A methodology and terminology of sustainability assessment and its perspectives for rural planning

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Abstract

Sustainability may be regarded as one of the most challenging and, in the same time, most fuzzy contemporary paradigms. In the present study, referring to the history of other leading ideas, this confusion is identified as a typical feature of young paradigms with a particular danger of miss-use and destruction of the idea. Requirements necessary to save and evolve the paradigm of sustainability are identified. It is shown that help can not be expected in the phrasing of a generally accepted definition. As an alternative it is proposed to focus on the assessment procedure, where quantitative ore qualitative value measures of the paradigm are developed for particular situations.
The present study intends (1) to clarify the logic and terminology of the assessment process in general, (2) to provide an effective assessment concept for sustainability in the field of agricultural land-use, and (3) to demonstrate possible perspectives for rural planning practices.

The first part displays fundamental aspects of valuation theory. The methodology of explicit assessment is introduced and described as a heuristic procedure, evolving the meaning of a term or paradigm in a socio-cultural discourse and in relation with practical experience. In the second part, focusing on sustainability assessment, the terminology, steps and elements of the general assessment procedure are defined on behalf of the assessment of land-use sustainability as an example. The iterative procedure allows developing quantitative and / or qualitative value measures for particular situations. The central element of the method is a hierarchically structured collection of viewpoints called „checklist of criteria“. In a holistic, comprehensive approach towards sustainability (“strong” sustainability), five principal criteria are recommended for consideration: (I) a-biotic environment, (II) biotic environment including animal welfare, (III) cultural values, defined as human emotional and mental well being and creativity of society, (IV) sociology and (V) economy. To each principal criterion a hierarchical list of important sub-criteria is added. For the project-specific selection of suitable sub-criteria, guidelines are described in detail. The result is an individual assessment system adapted to the natural, cultural, political and economic basic conditions of a given project. In the third part, the example of a Swiss land-use planning project shows the implementation of the methodology in practice and its benefits – e.g., the improvement of the communication within the project, or the promotion of an effective, goal-oriented planning procedure – as a basic tool for the valuation, communication, planning, implementation and monitoring of sustainability in the field of agriculturally based land-use systems.

Keywords*:* Sustainability; Valuation methodology and terminology; Leitbild; Criteria system; Implementation procedure; Agriculture

1. Introduction

Sustainability, as an idea and as a term, has experienced a unique career. Even in the seventies, sustainability, or the German “Nachhaltigkeit” respectively, was still an exotic word, used in some

specialised disciplines. The Brundtland report (Hauff, 1987) extended the term into many different fields and disseminated it among researchers and decision makers all over the world. Over a few years, the idea has grown to a comprehensive and powerful vision.

How was this success possible? There are at least two reasons. The term expresses – or promised to express – a central experience and problem awareness of today's society, which is confronted with a world-wide, self-made destruction of nature and with the severe threat to the life conditions of their own and of future generations. At the same time, the term lacked precise shape and, therefore, was an attractive screen for the projection of a wide range of individual ideas and interests. Both reasons explain the paradox that the paradigmatic term reached an important weight in the political and cultural discourse, although characterised, at the same time, by a restricted or often missing practical applicability.

History shows that the nebulousness is characteristic during the birth of paradigms (cf. Kuhn, 1962). Moreover, a fuzzy shape seems to be a prerequisite for a wide cultural identification and distribution. The inevitable phase of un-sharpness comprises a critical danger since it promotes the term's misuse and inflation. Politics and commerce try to take advantage of the idea's charisma, as a trendy slogan for their particular interests while science and press threaten to drown the term's original intention in a flood of paper. Meanwhile, several hundred sustainability definitions coexist (Ninck, 1996), and the number of publications about the topic is growing exponentially. It seems that the vision of sustainability actually stands at the threshold of self-dissolution in arbitrariness and irrelevance on one hand, whereas on the other hand, it has the potential to become a new revolutionary socio-cultural paradigm, with the power to induce a historically unique transformation of society's behaviour towards the human and the natural environment.

If definitions are not a suitable aid for the deliverance of a paradigmatic vision, what then is required? The term "bio" or "organic" makes an illuminating example. The idea, referring to an ecologically based agriculture, appeared – in different wordings – at beginning of this century (e.g., Steiner, 1924). A little pioneer group of farmers tried to find out how it was to be understood, to be realised in practice, to be formulated, and to be put into clear rules for labelling purposes. They performed a sound dialectic process of implementation, reflection and valuation for decades in a wide range of different situations. These pioneers also succeeded in bringing their vision – in the form of a precise and differentiated concept – to public and political discussion. The sound technical fundamentals were evolved in experimentation and examination of practice, and the exchange with a broad public of experts and society. They were the essential prerequisites for the breakthrough of the idea.

At the moment, the term "sustainability" seems to go through a similar process of concretisation in several fields. Particularly in the context of production and use of energy (e.g., Wuppertal Institut, 1996), traffic (Basler et al. 1998) and with regard to saving bio-diversity (Kuhn et al., 1992; Heywood and Watson, 1995), precise concepts of assessing and implementation of sustainability have already been elaborated for defined regions and show first political successes.

One of the fields where the lack of precision is particularly obvious and the process of concretisation has just started, is that of human land use. What does sustainability of human land use, in any particular situation, mean precisely? How can it be assessed, measured, monitored, or implemented?

