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Improving the quality of environmental assessments using the concept of natural capital: a case study from southern Germany

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Abstract

This paper explores how the quality of environmental assessment could be improved by using the concept of natural capital. The issues are examined by reference to golf course developments in the area between Freiburg, Germany and Basel, Switzerland. The paper evaluates the site-level environmental impact assessments statements that were undertaken prior to these developments and the related decision-making processes. The case study illustrates many of the shortcomings apparent in the EIA process when undertaken at local scales. However, it is also evident that even if such exercises had been more rigorous at the outset, they would still have been of limited value for assessing consequences in relation to policies for sustainable development. On the one hand, the nature and scale of impacts is highly dependent on subsequent management, which is often not considered during the EIA process and subsequently lies outside the regulation process. A further limitation of the assessment is that it does not take account of the consequences of the economic failure of the project, and the implications this may have for the long-term sustainable development of the area. In order to find ways to remedy these deficiencies in planning for sustainable development this paper considers how the concept of natural capital might be used to develop a more strategic focus when assessing proposals. The paper explores a particular formulation of the natural capital concept, namely the UKs *Quality of Life Capital (QoLC)* approach, and concludes by considering these ideas in relation to the 'Leitbild' concept, which is now being widely debated in the German-speaking literature. It is argued that these concepts taken together offer the basis for a more integrated and strategic assessment of development proposals.

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1. Introduction

1.1. The problem

Along with many other parts of Europe, the area between Freiburg, Germany and Basel, Switzerland

(Fig. 1) has experienced a steady growth in the number of golf courses. In 1999 there were, for example, 612 courses in Germany, with about 30 new ones opening each year (Deutscher Golfverband, 2000). In the area along the Swiss–German border, four new courses have been opened since 1997, to add to the 12 that already existed. Such developments are of interest because they provide a valuable case study that can be used to reflect upon the adequacy of current approaches to environmental assessment and an

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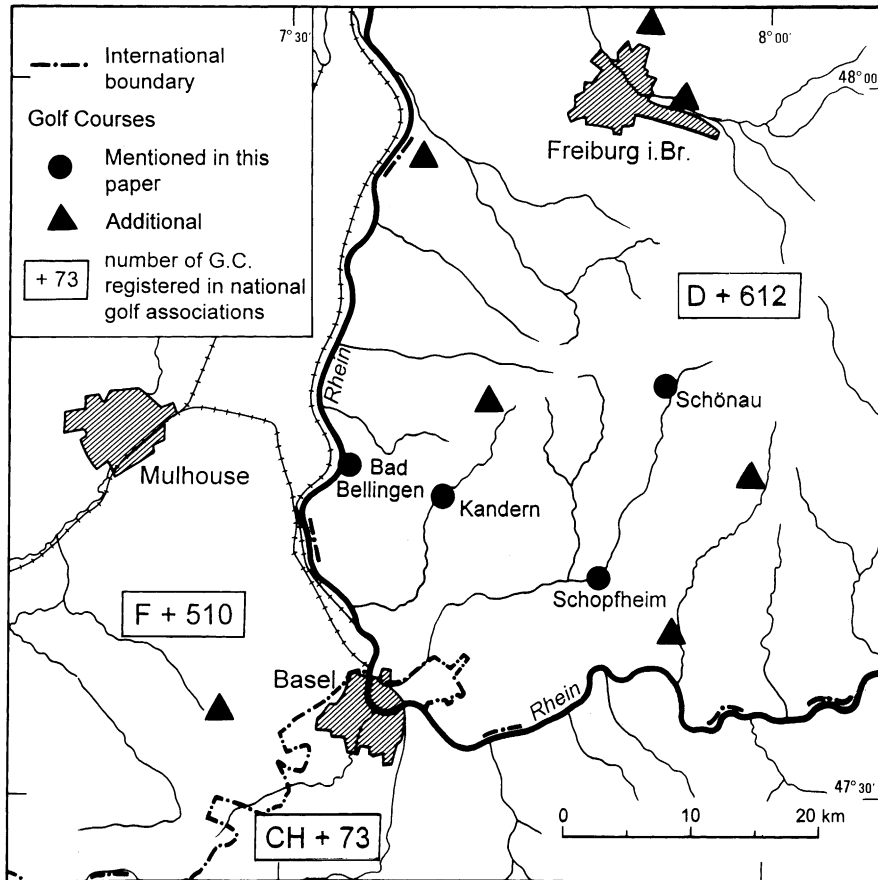


Fig. 1. Golf course developments along the Swiss–German–France Border (numbers of golf courses refer to 1st January 2000).

example of how impacts on the landscape are assessed in the context of sustainability issues. For, despite employing such assessment tools during the planning process, it is clear that overall such developments have taken place with limited regard to the long-term environmental, social or economic consequences that they might have for the area.

Although the impacts of individual golf course developments are small, when considered at the regional scale, they can collectively transform the character of an area. Individual initiatives are often justified by the benefits they bring to an area for employment and tourism. However, it is also clear that they may have significant negative impacts in both environmental and social terms. They often lead to biophysical change, including habitat modification, the introduction of new

visual elements into the landscape, and the movement and disruption of many cubic meters of soil. Such types of change are largely irreversible. For the area around Freiburg at least, it is also apparent that they may also lead to other infrastructure developments that further erode the physical and social character of the landscapes in which they are set. A striking feature of the development of golf courses in the study area shown in Fig. 1 is their 'sequential' nature. Each step in the development process may have been limited, but they result in a gradual or 'creeping' transformation of a rural and cultural landscape. When initially opened, courses in the area around Freiburg were often modest in size, with a limited number of holes and no clubhouse facilities. Kandern, the first course to be established in 1985 was, for example, set up as a 9-hole

course. It was extended to 18 holes in the early 1990s. Schönau, one of the developments that has taken place since 1997, started life as a 3-hole course on a ridge in a small valley in an ecologically sensitive part of the Black Forest. It was then developed step by step as a 6- and then 9-hole course.

The study area is of particular interest today, because a number of courses are now facing problems of economic viability, largely due to the fact that demand for facilities was over-estimated at the planning stage. Bad Bellingen, for example, which opened in 1997, was soon offered unsuccessfully for sale because returns were less than expected. It did not attract the expected number of Swiss clientele. Since a buyer could not be found, it was opened to day players to generate additional income, but this resulted in conflict with members who paid an annual fee. To resolve the situation proposals have now been made to extend the development by adding a further two 18-hole courses and clubhouse facilities, both to separate members and day players and to generate additional revenues. Another course, Schönau, is facing similar difficulties, and plans also have been put forward to extend the 9-hole course at Schopfheim–Hausen, which was opened in 2000, in order to improve its viability. Such plans have been met with strong local opposition and are currently ‘suspended’ (e.g. OV, 1997).

The example of golf courses along the Swiss-German-French border is a stark illustration of the failure of the *planning system* (rather than the consultants, planners and decision-makers themselves) to take account of either the environmental consequences of development proposals or issues relating to their long-term environmental, economic and social sustainability. The aim of this paper is to review the way in which environmental assessment techniques have been used to examine the consequences of golf course developments in the study area, and to consider how shortcomings could have been overcome by using and linking it to a more strategic approach based on ideas about *natural* or *Quality of Life Capital (QoLC)* (see for example, Thérivel, 2000). It will be argued that these ideas may offer one way forward, but that they need to be set in the context of another idea that is now being widely debated in the German-speaking literature, namely the *Leitbild* concept. By focusing on a case study outside the UK, the

paper will also serve to bring the *QoLC* approach to a wider, European audience.

