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is implementing an activity

INTERNATIONAL CONFERENCE
CONTAMINATED SITES
ZNEČISTENÉ ÚZEMIA
MEDZINÁRODNÁ KONFERENCIA

INTERNATIONAL CONFERENCE

CONTAMINATED SITES 2022

SENEC, SLOVAK REPUBLIC, 12 – 14 OCTOBER 2022

The activity has been implemented within the framework of national project
Information and providing advice on improving the quality of environment in Slovakia.
The project is cofinanced by Cohesion Fund of the EU under Operational programme Quality of Environment.

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THE NATIONAL INVENTORY OF CONTAMINATED SITES (NIKM) IN CZECHIA – RESULTS AND FOLLOW-UP ACTIVITIES

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The Czech Republic

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SLOVAK ENVIRONMENT AGENCY

N!KM
národní inventarizace kontaminovaných míst

Zdeněk Suchánek

THE NATIONAL INVENTORY OF CONTAMINATED SITES (NIKM) IN CZECHIA – RESULTS AND FOLLOW-UP ACTIVITIES

International Conference Contaminated Sites 2022, 12 – 14 October 2022, Senec

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Ministerstvo životního prostředí

The project phases and the main results

- The complete National inventory of contaminated sites (NIKM) took place in the years 2009 – 2021 in two phases, both co-financed from the EU Cohesion fund.
- The basic goal of NIKM was the capture and basic evaluation of the most complete number of contaminated sites/potentially contaminated sites (CSs hereinafter) on the territory of the entire country.
- The 1st stage of NIKM focused on the methodology of the inventory, its testing and collection of the main data sources.
- The 2nd stage of NIKM (2018-2021) was completed on 31.12.2021. CENIA teams and suppliers selected via public tender participated in the project.

The project stages and the main results

- 30,020 CSs or CSs clues were inspected of which 8,643 sites were evaluated as CSs. From other sources, 1,491 newly evaluated localities were registered. In result, a total of 10,134 assessed CSs were registered.
- Project results include the completed SEKM database, 14 reports on the inventory in individual regions, and the report on the inventory on the territory of the Czech Republic.

The concept of the inventory intention

- In 2008, the Ministry of the Environment (MoE) developed and implemented a plan to include the inventory of contaminated sites in the topics of the Operational Program Environment (OPE). From the beginning, two separate stages were envisaged.
- The first of which was to be focused on the creation of a technical and organizational background and on the preparation and practical testing of all inventory tools and methodological procedures in three test areas.
- The second stage was supposed to consist of the proper inventory, i.e., the collection, processing and evaluation of data using functional apparatus and verified methodologies developed in the first stage.

The concept of the inventory intention

- In the development of the project all respective EU documents were taken into account. First of all
- **Thematic Strategy for Soil Protection,**
- **Proposal for a Soil Protection Directive (withdrawn in 2014),**
- **INSPIRE Directive 2007/2/EC**, and also
- Directive 2006/118/EC on the **protection of groundwater** against pollution and deterioration.
- Directive 2000/60/EC establishing a framework for **Community action in the field of water policy**
- Directive 2004/35/CE on **environmental liability** with regard to the prevention and remedying of environmental damage

The concept of the inventory intention

- **Protection of Soil Directive (draft) - activities**

ANNEX II
List of potentially soil polluting activities

1. Establishments where dangerous substances are or were present in quantities equal to or in excess of the amounts indicated in Parts 1 and 2, column 2 of Annex I to Council Directive 96/82/EC (Seveso)[16].
2. Activities listed in Annex I to Council Directive 96/61/EC.
3. Airports.
4. Ports.
5. Former military sites.
6. Petrol and filling stations.
7. Dry cleaners.
8. Mining installations not covered by Council Directive 96/82/EC, including extractive waste facilities as defined in Directive 2006/21/EC of the European Parliament and of the Council[17].
9. Landfills of waste as defined in Council Directive 1999/31/EC[18].
10. Waste water treatment installations.
11. Pipelines for the transport of dangerous substances.