A number of current research projects deal with these difficult questions (e.g., van Mansvelt in this volume; FiBL, 1998; Vereijken, 1998). A central part of the research is the procedure of assessment, where for particular situations quantitative measurements are developed. The topic of assessment is subject of a large number of pragmatic as well as scientific publications, particularly in germanophone countries (e.g., ANU, 1996; Eser and Potthast, 1997) – a phenomenon comparable

with the mentioned "flood of paper" in the sustainability discussion. Each project is using different, often hardly defined terminologies, and up to now methodological fundamentals and a conceptual framework are missing (Plachter and Werner, 1998).

The present paper intends (1) to clarify the logic and terminology of the assessment process in general, (2) to provide an assessment concept for sustainability, which is suitable to bring the sustainability paradigm into concrete forms on behalf of the example of land-use systems, and (3) to improve the essential communication between experts and society, practice and theory regarding the sustainability paradigm.

The following Section 2 of the study presents a general value assessment methodology on behalf of the example of sustainability. In Section 3, a methodology of identification and assessing sustainability of land-use systems is proposed, and in Section 4 the practical use and benefit are discussed on behalf of a Swiss land-use planning project.

The paper presents the main results of a study (Bosshard et al., 1997) carried out for the Swiss Government, in close connection to an EU-concerted action described by van Mansvelt in this volume. The concept itself is based mainly on the personal experience and experimentation in a number of sustainability planning projects in Switzerland and abroad.

2. Methodological fundamentals of assessment procedures

2.1. Definition, purpose and systematic of assessment procedures

Ideas, concepts, paradigms or "Leitbilder" are translated into concrete actions by value judgements (Werturteile). If value judgements are systematised, they are called assessment procedures. Such procedures may consist of implicit and explicit elements. Predominantly implicit procedures are provided by the regular consultancy-based judgements or the widespread positivistic judgements. The latter type of judgement regards facts as values, without giving reasons for the assumption that the particular fact as such is good or bad ("naturalistic false conclusion", see e.g., Jessel, 1996), or why this and not other facts, objects or aspects of reality are selected for the valuation. For example, most often a high bio-diversity is a priori and implicitly equated with high natural value, whilst a reflection and discussion of this value judgement and why this aspect of reality is regarded so important is not reported on nor considered (see Bosshard, 1996, and 1997; Mühlenberg and Slowik, 1997).

In contrast, for assessment procedures suitable for science as well as for a democratic discourse and development, only explicit procedures can be taken into account (Wiegleb, 1997). An assessment procedure may be called an explicit one when all value related and thus subjective or, better, view point-depending steps, are indicated as such and open for discussion.

Despite the endeavours for scientific approaches, for objectivity and comprehensibility, even today most assessment procedures contain essential implicit elements. One reason might be seen in the disregarding of epistemological aspects during scientific education. With the following methodological outline of assessment procedures, the stimulation of the discussion about the reliability, task, potential and limits of science in valuation is intended.

2.2. Prerequisites for comprehensibility

A comprehensible and lucid assessment procedure, in a first approach, is based on the following three elements: (1) clear goals (see also Jessel, 1994), (2) a good knowledge of the facts underlying by the goals, and (3) an appropriate set of measurements for a sound determination of differences

between the goals and the facts. This concept, at a first glance, seems to allow a simple, linear, logical assessment procedure, in the way it is described in a good part of the assessment literature (e.g., Plachter, 1992; Bastian and Schreiber, 1994). However, the established approach neglects several important aspects (Bosshard, 1997). For example, it does not consider that neither a clear and suitable formulation of a goal, nor what might be considered as an "object" or "fact", is given at the beginning of a valuation research. Goals gradually evolve and become clarified as a result of an intensive cognitive process *during* the valuation procedure (Plachter and Werner, 1998).

Thus, "facts" and "goals", analysis and synthesis are not independent entities, rather, they are characterised by a dialectic or complementary relationship. In other words, the assessing problem appears as a typical chicken-and-egg paradox, which can not be solved by simple linear concepts (Bosshard, 1997).

A scientific method to deal with this paradox is called "heuristics", based on contributions mainly by Popper (1934) and Fleck (1935). Transposed to our task of an assessment methodology, the same approach can be called discursive paradigm development (Wiegleb, 1997). According to this concept, sustainability can't be regarded as a finished, everlasting concept or definition, but will stay in a permanent cultural evolution driven (also) by the valuation process itself. Consequently, any concept of sustainability has to respect this dynamic feature, including the socio-cultural dependence of leading moral ideas in general (Bosshard, 1997). A methodology for a heuristic assessment approach is presented in the following Section.