1.2. *Environmental assessment and the need for a strategic framework*

The methods that underpin current approaches to environmental assessment generally, and environmental impact assessment (EIA) in particular, are well documented (e.g. Sheate, 1994, 1996; Gassner and Winkelbrandt, 1997; Runge, 1998; Glasson et al., 1999; Harrop and Nixon, 1999; Petts, 1999; Treweek, 1999). Moreover, the pros and cons of the approach have also been widely discussed. The review of Dresner and Gilbert (1999, 105) is typical of those who have pointed to the shortcomings of current applications of the environmental assessment concept. These workers interviewed participants in decision-making processes for major installations in six western European countries. The environmental impact assessments were criticised for their lack of independence from the proposers, their failure to assess alternatives to the proposal adequately, their incomprehensibility to lay-people and their failure to consider social factors. There was also criticism of general lack of public involvement in the decision-making process, the fact that they took place too late to have any real influence on the project and their narrowness, which meant that they tended to ignore global and regional issues.

The criticisms of Dresner and Gilbert (1999) are very similar to the findings of other studies, such as that of Treweek et al. (1993). What is important to note from such work is that, despite the long period over which ideas about environmental assessment have developed, the concept and associated methods is still evolving. While some workers have suggested modifications to the approach, others have gone so far as to question its relevance in the ‘Post-Rio context’.

Vanclay and Bronstein (1995), for example, argue that sustainable development ‘Post-Rio’ clearly has both an environmental *and* social dimension associated with it. They argue that methods of social impact assessment (SIA) have to be developed as a natural adjunct to environmental impact assessment (EIA), to address the wider social and economic impact of development. They stress the need for public participation in this process. While many would agree,

SIA is rarely incorporated into the regulations covering the need for EIA, and rarely are they voluntarily undertaken by developers as part of the decision-making process. Other authors have gone further in their critique of EIA. Mayda (1996), for example, argues that traditional tools such as EIA and even more wide-ranging strategic environmental assessments (SEA, Thérivel and Partidário, 1996; Partidário, 1999) are now redundant, and what is now needed in the context of planning for sustainability, is “integrated planning and assessment” or IPA. That is an evaluation of developments, which fully incorporates environmental, social and economic factors within the *one* assessment.

It is not appropriate here to discuss the range of proposals that have been made concerning the development of more integrated and strategic methods of environmental assessment. In this case study, we consider one of them, namely that developed around the idea of *natural capital* and *QoFLC*, and ask whether it offers a framework that might have helped overcome the limitations of traditional approaches to environmental assessment as they were applied to the development of golf courses along the German–Swiss–French border.

A number of workers (e.g. Turner et al., 2001) have argued that Society needs to make the idea of sustainability ‘operational’. One way, it is suggested, is through the concept of ‘natural capital’ (Daily, 1997; de Groot, 1992; de Groot et al., 2002), which is defined as ‘... any stock of natural resources or environmental assets which provide a flow of useful goods and services, now and in the future’ (de Groot et al., 2002). It is argued that the idea is a useful one, because it focuses on the ways in which people use or depend upon the properties of ecological systems rather than the ecosystems themselves. Indeed, it has been suggested that ecosystems can be characterised in terms of their various *functions*,¹ or capacities to provide goods

and services that directly or indirectly satisfy human needs (de Groot et al., 2002). Four broad functional groups are distinguished (Table 1), namely regulation, habitat, production and information functions.

De Groot et al. (2002) and others have used the concepts of natural capital and ecosystem function as a framework for environmental valuation. It has also recently been developed as a framework in which the environmental consequences of development proposals can be considered, through the idea of *Quality of Life Capital*² (Countryside Commission, 1997; Thérivel, 2000; and Countryside Agency, 2001a,b). As Thérivel (2000) notes, a key advantage of the approach proposed is that it shifts attention away from the analysis of ‘things’ (i.e. ecosystems as simple objects) to the benefits they can provide. ‘By doing so...’ Thérivel (2000, p. 404) concludes, the approach ‘... can suggest more flexible, more creative solutions that focus on compensatory action rather than on trying to prove that an area cannot accommodate more development.’ He goes on to argue that the approach is particularly useful as an input to the pre-application, scoping stage of EIA, ‘... where the project context, alternatives, and constraints are identified and analysed’ (Thérivel, 2000, 406). However, as other commentators have argued and shown, the approach may also be valuable at the review stage following the receipt of specific development proposals (Countryside Agency, 2001a,b).

In this paper, we consider the *Quality of Life Capital* approach critically, by using it to reflect upon the golf course developments along the Swiss–German–French border. In order to explore what benefits the approach might offer the analysis of future developments we set this discussion against a review of the decision-making process based on archive EIA³ material, generated by the ‘real-world’ planning and assessment process. It is important to note, however, that the two ‘paradigms’ are not competing

¹ It should be noted that the use of the term ‘ecosystem function’ by de Groot (1992) differs from that found in the ecological literature, where, the functional properties of ecosystems are simply those which have a ‘time dimension’, such as the various nutrient and energy fluxes associated with ecosystems. The distinction can be characterised in terms of the difference between the functions “of” natural systems and the functions “for” people, which is described in the German literature on environmental assessment as “potential” and functions (e.g. Bastian and Schreiber, 1999).

² When initially proposed the approach was called ‘environmental capital’. The term ‘Quality of Life’ was substituted later, to tie in with the quality of life aspects emphasised by the recent publication of the suite of sustainability indicators for the UK, called ‘Quality of Life Counts’ (DEFRA, 2001).

³ In all projects mentioned no “Raumordnungsverfahren” (Regierungspräsidium Freiburg) or EIA procedures were required, so in the following ‘EIA’ refers to the EIA statements which were constructed on a voluntary basis.

Table 1

Functions, goods and services of natural capital (after de Groot et al., 2002)

<i>Regulation Functions:</i> maintenance of essential ecological processes and life support systems
Gas regulation (e.g. UVB-protection by O ₃ , breathable air)
Climate regulation (maintenance of a favourable climate for human habitation/health, cultivation)
Disturbance prevention (e.g. storm protection, flood prevention)
Water regulation (e.g. drainage and natural irrigation, medium for transport)
Water supply (provision of water for consumptive use (e.g. drinking, irrigation and industrial use)
Soil retention (e.g. maintenance of arable land, prevention of damage from erosion/siltation)
Soil formation (maintenance of productivity on arable land, maintenance of natural productive soils)
Nutrient regulation (maintenance of healthy soils and productive ecosystems)
Waste treatment (pollution control/detoxification; filtering of dust particles, Abatement of noise pollution)
Pollination (maintenance of wild plant species and population, pollination of crops)
Biological control (e.g. control of pest and diseases, reduction of herbivory—crop damage)
<i>Habitat Functions:</i> providing habitat (suitable living space) for wild plant and animal species
Refugium function (maintenance of biological and genetic diversity)
<i>Production Functions:</i> provision of natural resources
Food (hunting, gathering of fish, game, fruits, etc. nursery function for (locally) harvested species)
Raw materials (buildings and manufacturing, fuel and energy, fodder and fertilizer)
Genetic resources (to improve crop resistance to pathogens and pests and other commercial applications)
Medical resources (drugs and pharmaceuticals, chemical models and tools, test- and assay organisms)
Ornamental resources (for fashion, handicraft, jewellery, decoration and souvenirs)
<i>Information functions:</i> providing opportunities for cognitive development
Aesthetic information (enjoyment of scenery, e.g. scenic roads, housing, etc.)
Recreation (travel to natural ecosystems for eco-tourism, outdoors sports, etc.)
Cultural and artistic information (use of nature as a motive in books, film, painting, folklore, national symbol, architect, etc.)
Spiritual and historic information (use of nature for religious or historic purpose, i.e. heritage value)
Science and Education (e.g. school excursions, etc. scientific field laboratories, etc.)

but complementary ones. The potential links between them have been described elsewhere. In *Quality Of Life Capital and Environmental Impact Assessment*⁴ (see Countryside Agency, 2001a,b), for example, it is argued that while EIA considers impacts of development on the various environmental receptors, the *QoL Capital* approach considers more the environmental and social constraints on the development. It thus provides a framework in which judgements about the significance of the impacts and the acceptability of alternatives can be made. The purpose of this paper is to consider critically whether the benefits of using the *QoL Capital* approach are tangible when applied to developments at a local scale, such as those illustrated by the development of golf courses along the Swiss–German border.