Stages of the inventory

- In the autumn of 2008, CENIA submitted the project of **the 1st stage of NIKM** to a specific call of the OPE.
- The goal was to create a unified database, to develop a methodology for the identification and inventory of CSs, to prepare procedures and manuals, to verify the functionality of the outputs, including the technical background for **the 2nd stage** of the project.
- Based on the background analyses and syntheses a methodology of the inventory was formulated, which was subsequently verified in test areas (3 squares of 50 x 50 kilometres).

The 2nd stage of the inventory

- After the end of the 1st stage, for organizational reasons, it was not possible to immediately start the 2nd stage of NIKM in the OPE period 2007-2013.
- The project was fortunately included for implementation in the following program period 2014-2020. The relevant call was published on 01/03/2017. CENIA again submitted an application including the project documentation.

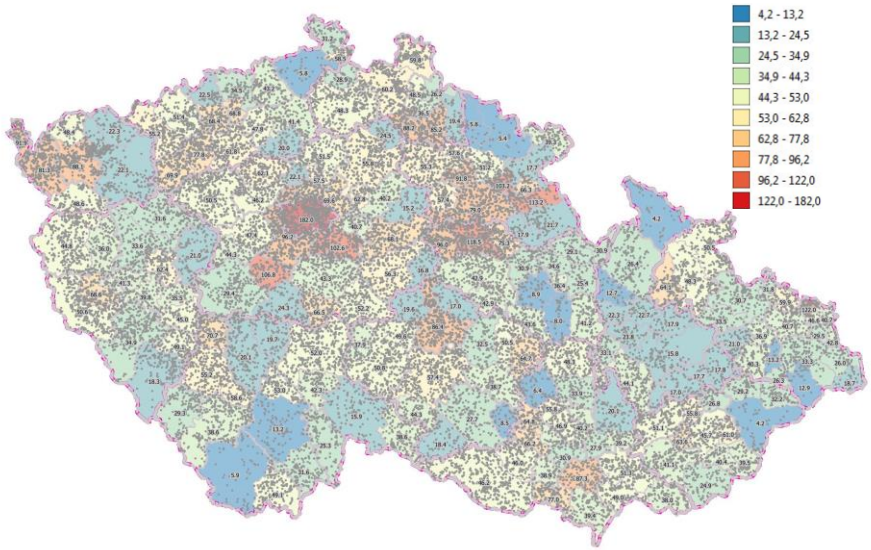
The 2nd stage of the inventory

- The decision to provide the subsidy was issued in May 2017. The amount of total eligible data according to the decision was CZK 116,627,180 (EUR 4,665,087), 85% of which - CZK 99,133,103.68 (EUR 3 965 324) - was co-financing from the EU FS and 15% - CZK 17,494,077.12 (EUR 699,763) from our own resources (CENIA/MoE).
- The project implementation started with CENIA works (RS) in January 2018. In the course of 2018, a public contract for "NIKM2 Supply of Inventory Works" was announced and evaluated. The main phase of the project implementation took place in the period 1/3/2019 – 31/12/2021.

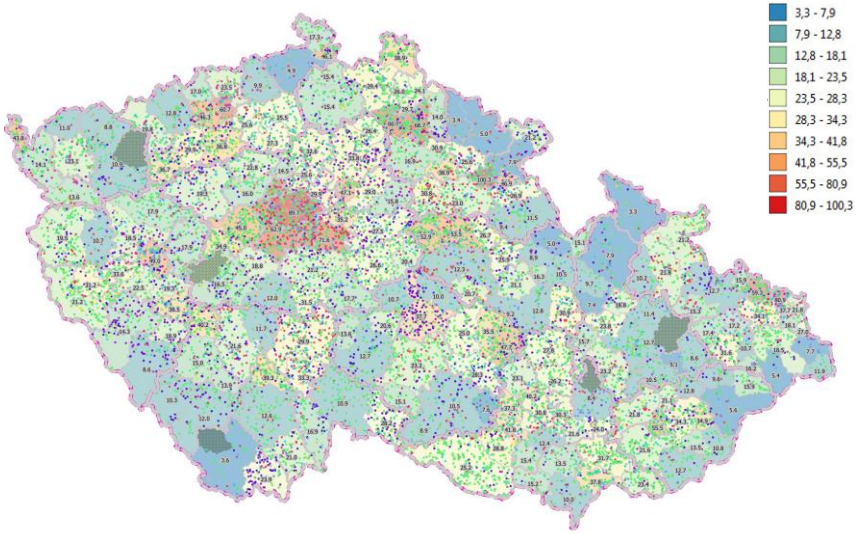
CENIA work and 2nd stage project tasks provided by contractors