3. Elements and steps of an Assessment Procedure

3.1. The Assessment Tool: From guiding principles (leitbild) to value judgement

A comprehensive and explicit value judgement consists of the following nine steps a) to i). These steps are applicable for any explicit assessment or valuation procedure (Figure 1). However, the specifications and examples given in this section are particularly designated to the objective of land-use sustainability assessment and might be used, as such, as a general **tool for the assessment** of sustainability. How this tool might be implemented in a given framework of a project is described in Section 3.2.

a) A **leitbild**, also called overall guidelines, paradigm or vision, is the fundament of an explicit valuation. A leitbild is the result of a personal and/or socio-cultural "atmosphere", i.e., of a personal or social problem awareness or of moral ideas. It does not necessarily contain quantitative goal definitions, neither does it need to be regionally specified. Rather, it should outline the spirit, attitude or general viewpoints, from which a valuation will start and from which objects, facts and situations will be judged. Since man is the only being able to judge, a leitbild is closely related to a compliant perception of mankind, which has to be included explicitly into the leitbild description (details see Bosshard et al., 1997, where also a proposal for a leitbild of land-use sustainability is provided). Particularly during the last 5 years, in the German planning and nature protection literature the term „leitbild" is intensively discussed, reflecting a wide spectrum of different approaches. The concept of leitbild used here is close to that of Wiegleb (1997) or Frede and Bach (1998).

b) **Criteria**: Criteria are terms reflecting aspects of the general goals of the leitbild and can be defined as particular viewpoints, from which the continuum of reality is structured – leading to "objects" – and described. According to this concept of reality, „viewpoint", „term" and "object" are used as synonyms. A person who does not know the term „house" is not able to be aware of

and define the object "house"; instead it sees something else, for what it has got already a term. Therefore, what is called an „object", „feature" or „fact" (or better: the perception of an object and fact) depends on the knowledge of the respective term or viewpoint.

A collection of criteria has to be structured into a hierarchical tree of criteria. General criteria of the respective leitbild might be defined and analysed by several narrower viewpoints or "sub-criteria" (see Figure 2). Within the criterion "biotic environment" the sub-criteria "bio-diversity" or "singularity of species" and others can be identified, and within the example of "singularity of species", "singularity of plant species", or "beetle species" might be suitable as sub-sub-criteria, and so on. A hierarchically structured collection of potentially relevant criteria belonging to a leitbild is here called a **checklist of criteria** (Figure 2, as an example for the leitbild of land-use sustainability). The selection of the criteria suitable for a given project context leads to the so called **assessment system**. This procedure is described in Section 3.2.

c) **Goal definitions**: A criterion defines the viewpoint from which an object is to be described, but it does not yet allow for any normative judgement. For that purpose, a definition is needed for each criterion, stating which forms of the relevant feature will be appreciated as positive or negative. Thus, this step of assessment, which is often neglected or mixed with step a), leads to "partial leitbilder" related to the respective criterion, here called "goal definition". These goal definitions contain more concrete information than the original and comprehensive leitbild, but they are restricted to the small aspect of the system defined by the criterion. For example the criterion "density of roads in a landscape", is as such, non-normative. Under the principal criterion economy (see Figure 2), a goal definition may determine high-density values as desirable, while under the criterion of bio-diversity or net energy productivity of a landscape, low values may account for higher quality. The goal definitions belonging to the different criteria normally are contradictory or inconsistent to each other. It is important to notice that a settlement of possible incongruences or contradictions is not to be strived for in this phase of assessment, but only in step i) (value synthesis).

d) **System delimitations**: The step of goal definitions has, in many cases, to be followed by the determination of a spatial and/or temporal reference status. In a special context, the criterion "bio-diversity" can refer to a district or a continent; in a temporal context to a historical status a hundred years ago, or to the landscape without men's influence. The spatial and temporal delimitation of what is regarded as a system or entity to be judged, determines the result of any valuation to a more or less crucial degree. Different delimitations can even lead to opposite results (e.g., Kuiper, 1997; Mühlenberg and Slowik, 1997). In some cases, delimitations are given to a large extent by the context itself (e.g., the limit of parcels for the judgement of a cultivation method). In other cases wider scope is the more relevant. The suitability of system delimitation depends inter alia on the details needed, the project budget, the available data, the typology used, and the respective criteria.

If a comparative valuation is intended, in a next step of the assessment process, a definition has to be added, stating with what indicator (e), with what instrument (f) and on what scale (g) the degree in which the goal is reached shall be measured. Finally the translation to quantitative values needs a scale (h, standard). The steps e), f) and g) often are summarised with the term "analysis" (e.g., Usher and Erz, 1994). If quantification is not needed, e.g., for an individual farm development plan, the steps a) to d) are sufficient (qualitative assessment, c.f. Bockemühl, 1992; Colquhoun, 1997; Kuiper 1997).

e) **Indicator definitions**: The worth or functional quality of an object cannot be measured directly.

Therefore, indicators, representing the level of worth under the respective criterion and regarding the respective goal definition, are to be defined.

Indicators are criteria on a low or concrete level of the systems' hierarchy. Thus, the transition between criterion and indicator is fuzzy. The decision, at which level of the hierarchy a criterion is defined as indicator has, beside a technical rationale, a pragmatic one. The higher in the hierarchy a criterion is used as an indicator, the more costly is the analysis, and the better of the main criterion is reflected. In the mentioned example (step b) the criterion "bio-diversity" is a more comprehensive indicator than the sub-criterion "number of beetle species" for assessing the sustainability aspect of "biotic environment".

Indicators may be functional or relational. Functional indicators are related to processes. They are spatially independent in the sense that they are valuable everywhere, as far as the conditions of valuation are considered as influencing factors. An example for a functional indicator is the maximum inclination of an arable field under the criterion "erosion" of sustainable a-biotic land-use (Table 2). As far as the relevant factors like soil texture, maximum rainfall, topography of the surroundings, width of the parcel in the direction of inclination, or the kind of cultivation are known, the indicator can be defined independently of regional priorities. For functional criteria, key processes or key functions, as e.g., "closed nutrient cycles", are particularly suitable for the indirect analysis of the sustainability of any system's functions. As far as key functions are predominantly related to human activities, they can be used at the same time as indicators for and as Tools to reach the defined goal of sustainability.

