LANDSCAPE OBSERVATORY

Part I: Land use mapping





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Part II: Landscape photography

Author: DI Michael Schimek, MA

schimek plant Ingenieurbüro für Raumplanung und Raumordnung DI Michael Schimek, MA A-3430 Tulln, Bahnhofstraße 65/1/20 www.schimek-plant.at

Commissioned by: Verein Welterbe Neusiedler See DI Hannes Klein A-7000 Eisenstadt, Europaplatz 1

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METHOD

1. Idea

Monitoring the changes in a World Heritage cultural landscape is an important element of precautions in order to detect slowly progressing changes of the landscape features and to discuss action to tackle those changes, if necessary. At the same time, it is important to discuss those changes in connection with the Outstanding Universal Value (OUV) of the World Heritage site. Some changes may be negligible, others may impose a threat to the OUV, and addressing and, if possible, tackling them should be made a priority.

The OUV of the World Heritage cultural landscape Fertő-Neusiedler See is formulated as follows:

Brief synthesis

Fertő/Neusiedlersee Cultural Landscape incorporates the westernmost steppe lake in Eurasia. This is an area of outstanding natural values and landscape diversity created and sustained by the encounter of different landscape types. It is situated in the cross-section of different geographical flora and fauna zones as well as wetlands, and is characterised by sub-Alpine mountains, sub-Mediterranean hills, alkaline lakes that dry out from time to time, saline soils, reeds, and shoreline plains. This area, a valuable biosphere reserve and gene bank, is home to a rich diversity of flora and fauna and has been shaped harmoniously for eight millennia by different human groups and ethnically diverse populations. The present character of the landscape is the result of millennia-old land-use forms based on stock raising and viticulture to an extent not found in other European lake areas. This

interaction is also manifested in the several-century-long continuity of its urban and architectural traditions and the diverse traditional uses of the land and the lake. The Fertö/Neusiedlersee Lake is surrounded by an inner ring of sixteen settlements and an outer ring of twenty other settlements.

Two broad periods may be discerned: from around 6000 BC until the establishment of the Hungarian state in the 11th century AD, and from the 11th century until the present. From the 7th century BC the lake shore was densely populated, initially by people of the early Iron Age Hallstatt culture and by late prehistoric and Roman times' cultures. In the fields of almost every village around the lake there are remains of Roman villas. The basis of the current network of towns and villages was formed in the 12th and 13th centuries, their markets flourishing from 1277 onwards. The mid-13th century Tatar invasion left this area unharmed, and it enjoyed uninterrupted development throughout medieval times until the *Turkish conquest in the late 16th century. The economic* basis throughout was the export of animals and wine. The historic centre of the medieval free town of Rust in particular prospered from the wine trade. Rust constitutes an outstanding example of a traditional human settlement representative of the area. The town exhibits the special building mode of a society and culture within which the lifestyles of townspeople and farmers form an entity. Its refortification in the early 16th century marked the beginning of a phase of construction in the area, first with fortifications and then, during the 17th-19th centuries,

with the erection and adaptation of domestic buildings. The remarkable rural architecture of the villages surrounding the lake and several 18th-and 19th-century palaces add to the area's considerable cultural interest. The palace of the township of Nagycenk, the Fertöd Palace, the Széchenyi Palace and the Fertöd Esterházy Palace are also exceptional cultural testimonies.

Despite the fact that it is a transboundary property, located on the territory of two states, Austria and Hungary, it has formed a socio-economic and cultural unit for centuries, which is outstanding in terms of its rich archaeological heritage created by consecutive civilisations, its rich stock of historical monuments reflecting ethnic diversity, and the elements of its rich ethnographic, geological and mining heritage.

Criterion (v):

The Fertő/Neusiedlersee has been the meeting place of different cultures for eight millennia, and this is graphically demonstrated by its varied landscape, the result of an evolutionary and symbiotic process of human interaction with the physical environment.

Integrity

The inscribed property, located on the Austrian-Hungarian border, is not only characterised by diversity but it has also maintained, in terms of both natural and cultural aspects, its landscape, its socio-economic and cultural features, as well as its land-use forms, the several century-long continuity of its viticulture and stock-raising, and the rich characteristics of settlement architecture and structure related to land-use. The integrity of the property is based on geological, hydrological, geo-morphological, climatic, ecological as well as regional and cultural historical characteristics.

The landscape of the Fertő/Neusiedlersee has advantageous natural and climatic conditions, which have made it suitable for agricultural cultivation and stock-raising for thousands of years. The water, the reed-beds, the saline fields, alkaline lakes and their remains, the row of hills enclosing the lake from the west with forests and vineyards on top, represent not only natural-geographical component features, but also hundreds of years of identical uses of the land and the lake, making the area a unique example of humans living in harmony with nature. Among the world's saline lakes, the Fertő/Neusiedlersee area is unique in terms of the organic, ancient, diverse and still living human-ecological relationship characterising the lake and society. The characteristic human-made elements of the cultural landscape include the tradition*al, partly rural architectural character of the settlements* around the lake, the settlements' structure, the unity of the homogeneously arranged buildings on squares and streets, and several 18th and 19th century palaces in their landscape settings. The several-century-long viticulture, viniculture and reed management contribute to the continuity of land-use as well as to the continuous use of traditional building materials.

Much of the value of the area lies in its genuinely unchanging qualities of the way of life, the preservation of vernacular architecture and a landscape based upon a traditional and sustainable exploitation of a limited range of resources. Though tourism is both a change and a catalyst thereof, associated development and insertion of the intrusively modern construction will need to be controlled. Maintaining these characteristics and the conditions of integrity will entail the development and enforcement of guidelines and zoning regulations to ensure that new development does not occur on open land and that it respects the form and scale of traditional buildings.

Authenticity

The overall landscape and scale as well as the internal structure and rural architecture of the towns and villages bear witness to an agricultural land-use and way of life uninterrupted since medieval times. The settlement pattern and occupation of several present-day village sites date to Roman times and earlier. Buildings, walls and vistas have been preserved in many places as well as the ratio of built-in areas. Authenticity is also supported by the continued use of local building materials (limestone, reed and wood). A varied ownership pattern is exemplified by the remarkable rural architecture of the very small villages and by the Fertőd Esterhazy and Nagycenk Széchenyi Palaces, outstanding examples of the landed aristocracy's architecture of the 18th and 19th centuries. The Leitha limestone, found near the lake and quarried from Roman times until the mid-20th century, provided building stone to Sopron and Vienna as well as to local settlements.

Protection and management requirements

The property has been a nature and landscape protection area since 1977, and the protection area has been classified as a reserve under the Ramsar Convention since 1983. The Fertő/Neusiedlersee is also a MAB Biosphere Reserve. In Austria, Neusiedler See-Seewinkel National Park (1993) is within the Ramsar area. The southern (Hungarian) end of the property has been a landscape protection area since 1977 and it became the Fertő-Hanság National Park in 1991; furthermore, parts of the property also belong to the Natura 2000 network. Cultural property, including outstanding monuments and groups of buildings and objects, is protected in Austria by the Austrian Monument Protection Act 1923 (consequently amended several times) and in Hungary by the Act of 2001/LXIV on the Protection of Cultural Heritage. The entire historic centre of the free town of Rust (Austria) and Fertőrákos (Hungary) are under historic area protection. Nature is protected by law on provincial level in Austria.

