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Parks of the Future

**Protected Areas in Europe Challenging
Regional and Global Change**

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Protected Areas in Europe Challenging Regional and Global Change

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What role can parks play for sustainable development in Germany?

Abstract

The article focusses on action fields and indicators of the national sustainability strategy, which can be influenced well by large-scale protected areas. Positive examples are the high shares of ecological farming in various biosphere reserves and the regional brands in many nature parks and biosphere reserves. However, nitrogen surpluses and the area consumption are still too large across Germany. Additional problems are created by the enhanced cultivation of maize and oilseed rape for the extraction of renewable energy and the construction of wind-turbines in forests. One result of the article is a catalogue of measures, which can be implemented by large-scale protected areas as a part of their responsibility and objective to contribute to a more sustainable Germany.

Keywords

National sustainability strategy
German parks
Catalogue of measures
Regional brands and regional marketing initiatives
Germany

1. Introduction

There exist many different views and publications about sustainability, which vary highly in their historical and social context. In Europe the concept was first mentioned in the field of forestry by Carl von Carlowitz in 1713 (Grober 2013, Michelsen & Adomßent 2014). For many scientists the term is arbitrary and not helpful because it is composed of many different elements and not clearly defined. Sustainable actions are supposed to bring ecological, economic, social and sometimes cultural aspects into balance, so that life of coming generations will not be endangered as the result of limited resources. The precautionary principle should thereby dominate the repair principle. Thus, especially people in industrial societies should minimize their ecological footprint (Jackson 2009), change their lifestyle and reduce their consumption habits. However, this shows an ethical dimension of the problem. A sustainable future for currently 7.3 billion people will not be possible without changes in politics and economy linked to an ethical and less materialistic approach regarding our actions.

The worldwide political debate on sustainability started in the 1970s and was reinforced in the late 1980s and early 1990s (Report of the Club of Rome 1972, Brundtland-Report 1987, UNCED-conference of Rio de Janeiro 1992 and the following Agenda 21). However, there have been no noticeable outcomes so far. Globally we have passed the point—probably a long time ago—where we would have been able to take control easily (Flannary 2006, Weismann 2013). The ecological crisis has increased (Secretariat of the CBD 2014, WWF 2014), the economic crisis still exists and social differences have continued to worsen in many states (Piketty 2014, Wehler 2013). Furthermore, the north-south divide is hardly improving. Although an ecological economy is outlined, up to now it is only realized in fragments (Constanza 1991, Jackson 2009, Daly & Farley 2010).

Depending on the point of view (ecology versus economy, the intrinsic value of nature against the anthropocentric perspective), a distinction can be made between a strong and a light sustainability (Ott & Döring 2004, Grunwald & Kopfmüller 2012, Michelsen & Adomßent 2014). The following article regarding Germany is written from the perspective of an ecologist and highlights the role of large-scale protected areas for ecological sustainability, in this case in particular for nature conservation and biodiversity protection.

2. Tasks, number and area of large-scale protected areas in Germany

While national parks (NLP) are primarily designated for the protection of biodiversity (economic use should be abandoned on 50 to 100 percent of the park area), the aspect of sustainable use plays a big role in biosphere reserves (BR) and a moderate role in nature parks (NRP; German MAB National Committee 2005, Dt. Rat f. Landespflege 2010, Weber 2013; see also Figure 1). Especially biosphere reserves should function as model regions to realize sustainable use in the field (Hammer 2003). Nevertheless, it should be considered that some areas in biosphere reserves and large areas in nature parks do not have any protection status (they are neither nature conservation areas nor landscape protection areas). Thus, sustainable use cannot be assumed. The proportion of all large-scale protected areas on the terrestrial area of Germany is about 30 percent. In this context, the percentage of legally protected areas like nature conservation areas (NSG), landscape conservation areas (LSG) and national parks (NLP), constitute about 64 percent. However, the share of strictly protected areas like nature conservation areas (NSG) and national parks (NLP) is only about 14 percent of all large-scale protected areas (Table 1). This explains the rather slight effect of the parks on sustainable development; marine areas are not taken into account.

It can be summarized that the proportion of strictly protected areas, which have a larger positive effect on biodiversity conservation than e.g. landscape protected areas, is only 14 percent of the expanse of all large-scale protected areas. This should be considered in discussion about the effects of large-scale protected areas on sustainability.