In contrast to the functional indicators, relational ones have to be defined separately for each spatial and/or temporal reference system, i.e., geographic region (details e.g., in Kaule, 1986; Kuhn et al., 1992). For example, the value of a species, is different in a region where the species is native and rare, than in a region where it was introduced some decades ago and now is perhaps abundant, or where it is at the limit of its natural distribution (see e.g., Landolt, 1991).

Useful for practical reasons is the OECD's distinction between pressure (or cause), state (or condition) and response (or symptom) indicators: The criterion "erosion" can be assessed by the indicator "stability of the turf" – which is a condition for the degree of erosion. A response indicator to assess the same criterion of soil erosion could be the "colour of the river during rainfall periods", a causal one the "sheep density per area". Pressure or causal indicators provide the advantage that they can be used directly for the development of measures against undesirable progresses or situations.

Further on, it is important to realise that the same indicators can be used under different criteria. However, in most cases their meaning (indication) and measurement, that is, the next steps in the assessment procedure, are different. The presence of the grass species Festuca rubra can be used as an indicator for a high diversity in grasslands (biotic environment), as well as for the stability of the turf (erosion / soil / a-biotic environment, see Figure 2).

f) **Methodology of measuring**: Indicators can be recorded by different methods. Since the methods influence the result of an assessment study (examples in Kaule, 1986), they must be a) defined and b) adapted to the specific project situation. In a system for the valuation of nutrient poor meadows in the canton of Zürich, developed for the payment of subventions to the farmers, a list of key plants is used as indicators (Direktion der öffentlichen Bauten, 1990). These indicators be used in a comprehensive and comparable way, if the (actually lacking) definition is included, stating in which phaenological stage, by what size, number and distribution of plots, during how many years, in what number etc. the indicator species have to be recorded in the

field(s).

g) The **unit of measurement** ensues from the chosen indicator and the method chosen for measuring them. Nominal, ordinal or interval scales are possible. Qualitatively ascertained data can be treated the same way. When they are quantified, ordinal scales result; usually, the distinction of three or five grades is sufficient for practice.

h) **Standards:** In a next step, values of goodness (appreciation) are to be assigned to measurement values found, by means of a rule of transformation. Here, this rule is called standard. Standards may be simple limits, or utility functions (different types of algorithms, e.g., linear, exponential, sigmoid, or hump backed). Limiting standards possess the advantage of a simple handling, and they are used only in many certification and control systems (SNV, 1990), e.g., to designate the amount of subsidiary payments in Switzerland. In the implementation process, limiting standards can be used directly to define duties and bans (e.g., Schweizerischer Bundesrat, 1996). On the other hand, limits lack the possibility of a differentiated assessment, and little differences in the measured values might lead to opposing judgements. – An example for a hump backed relationship between measured value and value of goodness with optimal goodness values related to medium measured values, is the number of cows on a farm.

i) **Value synthesis: Finally, a delicate problem is the comparison and synthesis of the (mathematically incomparable) goodness values of the different criteria used.** The value synthesis includes the two sub-steps of normalisation of the appreciation values and of weighting of each criterion according to a given project context. A large number of different approaches has been developed, each intending to resolve the synthesis problem in an objective and comprehensible way. In many assessment systems, mathematical value matrices are used (e.g., Plachter, 1994; Hase, 1996). Andreoli and Tellarini (1998) describe an aggregation approach particularly suitable for the synthetic valuation of sustainability in an agricultural context and also suitable to deal with qualitative and quantitative data sets. The value synthesis plays a crucial role for the social acceptance of a planning procedure, because in this step conflicts or competitive relationships between the different sustainability aims (criteria) as well with the particular aims of the population concerned become obvious (Frede and Bach, 1998). New techniques like GIS and computer based scenario modelling provide new perspectives to support the process of balancing and optimising the complex aim system and to minimise social conflicts (Plachter and Werner, 1998).

The results of the mentioned EU-concerted action, as well as a review of literature, showed that many questions concerning the quantitative value assessment in sociology, aesthetics or cultural features, have not yet been solved and need intensive research (see Andreoli and Tellarini, and Kuiper, in this volume).

3.2. The elaboration of an Assessment System on behalf of the Assessment Tool

A central element in the Assessment Tool is the checklist of criteria, described in Section 3.1.b as a systematically ordered, hierarchically structured, comprehensive collection of potentially leitbild-relevant criteria. I.e., for a given leitbild it is generally valid, and it is not necessary to consider particular object- and project-features.
For sustainability of land-use, a criterion checklist was presented by van Mansvelt et al. (1997), and developed by Bosshard et al. (1997) (see overview Figure 2). Besides the criteria checklist, Bosshard et al. (1997) provided a leitbild with an epistemological background and commentary (step

a), indications, examples and literature reviews to the steps c) to h) (Section 3.1.) for each criterion, and guidelines for a project-adapted selection of criteria. In this comprehensive form, a criteria checklist may serve as a complete toolbox for sustainability projects in the field of land-use (Figure 1, left-hand side).