⁴ See: http://www.qualityoflifecapital.org.uk/pdfs/qualityof_life_and_eia.pdf (Accessed July 2002).

2. Case study: the golf course at Bad Bellingen

2.1. Planning context

The various European directives on EIA do not cover golf courses. In fact, it was not until 1999, with the introduction of specific regulations in both Germany and Switzerland, that the landscape context of such developments were flagged as an important issue. Recent changes to planning regulations now control the modification and use of forested landscapes, and golf course projects can only be planned and set up on open or arable land. But environmental impact assessments are not required in every case. Despite the lack of any formal requirement for an environmental assessment, however, it is interesting to note that all recent golf course developments that have occurred around Freiburg since 1997 involved some kind of EIA at the planning stage.

Table 2
Land cover of the area before and after the Bad Bellingen project

Land cover type	Area before development (RegioPlan, 1995)		Area after development (average in Germany)	
	(ha)	(%)	(ha)	(%)
Arable land (maize fields)	71.0	86	0.0	0.0
Meadow	2.6	3.1	0.0	0.0
Orchards	2.0	2.4	0.0	0.0
Biotopes (16 out of 18 are protected under regulation §24a)	1.5	1.8	1.5	1.8
Forest	0.4	0.5	0.4	0.5
Not used land/fields	5.1	6.1	0.0	0.0
Intensive used areas	0.0	0.0	35	42.2
Greens, bunkers	0.0	0.0	18	21.7
Distance and security areas	0.0	0.0	10	12.0
Infrastructure	0.0	0.0	1	1.2
Not defined here	0.0	0.0	17	20.5
Total	82.6	99.9	83	99.9

Where estimates for the cover types associated with the golf course are given the average for courses in Germany are used. Actual area estimates were based on fieldwork undertaken in July/August 1994 and May 1995.

The controversy between golf course developers and conservationists goes back at least 20 years (Haber, 1983, Schulz and Hardt, 1996). Partly it is in response to such debates that developers have increasingly stressed the ‘green credentials’ of projects, often arguing that golf courses are more ecologically sound than the land uses that they replace (normally agriculture). However, while golf courses *could* be managed for conservation, there are clearly other sustainability issues that need to be considered such as the irreversibility of the project, who is responsible for any potential restoration and the wider impacts on the local economy and social system. In general, the courses are not managed for public access and other recreational activities besides golfing. A problem with such developments is that there is no formal requirement to demonstrate that supposed environmental benefits are actually realised, following permission to develop. The requirement for an EIA carries with it no implication that the environmental gains should be audited and confirmed ‘post-development’ (Schlup and Potschin, 2000).

2.2. Bad Bellingen: a post-project review

As noted above, the golf course at Bad Bellingen was one of the larger recent initiatives in the study area. Permission to develop was made in the context of

an unpublished EIA study undertaken by consultants (RegioPlan) in 1995. The materials⁵ which were the basis of the EIA are available for public consultation through the regional authority, Landratsamt Lörrach, and are the source of the discussion developed here.

The first project covered an area of 83 ha, which was about 10 ha larger than the average area for a golf course in Germany at that time⁶. The land cover of the project area before the development was largely arable land (maize), with more limited cover of meadow, orchard, small biotopes (mainly protected hedgerows) and woodland patches (Table 2). A comparison of land cover in the project area before and after development is also shown in Table 2. Since the archive materials did not provide estimates of the new cover types,

⁵ The materials for the golf courses mentioned in this paper consisted of RegioPlan (1995, 1999), Stadt Kandern (1993), Planungsgruppe Süd-West (1992) plus unpublished materials for Schopfheim available from Landratsamt Lörrach covering the period 1997–2000, interviews with decision makers (M. Thater, Landratsamt Lörrach, April–October 2001) and all written communication between investors, different and final decisions makers. Further experience is taken from BioLaGu (1997), Erismann et al. (2002), Potschin (1998).

⁶ i.e. 73.6 ha per 18 holes and 32.4 per 9 holes, DGV, written communication, 07.07.00. Additional 37.2 ha for the extension of the Bad Bellingen golf course are already accepted another 6 golf courses are planned (written communication Regierungspräsidium Freiburg 21.01.2002).

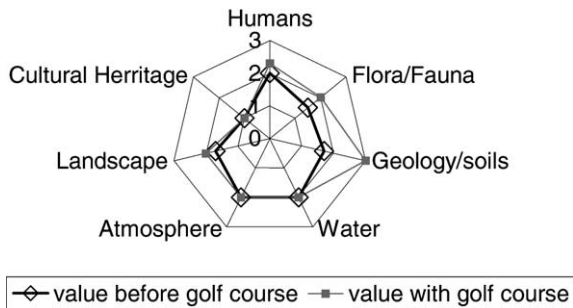


Fig. 2. Summary of main impacts on major environmental receptors according to the archive EIA materials investigated for Bad Bellingen (RegioPlan, 1995). Assessments are based on assignments of ‘value’ before and after, using the ratings 1 = low value, 2 = medium, 3 = high value.

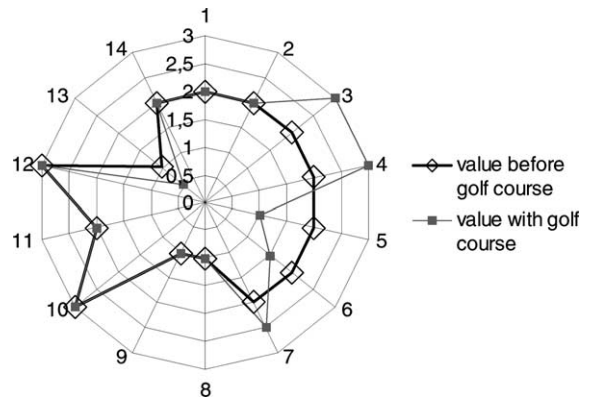


Fig. 3. Detailed analysis of components of major environmental receptors shown in Fig. 2, based on the analysis of archive materials for the Bad Bellingen development. Value ratings are as before, the 14 parameters investigated are: 1 = infrastructure, 2 = access to recreation area, 3 = experience value of landscape, 4 = arable land, 5 = meadows, 6 = biotopes, 7 = fauna, 8 = geology, 9 = resources (brick), 10 = soils, 11 = ground water, 12 = bio-/microclimate, 13 = air pollution, 14 = landscape.

the ‘after’ figures are based on the average for golf courses in Germany. However, the plan proposed that protected biotopes and woodlands would be preserved, and so the actual areas of these cover types have been used for the post-project estimates.