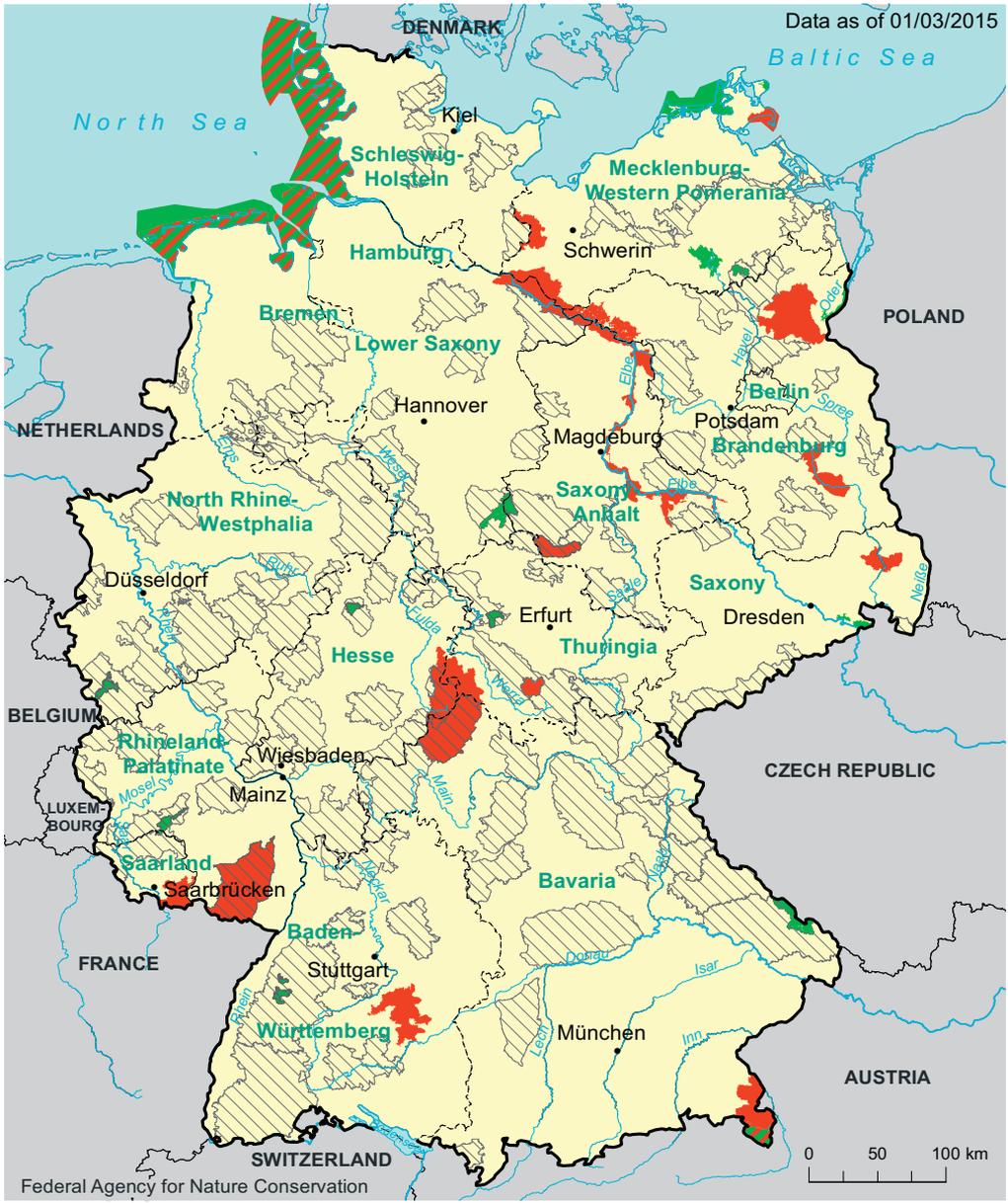
Table 1
Number and area of different types of large-scale protected areas in Germany and their proportion of integrated protected areas.