Particularly decisive is the step of the criterion selection (step B, Figure 1). This selection has to be closely related to the particular project situation, i.e., the kind of objects and features being found in the respective area or system, and the frame conditions of the project. The selection of a criterion is suitable if at the same time leitbild-relevance and the system-relevance is given.

In planning practice, the selection of criteria from the checklist should be elaborated and justified by a group of experts and subsequently discussed, adapted and adopted in a democratic process by the people concerned (see Güsewell and Falter, 1997). The same is true for the decisive step i) in Figure 1. The result is a refined assessment system, adapted to the specific project conditions and to the concerned people's ideas and goals. This project-specific extract of the general Assessment Tool is here referred to as **Assessment System**.

The elaboration as well as the subsequent implementation of an Assessment System normally induces a sociological and mental process of the people concerned. This process queries the suitability of all parts of the system, as well as the leitbild itself, and requires an ongoing revision of the actual assessment system. Thus a second loop of the heuristic process might be inaugurated (see Section 2).

An important conclusion of the mentioned EU-concerted action (van Mansvelt, 1997) was the insight that the assessment and implementation of sustainability needs a holistic approach. This in order to escape sectional inefficiency or contra-productivity caused by e.g., a lack of social acceptance of a one-sided ecological or nature conservation approach (see example Section 5), or by the unexpected behaviour of nature caused by focusing on economic viewpoints can only (Bätzing and Wanner, 1994). The holistic approach can be illustrated with the metaphor of a house. To serve as a house, a building needs a minimal stock of essential elements like cooking possibilities, heating installations, a waterproof roof, and so on. In the same sense the concept of sustainable land-use has to include a minimal fitting (furnishing) of viewpoints or principal criteria to be respected, if the construction is to function. Therefore, the election of criteria and the respective steps c) to i) are not completely free. According to the concept of Bosshard et al. (1997) the minimal stock of principal criteria that have to be respected for the assessment of land-use sustainability are: a-biotic environment, biotic environment, cultural values (defined as: emotional and mental well being of men and creativity of society), sociology and economy (Figure 2). The authors demand that in order to prohibit a sectional approach, from each of these principal criteria ("Main Criteria Groups", see Figure 2), a balanced set of sub-criteria has to be included into the assessment system. Thus, the necessary selection does not concern the highest hierarchical level of criteria ("Main Criteria Group") because this level has general validity, but it concerns "Main Criteria" and subsequent levels. According to Figure 2, a Main Criterion Group deduced from the leitbild of sustainable land-use is the "biotic environment". In the following hierarchy level, a Main Criterion is "organisms", followed by, e.g., the Criterion "diversity". With Daly (1991) this balanced concept of sustainability is called here a "strong" one, unlike several "weak", reductionistic concepts of sustainability, that try to identify a key problem or a principal reason for the inefficiency of a system, and then deduce the measures deemed necessary from this main reason alone (e.g., Ruh, 1997).

Summarising, the Assessment Tool with the central element of a criteria checklist fulfils three functions: first it serves as a toolbox providing suitable criteria and referring to available knowledge in

terms of the project-adapted concretisation of the criteria (steps c to h), resulting in an Assessment System; second it provides an instrument to structure and facilitate the communication among experts and between experts and concerned people while constructing as well as implementing the assessment system leading to "social sustainability"; and third it shall assure that the important sets of aspects are taken into account to warrant holism and efficiency of the Assessment System.

4. Application of the Assessment System: an example

It is shown here how the described assessment methodology can be used and in what respect it could support a successful advance in the field of rural planning. As an example, a land consolidation project on community level in the pre-alps of the canton of Zürich, Switzerland is taken (GKF-Project; details in Bosshard et al., 1996; Bosshard et al., 1997). It was running from 1993 to 1996.

4.1. The Assessment System used in the project

The project was based on a holistic, recently developed, completely new leitbild (guiding image) for sustainable land consolidation (KAM, 1993). The particular aims were

- the stimulation of labour in the region,
- the sustainable use of the landscape resources by agriculture and forestry,
- the protection and promotion of the high natural values in the region.

The principal criteria of sustainability used in the project are summarised and weighted in Table 1. The listed aspects were treated separately for agriculturally used and wooded areas; accordingly, the team of planners consisted of an agronomist, a forest engineer and an ecologist. For each of these three fields the sustainability goals have been worked out separately in a one-year discussion between the representatives of the involved governmental departments, representatives of interested NGO's, and the farmers, the district council and the engaged planning consultants. The deduction of the assessment criteria and the respective following steps (see Section 3.1.) in each field were elaborated by the consultants themselves and were not part of these discussions.

Transposed to the terminology proposed in this article, the Assessment System which resulted is given in Table 2 for the two examples of the Main Criteria Groups "I A-biotic Environment" and "II Biotic Environment". The table includes, for each criterion, also the important project phases of implementation and evaluation.

4.2. Evaluation of the success

Despite an explicitly holistic approach, ambitious sustainability goals, and a comprehensive involvement of concerned organisations and local interest groups, the project was not successful in many parts (Weiss, 1996). The – in that time not yet existing – sustainability Assessment Tool according to Section 3 could have provided an essential aid, especially in the following fields:

- Weiss (1996) identified the missing clear distinction between leitbild, goals, criteria, measures and instruments, and the inaccurate use of these conceptually fundamental terms as a main reason for the lack of success. This lack could have been avoided easily with the help of the concept proposed above.
- Weiss (1996) pointed out that the project structure splitting up agriculture, forest, nature protection and socio-economy was not suitable. The Main Criteria Groups (Figure 2) of the checklist could have been used as guideline for a more suitable, integrated project concept.