The documentary material shows that the project was accepted by the regional authority with only minor changes or restrictions, such as preservation of the protected biotopes, and limitations on the remodelling of the soils and landscape. The results of the EIA provided to the decision-makers is summarised in Fig. 2, which was drawn up on the basis of the descriptive material provided by consultants. The archive documents show that the authors undertook a scoping exercise prior to the EA itself, and then followed the appropriate regulations for EIA studies (RegioPlan, 1995).

When attempting to construct Fig. 2, a key problem associated with the EIA became apparent, namely that there was little justification in any of the discussion as to how a particular conclusions about a potential impact came about. The assessment was largely subjective, apparently based on the ‘opinion’ of the consultant rather than upon any wider body of empirical data. Moreover, it is apparent that the assessment itself was made at a very general level, which often tended to obscure specific, but nevertheless important effects that became apparent at a more detailed level of analysis. The problem is illustrated by reference to Fig. 3, which shows the impacts identified in the more detailed analysis contained in the EIA.

In the archive EIA materials, it is argued that for the each of the major receptors (Fig. 2), the condition will stay the same in three cases, and in the case of four other conditions will slightly improve. These materials form the basis of the conclusion of the EIA that the impacts of the development are minimal and that some environmental benefits would arise. At the more detailed sub-category level (Fig. 3), however, it is clear that for some of the major categories the picture is more mixed and it is unclear how the generalisation is derived. For example, at the general level the EIA suggests that the project will benefit “flora and fauna” (Fig. 2). There is no discussion of how the benefits from the loss of intensively farmed arable land of low biodiversity status are evaluated alongside the negative effects from the removal of meadows and the impacts on existing biotopes. Moreover, in the absence of any base-line data about the fauna of the area, it is merely assumed that there would be benefits due to the more ‘structured landscape’.

The problematic nature of the generalisation process is emphasised further by reference to Fig. 4, which takes all the parameters identified at the outset, before the scoping process reduced the variable set to those shown in Figs. 2 and 3. An ‘alternative’ expert opinion, based on further investigations of the authors

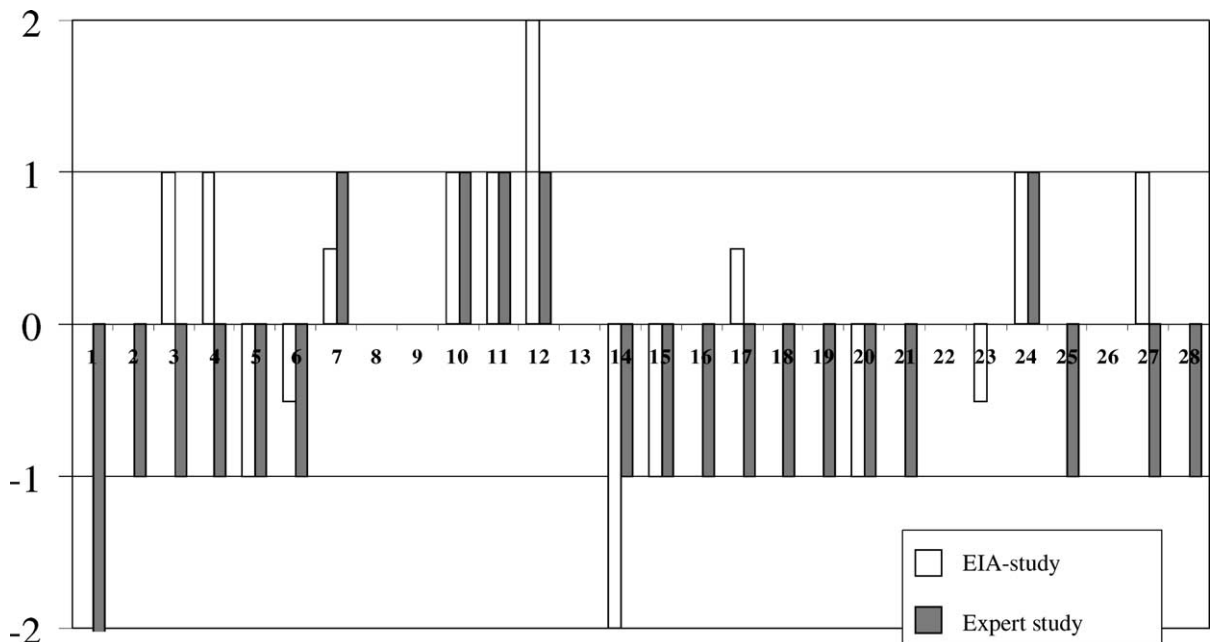


Fig. 4. Change of value of all environmental parameters considered at the scoping stage, for the development at Bad Bellingen. Ratings based on the EIA study are shown in the white columns (RegioPlan, 1995), those in grey are for an 'alternative' expert investigation that draws upon recent survey material. The rating scale is: +2 = improvement is reasonably certain, +1 = higher value could be expected, 0 = no change, -1 = lower value to be could be expected, -2 = change to a lower value reasonably certain. +0.5 refers to a valuation in EIA which is vague and only expressed as a 'tendency'. Where columns are missing there is no change of value expected or no data are given to analyse the change at the moment. From left to right the parameters are (sources are given in brackets: B: BioLaGu, 1997, E: Erismann et al., 2002, P: Potschin (1998)): (1) infrastructure/traffic (E) 81% of local people claim a higher traffic volumes result in disturbance; (2) access to recreation (E), 87 % of locals use the area less than before the golf course; (3) experience value to landscape (E), 36% of local feel that the golf course is a positive aesthetic point, while 48% call it an artificial landscape and that has resulted in a loss of the historic cultural heritage; (4) arable land (P) before high productive land, now out of use; (5) meadows (P) before high productive land, now out of use; (6) biotopes (P) some of the old ones are replaced – no concept of stepping stones resp. connection to surrounding area; (7) fauna (P) = more avifauna are associated with golf courses, (E) = locals mention a loss of reptiles; (8) geology; (9) resources; (10) soil contamination (B) = a higher contamination on local spots (greens and fees) is given and there is no proof that the ground water is not at risk; (11) compression of top soil (B, P) = from construction traffic; (12) erosion potential (B, P) = is lower as the whole area is covered by vegetation, however the area before development was threat from soil erosion; (13) natural vegetation (fields); (14) soil value for cops (P) loss; (15) soil potential for buffer (P); (16) water retention in soils (E); (17) potential for historic development of soils; (18) ground water recharge (E); (19) potential for ground water pollution (B); (20) water uptake (E); (21) decrease of water recharge through sealed soil; (22) bio-/microclimate; (23) air pollution (E); (24) structuring of landscape (E); (25) high human impact (E); (26) landscape/nature conservation; (27) change of visual image (E); (28) cultural heritage (E).

(BioLaGu (1997); Erismann et al. (2002); Potschin (1998), has been set alongside those on which the actual EIA was based. The 'alternative' expert judgement is not introduced here to suggest that the assessment was necessarily flawed, but to emphasise that any judgement has to be *reasoned*. Different workers may have come to different conclusions—and the assumptions need to be explicit. A major technical deficiency of the EIA was simply the general lack

of any justification for the assessment. It could be argued that the nature of the scoping exercise meant that many more potential negative effects were overlooked. Since there is little or no rationale presented to justify the way in which the ones included in the EIA were selected, on the grounds of precaution alone, it can be suggested that a wider range of parameters should have been included from the outset.