Large-scale protected area category	IUCN-category	Number	Area proportion of the terrestrial area of Germany	Area proportion of protected areas (NLP, NSG, Natura 2000, LSG) of all large-scale protected areas	Area proportion of strictly protected areas (NLP and NSG) of all large-scale protected areas
National park (NLP)	II	16	0,6 %	100 %	100 %
Biosphere reserve (BR)	–	16	3,5 %	84 %	43 %
Nature park (NRP)	V	104	27 %	59 % (with 5% NSG)	6.5 %
Sum for the whole area of large-scale protected areas (without overlapping)	–	136	ca. 30 %	64 %	14 %

NSG = nature conservation area; LSG = landscape conservation area

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Figure 1
 Large-scale protected areas in Germany
 (source: Federal Agency for Nature Conservation (BfN), 2015, Basic Spatial Data: © GeoBasis-DE/BKG 2015).



- National parks
- Biosphere reserves and National parks
- Biosphere reserves
- Biosphere reserves and Nature parks
- Nature parks
- National parks and Nature parks

Case studies and good examples of coping with global and regional change

3. The national sustainability strategy and its key indicators

The German national strategy on sustainability has been in place since 2002 (Bundesregierung 2002; for critical aspects see Grunwald & Kopfmüller 2012), the German biodiversity strategy since 2007 (BMU 2007). The 21 action fields of the integrative German national strategy on sustainability, a four-strand concept, are specified in Table 2.

Table 2
21 fields of action of the German national sustainability strategy.

Intergenerational fairness	Quality of life	Social cohesion	International responsibility
Limited use of resources <i>(Primary energy consumption/ productivity)</i>	GDP per inhabitant	Employment rate	Development cooperation
Greenhouse gas emission	Mobility	Whole-day care for children	Imports from development countries
Proportion of renewable energy	Land cultivation (Nitrogen surplus, Proportion of ecological farming)	Equalisation	
Area demand	Air pollution	Integration of foreigners	
Species biodiversity	Health and food		
Public debt	Crime		
Economic future precaution			
Innovation <i>(Expenses for science and development)</i>			
Education			
<i>Key indicators are set in italics</i>			

Fields of action, on which parks may have an important influence, are in bold in Table 2 and are going to be discussed below. For further aspects of the national strategy on sustainability see e.g. Wuppertal Institut (2008).

4. Threats to biodiversity

An evaluation of the red lists concerning German flora, fauna and biotope types (Korneck et al. 1996, Riecken et al. 2006, BfN 2009) results in the following compilation of threats to biodiversity (Table 3).

Table 3
Threat factors to biodiversity in Germany
(personal assessment after evaluation of the red lists).

Threat intensity	Threat factors
High	Intensive agricultural and forestry use Drainage / river regulation Pollution / Biocides Eutrophication Abandonment of use / afforestation of valuable cultural biotopes Direct loss of (valuable) biotopes
Medium	Fishery Recreation, human disturbances Climate change Re-allocation of land Excavations Habitat fragmentation Predation Suppression by neobiota Lack of natural dynamics
Low	Hunting Wind turbines (increasing) Coastline protection measures Rubbish

The German national strategy on sustainability integrates an indicator named *species biodiversity and landscape quality*, though it only regards the assessment of the population dynamics of 59 bird species. Breeding birds (260 species) represent merely about 0.4 percent of all 73,000 registered species in Germany. This indicator is therefore very selective and does not reflect Germany's biodiversity at all. Despite this, it still follows a negative trend.

5. Forests

Forests cover about 30 percent of Germany's surface. The percentage in large-scale protected areas is likely higher due to the high forest cover in e.g. national parks as well as nature parks and biosphere reserves. Naturally, Germany would be dominated by beech forests. However, the current proportion of beech forests is only 15 percent of Germany's land area. Old forests (>140 years) comprise only about 7.5 percent and unused forests only approximately 1.9 percent of the forest area (BMEL 2014). As a result, species that depend on old and dead wood are not promoted sufficiently. One possible way to foster these species is the certification of forests according to the FSC (Forest Stewardship Council). In this case, five percent of the areas belonging to forestry management would have to be taken out of use as reference areas (two percent in private forests). Yet the proportion of FSC certified forests in Germany is only five percent, compared to 78 percent of forests certified by PEFC (Program for the Endorsement of Forest Certification Schemes). To promote biodiversity it would be apt to increase the portion of FSC certified forests. The following Table 4 sets out the advantages of FSC compared to PEFC.

Table 4
Important differences between the certifications by PEFC and FSC.