- CENIA was involved in the project in the role of project management and in the support of inventory using Remote Sensing (RS) methods. In this role, CENIA processed a data layer of CSs clues before the start of the area inventory in 2019.

Colour scale legend: CSs clues density expressed as the number of CSs clues per 100 square kilometres



33,436 CSs clues (primary findings)



17,011 CSs clues (after revision)

CENIA work and 2nd stage project tasks provided by contractors

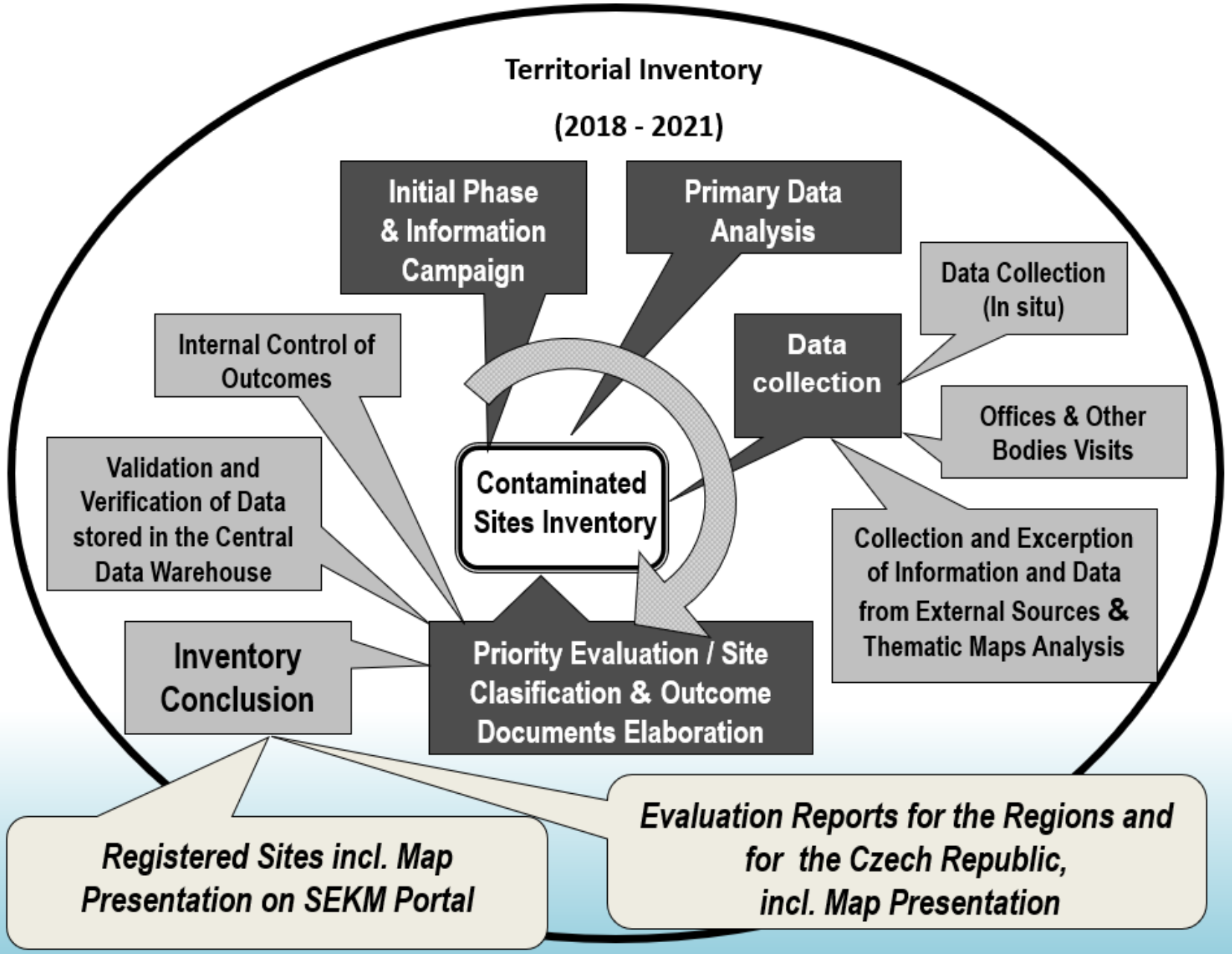
The project was divided into 5 project tasks, of which 3 were provided by the supplier:

