LCA Philosophy

Safeguard Subjects

The Conflict Between Operationalization and Ethical Justification

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Abstract

In the available literature on ecobalances, relatively little attention has until now been devoted to the discussion of the ultimate objectives of ecocontrolling, i.e. to the determination of those elements of nature which deserve highest protection. The goal of this paper is to elaborate and to provide grounds for a target-system of ecocontrolling based upon existing concepts in the environmental ethics.
The immediate connection between ethical considerations and the target-system of ecocontrolling arises from the fact that the ethical notion of 'intrinsic value' (applied on elements of nature), and the concept of 'safeguard subject' used in literature on ecocontrolling and ecobalances appear congruent. Principally, it would be desirable that the safeguard subjects consist only of natural elements with an intrinsic value – within the chosen approach of environmental ethics. However, in order to reach an optimal operationalization, it appears unavoidable to put elements of nature with an intrinsic value and those elements that do not possess such a value (but which operationalize elements with an intrinsic value) together in the list of the safeguard subjects.
Relying on the theoretical and practical analysis, a list of safeguard subjects similar that from CONSOLI et al. is proposed. The ethical frame allows for a new insight, the idea that there is a hierarchy between the different safeguard subjects, and that a limited influence on a safeguard subject of lower rank does not have to be considered an impairment of the corresponding safeguard subject.

Keywords: Safeguard subjects; value setting; environmental ethics; moral subject; intrinsic value; anthropocentrism; sustainable development

1 Introduction

The goal of ecocontrolling, and particularly that of ecobalances, is to provide an instrument to firms which enables them to record and then diminish their negative impacts on the environment. In the quantitative approaches to ecobalances, one attempts to obtain the most precise quantification of the impairment of the environment accounting for the utilization of natural resources[1] and for emissions and waste generated in the life cycle of products or services.[2]

For that purpose, one initially prepares an *inventory* of those by-products of the industrial activities relevant for the environment, these are then assigned to some *impact categories* using an assignment schema (*classification*) and a quantitative weighting system (*characterization*). Those impact categories are finally weighted (*weighting*) and assigned to some *safeguard subjects*. These safeguard subjects are nothing else than elements of the natural environment which are considered to be intrinsically worth being protected. If the impairments of the safeguard subjects are relatively balanced against one another (*value setting*), all environmental impact can be expressed through a number: the *eco-indicator value*.

Even though there are differences between the various approaches available today, existing literature on ecocontrolling and ecobalances only discusses the topic of safeguard subjects and their valuation[3] to a small degree. From my point of view, this doesn't come as a surprise, since reasoning for the choice of safeguard subjects and their valuation should be made out of an environmental ethical argumentation. However, ethical contemplation is almost unknown in the discussions on ecocontrolling and ecobalances which is dominated by aspects of natural science. This paper will develop some basic ideas which will lead to a well-founded choice of safeguard subjects. Here, considerations of environmental ethics, as well as possibilities of operationalization, are carefully taken into account.

The paper is structured as follows: in the next chapter we will present and discuss different approaches of environmental ethics, in the third chapter the existing proposals to the safeguard subjects and their valuation will be introduced and discussed, and an own proposal will be developed and motivated. The paper ends with a brief conclusion.

2 Ethical Positions Dealing with Nature

2.1 Basic questions of environmental ethics

In dealing with nature, different ethical approaches from different perspectives exist. These approaches provide dif-

[1] The natural resources are not recorded to ecobalances in every approach, since not every approach considers natural resources as belonging to the safeguard subjects.
[2] Here, we use a life cycle assessment according to CLM/Goedkoop. Other approaches can of course be used as well. Here and in the remainder of this paper, however, we will use the conceptual categories as well as the corresponding terms which have been introduced in the life cycle assessment according to CLM/Goedkoop (see GOEDKOOP, 1995).

[3] The valuation results from the weighting and the value setting.

ferent answers to the same general questions; the most important ethical aspects, discussed in the following paragraphs, result out of these three basic questions:

- Who or what is a moral subject, or in other words, who possesses moral rights?
- Which elements of nature have an intrinsic value? And which elements, in contrast, have a derived value?
- What are the basic rights of the elements of nature that deserve an intrinsic value?

