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ANALYSIS OF CURRENT SITUATION OF  
BROWNFIELD IN MUNICIPALITY OF CELJE FUA

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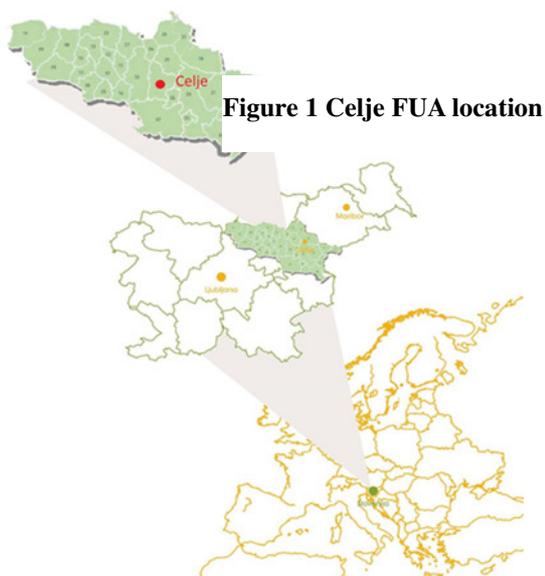
## 1. Functional urban area of City of Celje and its environmental degradation

### 1.1 Definition, size and location

Statistically data in Slovenia is collected only at the level of municipalities and smaller settlements. The term functional urban area in the Slovenian legislation respectively statistics does not exist. It was introduced with the implementation of the European cohesion policy in 2014 with the Partnership Agreement and the Operational Programme for the implementation of the European cohesion policy in the years 2014-2020. Given the importance of the Municipality of Celje and its main settlements in the Celje region and beyond, its FUA could be based on the daily work and school migrations as they could relatively well define so called functional urban area of Celje. A detailed studies and data, unfortunately, are not available for such area. The reason for adjusting FUA to the municipality borders is therefore based on available geographic data statistics collection areas.

The Municipality of Celje lies in the central part of the Celje basin. Its size is 94.9 km<sup>2</sup>. In 2014 the Municipality of Celje had 48,868 inhabitants (the city of Celje 37,628 inhabitants). The Municipality of Celje has 39 settlements, 119 statistical districts and 315 blocks. The average settlement area is 2.4 km<sup>2</sup>. Population density is 1,700 inhabitants / km<sup>2</sup>. Most of the settlements are located on the flat area or in transition in the hilly landscape.

Celje with 37,540 inhabitants (SURS, 2015) is the third largest city in Slovenia and an important center of national and regional importance. It lies along the river Savinja and is the hub of the transport network at the transition area between the Savinja Valley and Carinthia and Zasavje, Posavje and Dolenjska region, between the central and northeastern Slovenia. This is the reason it lies on the node of V and X traffic corridors (roads and rail). Due to that Celje has developed in the past as an important regional economic, administrative, cultural, educational and tourist center.



**Figure 1 Celje FUA location**

In Celje also seats or units of the courts, chamber of commerce, regional hospitals, institutions of higher education, museums, theatre and other institutions that are important for this part of Slovenia, are located.

The result is the strength of the employment centre not only for the city but also for the surrounding population. The power is thus characterized by a surplus of jobs over the number



of active population that lives in cities, which ranks the municipality among highly labour-oriented ones.

## 1.2 Environmental status of Celje FUA

Celje is a city with strong development of industry in the 19th and 20th centuries. The development of industry, agriculture, transport and compaction of urban settlements has also reflected in the environment. Most of the environmental problems of the past are now resolved. The situation in the field of air quality and water is much better than in the past.

### 2.2.1 Air pollution

Celje basin has due to the location highly unfavourable climatic conditions, which are reflected in lack of wind during temperature inversions. This situation is often in the winter half of the year.

Measurements of air pollution in Celje are conducted within the national measuring network with automatic measuring station, which is located near the city centre. It measures following air pollutants: sulphur dioxide, nitrogen dioxide, PM<sub>10</sub> and ozone. Occasionally also carbon dioxide.

Concentrations of sulphur dioxide, nitrogen dioxide and carbon monoxide in the air do not exceed the permissible limits.

Based on the environmental standards the number of allowed daily values of PM<sub>10</sub> in the air is in Celje often exceeded (35x in the year; 50 µg/m<sup>3</sup> is target value). The annual limit value of 40 µg/m<sup>3</sup> in recent years has not been exceeded.

### 1.2.2 Superficial water and groundwater quality

For the Municipality of Celje branched water system of liquid surface water, represented by the Savinja river and its tributaries from the mountainous hinterland, is characterized.

Water management is the responsibility of the state. Water quality is monitored under the national monitoring, carried out by the National Environmental Agency. It includes three watercourses in the Municipality of Celje: rivers Savinja, Hudinja and Voglajna. The national monitoring also includes Šmartinsko lake.

Chemical status of surface waters Savinja, Voglajna and Hudinja as well as Šmartinsko lake was in the years 2008 to 2013 evaluated as well.