Land ownership is complex: in the Austrian part less than 1% lies with the State, the bulk belonging to private owners and communities. In the Hungarian part within the Fertő-Hanság National Park, the State owns 86% of the land, with other owners in the property being the local governments, the Church and private individuals.

A detailed zoning plan for the Austrian part of the property has already been approved. A management plan for the whole property has been developed and its implementation is supported by the joint Management Forum. The Plan has advisory status and plays a strategic guiding and influencing role but is not generally compulsory. Control and monitoring functions are also exerted through the democratic participation and decision-making processes of the public. For conserving the existing cultural properties on both sides of the frontier, responsibilities are shared by federal, provincial and local levels. On the Hungarian part, the review of the Management Plan, based on the Act on World Heritage, will provide detailed regulations that may include zoning arrangements. The Regional World Heritage Architectural Planning Jury assists in the realization of high-quality developments adapted to the values of the property. The Fertőtáj World Heritage Hungarian Council Association is the management body of the Hungarian part of the World Heritage property. In Austria the combined effects of the Monument Protection Act and village renewal regulation within a tourist context encourage sustainable tourism. One of the management challenges consists in the balanced and sustainable development of the transboundary property through harmonising management plans. Short-term tasks include the protection of important views, bearing in mind long-distance visibility due to flat-land characteristics of the wider setting, and in face of development pressures (high-rise buildings, wind turbines, etc.) in the broader setting of the property. Tools to achieve this are planning regulations and World Heritage Planning Juries. Mid-term tasks include maintaining traditional land-use forms and activities adapted to the requirements of contemporary context: safeguarding the structure, architectural character and extension of the settlements, as well as, increasing the local economy's population retaining capacity. One of the means to attain the latter objectives is sustainable tourism, which needs to be managed in subordination to the interests of the preservation of heritage values. Another challenge consists in mitigating the impact of climate change on the built and natural environment (e.g. the extreme changes in the water level of Fertő/Neusiedlersee).

The following elements may be monitored by a land use mapping, a.o.:

- The extension of the water areas of Neusiedler See.
- The state of the salt pods in the Seewinkel region.
- The compactness and growth of settlements and built areas.
- The extent and growth of recreational areas.
- The growth or retreat of forested areas.
- The growth or retreat of the reed belt.
- The diversity of landscape elements in the agricultural area.

The work plan intends to repeat the land use mapping every three to five years, due to the rather high workload connected with evaluating the maps. Out of this comparison, the need of further action may be detected and formulated.

The results of the land use mapping may be put into relation with the other part of the monitoring programme, the landscape photography (part II).

2. Methodology

In general, it is (still) hard to find a common base map for both the Austrian and Hungarian part of the World Heritage site:

- In Austria, cadastral maps and orthophotos are already part of the Open Government Data programme.
- In Hungary, orthophotos still need to be purchased at a rather high price from private providers.
- During work, it was not possible to retrieve Hungarian cadastral maps.
- The Burgenland authorities have some satellite images covering the Hungarian part of the World Heritage site, but not at a desirable resolution.

Therefore, the base map choosen was retrieved from Google Earth. This map covers all of the World Heritage site at a reasonable resolution.

One negative point of using Google Earth is that Google doesn't give an exact date of photography but only a rather wide range of time (from 2012 to 2021).

By comparing the Google Earth images with the most recent Austrian orthophotos (from 2019), it is feasible to assume that the Google Earth photos used are from around 2017 to 2018. From the vegetation and the amount of water in the salt pods, the Austrian photos are most likely to have been taken in March or April. Areas of the Hungarian part of the World Heritage site probably have been shot during summer (and during late afternoon), since they show more vegetation on the fields and on the trees and partly rather large shadows. Of course, especially the amount of water in the salt pods would show a rather different picture if the photos would have been taken at the end of summer. The comparison with the Austrian orthophotos shows that they were taken during spring as well.

The land use mapping was created using QGIS version "Białowieża" 3.22.10. Based on the Google Earth images and the Austrian cadastral map, the following elements of the cultural landscape were mapped in a slightly generalized way:

- Built areas.
- Recreational areas.
- Castles.
- Quarries (active and non-active).
- Solar power areas.
- Agriculture (including winegrowing).
- Reeds.
- Nature protection areas and fallow land (Brachen).
- Forested areas.
- Water areas.
- Salt pods (Lacken).
- Dried-out salt pods.
- Former salt pods.

The following assumptions were taken during mapping:

- Unbuilt building land, especially at the fringes of the villages, was marked out as agricultural land. This gives an idea on how much building land reserve a municipalty still has unused.
- Smaller tree rows were generally covered as agricultural areas. Only larger tree rows were mapped as forested areas, especially if they have an important impact of the character of the cultural landscape, like especially in Hungary.
- Nature protection areas are difficult to differenciate from agricultural land. If a plot showed no significant sign of agricultural use, it was put into this category. This especially holds true of some areas close to the reed belts and in the national parks and of areas on rocky hills clearly showing the image of dry lawn areas.
- Parts of the lake and the reed belt close to leisure huts and areas and obviously designed for recreational use were mapped as part of the recreational areas.
- Former salt pods are clearly detectable on the Google Earth images. In some cases, they are still used for reed harvesting. In other cases, they are close to fallow land. They were categorized in one of these three groups.
- Parts of the shoreline of the lake showed some small retreat of the water surface in the orthophotos provided by the Burgenland State Government. Similarly, some of the salt pods still showing a water area in the Google Earth images may have already dried out since the photos were taken, especially during the summer

of 2022. It will be an interesting task to monitor this development in future cycles of land use mapping.

• When mapping agricultural areas, no difference was made between winegrowing and other areas, since there are no large cohesive wine areas in the World Heritage site. The change in extent of winegrowing areas may instead be monitored by using the data of the wine area cadastre issued by the relevant authorities.

3. Evaluating the World Heritage perimeters

During mapping, it showed that the existing World Heritage perimeters were obviously drafted using a more inaccurate base map (probably the Austrian map 1:50.000) and therefore rather often not follow the cadastral map and the limits of the municipalities. At some spots, the limits seemed a little unlogical given the actual state of the land use.

On the Hungarian side, the perimeter could not be checked if it is aligned with the cadastral map, since the map could not be retrieved during working on the land use mapping. At least, the existing perimeter could be checked for unlogical parts concerning the actual land use and could be relocated to the limits of the municipalities where obvious.

Especially on the Hungarian side, some spots of the perimeter still feel rather unlogical, like e.g. in the villages of Fertőhomok, Hegykő, and Fertőszéplak, where the perimeter cuts through the built perimeters of the villages. These deficits were not dealt with at this point of time.

The perimeters of the buffer zones were not changed as well, only relocated to cadastral borders where feasible. The location and extent of the buffer zones still feel rather unlogical in terms of their size and their protective purpose. A thorough assessment of the size, location, and purpose of the buffer zones is hindered, though, by the rule that any major alteration of the World Heritage perimeters would lead into the necessity of a total re-assessment of the initial World Heritage nomination. The size of the core zone and the buffer zones has changed in the following way during land use mapping:

Zone category	Size [ha] new	Size [ha] old	Difference [%]		
Core zone	67.632,51	67.479,44	+ 0,23		
Buffer zones	6.590,72	6.510,07	+ 1,24		
TOTAL	74.223,23	73.989,51	+ 0,32		

Examples for the relocation of the World Heritage perimeter:



Top left:

Perimeter relocated onto the municipality border of Mörbisch (old border orange, new border red).