- A third main problem of the project was identified in communication, both within the leading group and between the leading group and the local population. As a member of the planning team I guess that a basic understanding – even among the strongly represented nature protection experts and representatives – took more than one year, and particularly crucial thoughts and concepts never reached clarification as would be indispensable for a fruitful discursive planning process. The assessing methodology, as described here, would have forced all participants to make clear phrasings of their individual visions – if necessary including the steps from c) onwards.
- The local population regarded the project as a vehicle for the implementation of nature protection goals, and accordingly, the general acceptance was low. A comparison of the criteria used in the project (Table 1) with the criteria checklist (Figure 2) reveals that many more than half of the used criteria and goals in the project were part of the main criteria I, II and V. Thus, aspects of human welfare, culture, sociology, but also economy had been comparatively or totally neglected. The one-sided approach damaged the above-mentioned (Section 3.2) principle of a balanced selection of the criteria and therefore was, in this case sociologically, not sustainable.

The analysis of subsequent projects where the described assessment methodology was tested, revealed two other benefits:

- The criteria checklist helped to find unconventional solutions and new project perspectives. In many cases, interdisciplinary, synergetic solutions are not realised because the experts involved are used to think in the regular terms of their own subject. So they do not realise the existence nor the feasibility of possibilities of combining different viewpoints and instruments and, thus, creating unusual complementary strategies. The checklist provides for a multidimensional mental play-field, for evolving and testing ideas, which induces creative processes.
- Finally, the use of a systematic assessment procedure guaranteed an efficient and goal-oriented approach: The use of a matrix like Table 2 forces to an explicite elaboration of each step in the assessment procedure and reveals e.g., weak or missing points.

The Assessment System is able to support the project procedure not only regarding the assessment and planning of sustainability aspects, but also during the subsequent implementation and evaluation phase. An example is given in Table 2: Each criterion is to be related to a particular implementation and evaluation/monitoring strategy. The used methodology, i.e., the systematology and terminology of implementation and evaluation, is not within the focus of this paper (see e.g., Frey and Blöchlinger, 1991; Marti and Stutz, 1993; Blab et al., 1994; Bosshard et al., 1997; Frede and Bach, 1998).

5. Conclusions

It is obvious that the recursive or heuristic approach of assessment, as described here, is related with a severe disadvantage: It is not suitable to generate a “general truth” or the “only best solution”. The approach is not “objective” and “everlasting” as scientific facts are believed or claimed to be, rather, it is depending on people involved, cultural values, and project frame conditions. Moreover, the valuation can‘t be delegated to experts since the task is not only a question of knowledge and facts, but rather the facts are a result of an attitude and of experiences which must be made, evolved and defined in a discourse within the whole society concerned.

From another point of view, this disadvantage appears as a particular advantage: the heuristic, discursive assessment approach is (more or less) independent of the existence of generally accepted moral axioms or principles, and also from the authority, quality and integrity of experts. In this sense it is basically a non-authoritative approach. Instead of “general truths” it generates “local truths”, developed out of the concrete cultural and local context, comparable with the self organising system of a plant, always displaying the species’ most suitable form according to the current conditions in its growing site.

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Tab. 1. Criteria of sustainability used in the GKF-Project. Hierarchy according to Figure 2, first and second level of criteria; underlined and bold: criteria with high relative importance in the project; bold: rather important; criteria in parentheses: only marginally included in the project.

(next page)