Ecological status of Savinja and Hudinja river was rated as moderate. In Savinja due to the presence of elevated nitrates, in Hudinja due to increased specific pollutants (zinc and sulphates). Ecological status of Voglajna river was rated as good.

Šmartinsko lake still does not reach good ecological status due to higher biological quality elements, specific pollutants (metolachlor) and general physical parameters.

The area of the Municipality of Celje is situated in the area of the water body Savinjska valley.

Chemical status of a body water of Savinjska valley is, based on the results of the latest monitoring, rated as poor, because contamination covers more than 30% of the water body. But the percentage of inadequate monitoring sites is over the years gradually reducing.

Groundwater in the Savinja basin is most heavily laden with nitrates, but monitoring results indicate a gradual decrease in concentrations of nitrate. This trend also applies to pollution by



pesticides atrazine and its metabolite desethyl-atrazine. It also shows a decrease of the amount of pesticides.

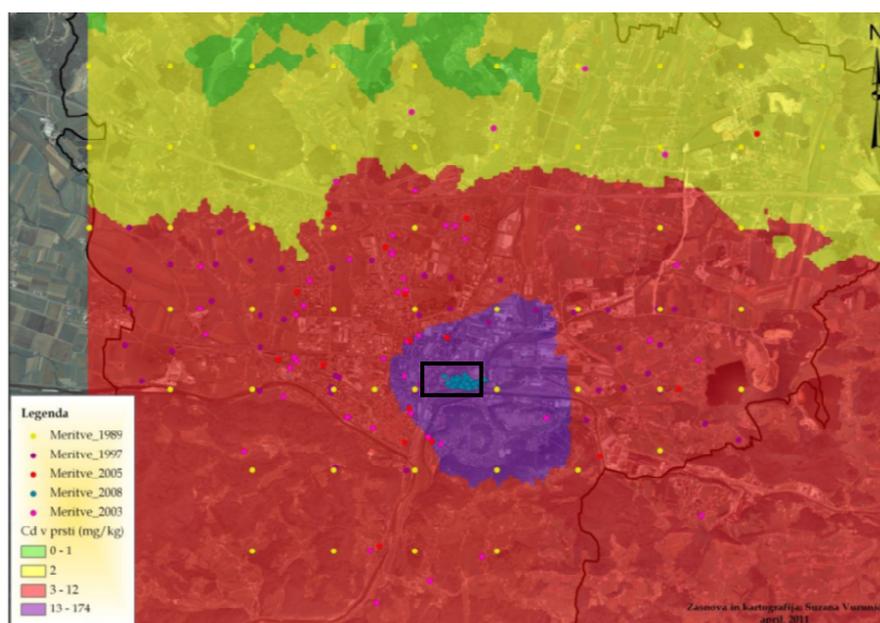
### 1.2.3 Soil quality

Most of the central part of the surface of the Savinja basin is covered with rosehip quaternary material. Also pilot area consists of mainly carbonate gravel and sand. On the riverbanks eutric and partly gley soils are developed, which have largely been technically modified.

A particular environmental problem of the city of Celje represents polluted soil. In the Celje municipality numerous soil investigations were held, which have shown strong potential contamination of certain toxic metals - cadmium, lead and zinc. The first comprehensive survey was conducted in 1989 (Lobnik et al.), By systematically taking samples at 117 locations. The results have pointed out the content of the above-mentioned elements in the surface top layer. Further investigations were carried out in 1994 (Zupan et al.), 1997 (Zupan et al.) and 2003 (Klavs), which studied "the link between the content of metals in the soil of gardens and lawns, and the metal content in vegetables and indicator plants" . Research has again confirmed the high content of Cd, Pb and Zn. Measurement results showed high content of cadmium (Cd), lead (Pb) and zinc (Zn), which often exceeded the critical value by legislation (Ur.l.RS 68/96).

Contaminated soil in particular reflects to the distinctive development of industry in the 19th and 20th centuries, and as the result of the agriculture, transport and concentrated urban settlements. The maximum value of the aforementioned heavy metals were established in

The maximum value of the aforementioned heavy metals were established in urban soil in the area of the old part of the city and east 'industrial' area. Contaminated soils are spread mainly in the east-west direction.





#### 1.2.4 Soil sealing

Detailed statistics on soil sealing is not collected by Municipality of Celje. At the national level only statistics on the amount of yearly sealed agricultural land is implemented. Daily around 7 ha soil is sealed. Which is with adjustment to the fact that Slovenia has only 28% of agricultural land and 860 m<sup>2</sup> of arable land per capita quite an alarming figure.

### 1.3 Main identified environmental challenges

Based on the analysis of the state of the environment we point out key environmental challenges of the Municipality of Celje:

1. Excessive air pollution by particulate matter PM<sub>10</sub> during the winter and ozone during the summer period.
2. Pollution and degradation of soil due to old burdens.
3. Noise nuisance factor at the roadsides.
4. The provision of energy efficiency and increase of the use of renewable energy sources.
5. Collection and treatment of waste water from agglomerations and outside the area of Šmartinsko lake.
6. Establishment and improvement of sustainable mobility.
7. Nature Conservation and increase of green areas in the city.