Top right:

Perimeter inside the village of Fertőhomok still rather unlogical, but only adapted following the spirit of the existing perimeter (old border orange, new border red).

Bottom left:

The old perimeter cut straight through the castle park of Széchenyi Castle in Nagycenk. New perimeter relocated following natural borders, like the castle park and roads (old border orange, new border red).

Bottom right:

Location of the perimeter of the buffer zone still rather unlogical (straight through the forest), but at least relocated onto the municipality border between Nagycenk and Kópháza (old border salmon coloured, new border yellow).





4. Technical hints

Google Earth may be easily integrated into QGIS. An idea how to do so gives the following website:

https://www.geodose.com/2018/03/how-to-add-google-maps-layer-QGIS-3.html

QGIS features some peculiarities that need to be considered when creating a map:

- The QGZ files created when drawing a map keep their links with the SHP files of the single layers. So if the QGZ file is copied and work goes on on the copy of the original file, all changes are recorded both in the original file and the SHP files that may already have been exported.
- So if you want to change parts of the file like for example delete certain polygons in order to calculate the area data of the buffer zones - you have to first export the SHP files from the QGZ file and then copypaste the SHP files in different folders in Explorer to avoid trouble with these unexpected cross-links.

The following settings were used for the various layers used in the land use mapping:

Polygon layers	Colour	Colour code	Opacity	Line settings	
Built areas	Light grey	H 100° S 1 % V 88 % R 222 G 224 F 221	58 %	full 0,26 mm	
Recreational areas	Light purple	H 313° S 47 % V 93 % R 236 G 126 F 212	59 %	full 0,26 mm	
Castles	Dark purple	H 278° S 72 % V 84 % R 159 G 60 F 213	50 %	full 0,26 mm	
Quarries	Dark grey	H 0° S 13 % V 53 % R 136 G 118 F 118	51 %	no line	
Solar power areas	Red	H 6° S 91 % V 92 % R 235 G 43 F 21	50 %	full 0,26 mm	
Agriculture	Light olive	H 56° S 92 % V 71 % R 180 G 169 F 14	47 %	no line	
Reeds	Dark olive	H 71° S 91 % V 66 % R 140 G 168 F 16	31 %	full 0,26 mm	
Nature protection	Bright green	H 126° S 69 % V 87 % R 68 G 223 F 86	49 %	full 0,26 mm	
Forest	Dark green	H 150° S 38 % V 60 % R 95 G 153 F 124	87 %	no line	
Water	Bright blue	H 209° S 76 % V 90 % R 54 G 144 F 229	53 %	full blue 0,26 mm	
Salt pods	Icy blue	H 200° S 27 % V 89 % R 166 G 206 F 227	66 %	full 0,26 mm	
Dried-out salt pods	Pale icy blue	H 200° S 27 % V 89 % R 166 G 206 F 227	30 %	full 0,26 mm	
Former salt pods	Turquoise	H 142° S 98 % V 98 % R 4 G 250 F 98	35 %	full 0,26 mm	

Line layers	Colour	Colour code	Opacity	Line settings
Core zone	Deep red	H 359° S 89 % V 89 % R 227 G 26 F 28	100 %	full 0,86 mm
Buffer zone	Deep yellow	H 60° S 71 % V 98 % R 251 G 251 F 73	100 %	full 0,86 mm
National border	Deep red	H 359° S 89 % V 89 % R 227 G 26 F 28	100 %	dash black 1,26 mm
Municipality border	Deep red	H 359° S 89 % V 89 % R 227 G 26 F 28	100 %	full 0,26 mm

5. Areas

After drawing the entire map, the single amount of area covered by the various land use forms was calculated using the field calculator provided by QGIS.

The total sum of the polygon areas differs from the total area size calculated from the core and buffer zone lines (see chapter 3.) by only 4,000 m².

Zone	Area [ha]			
Core zone Austria	48.436,05			
Core zone Hungary	19.198,87			
Buffer zones Austria	2.299,08			
Buffer zone Hungary	4.291,57			

Land use category	Core zone Austria [ha]	in %	Core zone Hungary [ha]	in %	Buffer zones Austria [ha]	in %	Buffer zone Hungary [ha]	in %	TOTAL [ha]	in %
Built areas	1.365,08	2,82	649,16	3,38	455,23	19,80	213,34	4,97	2.682,81	3,61
Recreational areas	502,77	1,04	41,85	0,22	25,15	1,09			569,77	0,77
Castles			242,85	1,26					242,85	0,33
Quarries	107,07	0,22	56,81	0,30	5,15	0,22	26,95	0,63	195,99	0,26
Solar power areas							3,28	0,08	3,28	0,00
Agriculture	18.457,73	38,11	6.813,62	35,49	1.648,31	71,69	3.292,90	76,73	30.212,57	40,70
Reeds	11.485,16	23,71	7.423,46	38,67	16,29	0,71			18.924,91	25,50
Nature protection areas / fallow land	851,53	1,76	128,60	0,67	16,49	0,72			996,62	1,34
Forests	1.268,09	2,62	2.538,78	13,22	88,75	3,86	754,86	17,59	4.650,04	6,26
Water	13.493,31	27,86	1.209,92	6,30			0,22	0,01	14.703,45	19,81
Salt pods (Lacken)	441,65	0,91	47,54	0,25	0,46	0,02			489,65	0,66
Dried-out salt pods	307,40	0,63	9,01	0,05					316,41	0,43
Former salt pods	156,26	0,32	37,27	0,19	43,24	1,88			236,78	0,32

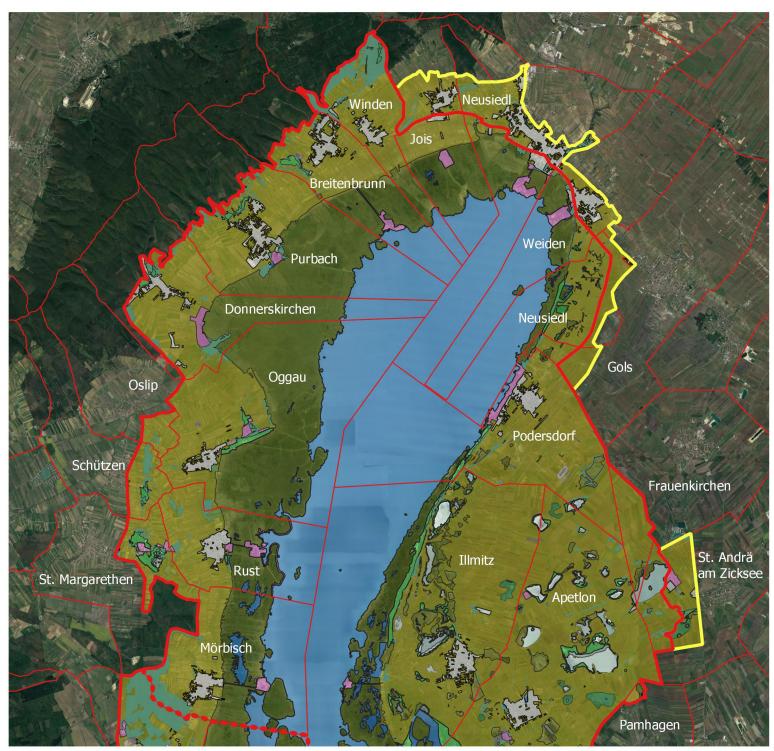
6. Insights gained

The following insights were gained during mapping:

- The built areas in Austria are still reasonably compact,
 except for some singular developments into the open landscape and areas usually at the fringes of the built perimeter, where there is, in many municipalities, still a wealth of unbuilt building land. Land plots used for housing are generally speaking smaller in Hungary and are much more interlinked with food gardening
 and agricultural use.
- The Austrian part of the core zone west of the lake is rather uniform, with clearly denominated parts of the landscape used for different purposes (settlement, agriculture, recreation). The Seewinkel part of the Austrian core zone is much more varied, due to the salt pods scattered over the area and the pattern of nature conservation areas, reed zones and agricultural land.
- The Hungarian core zone features a rather varied landscape impression, with larger forested areas both on the hills and in the flatter areas. On the other hand, the agricultural fields have been realigned to large plots, whereas in Austria the old longitudinal shapes of the fields have survived, creating a varied pattern of vinyards, crop fields and grassland. A particular feature of the Hungarian agricultural areas is the system of wind protection plantations still present especially in the eastern part of the Hungarian core zone.

- The reed belt in Austria is partly in a miserable state, especially between Mörbisch and Rust and next to Illmitz. Reed harvesting could obviously take place mainly close to agricultural areas, probably because of the mild winters. A remarkable amount of the reeds was harvested around the salt pods in the Seewinkel.
- Recreational huts at the lake are only present around the Rust bay and to a small extent near Mörbisch. At all other lakesides, such developments have not taken place anymore. The lakeside recreational areas are still rather compact, even though some larger developments have taken place or are still taking place in some areas on the Austrian side and, at least planned, at Fertőrákos.

DOCUMENTATION



World Heritage site (Austria)

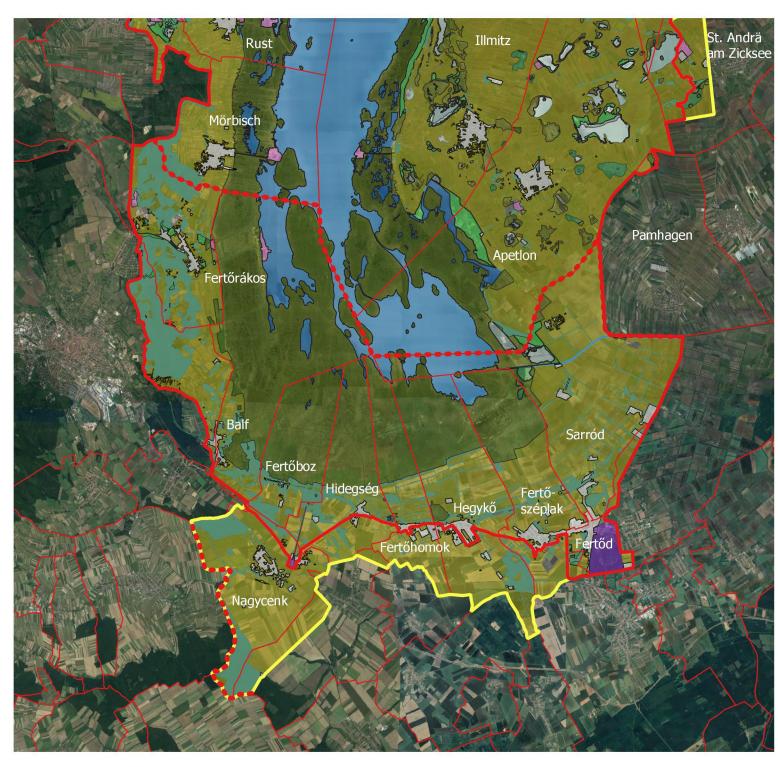


Fertö-Neusiedler See

Austria-Hungary

Common Heritage



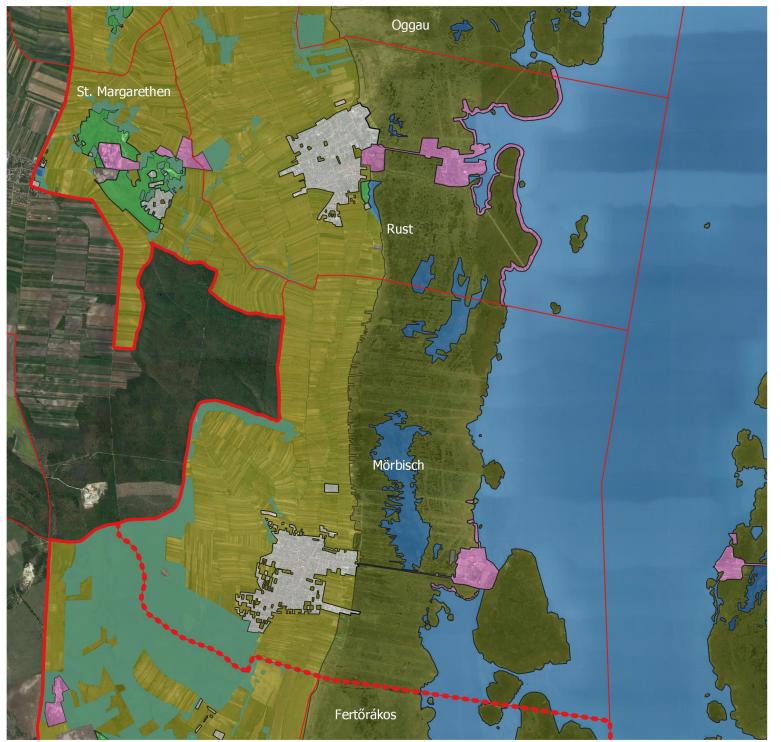


World Heritage site (Hungary)