The choice of which parameters to include in the EIA is clearly crucial. Under German planning law, EIA does not include any requirement to conduct an analysis of socio-economic factors. As the intense public debate that subsequently surrounded the project at Bad Bellingen illustrates, developers omit such considerations at their peril, even if EIA is undertaken on a voluntary basis. Debate has largely focused on issues of accessibility and protection of existing biotopes (RegioPlan, 1995). As a result it is likely that further development will be looked at even more critically given the failure of the initial proposals. Public scrutiny is likely to be even keener in the future, given the apparent ‘over-capacity’ for golf courses in the general area (see below).

2.3. A post-project review based on the quality of life capital approach

Our review of the EIA and the related decision-making process conducted for the golf course at Bad Bellingen suggests that the exercise suffered a number of important deficiencies. Quite apart from reservations about the scientific credibility of specific conclusions, the range of landscape, ecological and socio-economic information included in the process also hampered the exercise. Moreover, its value was further limited by the lack of any clear link between the analysis of environmental and social and economic issues. Unfortunately, the decision-making process for Bad Bellingen is not atypical. The same kinds of deficiency can be found for other golf courses in the area (see footnote 4), and more generally for other types of development (Section 1.2). How, with the benefit of hindsight, might the assessment process be redesigned to overcome the limitations that seem to be inherent in many such exercises? In this section, we consider the advantages of an approach based on the general concept of natural capital, and the specific formulation of it in the UKs *Quality of Life Capital* concept (*QoLC*).

Accounts of the methods underlying the *QoLC* approach are available both from web-based documents (Countryside Agency, 2001a,b) and the published literature (e.g. Thérivel, 2000). Six steps are envisaged involving:

- the specification of the purpose of the development;
- the identification of the area and features affected;

- a description of the benefits and services that the area and features provide for people;
- an analysis of the way these benefits and service are affected by the development;
- a statement of the management implications;
- how important processes in the environment should be monitored following the development to assess ‘performance’.

Implementation of the approach hinges on the construction of a table that lists for each of the features, the benefits that are derived from them, the importance of these features and benefits at different scales, the way each element of natural capital is changing over time, the extent to which loss of benefits in one area be substituted gains elsewhere, and the management implications that therefore follow. The stimuli for the construction of this table are the key questions that the methodology poses at the framework for the ‘evaluation stage’, namely:

- to whom do the benefits and service matter, why, and at what spatial scale?
- how important are the benefits and services?
- are there enough of the benefits and services?
- what can be done to make up for any loss or damage to the functioning of the environmental system(s) that generate these benefits and services?

In this paper, we apply the *QoLC* concept ‘retrospectively’, by drawing upon the archive material made available to the study. It is not our purpose, however, to provide a complete alternative or complementary analysis, but merely to ask what more such an approach would have *added* to the assessment and decision-making process. The purpose of reworking the case study materials is to better understand the advantages and disadvantages of the concept and therefore how it might be developed to strengthen its application.

As in conventional EIA, answers to the questions that form the core of the *QoLC* approach may be based on expert analysis and opinion, although there is a much stronger emphasis and impetus in the *QoLC* approach to involve the public when undertaking the process. Even so, when attempting to fill out the basic ‘*what matters and why?*’ matrix, which is the basis of the evaluation stage, it is clear that the selection of issues is as difficult as the scoping stages of any EIA.

At present, the *QoLC* approach lacks any clear guidelines that would assist in identifying potential benefits from a development or be affected by proposals. If it is to be applied more widely, therefore, then guidelines are probably required if it is to be applied rapidly and reliably. In the absence of such a framework, we turned to the recent review of [de Groot et al. \(2002\)](#), who has provided a systematic checklist of ecosystem functions.

As noted above ([Table 1](#)), four groups of ecosystems functions and associated goods and services were identified by [de Groot et al. \(2002\)](#), namely those relating to production, regulation, habitat and information functions. The typology nests 22 more specific functions into these general categories. On the basis of our review of the materials available at the time of the EIA process for Bad Bellingen, it is clear that key aspects of the information could have been presented using the natural capital framework, in a way that would have resulted in a clearer understanding of the implications of the proposals without significant additional work. Three issues stand out, namely those of water regulation and supply, habitat and recreation.

For example, the water regulation and supply functions identified by [de Groot et al. \(2002\)](#) stand out as key issues within the context of the golf course developments. About 10% of the area covered by the development is in a water protection zone of status III⁷, while about 30% of the golf course is within the catchment which also drains into the zone. Tertiary clays, mudstones, silts and calcareous sandstones, of low to medium permeability, underlie the area. The extent of changes in water quantity and quality are considered in the background documentation, but there is no clear statement of the strategic context of the development and the status of the water resource generally. Nor is there any discussion of how changes in landscape structure might affect local hydrological patterns⁸.

While it can be accepted that landscape ecologists are only just beginning to document the importance

of landscape structures such as hedgerows and woodland blocks on surface water hydrology (see for example, [Baudry et al., 2000](#)), given the evident importance of the water resources in the general area, it could be suggested that developments should not only protect these elements of natural capital but also seek to *enhance* them. Indeed, in the context of planning for a multi-functional landscape ([Brandt and Vejre, in press](#)), it could be argued on the basis of the precautionary principle, that Society should require developers to do so. These issues clearly lie outside the specific case study of the golf course at Bad Bellingen. However, it is clear that by shifting the focus of discussion of specific proposals towards the benefits and ecosystem services that are important in the development area and its surroundings, a more complete understanding of impacts and their consequences might be achieved. Moreover, it is also apparent that opportunities for enhancing the natural capital of an area might also be identified.

A lack of discussion about the strategic context of development proposals for Bad Bellingen is also evident in the treatment of what [de Groot et al. \(2002\)](#) call the habitat function. The presence of protected biotopes in the development area is noted by the EIA⁹. By implication therefore, it is clear that at national and regional scales such habitats are both threatened or in ‘short supply’. However, because of the way in which the EIA question is phrased, the only concern in the context of the development is whether they are lost or undermined. A virtue of the *QoLC* approach is that it would not only cause decision-makers to look at specific impacts, but also prompt them to ask whether the ‘benefits’ (biodiversity) that arise from these biotopes is sufficient, and therefore what opportunities might exist for expanding them. Moreover, in order to protect and enhance these benefits it is also apparent from using the *QoLC* approach that proposals would have to include a statement of the management implications that follow. Given that the acceptability of proposals depends the extent to which they can sustain or enhance specific ecosystem services such as biodiversity,

⁷ In Germany water protection zones are established where the quantity and quality of the ground water is suitable to serve the local to regional community, Zone I = the source itself, Zone II = outer source zone, Zone III is determined by a so called “50 day line” = the catchment area where water flows to the source within 50 days.

⁸ Developers were however required to minimise the extent of modification to soil structure and terrain.

⁹ According to the “Red List of Endangered Biotopes” ([Riecken et al., 1994](#)) biotopes are under protection (§24a) when they are qualitatively (slow but continuously degradation) and quantitatively degrading. In addition to that criterion “capacity to regenerate” is included. According to [Riecken et al. \(1994, p. 25\)](#) 64% of the existing biotopes in Germany are endangered.