Criteria	PEFC (Program for the Endorsement of Forest Certification Schemes)	FSC (Forest Stewardship Council)
Clear cutting	Possible without consultation of certifier in exceptional cases	In exceptional cases after examination by the certifier
Use of biocides	Possible in exceptional cases	Generally prohibited
Selection of tree species	Mixed stands are permitted; tree species from native forest communities in sufficient proportions	Focus on natural forest communities; foreign species are allowed only to a limited extent
Biotope trees and dead wood	To a reasonable extent (undefined)	Conservation of at least 10 biotope trees /ha; controls as a part of the inventory
Reference areas without utilization	No regulations	5% of the forestry management unit (> 100 ha); 2% in private forests

6. Agro-ecosystems

Agro-ecosystems comprise roughly 50 percent of Germany's surface. Within large-scale protected areas the proportion is likely to be lower. The same goes for the share of intensively used agro-ecosystems in large-scale protected areas compared to *normal landscapes*. This aspect is already shown by the location of large-scale protected areas compared to the overview map of the nationwide yield potential of soils. Also, it can be assumed that the percentage of funding from EU programs from the so-called *second pillar*, which flows into large-scale protected areas, is higher than the percentage share in other areas. Despite the high proportion of large-scale protected areas in Germany, the loss of grassland (about five percent of the overall grassland area in the

Figure 2

*Species-rich lowland hay meadow in the Vogelsberg Nature Park
(photo: Wolfgang Wagner).*



period of 2003–2012 (BfN 2014)) could not be stopped. The proportion of high nature value grassland in agricultural areas is also decreasing (Figure 2).

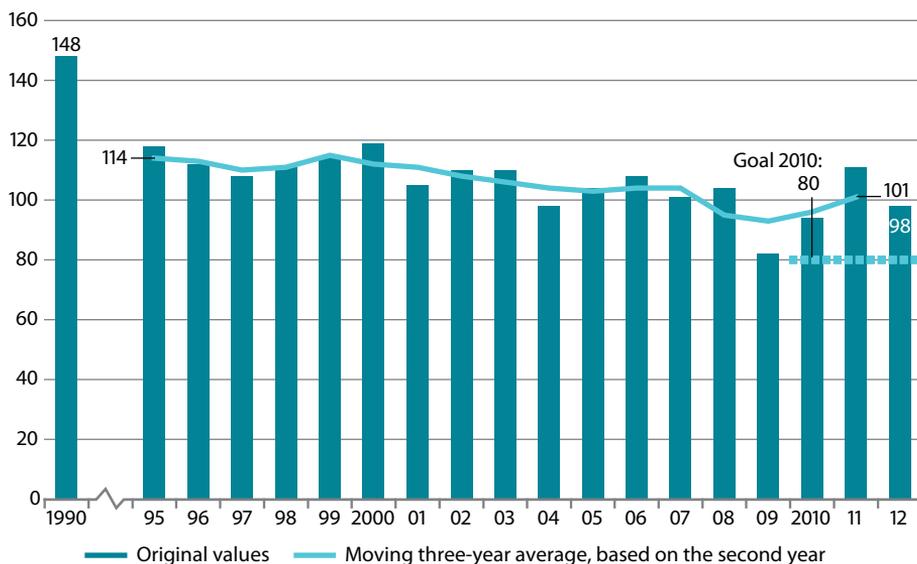
The decline of meadow birds, e.g. curlews, lapwings, black-tailed godwits, common snipes and meadow pipits, as well as other species of birds depending on extensive agricultural landscapes with high proportions of fallow land (e.g. corn bunting, partridge, skylark), is dramatic. The proportion of organic farming, a key indicator of the national sustainability strategy, has barely risen and currently comprises only six percent (compared to a target value of 20 percent). However, the proportion of organic farming in some biosphere reserves is already much higher, although in some cases even lower (Table 5).

Table 5
Area proportion of ecological farming in various German biosphere reserves
(State of 2014, according to data from the biosphere reserves).

