREHENSIVE MODEL FOR IMPACT ASSESSMENT.**

A usual way of making impact assessments is by formulation checklists, numerically listed or put into tables for use of cross-checking. Checklists for EIA usually include social matters such as the impact of a plan or policy on employment or communal and private services. The question of what to include in those checklists and how to evaluate the actual data is essential for the significance and reliability of the model.

From the point of view of the citizen, his co-existential conditions include features of his social and natural context and those particular features which characterise his actual situation at any time. Therefore, general threshold values are probably of little significance for him. For example, a noise expert declaring noise levels from rural roads under 55 dB as acceptable, makes no significant statement in those cases where one's reason for moving to the rural residential area is its peacefulness. It makes no difference to the residents whether the noise level in their area would rise to 45dB or 55dB because in both cases their main motiv for living in the rural area would be removed (Juslen 1997).

The point of reference for any impact assessment is the particular condition of concrete inter-human and man-nature relationships. Any change in physical infrastructure will affect human and non-human beings. For a comprehensive and proper assessment of this impact the particular circumstances have to be evaluated in relation to any affected moral subject (human beings, animals, plants, ecosystems, etc.). The proper criterion for such an evaluation are not quantitative measures (environmental load, threshold values, etc.), but decisions based on a fundamental respect for the moral status of the affected beings and systems and their particular co-existential conditions. The only judge in this connection are morally competent agents who perform a moral decision on the basis of informed and



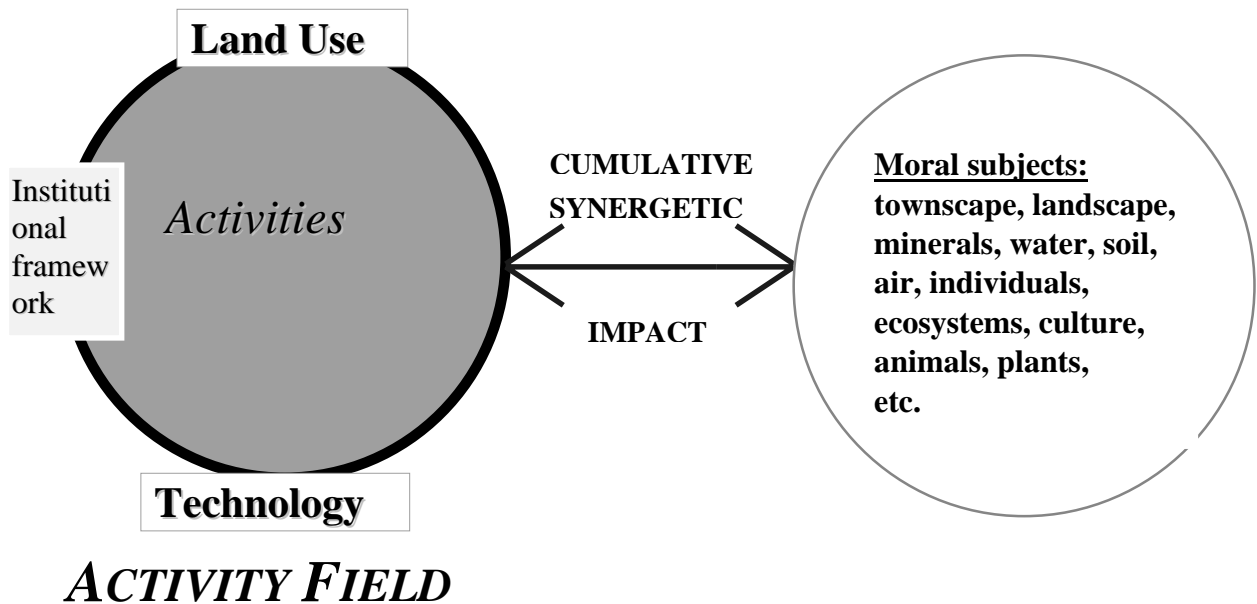
sensitive interactions and shared experiences. The use of qualitative measures means that assessment comes closer to the essential problems and their complexity and ensures a relatively open decision basis and extensive public participation (Elling & Nielsen 1996, 74).