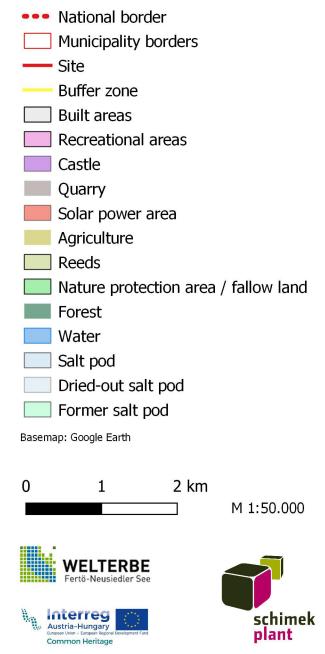


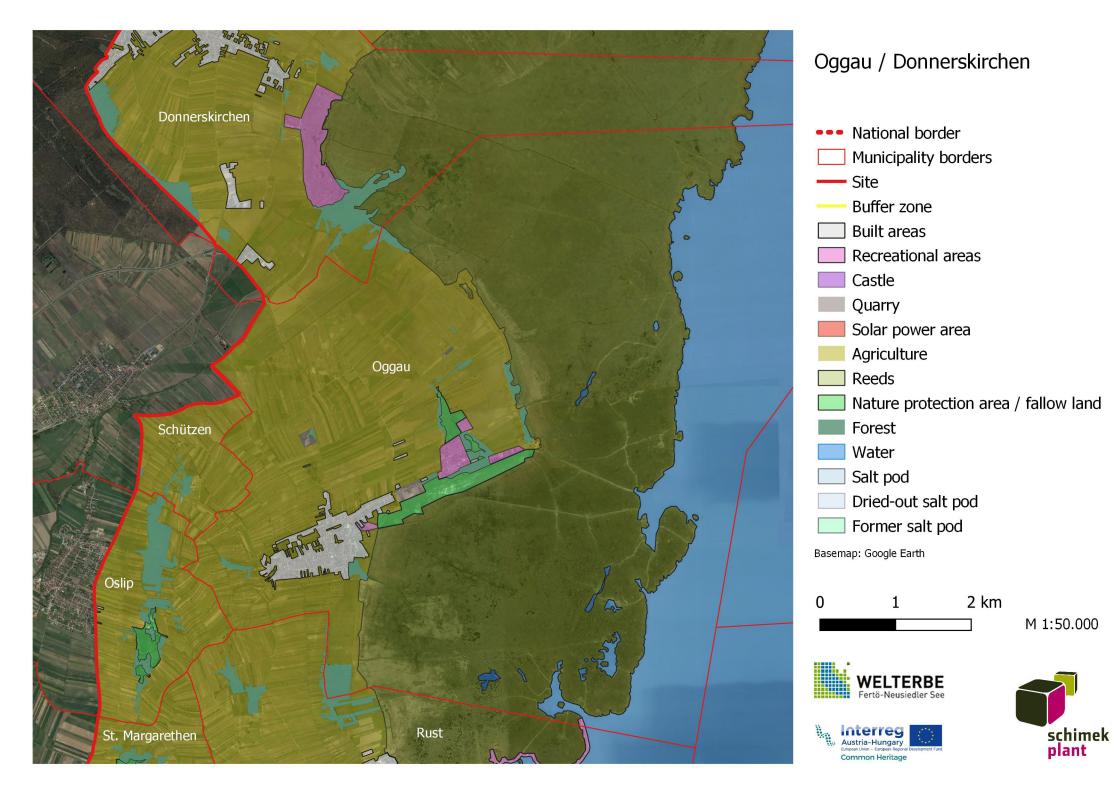


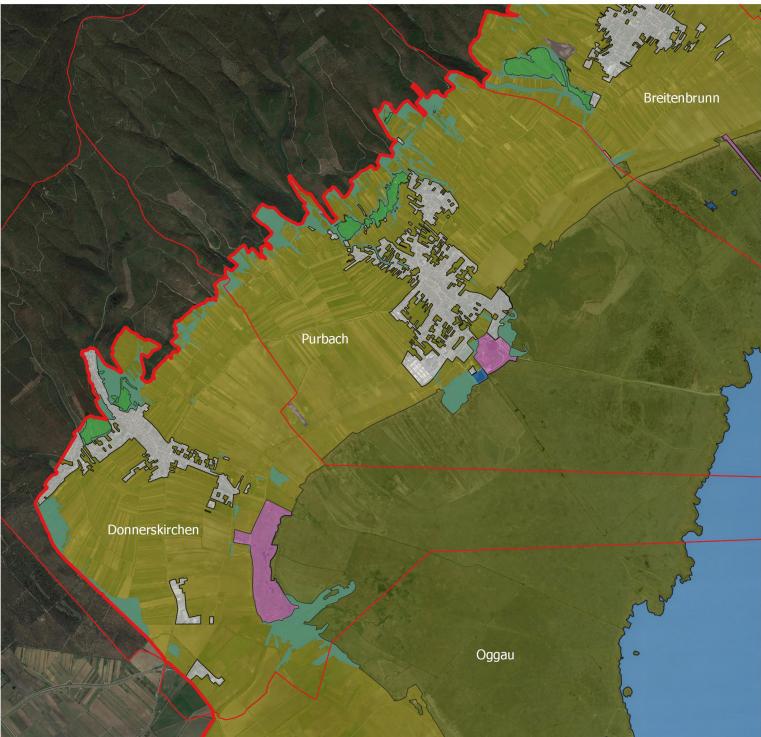




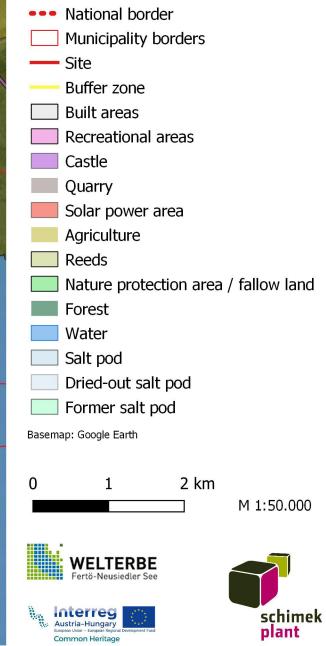
Mörbisch / Rust / St. Margarethen

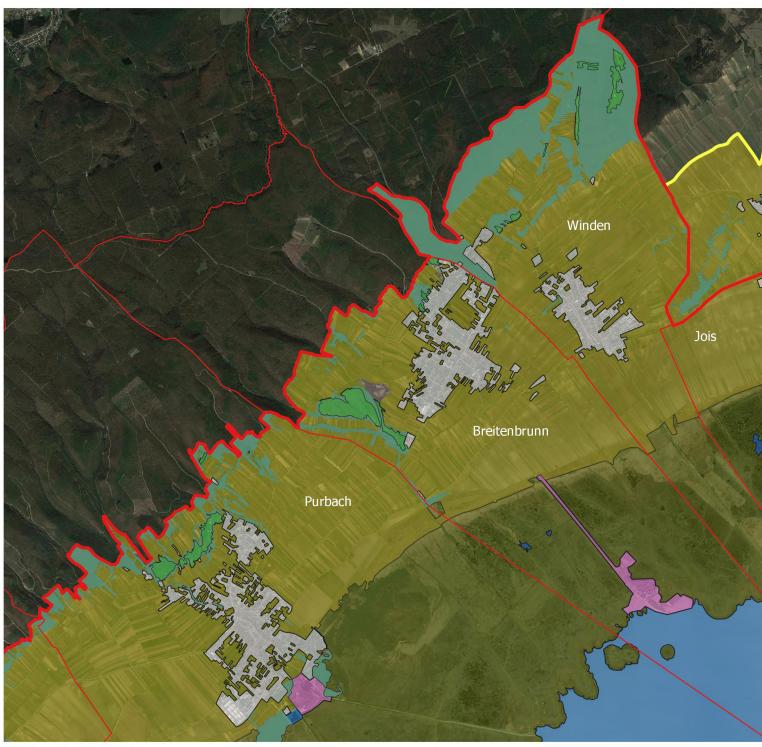






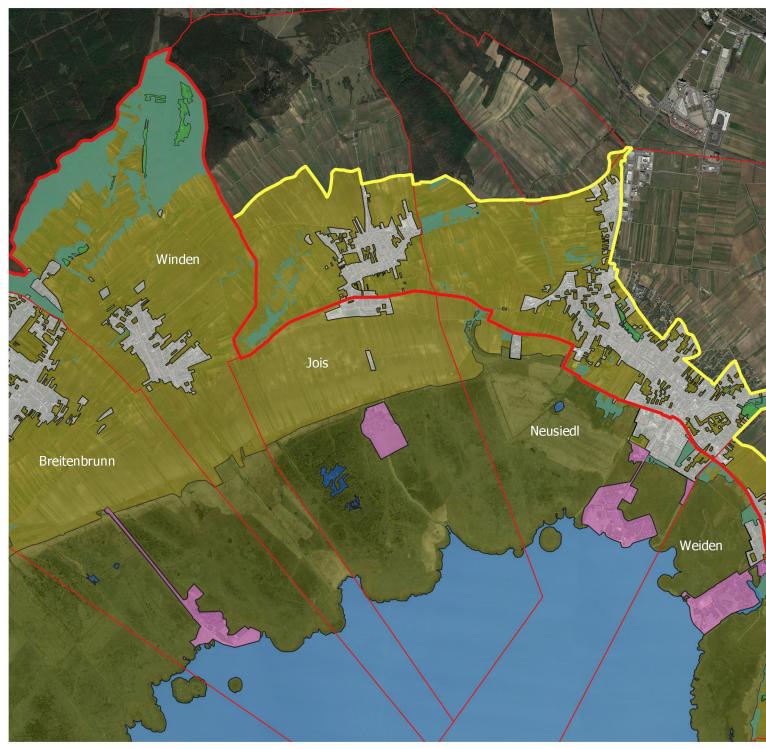