The first question deals with the problem of determining the criteria as to which moral rights should be assigned, especially whether only humans or also other living creatures or even inanimate elements of nature should possess such rights.

The second question discusses a point of great importance to this paper. By answering this question, it should be stated which elements of nature actually have a value themselves, and are *eo ipso* worth being protected and which, in contrast, should be protected only because they are of importance to one of the valuable elements. In general, the elements that are judged as intrinsically valuable also count for being moral subjects. This means that the answers to the two corresponding questions are the same.[4]

The third question concerns which rights have the elements of nature with an intrinsic value: If, for example, the human being, in an anthropocentric frame, aside from having the right to live and the right to health, also has the right to a psychological welfare; if, in a pathocentric frame, sentient beings, aside from the right to live also have a right to a dignified life; and so forth.

Following BIRNBACHER (BIRNBACHER, 1991), the next paragraphs will show four different approaches to ecological ethics[5].

2.2 Anthropocentrism

In the anthropocentric approach, only the human being is seen as a moral subject. Moral rights can generally only be assigned if the subject underlies moral duties. Now, because moral behavior demands rationality, autonomy and freedom, which are all exclusive characteristics of humans, anthropocentrists conclude that only humans can be seen as moral subjects (see BAYERTZ, 1987, p. 161). According to this, they assume that only human life, human health and human welfare of today's and future generations deserve an intrinsic value. Elements of the non-human nature only deserve a derived value, to the extent that they interact with the human beings.

Within the anthropocentric approach, two different views exist. They differ in the definition of the basic rights of humans and in the way the rights of elements of the non-human nature are derived. In the frame of a tighter anthropocentric approach (*strong anthropocentrism*), the physical welfare of humans is underlined, and the living as well as the inanimate elements of nature only have an instrumental value. These elements only represent a value when supporting human life and human physical welfare through their productivity. In the view of a broadened anthropocentric approach (*weak anthropocentrism*), the psychological welfare of humans has a higher value, and the risks generated by the influence of human activities on the natural environment are emphasized. This is why nature is valuated higher. Environmental goods next to their primary economical productive function also reflect an aesthetic, recreative, even a religious value on the one hand and, on the other hand, stand as a sort of 'life insurance' for future generations.

Important elements of an anthropocentric approach are an enlightened self-interest, fairness in the meaning of ecologically equal rights for every human being, and the responsibility for our future in the sense of a 'stewardship for nature'.

The anthropocentric approach, however, leaves some questions open:

- Why should we require rationality or linguistic ability as criteria for characterizing a moral subject?
- Why should merely humans have an intrinsic value? Why can't sentient animals have an intrinsic value, although severely handicapped humans who cannot speak or think logically possess an intrinsic value?
- In strong anthropocentrism, we generally find the danger of instrumentalizing nature: Only those elements which have an immediate monetary value are also considered worth being protected. However, not only in strong anthropocentrism, but also in weak anthropocentrism we find ethics as being subordinate to human advantages: In today's political decision-making, this can mean that the material and aesthetic interests which will concern humans in a far future are consequently put last with regard to the present material interests (see VON GLEICH, 1989, p. 78f.).

2.3 Pathocentrism

Some questions left open in the anthropocentric approach can be answered using the pathocentric approach. In this ethical approach, the qualification of a moral subject is not measured in rationality, autonomy or linguistic abilities, but in the capacity of having sensations and feeling pain. This can be called the ethics of bounding pain: the sentient creature, which in the pathocentric approach is mostly identified with an animal with a higher organizational degree, should not have to sustain pain, fear or stress. According to this, all sentient beings possess an intrinsic value.

The pathocentric approach, however, leaves the questions about the definition and the delimitation of the basic rights of non-human moral subjects open:

- Can human pain be compared with animal pain? For example, how far can animal experiments be ethically justifiable?