### 1.4 Pilot brownfield area Stara Cinkarna (Old Cinkarna)

The Municipality of Celje does not run a cadastre of brownfield sites, because even at the national level there is no unified inventory of brownfields on the basis of a standardized methodology. Based on knowledge of local environment and past activities in the field of environmental protection Municipality of Celje has identified a large brownfield site, which can be defined as environmental, spatial and social brownfield site. This site is also our pilot area for the ReSites project. The remaining areas are small-scale or they could be classified as a single row degraded areas. Therefore, as the absence of a uniform methodology of their determination, these small areas we do not define for the purposes of this analysis as degraded areas.

#### 1.4.1 Location and size

The ReSites pilot brownfield site for the project purposes is degraded area in the Municipality of Celje, which reflects the different types of degradation. This is the area of the old zinc factory. Old Cinkarna is located on the northeastern edge of the old town in the triangle, which is broadly restricted with Mariborska road to the west, Kidričeva road to the north and Hudinja river and railway line Celje - Maribor in the east and south. The area of the Old Cinkarna logically includes the former landfill, the so-called "Halda rajmovka", which lies next to the railway line and Voglajna. In the west, the north and the south current industrial area continues into a mixed commercial residential area. In the east on the left bank of river Hudinja, commercial use and freight station Čret are located.

Pilot area covers about 17 ha.

Wider part of the pilot area in the west is old business-residential area Gaberje at Mariborska road, on the north business area to Kidričeva road, the so-called Gaberje south, which is already partly revitalized. In total widened area is comprising approx. 30 ha.



Figure 2 – ReSites PP3 pilot area location



Figure 4 – ReSites PP3 wider pilot area location



Figure 3 – A look on the pilot area



#### **1.4.2 Historical background**

From 1874 to 1990, the area was used by metallurgical-chemical company Cinkarna Celje. For a few decades, roasting zinc ore and zinc smelting production took place. Parallel to it new industrial facilities that have been designed to support primary production were built up. Since late 1980's the company Cinkarna has moved to a new location, a few hundred meters eastwards. The pilot site was left abandoned and unrevitalised.

#### **1.4.3 Ownership**

The Municipality of Celje was given the possession of the land in the area of the Old Cinkarna in 2002 from the company Cinkarna Celje.

#### **1.4.4 Main environmental burdens and problems**

The area of the old zinc factory was since the creation of the zinc factory in 1873, to the present day, intended for colour metallurgy and chemical industry. At the beginning was there for a few decades production in roasting zinc ore and zinc smelting. The carbonate zinc ore was firstly dug around Celje, later was replaced by sulphate ore, which was imported from more distant places. Parallel to the roaster production new industrial facilities designed for supporting basic production were introduced (production of generator gas, production of lead blocks, lead sheets, sulphuric acid production ...).

Production was also causing serious environmental burdens. Emissions of harmful gases and polluted waste water were discharged directly into air and water bodies without adequate treatment plants. Hazardous waste management was neither normative nor otherwise regulated, many environmental impacts were not yet even known.



Problems that are related to environmental pollution in the past period on pilot area are largely derived from the facts that:

- from the start of production on, for almost a century, no one has dealt with the problems of environmental pollution (the problem is not related exclusively to the Celje zinc industry - positive environmental consciousness began in the late sixties),
- often were used outdated technological processes with low efficiency (depending on the technology used and the data from the literature were in Zn smelter production 10-15 % losses,
- releasing exhaust gases into the air and waste water has for a long time been doing without any treatment,
- management of hazardous and other wastes has not been normatively regulated,
- many problems associated with environmental pollution have even not had been known.

Estimated environmental risk at the site of pilot area are:

- contaminated soil with heavy metals (identified as the extreme contamination with some heavy metals) and mineral oils. They can represent during construction and excavation works wastes, which may contain hazardous substances,
- buried industrial waste and tar pits,
- buried reservoirs and underground drainage technology,
- lack of information/research on soil contamination in depth and groundwater in the area.

## 1.5 Conclusions

Existing unrevitalised degraded industrial areas have mostly several mutually synergistic negative impacts, such as: attracting investors, negative effects on quality of life, increasing social conflicts, population concerns and increased pressure on the spread of settlements in agricultural areas.

*At the state level problem of solving degraded areas is not regulated by a standardized regulation. Even the current environmental legislation and legislation in the field of spatial planning does not define the procedures and methodology nor the management of abandoned brownfield sites.*

Given the fact that more complex degraded area might have more significant impact on the environment, rehabilitation of such areas should have been aiming at achieving three objectives:

- suitability of brownfield for further use after remediation,
- ensuring protection of the environment,
- implementation of sustainable land management.

With this actions we want to prevent further degradation on pilot area and revitalise it for future new reuse.



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### 3 Imprint

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