Donnerskirchen / Purbach / Breitenbrunn



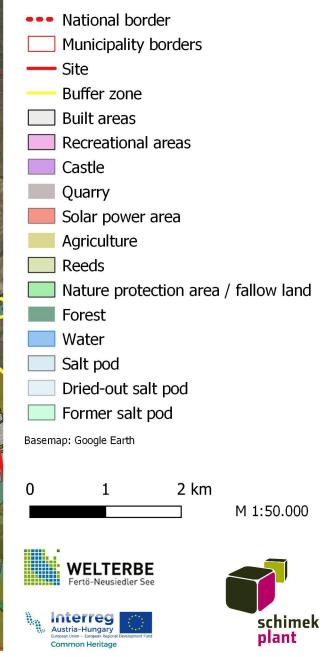


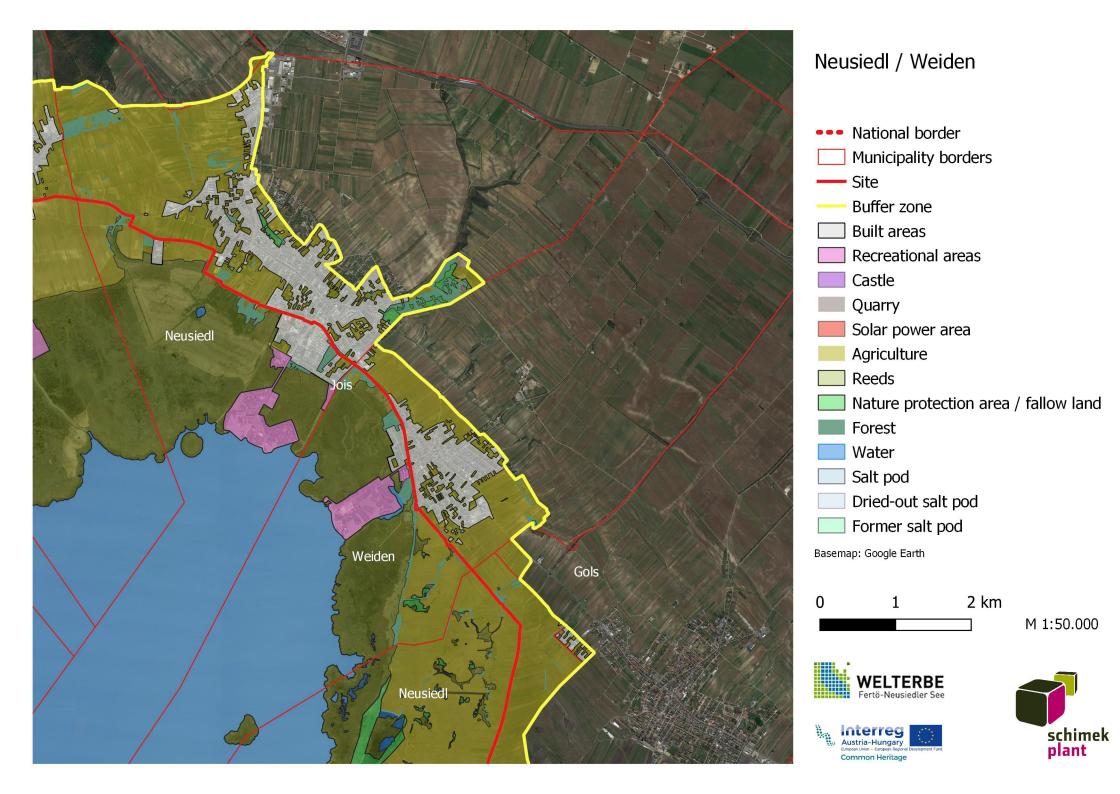
Purbach / Breitenbrunn / Winden

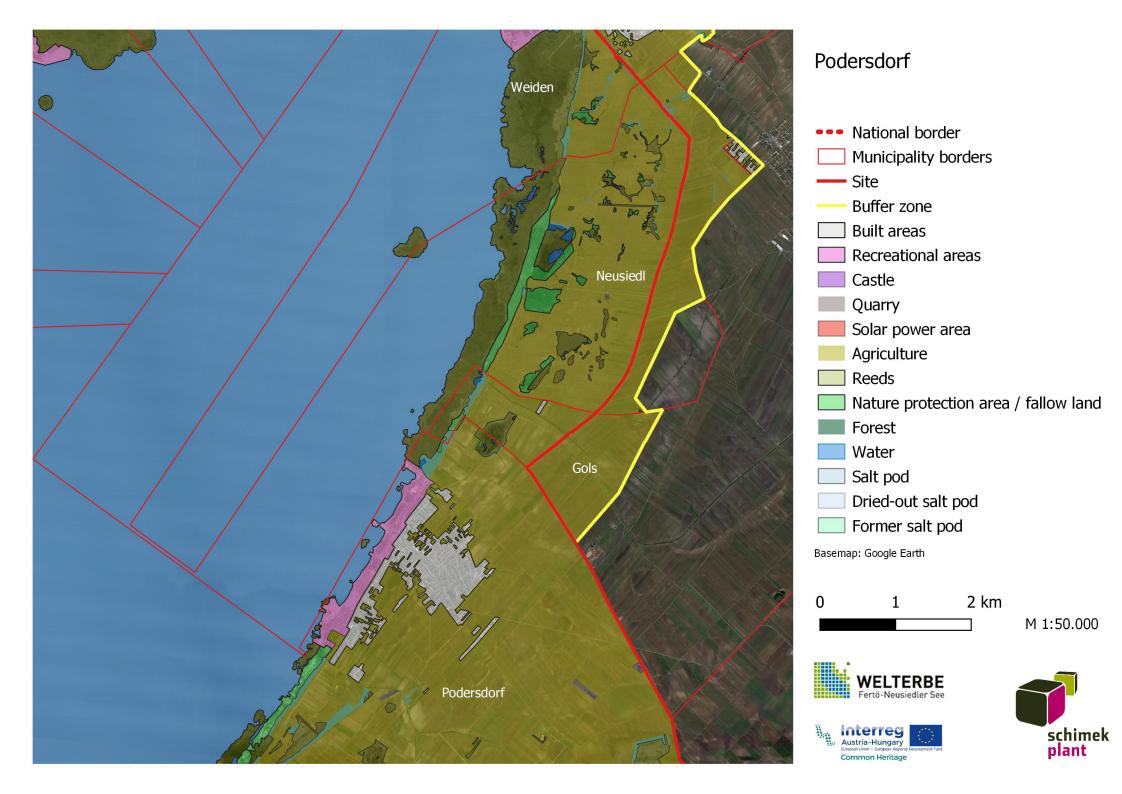




Jois / Neusiedl

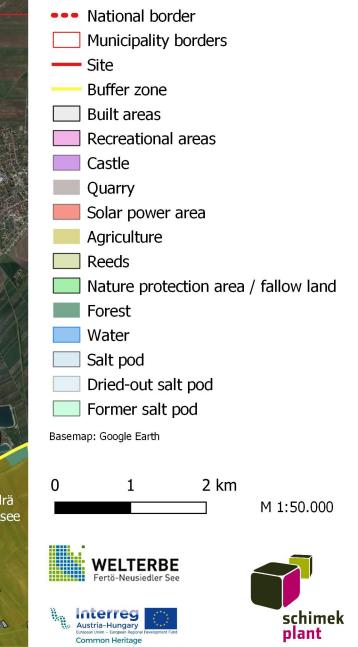








Seewinkel (north)



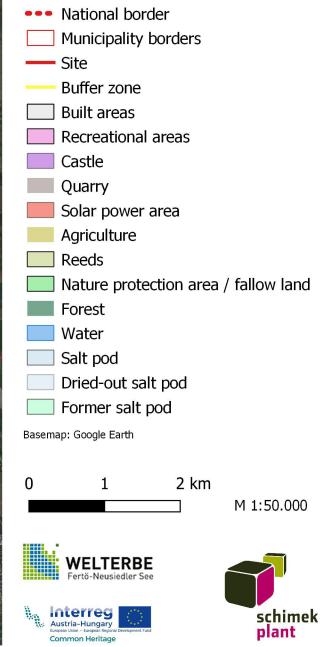


Illmitz





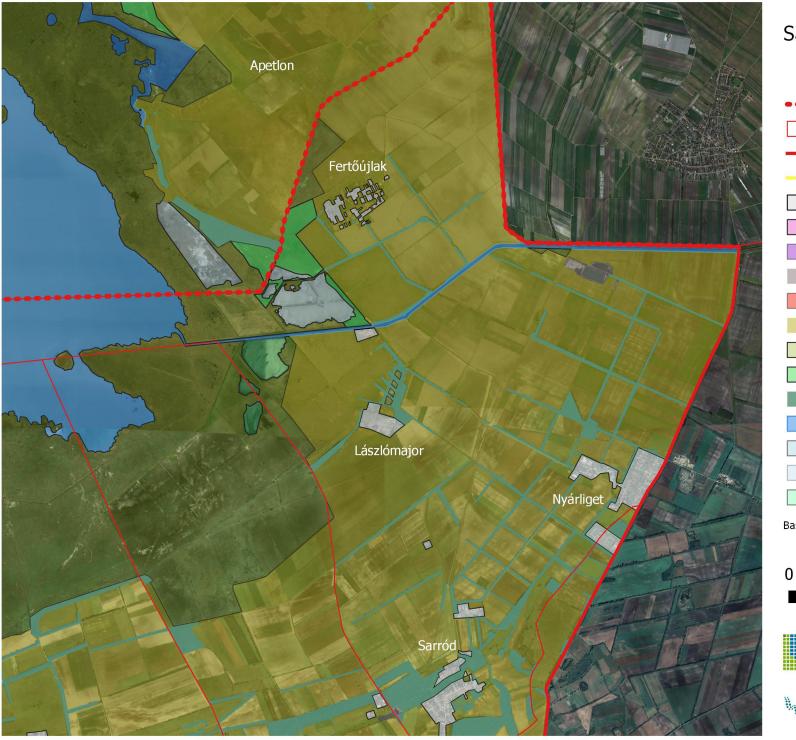
Apetlon / Pamhagen / St. Andrä am Zicksee



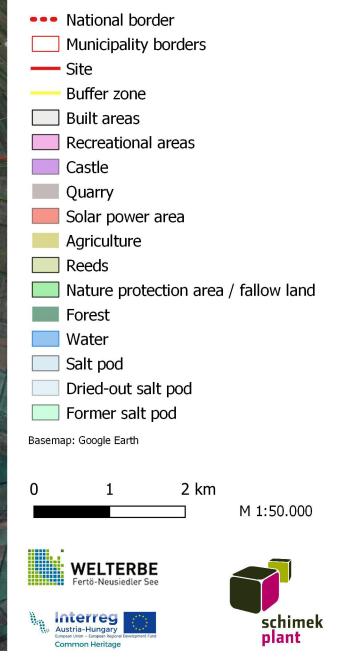


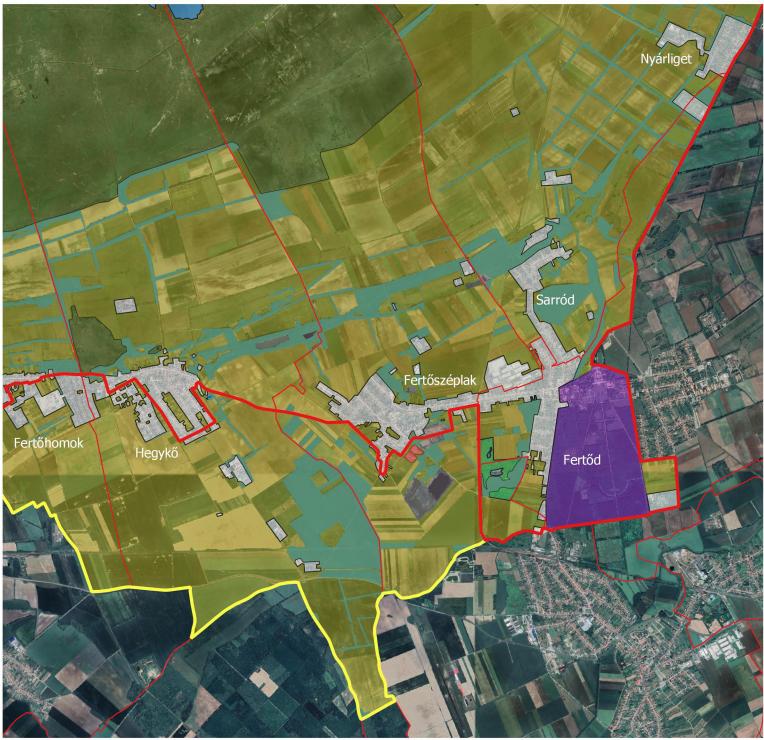
Seewinkel (south)





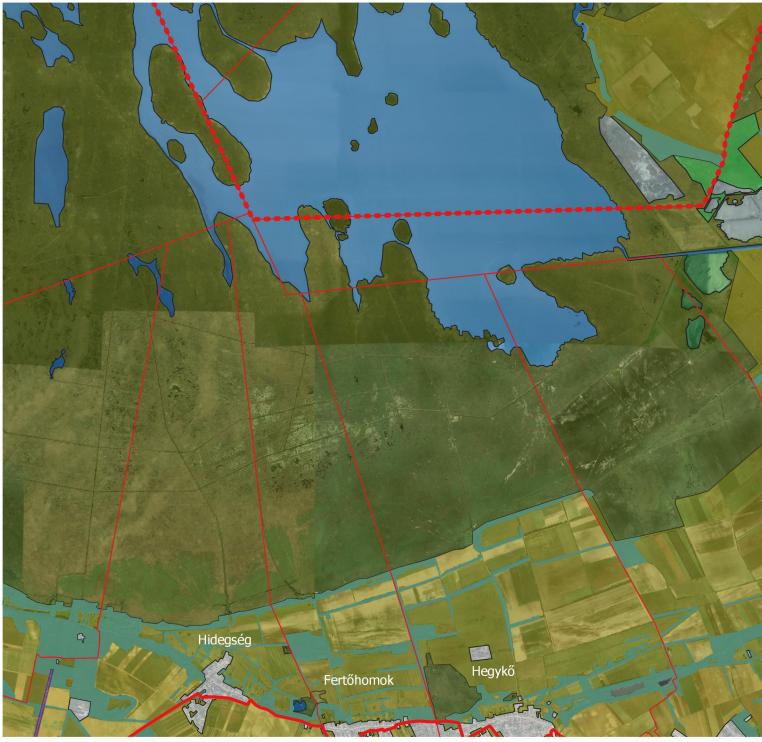
Sarród



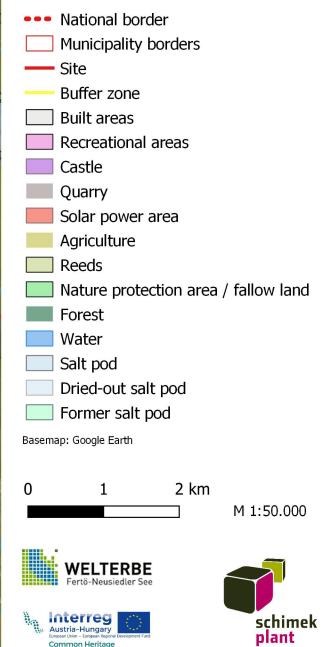


Fertőd / Sarród / Fertőszéplak / Hegykő /





Fertő tó



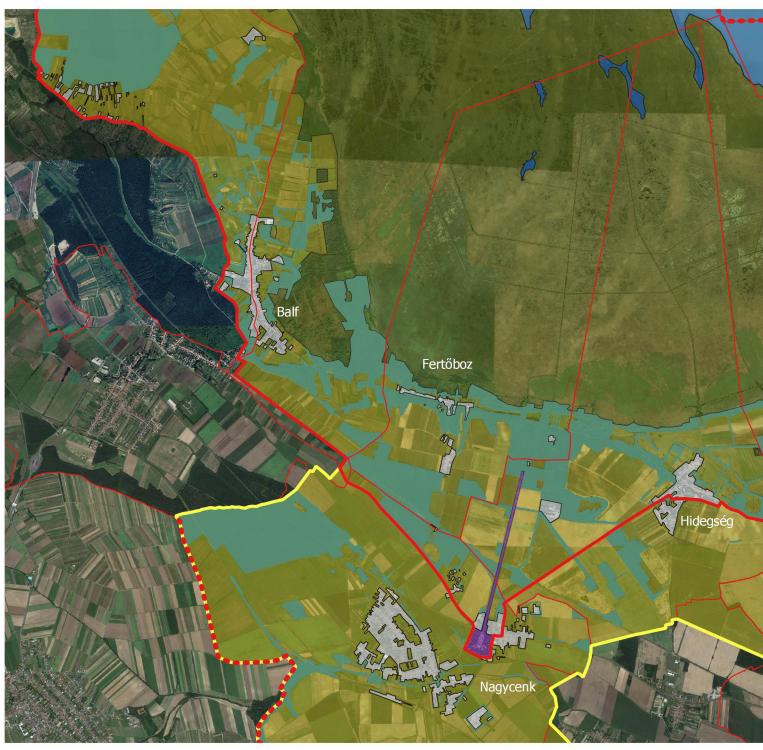
Common Heritage



Fertőboz / Nagycenk / Hidegség / Fertőhomok

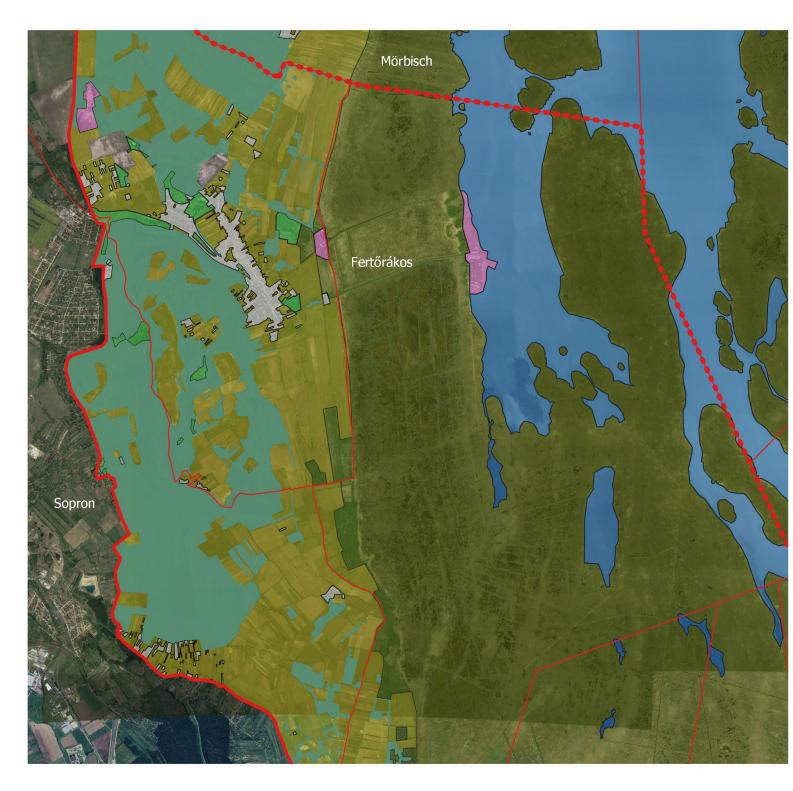


Common Heritage



Balf / Fertőboz / Nagycenk / Hidegség





Fertőrákos