[4] In the setting of this paper, we simply assume that natural elements which have an intrinsic value are also ethical subjects. Occasionally, we find ethical approaches where this assumption cannot be adopted (see BIRNBACHER, 1991, p. 285).

[5] In the discussion about the ethical reasons which shall shape the relations of human beings to non-human nature, one frequently distinguishes between environmental ethics, which is understood as relying on the traditional anthropocentric view, and ecological ethics, which is considered to be more open to the 'interests' of the non-human nature. This distinction, however, is controversial (see BIRNBACHER, 1991, p. 278f.). In this paper, we will not deal with it and will instead use the two terms as synonyms.

- Are we allowed to kill animals without a strict necessary reason?
- Next to the duties of omission towards animals,[6] are there also any duties of active help exist?
- Do animals have a right to live with dignity?

2.4 Biocentrism

In the frame of biocentrism, all creatures possess the quality of moral subjects and have an intrinsic moral value. The intrinsic value can be possessed by natural individuals or by natural collectives such as ecosystems or species. A certain downgrading of the intrinsic value according to the biological organization is compatible with this approach. The biocentric approach faces different problems:

- The argument that every living creature or every species deserves an intrinsic value is based on an ethical point of view, which is pre-modern and transcendental. The existence of living nature's own rights is an ethical a-priori based on the so-called naturalistic fallacy: by setting values in nature, one deduces from the actual quality of what '*is*' the normative conclusion of what '*should be*'.[7]
- Principally, it is not clear why all forms of life should be protected. Why should the existence of a pox virus which is harmful for humans be protected?[8] And even if this seems to be worth protecting, such radical protection would not be realizable if applied to the single living being and not to the species.
- A partial solution would be to legitimate a downgrading of the intrinsic value of the creatures, according to their biological organization. Unfortunately, only few biocentrists try to put this possibility in concrete terms. What nevertheless remains open is the question concerning the criteria which shall be applied in the weighting of human interests against those of non-human living nature.
- Moreover, it is not convincing why the evolutionary change from inanimate to living matter should make the whole ethical difference. Why should the Matterhorn have less value than a slime mold?

2.5 Holism

In the holistic approach, all elements of nature, living or inanimate, possess an intrinsic value. The holist can relate the assignment of intrinsic values to certain aesthetic, structural or historic features. As in the biocentric approach, these features can concern natural individuals or natural collectives such as landscapes, biotopes or the stock of a non-biotic natural resource.

Principally, the holistic approach faces the same problems as the biocentric approach. Further problems come from the fact that the holistic position is often teleologically founded: according to this, nature has a certain purpose which is good and humans should subordinate themselves to this purpose. Objection to this view are as follows:

- Nature aside from humans strives for surviving matters only. Here, no ethical principles are evident.
- If humans are counted together with all their motives and actions as a part of nature, this would mean that the exploitation of nature would also be something '*natural*'.

2.6 Ethical fundamentals of the concept of sustainable development

In today's environmental discussion, the concept of sustainable development is of utmost importance. The definition of sustainable development emerged from a continuing international discussion. The result of this discussion was a first binding consensus about the desirable form of the economical, social and ecological developments.

Although neither the Brundtland-Report nor the Agenda 21 still specially goes into aspects of environmental ethics, the ethical position which supports the proposed solutions of the environmental problems can be read between the lines. The definition of sustainable development, for example, is formulated in terms of human needs:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs [...] The satisfaction of *human* needs and aspirations is the major objective of development [...] In essence, sustainable development is a process of change in which *the exploitation of resources*, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet *human* needs and aspirations." (The World Commission on Environment and Development, 1991, p. 43ff.; my emphasis)[9]

Thus, it seems that sustainability is based on an all in all anthropocentric perspective. Occasionally, however, we find biocentric arguments. This mixture of views appears, for example, in the analysis of the extinction of species: sometimes argumentations are used that originate in a tightly understood anthropocentrism (see The World Commission on Environment and Development, 1991, p. 147f.), sometimes the intrinsic value of biodiversity is emphasized (see UNEP, 1992, Preamble).[10]

Even when arguments with an anthropocentric character seem to dominate, sustainability appears to be ambiguous in another respect: the authors of the Brundtland-Report and of the Agenda 21 phrase it in such an open manner that it is hard to tell if their understanding of sustainability tends to rely on a strong or rather than on a weak anthropocentrism.[11]

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[6] In this context, the duty of omission means the duty to avoid causing pain.