Biosphere reserve	Proportion of ecological farming (related to agricultural land)	Comments on the landscape
Spreewald	70 %	Approximately the same portions of forests, arable land and grassland
Schorfheide-Chorin	33 %	High portions of forest and arable land
Rhön	14 %	High portion of grassland
Bliesgau	12 %	Fragmented cultural landscape with a balanced arable land/ grassland ratio
Schwäbische Alb	7.5 %	High portion of grassland and nutrient-poor grassland
Nds. Elbtalaue	6 %	High portion of grassland
Schaalsee	5 %	High portion of fertile arable soils
Oberlausitzer Heide- und Teichlandschaft	3 %	High portion of agricultural landscape; especially arable land
Südost-Rügen	0.7 %	High portion of fertile soils and forests

On the one hand, the threat to biodiversity through agriculture is explained by the low portion of organic farming, the loss of fallows and margins, the increasing enlargement of management units (parcels), the loss of habitats (e.g. (wet) grasslands, nutrient-poor grasslands, pastures), reduction of cultivated crop species, seed cleaning and the ongoing use of pesticides (see Hampicke 2013). On the other hand, there are still very high nitrogen surpluses, which threaten biodiversity in Germany. These oversupplies are also used as an indicator in line with the national sustainability strategy. In 1990 the original value was 148 kg/ha, currently it amounts to 101 kg/ha of agricultural

Figure 3
Nitrogen surpluses in Germany's overall balance
 (kg per ha of agricultural land; see Statistisches Bundesamt 2014; source: Federal Research Centre for Cultivated Plants – Julius Kühn Institut and Institut of Landscape Ecology and Resources Management, University of Gießen).



area (Figure 3). The target of 80 kg/ha set for 2010, still too high from an ecological point of view, could not be reached yet.

Fundamental problems for sustainable agriculture are caused by the agricultural subsidies, in particular provided by the so-called first pillar (Coenen & Grunwald 2003, Holst & von Cramon-Taubadel 2014).

7. Energy use, renewable energies

Since the early 1990s, primary energy consumption in Germany has shown little decline. However, in terms of greenhouse gas emissions the trend looks somewhat more positive (Statistisches Bundesamt 2014). The share of renewable energy in total energy consumption is currently at 12.3 percent (target for 2050 = 60 percent) and in electricity consumption at 25.4 percent (target for 2050 = 80 percent). The trends are positive, but lead to conflicts with nature conservation. It is known that the concentration of wind turbines in certain regions—there are now about 25,000 wind turbines all over Germany—can result in severe losses of birds like red kites and black storks or bats (Richarz 2014). This problem occurs in large-scale protected areas too. So it is questionable if this kind of energy generation in protected areas can be labeled as sustainable (see Table 6).

Table 6
Density of wind turbines in Germany's large-scale protected areas.

Parks without or very few wind turbines	Parks with a series of wind turbines (selection)		National parks with wind turbines in the immediate vicinity
Large-scale protected areas in Thuringia and Brandenburg	BR Hess. Rhön BR Pfälzerwald NRP Soonwald NRP Saar-Hunsrück NRP Eifel NRP Vogelsberg	NRP Elbhöhen-Wendland NRP Dümmer NRP Eggegebirge NRP Lahn-Dill-Bergland NRP Münden	Wadden Sea Eifel Hunsrück-Hochwald Unteres Odertal
<i>BR = biosphere reserve; NRP = nature park</i>			

The shift to renewable energy as part of the transition towards sustainable energy generation and use has also led to a significant increase of environmentally harmful maize cultivation (e.g. as material for biogas digesters) as well as a higher rate of oilseed rape cultivation (e.g. for the production of biofuels) since the turn of the millennium. The cultivation of energy crops, which is harmful to biodiversity, by now accounts for about 20 percent of all agricultural land and often does not stop at the borders of large-scale protected areas (Table 7). If this is the case, there also exists a clear conflict between use and nature/ecosystem conservation. Hence, from the perspective of the author, this arrangement cannot be regarded as sustainable. One just has to consider the high contamination of ground water with N-compounds in some parts of Germany resulting from the increased need of fertilizers for maize cultivation.

Table 7
Large-scale protected areas with high portions of energy crop cultivation (e.g. maize and oilseed rape).

Biosphere reserves with high portions of energy crop cultivation	Nature parks with high portions of energy crop cultivation (selection)	
Nds. Elbtalau Schaalsee Schorfheide	Lüneburger Heide Wildeshauser Geest Dümmer Drömling	Elbhöhen-Wendland Westhavelland Aukrug

Using the example of renewable energy, which is supposed to increase sustainability, illustrates that conflicts with nature/ecosystem protection may occur. In many cases large-scale protected areas are forced to decide whether the protection of biodiversity is more important than, for example, the establishment of wind turbines or the large-scale cultivation of maize.