- The area inventory was provided by the consortium *"DEKONTA, VZ Ekomonitor, GEOtest – NIKM 2"*. The work included initial analysis, data collection, data evaluation, inventory synthesis, project progress evaluation, report development, and publication of results.
- The inventory administration within the SEKM database including verification and validation of records and user support was provided by *ProGeo Consulting Ltd*.
- The supervision was assured by *Jiří Tylčer*. The content was a continuous control of the compliance of work with the methodology, audit and control activities, incl. output opponent assessments.

NIKM investigation team and CSs inventory methodology

- A total of 77 workers were involved in. 57 of them in area inventory. 3 workers were involved in the task of the SEKM/NIKM Administration, one supervisor provided external control. 16 workers were engaged within the CENIA tasks (7 in project management and 9 in inventory RS support).
- The methodological basis:
- "Inventory Methodology" with conceptual principles and
- "Inventory Manual" with details of the procedures.

NIKM methodology



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Tab. R1 – KLASIFIKAČNÍ MATRICE	Kategorizace kontaminovaných míst podle dalšího postupu				
1	2		3	4	5
situační výrok o lokalitě: charakteristika prozkoumanosti lokality a aktuálních či potenciálních důsledků kontaminace	charakter dalšího postupu		kód priority – základní kód		3. pozice – řád priority
- potvrzeno aktuální neakceptovatelné riziko pro lidské zdraví[2], vyplývající z kontaminace lokality při jejím současném způsobu využívání, nebo - potvrzeno šíření kontaminace, hrozící vznikem neakceptovatelného zdravotního rizika	nápravné opatření[1] je nutné	bezodkladně nutné	A	3	*podle úrovně a charakteru potvrzené či předpokládané kontaminace, podle podmínek migrace znečištění a podle významnosti ohrožených zájmů (v modulu hodnocení priorit databázi SEKM je včleněn automatický skórovací systém, hodnotící zde uvedené faktory)*
- potvrzena kontaminace nad úrovní legislativou stanovených koncentračních limitů [2,3] nebo - nemožnost využívání lokality v souladu s platným územním plánem[4], nebo - je potvrzeno šíření kontaminace ze znečištěné lokality		nutné	A	2	
kontaminace je potvrzena, avšak žádná ze situací výše - není aktuální riziko pro lidské zdraví ani rozpor s legislativou, avšak jde o obecný nesoulad se zájmy ochrany životního prostředí nebo s jinými zájmy, chráněnými podle zvláštních předpisů[5]	nápravné opatření[1] je žádoucí		A	1	
nedostatečné informace pro hodnocení a pro definitivní závěry – zatím nelze vyloučit nezbytnost nápravného opatření	žádné informace o kontaminaci – na lokalitu je tedy nutno nahlížet jako na potenciálně kontaminovanou	nutný je průzkum kontaminace	P	4	
	kontaminace je potvrzena orientačním vzorkováním, avšak nedostatečný rozsah informací neumožňuje definitivní závěry		P	3	
kontaminace je potvrzena, není aktuální riziko pro lidské zdraví, není rozpor s legislativou či s jinými zájmy, zatím však neznáme, zda se kontaminace šíří či nikoliv - nutnost nápravného opatření zatím nelze vyloučit	nutný je další monitoring vývoje kontaminace v čase		P	2	
kontaminace, která by mohla znamenat vznik neakceptovatelného zdravotního rizika v případě změny funkčního využívání lokality či dotčeného okolí na více citlivé ve srovnání s využitím současným[6]	nutnost institucionální kontroly způsobu využívání lokality		P	1	
nadpozaďová, avšak nízká kontaminace – žádné zdravotní riziko, žádný rozpor s legislativou či s jinými zájmy, žádné omezení multifunkčního využívání lokality	není nutný žádný zásah		N	2	
známá historie využívání lokality prakticky vylučuje riziko kontaminace nad úrovní pozadí			N	1	
průzkumem je potvrzena neexistence kontaminace nad úroveň pozadí			N	0	