## **6 MODEL FOR IMPACT ASSESSMENT AND ASSESSMENT RULES.**

The major criterion for Impact Assessment is impact on conditions of co-existence (e.g. Sukopp & Wittig 1993, 356), including the moral competences essential for successful symbiotic behaviour. As a general rule impacts have to be evaluated in relation to the question whether the activity concerned makes it possible or prevents moral agents from making proper, i.e. responsible decisions. Any physical infrastructure, technology or any other particular measure which forces people to act in morally reprehensibly ways has to be assessed negatively. Negative impacts can also be termed “pollutive”. “*Pollution*” is just another word for the negative impact on conditions of co-existence or, what is literally the same, for the impairment of capacities of moral judgment.

By focusing on *co-existence* and not just existence, I shall exclude short-sighted, individual want-satisfactions which do not pay attention to their social and natural contexts. The important thing is not to protect each individuals separate rights and interests, but to recognise the symbiotic context of any being as the natural starting-point for analysis. It is assumed that any human or other individual can only be identified and respected, if it/she/he is not unduly abstracted from its/her/his life context. When we insist on somebody’s right to a good environment, the problem is not the well-being or survival of the single individual, but a disturbed or distorted relationship between so-called rights-holder and other co-existing beings. The focus on cross-checking within impact assessment lists has exactly this function. However, these lists don’t work satisfactorily as long as different terminologies block out comparative analysis. Therefore, we need existential referents as listed in table 1.

Below fig.2 is a graphical representation of the general structure of impact assessment, applicable to assessments of projects, plans and strategies. Tab.1 explains the elements of impact assessment in detail. It must be observed that environmental issues and social issues, human and non-human concerns are integrated into this scheme and no priority rules are given. Tab.2 describes general assessment rules and the specification of the extent to which the public is involved in this process.



**Fig.2: General model of impact assessment**

The sources of impact consist of activities which are located within an activity field. The activities and their impact are determined by the particular technology and the character of the landscape, the latter makes a differentiated view on land use necessary. Impacts can be distinguished according to their particular character (see types of impact below) and to their effect on particular moral subjects.

Activity Field	Typical Land Use
Transport	Rural Landscape
Recreation	Townscape/Streetscape
Work	Waterscape, Airscape
Other “stationary” activities	Housing

**Tab.1a: Activity field and typical land use.**

<b>Technology</b>	<b>Institutional framework</b>
Highspeed/Lowspeed technology Hightech	Law Social institutions (family, household, marriage, democratic decision-making practices, etc.
Mediumtech	Political institutions
Lowtech	Economic mechanisms
Institutionalisation, Organisation	Labour market

**Tab.1b: Technology as mediator and typical institutional framework.**

<b>Types of Negative Impact: Pollution</b>
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Noise  
Smell / Odour  
Particle Emission  
Time Pollution  
Space Pollution  
Light / Darkness  
Resource Deterioration / Exhaustion  
Ugliness  
Exchange impairment  
Non-vigorous development  
Impairment of power and sensibility

**Tab.1c: Types of negative impact / forms of pollution.**

Impacts are relative in meaning, significance and extent to the particular *moral subjects* and their circumstances. For centuries it has been an uncontested assumption in modern liberal society to reserve the status of moral subjects to human beings and that of moral agents to a subclass of humanity, namely rational, experienced people.

However recently, not only beyond moderne Western culture, but also as a result of critical reflection within that culture, this classical anthropocentric attitude has been repeatedly challenged. Considering the impact of our activities, Nature (not only human nature) has been awarded the status of moral relevance. Environmental impacts are not only impact of significance for human well-being and survival, but have some kind of moral importance of its own. It is now largely accepted that certain animals, plants and landscapes as well as urban heritages and natural resources should be preserved not only for present and future human societies, but partly also for their own sake and without identifiable utility effect. As a consequence, the class of moral subjects should be kept as open as possible.

Clearly, the way a human being fulfills its role as moral subject is quite different from the way a particular animal, plant, a ecosystem or substance should be treated. Accordingly,

the impact of a particular pollutive phenomenon (e.g. noise or darkness) is different among different moral subjects. A few remarks may illustrate this point.