Project phase	Step (see Section 3.1)	Specification	Examples of Main Criteria Group I and II (see Figure 2)					
	b) Criterion selection	**MAIN CRITERIA GROUP:**	**I A-BIOTIC ENVIRONMENT**				**II BIOTIC ENVIRONMENT**	
		Main Criterion:	**A Soil**				**A Organisms**	
		Criterion:	*Chemistry*			*Depth of soil profile*	*Species diversity*	*Species jeopardizing*
Level of criterion hierarchy (cf. Fig.)		Sub-Criterion:	Nutrient status			Erosion	Species number	-
		Sub-Sub-Criterion:	Nutrient form of manure	Nutrient supply	Nutrient content of soil	Stability / presence of turf	-	-
Assessment	c) & e)	Goal and indicator definition	fR: processing of animal excrements suitable for the site adapted meadow types	fR: closed nutrient cycles or equilibr. nutrient balances	fS, fP: absence of species indicating unadapted nutrient level; dense turf	fS & fP: no visible soil patches	rS: preserve and enlarge species rich plant associations	rS: preserve sites with rare or endagered spe-cies according to regional distri-
			r=relational indicator R=indicator of reason		f=functional indicator S=indicator of symptom		P= indicator of potential /	
	d)	System delimitation	farm	farm and lot	lot	local	biotop (limits of plant associ-ation)	species, in so-me cases sub-species or types
	f)	Methodology of measuring	expert ascertained on farm	input/output analysis	cartography of meadow types and facies according to regional det.key	cartography in field	cartography of meadow types and facies according to regional det.key	inventories
	g)	Scale of measurement	storing capacity and kind of manure processing	P- and N-units	Plant species and size of open soil	size (cm^2) / width (cm) of open soil patches	meadow types and facies	number and red list status of resp. plant species
	h)	Standard	L: x months (depending on i.a. different fac-tors), ventilation of liquid manure	input ≤ export	L: regularly present/absent	L: single >1000cm^2 / regularly >10cm	U: rank of plant associations and facies	U: value classes according to number and status
				L=limit value U=utility function				
		Remarks	Well decom-posed dung is the only suitable manure for the predominant meadow types (Trisetetum)	ascertained only in critical cases (expert and farmers judgement)	potential for more intensive cultivation indicated only if lot with suitable size, topography and distance to farm	only > 60% inclination		
	i)	Priority (1>4)	2	1	1	1	1	1
Implementation	1	Presentation of the results	oral	Short written re-port with results and recommen-dations for the farmer; synthe-sis in final	Map 1:5000 of the region; specified for the single farms at request of farmer	Map 1:5000 of the region; specified for the single farms at request of farmer	Map 1:5000 of the region; specified for the single farms at request of farmer	explicite: none; implicite: biotop value map 1:5000 of the region
	2	Strategy of implementation	m, i	i, m, p	i, m	m, (i)	m, i, d, p	m, i, d, p
			b=bans d=disincentives i=incentives m=motivation and information p=(regional)					
	3	Instrument of implementation	le, e	le, e	e	e	le, ln, e	le, e
			le=existing laws and/or decrees ln=new laws or decrees e=educatio-nal offer					
	4	Level of implementation	l, F	l, F	P, F	l and/or P	P, F, L	P, F, B, L
			l=local P=parcel F=farm B=biotop L=landscape/region G=geomorphological area					
	5	Proposed activities / measures (examples)	Adaptation of infrastructure	Differentiation of cultivation intensity according to site conditions; change of lots	Differentiation of cultivation intensity according to site conditions; change of lots	Cessation of liquid manure or synthetic NPK-fertilizer input; local planting of bushes	Adaptation of cultivation: mo-wing instead of grazing, particu-lar grazing sys-tems, etc.	Adaptation of cultivation, visitor guiding to avoid perturbations
Evaluation	A	Control of ... ... penal system	none	none	none	none	yes	none
	B	... goal reaching	none	none	partly yes	none	partly yes	partly yes
	C	... effectiveness	none	none	none	none	none	none
	D	Discussion of the original leitbild / goals	none	none	yes	none	none	none

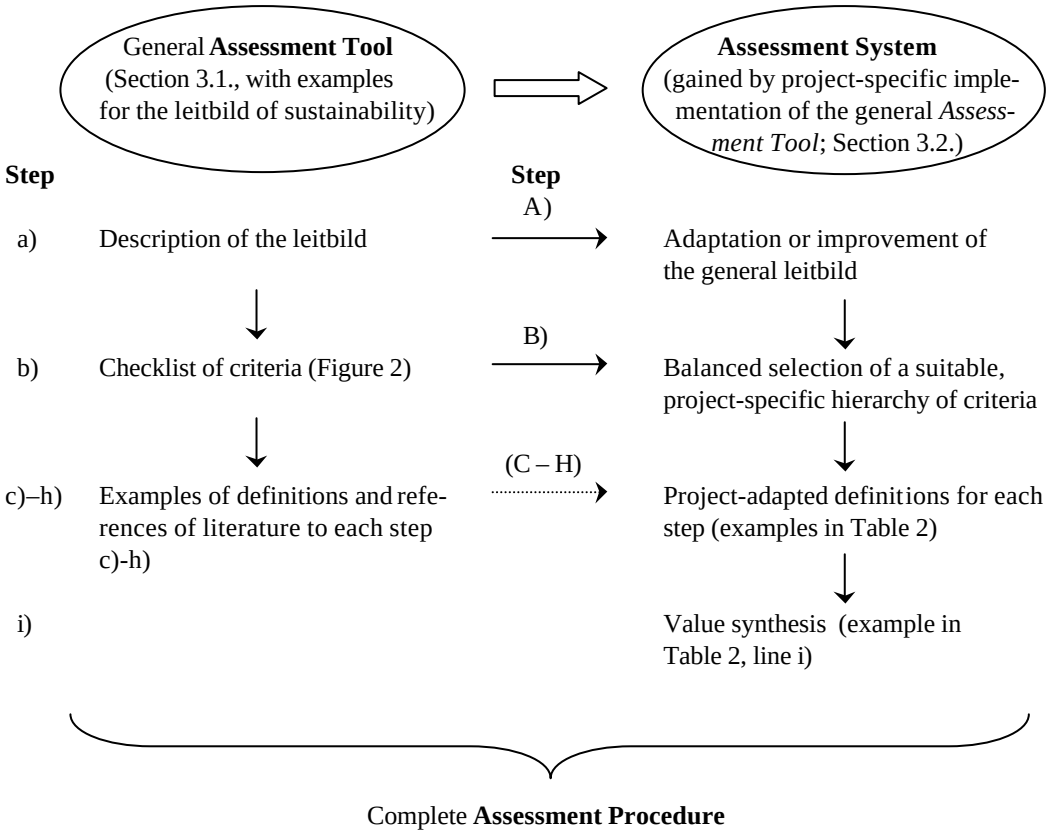

Fig. 1. The process of a comprehensive and explicit value assessment. Description of steps a) to i) see text Section 3.1.