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8. Unfragmented areas, settlement and transport areas

Unfragmented areas >100 km² exist hitherto mainly in northeastern Germany. However, large-scale protected areas are evenly distributed over Germany (Figure 1). This means that even in many parks the fragmentation of landscapes is (very) high. Additionally, settlement areas and transport areas in Germany are constantly increasing at a rate of about 74 ha/day, so that the targeted goal of a landscape consumption rate of max. 30 ha/day for 2020 is still far off.

In the future, the increase of settlement and transport areas should be limited even further (or rather be reduced to zero), especially in large-scale protected areas. Furthermore, paths and streets that are no longer needed should be removed or not be maintained any longer, to reduce the effects of landscape fragmentation. It should be possible to accomplish this in an intelligent manner, without hindering economic development.

9. What role do large-scale protected areas play for sustainable development in Germany?

The following measures, based on the trends and examples given above, have to be utilized by large-scale protected areas to accelerate sustainable development in Germany under the particular perspective of biodiversity conservation:

- ◆ Increasing the share of unused or FSC-certified forests
- ◆ Increasing the share of organic agriculture or extensively used land, funded by the second pillar of the CAP
- ◆ Increasing the share of fallows in the agricultural landscape (e.g. by redirecting funding for the first pillar to the second pillar of the CAP)
- ◆ Decreasing the cultivation of crops with high N-consumption (e.g. maize)
- ◆ Conserving or increasing the percentage of grassland (also due to the better C-bonding compared to arable land)
- ◆ Further designations of protected areas, especially nature conservation areas (NSG)
- ◆ Rewetting of peatlands and wetlands to reduce CO₂ emissions (Drösler et al. 2012)
- ◆ Reduction of land use and fragmentation of landscapes

- ◆ Development of services in the field of landscape management, e.g. energetic use of landscape management material (wood, green cuttings, etc.)
- ◆ Marketing of regional products, establishing regional brands (Table 8)
- ◆ Promoting of endangered livestock breeds and varieties (e.g. fruits)
- ◆ Environmentally friendly tourism/mobility (reduction of individual car traffic), certified by the EUROPARC Federation in line with the European Charta for Sustainable Tourism, acquisition and certification of other partnership companies (Hoffmann 2014)
- ◆ Promoting education on sustainable development

Overall, the park administrations need to take a central role in the sustainable regional management of their local areas. Admittedly, in many cases this approach requires an increase in staff. It would make sense to concentrate the nationwide promotion of ecological and sustainable projects in large-scale protected areas—however, until now there has been a lack of innovative impulses regarding that matter. Furthermore, the development of regional ecological and energetic cycles in parks should be further promoted (Gehrlein et al. 2007). One example is regional branding, so far especially for agricultural products (Table 8). Accordingly, it is assumed that the consumption of certain regional products within the regions where they are produced is linked to a lower energy balance regarding transport (and thus a better eco-balance). In this way regional products may contribute to the conservation of certain biotopes (e.g. apples to the conservation of orchards, sheep to the conservation of nutrient-poor grassland, cattle to the conservation of extensive grassland or carp and trout to the conservation of ponds; Kullmann 2007). Additionally, they strengthen the regional economy and smaller farms (Kraus et al. 2014). In food sales, products of regional brands only occupy a small niche, so that the associated positive sustainability effects are still low.

In addition, the business partners of large-scale protected areas, mostly in the field of accommodation and nature/tourist guiding, should be working closely with the park management and comply with certain environmental standards (Hoffmann 2014).