Living beings (humans, animals, plants, etc.) respond naturally to given challenges. Their “response-ability”, however, is quite different and thus our expectations to them - which form the basis of complaints - must be relative to their particular capacities. To treat specific natural phenomena inadequately, i.e. to impose an impact on them which affects them adversely, means to neglect their particular nature or capacities, or, in other words, to impair their ability to respond properly to various challenges. Examples are the impairment of the moral judgement of human beings, the prevention of domestic animals to use and develop their natural instincts (e.g. scraping of hens, etc.), the transgression of the carrying capacity of an ecosystem, the weakening of the resistance of organisms, etc. In impact assessment, the crucial question, therefore, is to whether any plan or project is likely to affect the capacities of natural phenomena (man included) to respond properly to present and future challenges.

Although the extension of the status of moral subjects to other natural beings is still far from being universally accepted, its line of reasoning is at least conceivable. This is not necessarily the case with moral subjects like “landscape”, “townscape”, “water”, “soil” or “cultural heritage”. How can a *landscape* be a moral subject? A piece of nature is said to be a “landscape”, if we take it as a sensory experience without any utility function. The piece of nature imposes an impression on us which is not purely subjective but originates from the interaction between the human agent and the particular natural phenomenon called “landscape”. Landscape is the total sensory impression of some piece of nature which is aroused in a sensitive human being. (Hellpach 1950, 107). This means that for other natural beings, the character of a landscape may be less important or not important at all or have a quite different meaning. Therefore, assessing the impact of any plan or project on landscape involves primarily the careful investigation of the empowering interaction between beings with aesthetic and other sensory capabilities and a particular segment of natural phenomena. To the extent the sensory and related capacities of co-existing individuals is adversely affected by man-made changes of the landscape, these impacts on the landscape should - from a moral point of view - be avoided. In this case, the landscape is not an independent moral subject, but is defined contextually as a dynamic relation between a human, sensitive agent and another specified natural phenomenon. The beauty of a landscape (which is said should be morally preserved) is not an objective quality of a piece of nature, but its potential to create a perception of beauty in certain sensitive beings.

In relation to human beings, the impairment of moral judgment is crucial in impact assessment. It threatens one of our most vital capacities as responsible human agents and prevents future responsible decisions. Therefore, a general guiding idea in any impact assessment procedure is to raise the question whether the activity concerned has a negative impact on our capacity to act as morally responsible beings. Having this in mind, we may formulate the following *Assessment Rules*, for short called **SPEAK-PRO**, where SPEAK is concerned with the major steps in Impact Assessment and PRO deals with the involvement of the public in this process.

<b>Assessment Rules</b>	<b>SPEAK</b>
<b>S</b> creening and scoping. Preliminary overview and classification of problems.	<b>S</b>
<b>P</b> henomenological experiments, interviews and other field work.	<b>P</b>
<b>E</b> ffect analysis. Single, cumulative and synergetic effects.	<b>E</b>
<b>A</b> evaluation of Alternatives.	<b>A</b>
<b>K</b> nocking down pollution. Countermeasures. Feedback.	<b>K</b>

<b>Public Governance</b>	<b>PRO</b>
<b>P</b> roposals. Mail boxes and audiences for the public to give comments / make proposals (as known from Quality Circles).	<b>P</b>
<b>P</b> articipation in phenomenological experiments.	
<b>R</b> eviewing different options and interpretations in fokus groups (not based on interest balancing but out of motivations to serve the common good). Open to all with qualifying motivations.	<b>R</b>
<b>O</b> mbudsman institution for decision making. Independent of political parties and interest groups. Observer and mediator. Monitor.	<b>O</b>

**Tab.2: SPEAK-PRO. Assessment rules and public governance.**

The SPEAK-rules are supposed to be performed with extensive public government. Scientific experts are involved in effect assessment (E), the formulation of viable alternatives (A) and the design of countermeasures (K). However, their contributions will be critically screened by the responsible working groups and the ombudsman and they will be asked to interpret their work in relation to basic co-existential referents. The ombudsman has as his primary function to act as mediator and to observe that the procedure adheres to the central ethical objectives of the assessment.

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