[7] Against the naturalistic fallacy, GROH and GROH argue that nature is not suitable as a measure of values, because the natural values are influenced by human perception. Our relationship to nature is marked by our culture; one cannot escape this epistemological anthropocentrism (see GROH; GROH, 1993).

[8] EHRENFELD argues that the harmful pox virus has a right to existence since it already existed evolutionarily before humans – and therefore, reasoned by age, deserves an intrinsic value (EHRENFELD, 1978, p. 208). BIRNBACHER opposes this since, if value is based on age, inanimate elements would then deserve a higher degree than living elements (BIRNBACHER, 1991, p. 307). WOLTERS, on the other hand, declares that it is not only *allowed*, but even *imperative* to exterminate harmful species (WOLTERS, 1995, p. 246).

[9] See also the first principle in the Agenda 21: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature." (UNCED, 1992, p. 9)

[10] One notices that the Convention on Biological Diversity is an international contract, including material obligations.

[11] Mostly economical arguments are used, which originate from a narrower anthropocentric point of view. Sometimes, however, non-economical arguments are used, which is typical for a broadened anthropocentric view. See, for example, The World Commission on Environment and Development, 1991, p. 155 or UNCED, 1992, p. 131.

2.7 Discussion

As explained in the preceding paragraphs, each of the approaches of ecological ethics presented here has some weaknesses. From this point of view, none of the presented positions can be preferred absolutely. However, in today's perspective, the pre-modern character of the biocentric and the holistic approaches demonstrates major drawbacks. A modern environmental ethics should only be derived from generally accepted assumptions, such as the recognition of the vulnerability of humans, and eventually even of sentient animals, or the rational belief in the discourse as being the site where morals are generated. Knowing this, the anthropocentric or the pathocentric approach seems preferable.

However, this does not mean that the biocentric and the holistic approach have not provided extensive support for the development of a form of ecological ethics which corresponds to the requirements of a modern world. These positions, which often rely on metaphysical or emotional arguments, express a feeling that comes too short in the rationally faultless argumentation of the anthropocentrists. In the words of VON GLEICH:

"A 'primary ethical impulse' still exists in our population. We are still aware of the beauty of landscapes, which is being ruined. We even have an awareness of the 'integrity' of organisms, which is slowly being destroyed by intensive animal breeding, experimentations on animals, surgical interventions and genetic engineering. We are still aware that such interventions are not 'good', but we have tremendous problems in explaining and reasoning this rationally." (VON GLEICH, 1989, p. 79f.; my translation)

Because of this 'ethical feeling', it seems justified to prefer ecological ethics which cover most of nature's functions. From my point of view, weak anthropocentrism or pathocentrism provides a better account for suitably dealing with nature, and with this, for an entrepreneurially-directed form of environmental protection such as ecocontrolling.

3 Safeguard Subjects and Value Setting

In modern literature about ecocontrolling and ecobalances, different approaches for the determination of the ecological safeguard subjects and of their valuation are suggested. The thoughts which have been elaborated out of the theoretical analysis of the previous chapter will form the basis for the discussion of some of these approaches.

3.1 Requirements on safeguard subjects and value setting

From an ethical-theoretical point of view, it seems natural to choose those elements of nature with an intrinsic value as safeguard subjects. The concept of ecocontrolling, however, primarily has a practical importance; to form it in a operationable manner, some short-cuts and simplifications are unavoidable. The ethical foundation and the operationability form the poles of an area of conflict in which the choice of the safeguard subjects has to be positioned.