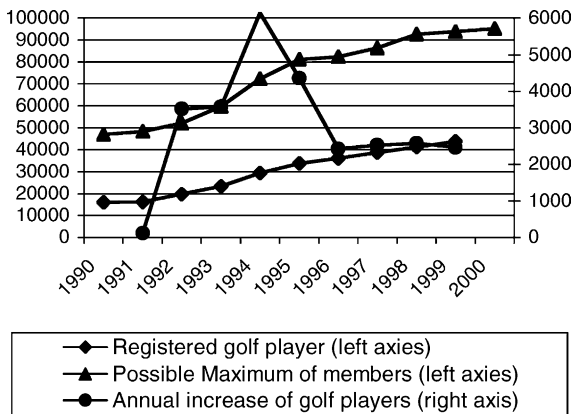


Fig. 5. Development of golf in the county of Baden-Württemberg (source: The German Golf Association, DGV).

it could be argued that Society might even require evidence through post-impact monitoring that such goals have been achieved as a condition of granting approval for any future developments.

The final area where we suggest the *QoLC* approach might have contributed towards a more strategic appreciation of the implications of developments at Bad Bellingen is in the context of the recreational benefit, which de Groot et al. (2002) include within the ‘information function group’. The particular issue here is the ‘sufficiency’ of the supposed recreational benefit.

The data shown in Fig. 5 is for Baden-Württemberg, which takes in the study area on the German side of the border. The graph shows that the number of registered players increased rapidly in the early 1990s but that the rate of increase slowed in the latter half of the decade. The graph also shows the maximum number of registered players that could be accommodated by all the registered courses in the area, according to the German Golf Association (DGV). The gap between the number of registered players and total number of payers that could be supported is not in itself a problem, because these data do not take account of the number of times each player visits a course. What is more problematic, however, is that there is increasing divergence between the rate of supply of new capacity and new registrations. Unless players play more often than they have in the past, there is on the basis of current experience, increasing ‘over-capacity’ in the study area.

Clearly further analysis of supply and demand needs to be made, particularly taking in cross-border movement of players, day visits, and the role of un-registered courses in the area. However, on the basis of the preliminary analysis of these data it could be argued that on strategic grounds alone, the desirability of further golf course development may be questionable. The extent to which decision-makers would have drawn the same conclusion at the time proposals for Bad Bellingen were made is, of course open to debate. However, what does seem clear is that since the EIA regulations do not require social and economic factors to be considered, such data may not have been taken into account even if they were available. These issues would only have been included in the assessment if a ‘Raumordnungsverfahren’ (county level administration) had been requested from the Regierungspräsidium Freiburg. However, since the developments when taken in isolation were considered to be small with no major impact on the environment, a more holistic assessment was never made. The same situation applies over the assessment of the proposed extensions to the developments.

By linking the analysis of ecosystem function and the benefits and services that Society derives from the various elements of the environment, the *QoLC* approach would have been more effective at bringing these types of issue into sharper focus. Moreover the framework would also have been more effective in taking account of the different recreational interests that existed in the area and how these might be affected by the development, and the disturbance that developments had for residents. For example, while the developers argued that the area of the golf course would be ‘open’ to the public for informal recreation, there were no specific proposals in the design of the course to ensure that this could be achieved in a satisfactory way. Nor were there specific proposals for management the additional traffic in sensitive ways. A recent survey (see Erismann et al., 2002) of 121 local people (53% of local households) in 2002 showed that 87% of those interviewed use the area less than before the development. Moreover, 51% were aware of higher traffic volumes on weekdays, and of those 51% again 81% felt that they were disturbed by its impact. If a *QoLC* approach had been applied, and the analysis had identified access or tranquillity as key benefits of the area, then it could be argued that developers would

have had to formulate proposals to protect these ‘landscape functions’ to make plans acceptable.

3. Operationalising sustainability

3.1. The quality of life capital approach

Turner et al. (2001) have stressed that Society needs to make the idea of sustainability ‘operational’. The development of the concept of natural capital is clearly one attempt to do this. As the case study reported here shows, its application potentially has a number of advantages over traditional approaches to environmental assessment, including the development of a more strategic understanding of the consequences of proposals a better understanding of the linkage between environmental and human systems, and the extent to which the output of ecosystem services are being maintained or enhanced over time. However, as the number of case studies involving the approach grows (see Countryside Agency, 2001a,b), it is also important to reflect upon these experiences critically, in order to understand the limitations of the idea. In the context of our review of golf course developments along the Swiss–German–French border, two issues stand out where further thinking is required when using the *QoLC* approach. These concern issues of risk, reversibility and the evaluation framework within which the techniques are used.

Issues of risk and uncertainty permeate all assessment techniques, and the *QoLC* approach is no exception. However, as it stands the framework does not ask developers and decision-makers to consider the risks associated with each benefit or ecosystem service, and the extent to which developments might affect the situation. Our experience of the Bad Bellingen case study materials suggests that while the *QoLC* approach would, for example, effectively expose the water resources issue, as it stands it would not lead to the kind of assessment that would be required given the need to sustain the natural capital of the area. The analysis of risk is, we suggest, an area where further development of the *QoLC* concept is required.

In addition to issues of risk, discussions of the reversibility of actions or developments also seem underplayed in the *QoLC* approach. Golf courses in the study area have taken place on highly productive

agricultural land. Although at present the loss of such productive land in Europe is not an issue, it could be argued that developments should not change the soils and landscapes of the area so fundamentally that the range of ‘after uses’ is diminished. This is particularly an issue in other parts of the study area where loess soils have been disrupted by golf course developments (Stadt Kandern, 1993). The importance of such impacts are a more general issue, given the way in which golf courses in the study area have led to incremental forms of development that collectively can transform the character of an area. Since any economic venture might fail, the reversibility of change is clearly an area where the *QoLC* approach might be further developed to expose the issues that underpin notions of sustainability.

A final area of concern that has arisen in attempting to apply the *QoLC* approach to developments along the Swiss–German–French border is the way in which benefits are identified and ultimately evaluated. Clearly checklists are valuable, and through public consultation and discussion a clearer picture could be developed. However, it is also apparent that developers, decision-makers and the public would also benefit from a more systematic understanding of the wider context. Although the *QoLC* framework asks evaluators to identify local, regional and global issues, we would argue that the approach would benefit by setting the assessment in context of some broader understanding or visions for the landscapes of the study area. Only then, perhaps, could the losses and gains in the various benefits, or the risks associated with maintaining the various ecosystem services be assessed. Our experience in southern Germany suggests that the development of such visions might be achieved by linking the *QoLC* approach to the idea of a ‘*Leitbild*’.

3.2. The *Leitbild* concept

Although the term *Leitbild* (pl. *Leitbilder*) has its origins in the psychological literature, German planners took it up in the 1950s. It is now widely used in economy and politics, and Post-Rio, was initially used by those interested in environmental issues in discussions about the goal of sustainability. In the late 1990s, however, the term has been used more widely to refer to a statement of some future desired state or situation (cf. Gaede and Potschin, 2001). Nevertheless, while

the term *Leitbild* is somewhat similar to the notions of ‘future desired condition’ and ‘vision’ that are common in the English-speaking literature there is no direct translation. It carries with it a stronger sense of a hierarchy of goals, the steps that one must take to realise a given set of aims and the notion of a regulating idea than the English equivalents. The term *Leitbild* rolls-up the ideas of ‘mission statement’ and ‘reference condition’ in a single term, to represent something that is more concrete and more formalised than these English concepts.

