

Sustainable Use of Land and Water in the Design of Recreational Communities

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1. Characterisation of Lake Balaton and Lake Balaton Recreational Area

With a surface area of 594 km², Lake Balaton is the largest lake in mainland Europe. However, because of its extreme shallowness, its volume is only 4 % of Lake Constance or a mere 2% of Lake Geneva. The long-term water budget of Lake Balaton is positive: tributary inflow is roughly equal to evaporation (900 lake mm/year), and outflow is almost equal to direct precipitation (600 mm/year), since water use is only 30 to 50 mm/year. The water budget figures are less favourable in the last 20 years and particularly unfavourable in the last 5 years (no outflow).

The Lake Balaton catchment area (5776 km²) lies entirely in Hungary, therefore, the water quality of the lake is a domestic issue. Because of the Lake's significance, the catchment is designated as an individual subcatchment in accordance with the Water Framework Directive of the EU. Lake Balaton Recreational Area (called the Lake Balaton Region including the lake and 164 municipalities in its vicinity) is a special territorial development area specified by the Hungarian Law (Lake Balaton Act of 2000). Situated almost entirely in the catchment area, Lake Balaton Region (LBR) has a surface area of 3780 km² and 250 thousand permanent residents. There are 110 thousand permanent residences and 70 thousand recreational (seasonally used) homes. The Lake Balaton Region produces 34% of Hungary's annual tourism revenues i.e. some 3 to 4 % of GDP. There are more than 10 million registered guest nights annually. Non-registered guest nights may exceed this figure by a factor of two to four.

Characteristics of land use in the Lake Balaton Region are shown in Table 1. Percentage of forest, vineyard and reed cover substantially exceeds the national averages in LBR. Important aspects of agriculture in this region are vineyards.

Table 1: Land use in the Lake Balaton Region (Source: 2000, LB Strategic Development Plan).

Land Use Category	Lake Balaton Region, ha *	Lake Balaton Region, %	Country %
Cultivated land	227,041	77.2	85.6
Agricultural	144,338	49.1	66.5
Arable land	95,256	32.4	51.8
Vineyard & orchard	19,973	6.8	2.4
Meadow	13,827	4.7	12.3
Other (reed, fishpond)	15,364	5.2	0.7

Forest	82,703	28.1	19.1
Non-cultivated	67,094	22.8	14.4

* without Lake Balaton surface

2. Development and sustainability

The principle of sustainability has frequently (if not always) been neglected during the history of development of Lake Balaton and its Recreational Area. In this region “development” is synonymous with “careless human impact”.

The first, and probably most severe human impact on the lake was the considerable water level (and therefore volume) reduction during the 1860s. The purpose of the volume reduction was to protect the newly constructed railways from level fluctuations and more importantly ice pressure in winter. The lake lost almost half of its volume and large areas of neighbouring marshlands became disconnected and eventually dried up.

The lake level was controlled with ever increasing “precision” meaning that natural water level fluctuations required by reed and other macrophytons were reduced.

Increasing use of fertilizers and development of water supply infrastructure without developing proper sewer and sewage treatment systems resulted in a huge increase in nutrient load and subsequent algal blooms.

Permitting building directly on the lake shore resulted in loss of wildlife habitat and increased pollution. It also increased the need to construct walls to protect against wave erosion - further amplifying the loss of habitat.

Intentional or accidental introduction of foreign/invasive species: Eel, zebra mussel, silver carp and other fish, tropical blue-green algae (*Cylindrospermopsis raciborskii*), solidago, etc. **this sentence is out of context – not sure how it is supposed to fit**

Most development in the past has resulted in non-sustainable processes and negative changes. Degradation of water quality, loss of biodiversity, and degradation of the state of the environment has resulted in long lasting, historic problems. These changes are compounded by the negative water balance recently caused by low precipitation.

Table 2: Historic and emerging issues

Category of issue	Historic	Newly emerging
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Environmental	Vulnerable water quality (WQ), eutrophication Landscape degradation Overbuilding Intensive use of agrochemicals	Negative water balance Declining fish catch Reed degradation Appearance of invasive species Aging vineyards
Socio-economic	Slow pace of WQ control measures Sub-standard waste management Conflicts of conservation vs. development Aging and other demographic issues Complex governance framework, weak policy coordination Excessive reliance on tourism for livelihoods Grey economy and tax evasion	Deficiencies in WQ monitoring system Water conveyance conflicts Declining number of tourists and tourism income Fragmented land ownership

3. Present Planning and Trends

It can be seen now, that many of the problems caused by poorly planned or well planned but poorly implemented development could have been avoided. Regional planning considering the complex issues has made considerable progress in the last 15 years.

In case of Lake Balaton, a mid- term development plan and a strategic development program have been formulated and endorsed by government agencies and regional players. The Strategic Development Program of Lake Balaton has five major components:

- Environmental protection and nature conservation
- Infrastructure development
- Activation of the regional economy – tourism industry
- Human resources development
- Development of the institutional framework and cooperation

It has been widely recognised that a clean and inspiring environment is a precondition not only to biodiversity but of a sustainable tourism industry. Human resource development and education can contribute to increasing environmental awareness and improved services at

the same time. A carefully developed infrastructure reduces the environmental impacts of transportation and other environmental uses.

Although the "think globally act locally" principle is very important in achieving sustainable land and water use, some issues such as the impacts of climate change or demographic trends can not be dealt with at local or regional level. International cooperation and, if necessary, pressure on governments and business organizations may constitute important means to free ourselves from the non-sustainable pathways of development.