[1] *Pod pojmem nápravné opatření je zde nutno rozumět všechny možné druhy zásahu, vedoucího k redukci rizik. Tedy nejen sanaci kontaminace, ale i vhodné náhradní řešení (například zajištění nezávadné pitné vody z náhradního zdroje, nebo změna funkčního využívání území).*

[2] *Překročení legislativou stanovených koncentračních limitů pro potraviny či pro pitnou vodu se považuje vždy za neakceptovatelné riziko pro lidské zdraví.*

[3] *Jakýkoliv legislativou definovaný koncentrační limit, vztahující se ke kontaminované složce životního prostředí.*

[4] *Například: využívání lokality podle územního plánu by znamenalo neakceptovatelné zdravotní riziko. Jiný příklad: skládka blokuje zástavbu území podle územního plánu.*

[5] *Zavedením této kategorie se zohledňuje kontaminace, jejíž sanaci budeme považovat za žádoucí, ale jejíž nutnost nedokážeme jednoznačně vyžadovat na základě existující legislativy ani analýzy rizik. Otevírá se tím například možnost, uplatňovat přísnější měřítka v přírodní rezervaci ve srovnání s průmyslovou krajinou. Lze v takových případech předpokládat obecnou shodu v zájmu na snížení kontaminační zátěže.*

[6] *Například: v rámci platného územního plánu změna administrativní budovy na dětskou školku. Jiný příklad: změna územního plánu z průmyslové zóny na zónu bytové výstavby.*

Evaluated priority of needed corrective measures

Three basic categories of locations are distinguished

- **contaminated (A),**
- **potentially contaminated (P)** and/or
- **non-contaminated (N) sites.**