Bossard (2000), Braukmann and Pinter (1997), Muhar et al. (1995), and Van der Vorst et al. (1999) have used the term *Leitbild* explicitly in the English literature. The discussion by Bossard (2000) deals with its philosophical and methodological aspects rather than its application. He describes a framework for sustainability assessment in which *Leitbilder* provide a mechanism whereby ‘ideas ... are translated into actions by value judgements’ (Bossard, 2000, p. 31). While such ideas provide a set of guidelines that shape action, he stresses that these frameworks

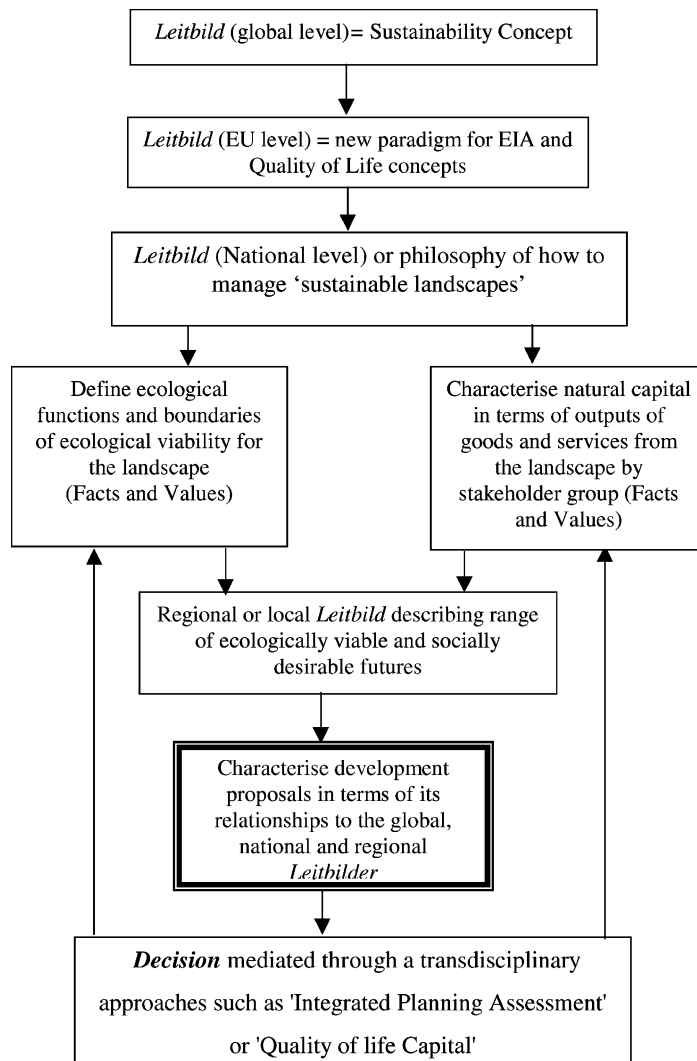


Fig. 6. The *Leitbild* concept and approaches to sustainable landscape planning (adapted from Turner et al., 2001).

are refined and therefore evolve as they are applied. The position Bossard (2000) describes has a number of parallels with the iterative, ‘soft-systems’ approach to sustainability planning described by Clayton and Radcliffe (1996), in which we learn more about problem by trying to solve it.

We suggest that the term *Leitbild* can be used to describe the set of ecologically viable futures for a given landscape that are mediated through the idea of natural capital. An ‘ecologically viable future’ is not one determined solely by biophysical criteria. While natural laws may ultimately govern our actions, there is generally ‘room to manoeuvre’. We can arrange and design our landscapes in different ways, depending on what outputs (goods and services) the various stakeholders or interest groups in an area desire. Decisions about landscape sustainability therefore turn on what is possible ecologically, in terms of continuing ecological function, and what outputs Society is trying to maintain over time within a given area (cf. Haines-Young, 2000).

In the context of environmental assessment and the *QoLC* approach, a *Leitbild* provides a framework within which the impacts of particular developments can be judged. The value of the idea lies in the fact that in developing a *Leitbild* for a given landscape, one has to combine two perspectives. First, a purely technical one, that focuses on ecological function and the integrity of ecological systems. Second, a more holistic one, that takes account of Society’s needs and aspirations, as they are expressed in the way they characterise the natural capital of an area.

Fig. 6 shows how *Leitbild* at different scales might shape decisions about the significance of development proposals in a particular landscape or region. The Figure suggests that the local visions are nested with more global or regional ideas. Moreover, it is envisaged that the evaluation process is achieved through an understanding the relationships between ecological function, natural capital and the benefits and services that people value. Different stakeholder groups in a landscape will value outputs from the landscape differently. They will also have different aspirations for the future, some of which may impact negatively on the ecological systems that sustain these outputs. The task for the scientist is to define the ‘ecologically viable space’ in which these socio-economic discussions and decisions are made, rather than to be

prescriptive about which particular states are more ‘desirable’. Clearly the process may be iterative for, as people understand what is or is not possible, the values they put upon the different elements of natural capital may change. Ultimately, we suggest that decisions are mediated through some kind of transdisciplinary process, such as that envisaged in concepts such as ‘*integrated planning assessment*’ or more specifically the ‘*Quality of life Capital*’ approach.

4. Conclusions

Our analysis of golf course developments along the Swiss–German–French border suggests that key factors contributing to the failure of environmental assessments were:

- the limited range and type of ecological and socio-economic information that were included in the environmental assessments prior to development, and the problems of linking scientific and socio-economic data to inform the assessment process;
- the adequacy of assessments in the context of the sustainable planning and management of at the landscape scale, and in particular a lack of any strategic vision for landscapes and communities of the study area.

We suggest that some of these shortcoming could have been overcome through the application of the *Quality of Life Capital* approach now being developed in the UK, which stresses the need to analyse proposals in terms of their consequences for the various ecosystem services which are valued by people. Environmental assessment provides us with a set of tools that can help us minimise impacts of developments. The *QoLC* approach seeks to go beyond this narrow aim, and focuses thinking on how we might protect, maintain and maximise the benefits and services that we derive from the environment. Moreover, since the approach depend upon public input to identify and evaluate ecosystem services it encourages participation of stakeholders throughout the process.

Application of the *QoLC* approach also has shortcomings, however, relating to issues of risk, reversibility and the evaluation framework within which the techniques are used. In addition the cost-benefit of the

approach over traditional methods is yet unknown. In this paper, we have argued, however, that the impacts of proposals can only be properly assessed by considering them in the context of what people want or need to sustain at the landscape scale. To describe these visions we have used the German *Leitbild* concept, and have emphasised that these frameworks are determined both by what is ecologically viable and socially and economically acceptable. Given that these broader visions are necessary, the challenge that now presents itself is how to engage more formally with people at national, regional and local scales to construct such *Leitbilder* and to use them to evaluate specific development proposals.