Safeguard subjects, moreover, are requested to form a complete system in the sense that every ecological impact should, in some way, lead to an impairment of at least one safeguard subject. This is why the number of safeguard subjects should not be too low. From the point of view of operationability and clarity, the number of safeguard subjects should not be too high either.[12]

The valuation of the safeguard subjects in an ideal case should be based on an ethically well-founded discourse within the society. However, because of the young age and the limited public questioning of ecocontrolling as a scientific instrument, a public discourse about the ideal and relative valuation of the safeguard subjects cannot be expected in the near future. Because of this, it seems very important that, at least in the small circle of the experts on ecocontrolling and other interested parties, well-founded arguments for one or the other valuation system be developed. Such a discourse, however, can only take place if agreement about the safeguard subjects is given, a situation which is not yet the case.

The public or at least the scientific acceptance is a precondition for supporting the choice and the valuation of the safeguard subjects with the necessary stability. Stability is another important requirement concerning the safeguard subjects and their valuation. We have to hinder as much as possible an ongoing change of the valuation factors which constricts us to a continuous adjustment of the instruments of ecocontrolling.

3.2 The EPS system

The system called EPS (Environmental Priority Strategy) was developed for Volvo in Sweden (see STEEN; RYDING, 1992). The EPS-system states five different safeguard subjects:

- Natural resources,
- Human health,
- Economical productivity, especially in agriculture,
- Biodiversity and
- Aesthetic values of nature.

The value setting results from a monetarization of the costs caused by the impairment of the safeguard subjects.

The costs caused by the depletion of natural resources are measured through future extraction costs. In other words, one estimates either the costs caused by the extraction of the last reserve of a given resource, or the costs for a suitable substitute. The costs of lowering productivity are quantified by the estimated loss of income in agriculture or in industrial production. The costs for an impairment of the remaining safeguard subjects are determined by the estimated social willingness to pay.

The complete environmental impairment, which arises from the worsening of the state of some safeguard subjects, is in this way expressed as an amount of money.

3.3 The proposal of Consoli et al.

In the approach of CONSOLI et al., the following safeguard subjects[13] are proposed:

[12] A high number of safeguard subjects requires a complicated system of coefficients for value setting which should show the public preferences for each safeguard subject. The development of such a system would be problematic.

[13] CONSOLI et al. use the term *general protection areas*.

- Natural resources,
- Human health and
- Ecological health (see CONSOLI et al., 1993, p. 23).

In Table 3–1 of CONSOLI et al.'s paper, effects on safeguard subjects are assigned to certain specific impact categories. These effects, however, are only understood qualitatively and are only differentiated between direct and indirect effects (see CONSOLI et al., 1993, p. 27). The authors do not state an explicit value setting, but they mention a procedure which helps with the determination of such a value setting: mainly it consists of decision theory techniques which include the advice of experts as well as the consideration of public preferences. The methods used can be of a qualitative or quantitative nature, whereby the valuation factors remain implicit in the qualitative value setting methods (see CONSOLI et al., 1993, p. 25).

The main direction that still needs to be investigated for the determination of the value setting is specified in paragraph 8.4 of CONSOLI et al.'s paper (see CONSOLI et al., 1993, p. 61).

3.4 The proposal of Goedkoop

In 1995, GOEDKOOP developed a system which should allow us to quantifiably cover all environmental impairments in Europe (see GOEDKOOP, 1995). The following safeguard subjects are used in this approach:

- Ecosystems and
- Human health (see GOEDKOOP, 1995, p. 22).

The impact on an ecosystem is measured according to the percentile lowering of the corresponding soil surface or of the corresponding water volume. The effect on human health is measured by way of two factors: the number of deaths caused by a negative environmental influence and the number of non-lethal health impairments occurring because of smog periods (see GOEDKOOP, 1995, p. 25).

The neglect of further safeguard subjects, which could account for further negative environmental influences such as depletion of natural resources, local environmental problems like odor, noise and light, or the production of final waste and toxic effects which cause only local problems, is justified argumentatively by GOEDKOOP (see GOEDKOOP, 1995, p. 22ff.).