Level of criterion hierarchy:	**MAIN CRITERIA GROUPS**	**main criteria**
	I A-biotic Environment:	A Soil
	II Biotic Environment:	A **Organisms** B **Biotops** C **Emotional well-being of animals**
	III Cultural Values:	A (Physical and emotional well-being of men) B (Art, science & religion)
	IV Sociology:	A (Reproduction & life conditions) B **Social participation**
	V Economy:	A **Productivity** C **Agriculture as regional economic base**

Tab. 2. Assessment, implementation and evaluation of sustainability by an Assessment System in the agricultural planning project "GKF": examples of the Main Criteria Groups I and II of Figure 2. Since the terminology and systematology proposed here did not yet exist during the project was running (1993 – 1996), the grouping and expressions of the table have not been used in the project.

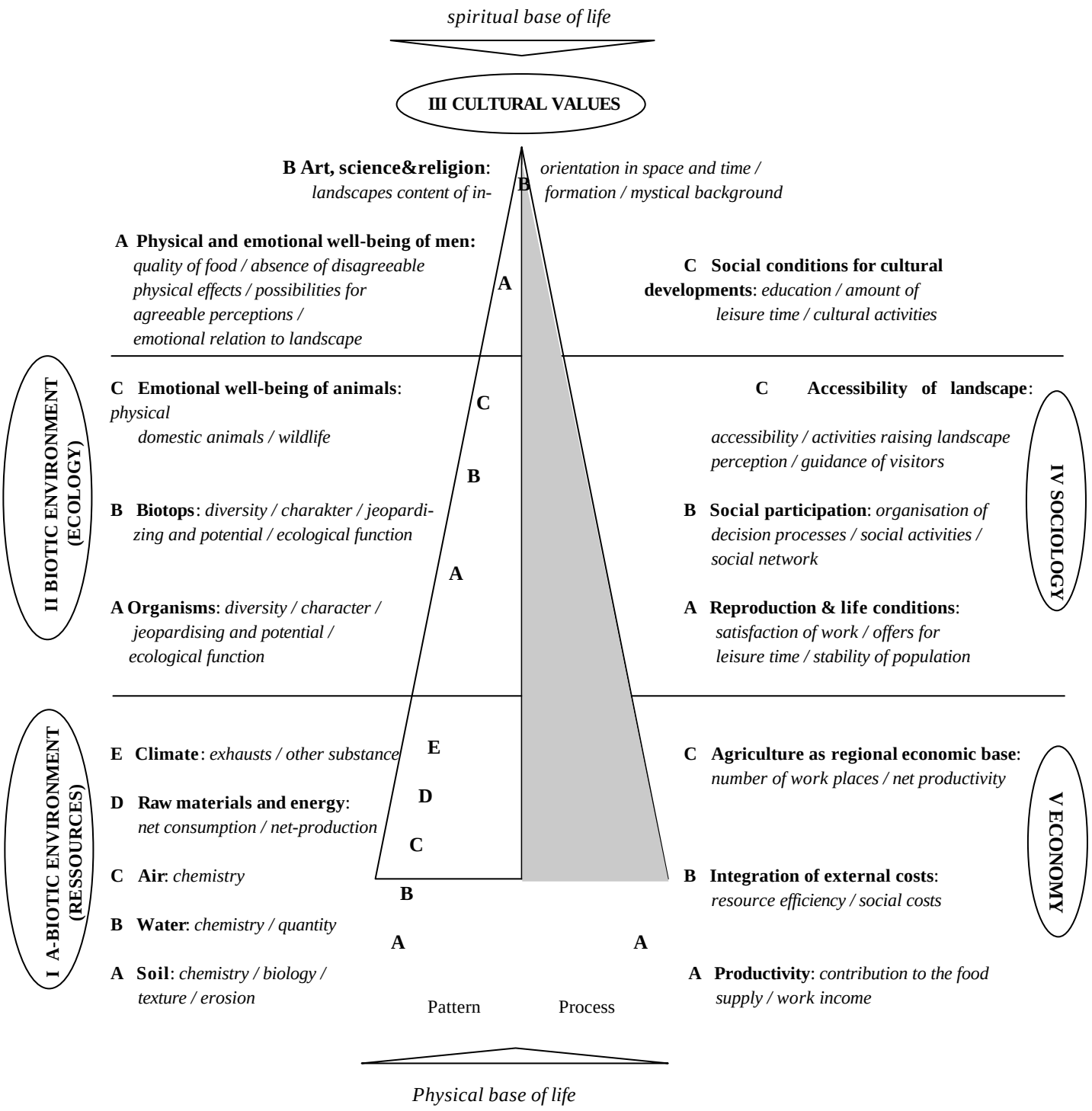

Fig. 2. Checklist of criteria for the assessment of land-use sustainability, with three levels of the criterion hierarchy: **FIRST ("MAIN CRITERIA GROUPS")**, **second ("main criteria")**, and *third* ("*criteria*") level; third level: examples only. From: Bosshard et al., 1997, and van Mansvelt, 1997, adapted.

ELEMENTE UND SCHRITTE EINER NACHVOLLZIEHBAREN NACHHALTIKGEITS-BEWERTUNG: