

**Study**

**“Economic Value of Lakes  
and Wetlands”**

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**Summary**

## Legal Notice

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## **1. Introduction**

Ecosystem services (ESS) have the character of a public good. That is why they are often not reflected as a cost in a company's accounting. As an example, the global contribution of wetland areas worldwide is estimated up to 15 trillion US \$ per year (MA in 2005 b: 34). The present publication would like to highlight the importance of the contributions delivered by lakes and wetlands for society and in particular for the economy, where the value is, not yet sufficiently appreciated. It will be shown which risks, restrictions and disadvantages can potentially derive from the loss of our nature capital with the intention to increase the engagement and the responsibility for the preservation and sustainment of the ESS. Based on the examples shown, an incentive shall be created in order to better incorporate municipal and entrepreneurial impacts on ecosystems in the decision-making and planning processes and contribute to the development of new instruments for the financing of nature conservation. The results of the Lake Constance case study aim primarily at raising awareness of enterprises and stakeholders on site, as those have a tangible relationship to Lake Constance and are likely to be more willing to engage in the preservation of the water ecosystem.

## **2. Ecosystem Services**

Wetlands are among the highest valued ecosystems, because they provide clean water, minimise natural risks (e.g. coastal protection, water retention) and act as CO<sub>2</sub> sinks (e.g. moors and fens) (ebd). The Millennium Ecosystem Assessment (MA 2005a) defines four categories of biodiversity-based ESS which contribute to the human well-being (Table 1).

**Table 1: Types of Ecosystem Services**

Type of ESS	Definition of ESS
Provisional	Comprising all services and goods produced and provided by ecosystems, or with their help, and being used directly by the human beings.
Regulating	Services of ecosystems having an influence on elements and processes of other ecosystems.
Cultural	ESS contributing to the spiritual, cultural and individual well-being of mankind.
Supporting	Supporting ESS are prerequisites for all other ESS and usually not directly usable by humans.

Source: *Naturkapital Deutschland – TEEB-DE (2012)*

Different users benefit from the ESS of the wetlands. Table 2 distinguishes three different user groups, Private Sector, Public Sector and "Other Users".

**Table 2: User's groups of ESS of wetlands**

User Groups	Example for the use of ESS
Private Sector	Safe and sustainable water supply; supply of food; heat storage capacity of the water causes favourable microclimate conditions; soft location factors.
Public Sector	Administration unions or Federal States as suppliers of drinking water; tax revenues and fees from companies depending on the lake and wetlands; flood control and water retention; functions for science and education.
Other Users	Leisure activities; quality of life.

Reference: *Own data.*

Biodiversity and ESS can provide benefits in many ways. To capture a high portion of these it is often referred to the Total Economic Value (TEV). As main categories, use- and non-use values are distinguished. The first one looks at consumptive uses (e.g. consumption of fish, wood or fruits) and non-consumptive use (e.g. recreation). These direct-use value categories are relatively easy to assess, because here it can

often be related to existing markets and market prices in the evaluation, for example entry fees. Indirect uses, e.g. the pollination by bees as a prerequisite for the ESS "food", are also added to that category. In order to cover insecurities about future uses, the option value is often being used. It refers to potential advantages and uses from nature which are not known to date. The objective of the authors is not primarily the identification of a monetary market value for biodiversity and ESS. Their priority is to demonstrate that nature provides valuable and crucial goods and services that are – still – freely available to the public but at a risk of being irretrievably damaged. This makes it evident that nature and the services and products it provides should have a value and not be used free of charge.

Many of the mentioned ecosystems and ESS have recently been significantly affected through human influences. This created changes and pressure on the ecosystems. The damages caused are getting bigger and will eventually endanger the regeneration of the ecosystems. Hence, measures for the protection, preservation and the restoration of the ecosystems and their services must be seized by the private and public sector quickly. Different approaches for the acquisition of funds for the required measures exist. Traditional financing instruments for the protection of biodiversity and ESS in catchment areas are water fees and compensatory payments. Remunerations for water withdrawals are environmental regulatory instruments already being used by different federal states in Germany. For the withdrawal of ground and surface water the user must pay a certain amount per cubic meter which is fixed in respective legal regulations of the Lands. Payments for ESS (PES) are a rather new approach to finance nature and water protection measures. It is the basic idea of the PES that for external ESS a direct, contractual payment is made to local land owners in order to enable them to apply methods that guarantee the protection or the restoration of ESS (WUNDER 2005:3). The difference to water withdrawal remunerations such as water fees lies in the fact that PES are, up to now, voluntary arrangements.

### **3. Case Study Lake Constance**

With a surface of about 536 square kilometres, Lake of Constance is the third-largest lake in Central Europe. The catchment area of Lake of Constance has a surface area of approximately 11,500 km<sup>2</sup> (IGKB 2004: 8f.). Due to the excellent water quality the lake serves as a drinking water reservoir for almost five million people (BURKHARD et al. 2000: 20; IGKB 2009a: 12, ZINTZ et al. 2009). In addition to the supply of drinking water, the lake fulfils a number of other functions. In addition to wide areas of littoral zones and the glacially formed hinterland, designated as FFH areas, there are two RAMSAR wetlands at Lake Constance (MEGERLE and EBERLE 2005: 1; IGKB 2004: 18; ZINTZ et al. 2009: 106). Furthermore, the large water mass of the lake acts as a heat accumulator. Therefore, winters at the lake are rather mild with some 210 frost-free days per year. Hence, sensitive plant cultures can be grown in the Lake Constance region (IGKB 2004: 161).

The Lake Constance region is one of the touristic hot spots in Central Europe. Every year about six million overnight stays are registered. On the one hand, tourism is an essential economic factor in the region, whilst on the other hand it can also contribute significantly to environmental problems at the lake. Here the surface consumption and the intensive use of the riparian zones are to be considered and in particular, during the high-level season (ZINTZ et al. 2009: 118f; IGKB 2009b:10; MEGERLE and EBERLE 2005:1).

Besides the outstanding touristic importance, the German Lake Constance area contributes to the most innovative and fastest growing high tech regions of Germany. High levels of employment, combined with attractive soft factors such as the location factor, "lake", has led to immigration rates above average and consequently to a population density rate clearly above the average in Baden-Württemberg.

In particular, areas close to lake are characterised by high population density and high workplace concentrations as well as sub-urbanization and urban sprawl effects in the urban hinterland (MEGERLE & EBERLE 2005:1; MEGERLE & LASSEL 2011:1). Lake Constance is an attractive destination with a high leisure component,

and extremely good image value: 90% of the Germans know the lake and approximately 88% have already visited it (INTERNATIONALE BODENSEE TOURISMUS GMBH 2012:6). Since 1997 the number of overnight stays in Germany has increased by 37%. For the estimation of the recreational value of Lake Constance a simplified travel cost method is applied. That method assumes that visitors are willing to cover travel and opportunity costs to enjoy their holidays.

**Table 3: Figures tourism at Lake Constance: For the Bodenseekreis (administrative district) the following tourism statistics occurred in 2010.**

Number of German tourists	807,187 persons
Number of tourists from Europe	1,202,800 persons
Number of tourists from other continents	112,900 persons
Overnight stays German tourists	3,610,400 overnight stays
Overnight stays international tourists	507,400 overnight stays

*Source: Internationale Bodensee Tourismus GmbH*

Based on the information for the Bodenseekreis, about 2.1 million people visited as overnight guests. Furthermore, the whole Lake Constance attracts up to 32 million day trippers per year. In 2010 807.187 German Tourists have booked 3,610,400 overnight stays in the Lake Constance area, equalling 4.47 overnight stays per person. According to own calculations, the average German tourist spends 456.60 € per visit at Lake Constance. Not including the expenditures of day trippers, it can be calculated that the annual recreational value of Lake Constance based on, is an estimate of 369 millions €. Even if these are assumed very conservatively at 10 € per person a day, this would make an additional income of 320 Million Euro on the basis of 32 million day trippers. Surveys in Tübingen determined average expenses of over 38 € per day per guest (ROSNER & MEGERLE 2010). Comparable survey showed similar results, so that the actual income from day trippers at the Lake Constance could be in the range of almost one Billion Euro per year.

Commercial fishing has a long tradition at Lake Constance. Nevertheless the economic significance has decreased over the last years and the number of professional fishermen has dropped. A pilot study on the economic efficiency of commercial fishing in Switzerland concludes that „even if professional fishermen process and market their whole catch, their average incomes from the fishing do not reach the height of an average income of employees in other economic sectors“ (AGRIDEA 2010:23). Hence, a lot of fishermen try to open up additional sources of income, for instance from holiday pensions (SÜDKURIER 2013). In 2011, commercial fishermen achieved a total catch of 970 t corresponding almost exactly to the 10-year-average of 964 t p.a. (IBKF 2012b). The total quantity of recreational rod fishing is substantially lower at about 68 t. However, the economic value of the lake in terms of recreational fishing does not lie primarily in the yield value but in its importance for the leisure and tourism offer at Lake Constance. The total value of fishing can be calculated at more than 4 millions € per year.

**Table 4: Economic calculation of the ecosystem “freshwater provision”**

<b>Calculation of the value of the drinking water provision</b>	
Withdrawal amount (in m <sup>3</sup> )	127,600,000
Average price for drinking water (in €)	2,191
Total per year (in €)	279,571,600

*Source: Own calculation*

Lake Constance has great significance as a fresh water supply for Baden-Württemberg. All together about five million people in 320 towns and municipalities of the federal state are supplied with fresh water from Lake Constance. The annual withdrawal of water has remained relatively steady during the last years and amounted to 127.6 million cubic meters in 2012. There is an existing market price for drinking water which has to be increased due to different reallocations of fixed and operational costs. For this study, an average price derived from the different water prices of the four biggest towns supplied by Lake Constance has been calculated. It amounts to a total sum of almost 280 millions € per year, even without the value of direct with-



drawals of the riparian municipalities and the water withdrawals of Switzerland.

Lake Constance and its surrounding area influences the quality of life as well as on the attractiveness as a location for companies. As it is very difficult to attribute monetarily value these cultural ESS of Lake Constance, a qualitative judgement of the site attraction was carried out. Last century the attraction factor “lake“ caused a population growth that is considerably higher in the Lake Constance region than in more lake-remote regions (MEGERLE & EBERLE 2005). Current surveys show that a clear gradient in the population density exists between municipalities in the first row and the municipalities in the second row. Despite that, the population density is considerably higher in municipalities in the first lake row (333 Inhabitants/km<sup>2</sup>) as well as in municipalities in the second lake row (256 Inhabitants/km<sup>2</sup>) compared with the national average of rural areas i.e.S. (128 Inhabitants/km<sup>2</sup>) (see STALA 2010:11) . The average standard land values of residential areas for districts with connection to the lake are almost double those of villages without connection to the lake. This gives a clear evidence of the special attraction to the direct lake connection.

To assess the value of Lake Constance as a business location, local city and location marketing agencies as well as economic development associations in the administrative areas of Bodenseekreis and Konstanz (Landkreis) in addition to a number of local companies of various sizes were consulted. Two questionnaires have been developed. One was directed towards town and location marketing agencies respectively economic development associations, the second one addressed directly the regional enterprises. The results show that Lake Constance has a direct influence on the attraction as a residential location what can be proved with the help of ground value and population density indicators. For enterprises, Lake Constance is also a determining location factor, not only in relation to hard location factors, but also on account of the existing soft factors, as for example the high leisure value for the employees.

#### **4. Action Recommendations**

One reason why the pressure of human beings on wetlands is so high is the lack of incorporation of environmental impacts in operational decision-making processes and the accounting systems (internalisation). This is partially due to inadequate political frameworks and legislations. A solution would be to develop compulsory frameworks for the monetary assessment, standards and accounting regulations for enterprises (TEEB 2010: 37f).

One of the most important regulations for the preservation and protection of lakes, wetlands and fresh water is the Water Framework Directive (WFD). Among others, the objectives of the WFD are the cost recovery of the water services and achieving adequate water prices according to the polluter-pays principle. The implementation of these principles is proceeding too slowly so far. Furthermore, the action plan for the rehabilitation of the lake shores and littoral zones is also evolving too slowly due to the lack of financial resources, although climate change is increasing the pressure to take measures more quickly. A better financial framework for these programs is urgently recommended. The principle of volume related cost recovery prices on water withdrawals and sewage discharge is not yet stringently applied to private user groups and in particular, agriculture, tourism and energy production as a central instrument for maintaining the sustainable use of water and the ESS.

Basically all users of water should be compelled by regulatory instruments like a water abstraction fee or wastewater charge to balance external costs of utilisation and to internalise them through corresponding fees. A more precise determination of the external, societal costs of the utilisation would be required. A further long-term goal would be an ecological financial equalization. Therefore, ecological indicators should more than ever before, function as a basis for the distribution of funds. A stronger inclusion of conservation-relevant aspects based on a PES-approach would be useful. Besides the ESS water supply, users of other ESS could be included as well. For example, tourism businesses could be compelled to allocate a part of their turnover for nature conservation and, analogous to a visitor's tax, implement an ecological tax. Also voluntary measures and programs like the "Moore Futures" (voluntary carbon

credits) or the concept of forest shares, where guests can compensate their carbon footprint by planting trees, can be possible in the Lake Constance region.

Very often, agricultural payments, for example from the common EU-agricultural program, unfortunately have a negative impact on the environment. Therefore, ecological payments have to be more explicitly attributed to environmental objectives. Besides the introduction of new support mechanisms for the conservation of ESS it makes sense to inspect existing subsidies regarding their environmental impacts. Ecological payments have to be bound on the attainment of clearly quantifiable environmental objectives and may only be paid if a measurable improvement has been achieved.

At Lake Constance, the intensive and long-term studies of the Institute for Lake Research Langenargen (ISF) prove a good technical basis for the protection and development of shallow water and littoral zones. The results of the research and studies of the ISF have already been published (1994) in the “Lake Constance shore plan” (Bodensee-Uferplan) by the regional association Bodensee-Oberschwaben and the special-purpose association Hochrhein-Bodensee and had influence on the published “Action program littoral and shallow water zone at Lake Constance” (Aktionsprogramm Ufer- und Flachwasserzone am Bodensee), published by the state government of Baden-Württemberg in August 2012. The extensive enlargement of areas defined as “Protection Zone I”, now has to be kept free from all structural measures. The permission of changes in littoral zones defined as “Protection Zones II” (e. g. seaside resorts, footbridges, port facilities, buoys) has to be checked even more strictly for the environmental compatibility by the responsible approval agencies. Buffer zones have to be created around the existing protected areas to establish natural corridors and to achieve a connection of the near-natural littoral and shallow water zones to the hinterland. A more stringent implementation of regional planning guidelines by responsible authorities, preventing and limiting undesirable surface consumption, is advisable. The most effective protection of ecologically high-grade areas seems to be ensured by regulations and guidelines of the EU (e. g. Birds and Habitats Directives) because the matter of nature and landscape are weighted highly.

Otherwise, Birds and Habitats Directives and the EU Water Framework Directive are purely additive and rarely interconnected at the moment. A coordination function guided by regional planning with competent staff is highly recommended.

For tourism and local recreation, strategic regional coordination instruments are so far only equipped with rudimentary competences and can barely make guidelines to limit tourism induced stress. Although regions have set a of precedence for nature protection and are seen to be accountable, goals of spatial and landscape planning stricter implementation mechanisms have to take effect. Traffic planners should consult on a *traffic master plan* within the limited resources and also focus on the extension of local public transportation as well as on conceptual approaches to reduce private transport. The influence of planning control elements is especially is limited. in the private sector. Here, funding instruments and incentive schemes can be applied successfully. Especially in the tourism sector, desired structures, measures and programmes can be supported by targeted funding policies. Valuable examples of good practice can be found in major protection areas in Baden-Württemberg like the Biosphere Reserve Schwäbische Alb and PLENUM regions.

The huge concentration of shorelines of Lake Constance is the result of the fact that offers and potentials of the hinterland are often known insufficiently. This leads to an unsatisfying distribution of tourist flows and to an inadequate participation of hinterland-communities in the tourist industry. The mentioned ESS approach can offer suitable instruments to involve enterprises in the protection of ecosystems, especially if transaction costs are reduced and effect and range are increased. The “Visit, Give, Protect” at the Lake District in England can be instanced as an example. Here, different tourism businesses got together to motivate guests and customers to pay a voluntary amount for the conservation of nature (NURTURE LAKELAND 2013).

The members of the International Lake Constance Conference (IKB) have passed a lake spanning concept in cooperation with the International Commission for the Protection of Lake Constance (IGKB) for sustainable use of the shore of Lake Constance. The concept and the action programs include, e.g. for the rehabilitation of

shores and shallow water zones, have to be implemented now. Furthermore it would be useful to rework the Lake Constance model. It should include greater references to the important ESS and to the necessity to protect the ecosystem and its services. The model should be a binding cooperative agreement, where politics and administration of all adjacent states are obliged to acknowledge the model as a binding planning tool, to consider the guidelines as a guiding principle for their decisions and to contribute to reaching agreed-upon goals.

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## **5. Literature**

Please see long version of the study (in German only) at

[www.globalnature.org/seenstudie/](http://www.globalnature.org/seenstudie/)