GOEDKOOP proposes the following equivalence coefficients between the safeguard subjects: one additional death per million inhabitants per year, health complaints caused by smog periods,[14] and an impairment of 5 % of an ecosystem (see GOEDKOOP, 1995, p. 25f.).[15]

Thanks to these equivalence coefficients, any impairment of the safeguard subjects can be compared to any another, and all negative environmental influences can be expressed in one dimension (e.g. the additional number of deaths per million inhabitants per year).

[14] This coefficient is not quantitatively specified by GOEDKOOP – and so cannot be considered as a value setting coefficient.

[15] These equivalence coefficients mean that an impairment of 5 % of an ecosystem, which takes place over n years, should be considered as equivalent to n additional deaths per million inhabitants in the examinated area.

3.5 The proposal of Müller-Wenk and Braunschweig

MÜLLER-WENK and BRAUNSCHWEIG understand their input as an addition and improvement of the approach of GOEDKOOP. Their paper for the first time provides a clearly defined and operationable set of safeguard subjects (see MÜLLER-WENK; BRAUNSCHWEIG, 1996, p. 213ff.).

The following safeguard subjects are proposed:

- Human health and
- Biodiversity.

Compared to the approach of GOEDKOOP, the environmental impairment is measured in a more restrictive, but also more precise manner. Here, not the whole influence on ecosystems, but only the effect on the spreading of the species, is taken into consideration.

The instruments used for measuring the changes in the safeguard subjects are carefully choosen. To measure the impairment of human health, the day of sickness is used as the unit of measurement. One day of life less caused by an environmental impact is considered equivalent to N days of sickness.[16] The authors suggest N = 10. In this way, an equivalence between the impairment of health and cases of death is established. To measure the decreasing of species, the percentile lowering of their geographical spreading is taken into consideration. However, because this measuring leads to an unsolutionable practical problem,[17] MÜLLER-WENK and BRAUNSCHWEIG suggest two alternative solutions: 1) the geographical extent of a representative part of the European species or 2) the change in the extension of the habitats[18] of the entire European species should be used as a unit of measurement for the decreasing of species (see MÜLLER-WENK; BRAUNSCHWEIG, 1996, p. 215f.). A value setting coefficient between the two safeguard subjects of 'human health' and 'biodiversity' is not given explicitly.

Further possible safeguard subjects such as natural resources, natural productivity, aesthetic values or quality of life are being discussed, although they are not yet included in the list of the safeguard subjects. These decisions are founded argumentatively. MÜLLER-WENK and BRAUNSCHWEIG also assume that emissions, followed by impairment of health without spreading into the environmental media, do not form an influence to be taken into ecobalances (see MÜLLER-WENK; BRAUNSCHWEIG, 1996, p. 214).

3.6 Discussion

In paragraph 2.7, I came to the conclusion that only the weak anthropocentrism or the pathocentrism comes up to the requirements of modern, not transcendentally founded ethics, at the same time not showing a reductionistical understanding for nature. This is the starting point of my final conclusion.

[16] A day of sickness is defined as a situation where a person is not able to follow its normal activities. See MÜLLER-WENK; BRAUNSCHWEIG, 1996, p. 214.

[17] There are about 200,000 existing species in Europe. It would be practically impossible to control the geographical spreading of them all.

[18] There are about 2,500 different and already classified habitats in Europe. To control the change of their geographic extension seems easier than to control the change of the geographical spreading of every species.

From an ethical-theoretical point of view, the safeguard subjects in an ecobalance model should be those natural elements which possess an intrinsic value. In the frame of a weak anthropocentric approach, human life, human health and human welfare deserve the characteristics of a safeguard subject. If one chooses a pathocentric approach, one has to add the life and eventually also the health and welfare of sentient animals to the catalog of safeguard subjects. As already mentioned in paragraph 2.3, the pathocentric approach, however, does not answer the question which basic rights animals with a higher degree of organization should and can have. In order to avoid these difficulties in the following discussion, the weak anthropocentrism will be chosen as an ethical basis. This is also justified since the problem of the protection of animals, especially of the sentient animals, does not play a major role in ecobalancing.[19]

As already mentioned, weak anthropocentrism suggests the choice of following safeguard subjects: 'human life and human health', as well as 'human welfare'. While the safeguard subject 'human life and human health' is already precisely implemented in the literature concerned with ecobalances,[20] the safeguard subject 'human welfare' is still very vague. The first question that comes up is whether or not human welfare is subordinate to human health. For me, a striking answer to this is given by the statement of REICHE and FÜLGRAFF:

"No matter which environmental ethical approach we assume, the safeguard subject nature is more extensive than the safeguard subject human health |...| Protected is the existence of the [...] natural goods as objects of the enjoyment of nature, of the artistic and cultural products, as useful objects, as resources and as an expression of the variety of life." (REICHE; FÜLGRAFF, 1987, p. 247; my translation)

To indirectly justify the protection of natural goods in regard of their positive influence on the health of today's and future generations, would be very laborious. Apart from this, this constraint to indirectly argue could be dangerous since environmental protection normally appears to be less important than many other concerns of today's living humans: this would lead to a disadvantage for future generations.

A second possibility would be to add the safeguard subject 'human welfare' directly into the list of the safeguard subjects. However, two reasons can be held against this. Firstly, human welfare doesn't have to come out of the experience of untouched nature, but it can also be generated by activities which contribute to the destruction of nature. For example, it seems to be undisputable that, for many of today's living humans, consumption patterns that actually destroy nature generate welfare. From the point of view of sustainability, future generations may have to face severe problems, if human welfare would be regarded as a safeguard subject. Secondly, even without this occurring, human welfare should not be chosen as a safeguard subject because it is not operationable enough.

Let me suggest a possible solution. The part of today's and tomorrow's human welfare that is generated by using, enjoying and experiencing untouched nature can be expressed through some alternative measurement units which on the one hand delimitate the nature-focused welfare but, on the other hand, make it more precise and operationable. To *replace* the welfare generated by nature, I propose the two following units of measurement: *natural and semi-natural habitats* as well as *natural resources.*

Natural and semi-natural habitats indicate living spaces of animals and plants which have relatively little contact with human beings. In Europe, about 2,500 different types of such habitats have been classified (see STANNERS, 1995, p. 530). These encompass extensively managed agri- and silvicultural landscapes (semi-natural habitats; see STANNERS, 1995, p. 172ff.), as well as ecosystems (natural habitats; see STANNERS, 1995, p. 190ff.). To measure the impairment of the natural and semi-natural habitats, one can measure the change in the extention of the totality of these habitats.[21]

The impact on the safeguard subject 'natural resources' can be measured through the diminishing of their reserves.

The choice of these safeguard subjects brings two advantages. **Firstly**, a lot of important natural elements are recorded. The protection of semi-natural habitats and ecosystems indirectly ensures the protection of animals, plants, landscapes and the conservation of aesthetic values of nature and, in this, ensures important components of the *psychical* welfare of today's and tomorrow's generation generated by nature. The protection of the biotic and abiotic resources assures the production and the consumption, and consequently the *physical* welfare, of all generations.[22] **Secondly**, through this choice, the ethical problem that appears, when biodiversity is chosen as a safeguard subject, is solved: If natural and semi-natural habitats instead of species are chosen as a safeguard subject, it is possible to eradicate such harmful species as, for example, the pox virus.

Summarizing, I would propose the following safeguard subjects:

- Human health,
- Natural and semi-natural habitats and
- Natural resources.

Essentially, my proposal is also quite similar to that of CONSOLI et al. Between the approach of CONSOLI et al. and mine, however, there is an important difference: here only the safeguard subject 'human health' deserves an

[19] Of course, there are economic sectors where the choice of a pathocentric instead of an anthropocentric approach makes a big difference, e.g. sectors where experimentation on animals or unnatural forms of animal breeding are practiced for reasons of production. These problems are not discussed here. For further information see BIRNBACHER, 1991, p. 310ff.

[20] This safeguard subject is measured at best by adopting MÜLLER-WENK and BRAUNSCHWEIG's suggestions. See paragraph 3.5.

[21] However, it must be granted that ecosystems are not replaced by semi-natural habitats.