References

- Baudry, J., Bunce, R.G.H., Burel, F., 2000. Hedgerows: an international perspective on their origin. *J. Environ. Manage.* 60 (1), 7–22.
- Bastian, O., Schreiber, K.-F., 1999. Analyse und Bewertung der Landschaft. 2nd ed., Gustav Fischer, Jena.
- BioLaGu, 1997. Umweltverträglichkeitsstudie Golfplatz Lüne-Erbstorf. - Biologisch landschaftsökologisches Gutachterbüro, Bleckede, unpublished report to Heinz Fehring Golfplatzbau GmbH.
- Bossard, A., 2000. A methodology and terminology of sustainability assessment and its perspectives for rural planning. *Agric. Ecosys. Environ.* 77, 29–41.
- Brandt, J., Vejre, H. (Eds.), in press. Multifunctional Landscapes: Theory, Values and History. *Advances in Ecological Science*. WIT Press, Southampton.
- Braukmann, U., Pinter, I., 1997. Concept for an integrated ecological evaluation of running waters. *ACTA Hydrochim. Hydrobiol.* 25 (3), 113–127.
- Clayton, A.M.H., Radcliffe, N., 1996. Sustainability: A Systems Approach. Earthscan, London.
- Countryside Agency, 2001a. Countryside Character Initiative http://www.countryside.gov.uk/activities/special/character_01.htm (accessed 24/10/2001).
- Countryside Agency, 2001b. English Heritage; English Nature and Environment Agency, Quality of Life Capital, <http://www.qualityoflifecapital.org.uk/> (accessed 24/10/2001).
- Countryside Commission, 1997. What matters and why. Environmental capital: a new approach. A Report to the Countryside Commission, English Nature, English Heritage and the Environment Agency, by CAG Consultants and LUG.
- Daily, G.C., 1997. Introduction: what are ecosystem services? In: G.C. Daily (Ed.), *Nature's Services*. Island Press, New York, pp. 1–10.
- DEFRA, 2001. Quality of Life Counts <http://www.sustainable-development.gov.uk/> (accessed 24/10/2001).
- de Groot, R.S., 1992. Functions of Nature. Evaluation of Nature in Environmental Planning, Management and Decision-making. Wolters-Noordhoff, Groningen.
- de Groot, R.S., Wilson, M.A., Boumans, R.J., 2002. A typology for description, classification and valuation of ecosystem functions, goods and services. *Ecol. Econ.* 41 (3), 393–408.
- Dresner, S., Gilbert, N., 1999. Decision-making processes for projects requiring environmental impact assessment: case studies in six European countries. *J. Environ. Assess. Policy Manage.* 1 (1), 105–130.
- Deutscher Golfverband, 2000. http://www.golf.de/_dgv/stat/stat1.html (updated January 2000).
- Erismann, C., Minder, C., Potschin, M., 2002. Nationaler Nutzen—lokale Belastung. Die sozio-ökonomischen Auswirkungen des Golfplatzprojektes Bad Bellingen. Materialien zur Physiogeographie, Heft 23, Universität Basel.
- Gaede, M., Potschin, M., 2001. Anforderungen an den Leitbild-Begriff aus planerischer Sicht. *Berichte zur Deutschen Landeskunde* 75 (1), 19–32.
- Gassner, E., Winkelbrandt, A. (Eds.), 1997. UVP—Umweltverträglichkeitsprüfung in der Praxis, 3rd ed. Franz Rehm, München.
- Glasson, J., Thérivel, R., Chadwick, A., 1999. Introduction to Environmental Impact Assessment: Principles and Procedures, Process, Practice and Prospects, 2nd ed. UCL Press, London.
- Haber, W., 1983. Zur landschaftsökologischen Beurteilung von Golfplätzen. *Golfmagazin*, März.
- Haines-Young, R., 2000. Sustainable development and sustainable landscapes: defining a new paradigm for landscape ecology. *Fennia* 178 (1), 7–14.
- Harrop, D.O., Nixon, J.A., 1999. Environmental Assessment in Practice. Routledge Environmental Management Series. Routledge, London.
- Mayda, J., 1996. Reforming impact assessment: issues premises and elements. *Impact Assess.* 15 (1), 87–96.
- Muhar, S., Schmutz, S., Jungwirth, M., 1995. River restoration concepts—goals and perspectives. *Hydrobiologica* 303 (1–3), 183–194.
- OV, 1997. Die Wohlsituierten sollen zurückstecken, Oberbadisches Volksblatt no. 230, 6 October 1997, Lörrach.
- Partidário, M.R., 1999. Strategic environmental assessment: principles and potential. In: Petts, J. (Ed.), *Handbook of Environmental Impact Assessment*, vol. 1. Blackwell Scientific Publications, Oxford, pp. 60–73.
- Petts, J. (Ed.), 1999. *Handbook of Environmental Impact Assessment*, vol. 2. Blackwell Science, London.
- Planungsgruppe Süd-West, 1992. Änderung des Flächennutzungsplanes und Erläuterung. Lörrach (Unpublished report).
- Potschin, M., 1998. (Hrsg.). Umweltverträglichkeitsprüfung und Landschaftsökologie. Das Golfplatzprojekt, Bad Bellingen'. Abschlußbericht des Regionalpraktikums am Geographischen Institut der Universität Basel (vervielfältigtes Manuskript).
- RegioPlan, 1995. Umweltverträglichkeitsstudie zum Projekt "Golfplatz Bad Bellingen", unpublished EIA-statement, September 1995, Lörrach.
- RegioPlan, 1999. Umweltverträglichkeitsstudie für die Prüfung der Umweltverträglichkeit zum Projekt "9-Loch Golf-Kompaktanlage Schönau", unpublished EIA-statement, February 1999, Lörrach.

- Riecken, U., Ries, U., Ssymank, A., 1994. Rote Liste der gefährdeten Biotoptypen der Bundesrepublik Deutschland. Schriftenreihe für Landschaftspflege und Naturschutz, Heft 41. Bonn Bad-Godesberg.
- Runge, K., 1998. Die Umweltverträglichkeitsuntersuchung. Internationale Entwicklungstendenzen und Planungspraxis. Springer, Berlin
- Schlup, M., Potschin, M., 2000. Ökologische Wirkungskontrolle von Ausgleichsmaßnahmen im Rahmen des UVP-Verfahrens/Ecological Quality Assurance of EIA. UVP-report 4/2000: 2-7-210.
- Schulz, H., Hardt, G., 1996. Golf + Naturschutz. Boden- und Grundwasserbelastung durch Dünge- und Pflanzenschutzmittel auf Golfplätzen im Vergleich zur Landwirtschaft. Deutscher Golf Verband, Wiesbaden.
- Sheate, W.R., 1994. Making an Impact: A Guide to EIA Law and Policy. Cameron May, London.
- Sheate, W.R., 1996. Environmental Impact assessment: Law and Policy-Making an Impact II, 2nd ed. Cameron May, London.
- Stadt Kandern, 1993. Erläuterungsbericht zum Antrag auf wasserrechtliche Genehmigung, Kadern (Unpublished report).
- Thérivel, R., 2000. Quality of life capital. In: Morris, P., Thérivel, R. (Eds.), *Methods of Environmental Impact Assessment*, 2nd edn. SPON, New York, pp. 402–408.
- Thérivel, R., Partidário, M.R., 1996. *The Practice of Strategic Environmental Assessment*. Earthscan, London.
- Treweek, J., 1999. *Ecological Impact Assessment*. Blackwell Science, London.
- Treweek, J.R., Thompson, S., Veitch, N., Japp, C., 1993. Ecological assessment of proposed road developments: a review of environmental statements. *J. Environ. Plann. Manage.* 36, 295–307.
- Turner, R.K., Bateman, I.J., Adger, W.N., 2001. Ecological economies and coastal zone ecosystems' values: an overview. In: Turner, R.K., Bateman, I.J., Adger, W.N. (Eds.), *Economics of Coastal and Water Resources: Valuing Environmental Functions*. Kluwer Academic Publishers, Dordrecht, pp. 1–43.
- Vanclay, F., Bronstein, D.A. (Eds.) 1995. *Environmental and Social Impact Assessment*. Wiley, Chichester, England.
- Van der Vorst, R., Grafé-Buckens, A., Sheate, W.R., 1999. A systematic framework for environmental decision-making. *J. Environ. Assess. Policy Manage.* 1 (1), 1–26.
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