Table 8
*Examples for regional brands or regional marketing initiatives
in Germany's large-scale protected areas*

Name of the large-scale protected area	Name of the regional brand or other regional marketing initiatives	Products generated, branches involved
Biosphere reserves		
Rhön	Dachmarke Rhön	Food, gastronomy, tourism & recreation
	Apfelinitiative	Apples, apple juice
	Rhönschaf	Lamb, wool
Spreewald	Spreewald	Food (esp. cucumbers, horseradish)
Schorfheide-Chorin	Prüfzeichen Biosphärenreservat Schorfheide-Chorin	Food, gastronomy, beekeeping
Schaalsee	Für Leib und Seele – Partner Biosphärenreservat Schaalsee	Food, gastronomy, craft, tourism & recreation
Oberlausitzer Heide- und Teichlandschaft	Biokarpfen	Carp
Bliesgau	Bliesgau Genuss e.V.	Food, gastronomy, craft
Flusslandschaft Elbe	Elbelamm	Lamb
Nature parks (selection)		
Altmühltal	Altmühltaler Lamm	Lamb
Bergisches Land	Bergisch pur	Food
Bergstraße-Odenwald	Echt Odenwald	Food, craft (e.g. Odenwälder Gäulchen)
Dübener Heide	Bestes aus der Dübener Heide	Food, wood products, craft
Eifel	Eifel	Food, gastronomy, tourism & recreation, wood products
Harz	Typisch Harz	Food, craft, gastronomy, tourism, wood products
Märkische Schweiz	Märkische Schweiz	Tourism & recreation, food, gastronomy
Schwarzwald	Echt Schwarzwald	Food, gastronomy
Soonwald-Nahe	SooNahe	Food, renewable energy
Bayer. u. Hess. Spessart	Grünland Spessart	Food (esp. animal products)
Nördlicher Oberpfälzer Wald	Ein Produkt aus dem Naturpark Nördlicher Oberpfälzer Wald	Food, Christmas trees
Obere Donau	Lebensmittel aus dem Naturpark Obere Donau	Food

10. Conclusion

There are more indicators in the German national sustainability strategy that could have been discussed, to see if large-scale protected areas have an influence on them (e.g. energy consumption, mobility, air pollution). In the case of energy consumption and mobility it is postulated that there is likely no difference in the consumption of people living inside or outside a large-scale protected area. Regarding air pollution, it is assumed that the pollution is lower within large-scale protected areas (except major cities) than outside of large-scale protected areas (with major cities).

Other important aspects like water pollution and groundwater contamination are significant as well. However, they are not discussed here, as they are not indicators of the national sustainability strategy. Unfortunately, it is currently reported that the number of drinking water sources contaminated with nitrate has risen once again (Sachverständigenrat für Umweltfragen 2015).

How big is the influence of large-scale protected areas on the mitigation of climate change? Even though drained peatlands comprise only six percent of agricultural land in Germany, they emit 43 million tons of CO₂-equivalents annually. This corresponds to 58 percent of total agricultural emissions. An assessment of peatland areas in large-scale protected areas was conducted by Ssymank & Scherfose (2012). Especially by rewetting or abandoning peat- and wetlands, a valuable contribution to climate protection could be made without endangering biodiversity targets, as it is often the case with the usage of wind turbines and biomass (Figure 4).

On average, every citizen of the United States of America, western Europe and Japan uses 32 times more fuel and other resources than a citizen of the Third World and also produces 32 times more waste (Diamond 2005). The richest seven percent of the world population cause 50 percent of the CO₂ emissions, while the poorest 50 percent contribute only 7 percent of the emissions (Weismann 2013). Regarding the necessary steps to close this gap, the German sustainability strategy tends to a low sustainability.

What can be done in Germany? Besides the increasing of resource productivity (efficiency strategy) and material substitution (consistency strategy), mainly a change in consumer behavior (like sharing consumption) or a reduced consumption by every citizen is crucial (sufficiency strategy; Paech 2012, Skidelsky 2013). For example, lower meat consumption reduces mass farming and negative impacts on soils or groundwater by fertilizers. In doing so, large-scale protected areas can set positive examples. Additionally, changes in the political decision making process on sustainability are required, for example, regarding the consequent reduction of harmful subsidies, but also in terms of our general economic practices (e.g. Jahrbücher für nachhaltige Ökonomie, Scherhorn 2013, Heinrichs & Laws 2012).

Figure 4
More or less intact raised bog in southern Germany with high water level
(photo: Uwe Riecken).



The sustainability crisis started at about the same time, in the early 1970s, as the rise of national debts in countries worldwide—due to the hunger for economic growth. Both phenomena are linked to each other. Today—put simply—the states do not control the banks, but rather the banks control the states (e.g. Ziegler 2002). As long as these circumstances do not change, there is little prospect for a successful form of sustainable development.

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