[22] Keeping standards of today's consumption is an important element of the living standard and, with this, of the welfare. To justify the protection of resources indirectly over the protection of human life and human health would be problematic since the necessity of arguing indirectly would lead to an overvaluation of today's concerns, which again would interfere with the legitimate claims of future generations on a suitable consumption. One could well argue that an excessive depletion of today's oil resources means a limitation of the production possibility for our descendants; this would lead to lower incomes which would naturally cause restrictions in the medical care sector. The health of future generations would then not be granted as our health. Obviously, this argumentation is very awkward and easy to attack. Now, facing the eminent meaning of the natural resources for the ensurance of an appropriate living standard and physical welfare, it seems inevitable to include natural resources in the list of the safeguard subjects.

intrinsic value, the natural and semi-natural habitats as well as the natural resources possess only a derivated value.[23] At least theoretically, this means that the protection of the last two mentioned safeguard subjects could be limited. Not all impacts on ecosystems or depletions of a natural resource have to lead to a decrease in the welfare generated by nature. Of course, such a 'limited right to impair' cannot be established for the safeguard subject 'human health'.

The practical determination of the limited right to impair for environmental influences is best determined by looking at the definition of sustainable development. Accordingly, an abiotic resource is exploitable as long as the diminution of its reserves is compensated through a higher efficiency of utilization or as long as the quantity of a biotic substitute is raised correspondingly. This means that the maximal limit of utilization of an abiotic resource is determined by its degree of substitutability or by the increase in the efficiency of exploitation. According to this, the exploitation of an abiotic resource only has to be classified as impairment of the corresponding safeguard subject when the exploitation rate is higher than the growth rate of the efficiency of utilization, or higher than the growth rate of a renewable substitute. Analogously, the exploitation of a biotic resource can only then be considered as the impairment of a safeguard subject when the exploitation rate is higher than the regeneration rate.

The practical determination of the limited right to impair a natural or a semi-natural habitat is much more difficult because of its multifunctionality. Criteria of caution suggest setting the limited right to impair to zero. Accordingly, any interference in an ecosystem or in an extensively managed agricultural landscape has to be considered as an impairment of the corresponding safeguard subject.

A well-founded discussion about a suitable value setting for the suggested safeguard subjects is premature at this stage, and goes beyond the scope of this paper. However, we can notice that the value setting of the safeguard subject 'natural resources' against the other safeguard subjects is only then admitted when the effective exploitation of a resource is higher than its maximally permissible exploitation degree (given by the limited right to impair).

4 Conclusion

In today's available literature on ecobalances, the discussion of the target system does not play an important role. However, it seems indisputable that the choice of suitable safeguard subjects is of primary importance in order to determine the gravity of the impact of human activities on the environment. For instance, entering natural resources into the list of the safeguard subjects means that their depletion has to be considered as an environmental impairment to be recorded by an ecobalance. This paper attempts to provide a methodological and practical contribution to a well-founded choice of the safeguard subjects. From a methodological point of view, this paper suggests that the importance of ethical arguments has to be taken into consideration increasingly. This will be possible only if experts of ethics will be deeper involved in the ongoing discussion on the target system of ecocontrolling and ecobalances. From the practical point of view, a concrete set of safeguard subjects is proposed.

Moreover, the paper suggests some indications for further research work.

In order to be an applicable instrument, ecobalances must rely on a quite stable target system. In my opinion, this initially requires to recognize the importance of the choice of suitable safeguard subjects and then to come to a consensus about the chosen safeguard subjects as soon as possible. In order to reach a sustainable agreement, it is necessary to increasingly involve not only experts of ecocontrolling or ethics, but every interested party in the discussion on the target system of ecocontrolling.

The rapid attainment of a binding agreement about the safeguard subjects would allow the determination of a value setting in the near future in order to complete the program of developing a quantitative instrument for recording every environmental impact caused by economic activities.

[23] In the proposal of CONSOLI et al., neither the nature of the safeguard subjects nor their equivalence relation is examined closely.

5 References

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