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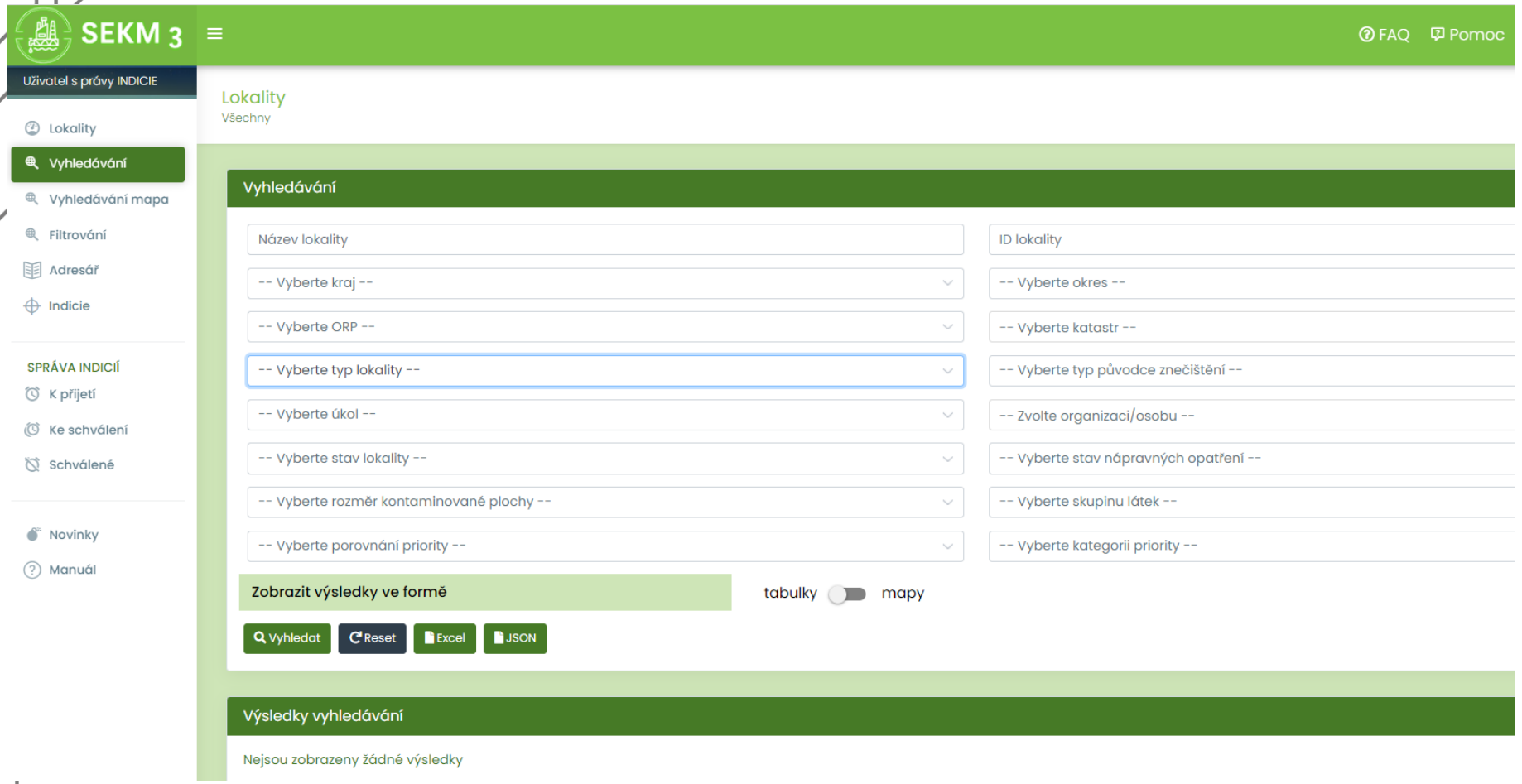
Evaluated priority of needed corrective measures

Each of these three basic categories is broken down into even more detail.

- **Category A sites** are those where contamination represents an existing and confirmed problem.
- For **sites of category P**, contamination means a potential problem, there is not enough information for definitive conclusions. The actual severity of contamination must be verified by survey and/or risk analysis for this category.
- Locations of **category N** do not require any intervention.

SEKM 3
https://www.sekm.cz/portal



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NIKM investigation team – training, methodology modification

- Introductory training session for twenty team leaders. During the project, 6 mapper's manuals were published.
- Two certified methodologies were processed.
- In November 2019, during the shutdown of SEKM due to the migration of the data warehouse from SEKM 2 to SEKM 3,
  - four consultation days / training seminars were organized for company teams for which also
  - 13 methodological modifications were issued.
  - Three more methodical meetings were organized, incl. seminars during the project.

Input content of the central data warehouse

- The SEKM central data warehouse is the core of the entire structured and distributed data warehouse, which ensures editing, storage, and management of CSs.
- The input content was prepared by transforming and merging partial data sources about CSs. It contained 30,020 locations (incl. 12,982 SEKM records and RS clues - 17,038 locations). During the inventory, the SEKM data warehouse was completed with records of newly discovered CSs (1,491 records).
- All records from this input content of the central data warehouse were checked, updated, and evaluated or excluded as irrelevant or duplicated to other locations.

Effectiveness of area inventory

The input content of **30,020 locations**:

- **12,982 SEKM records,** from which **6,839 records** were evaluated
- **RS clues** - **17,038 locations**, from which **1,804 records** were created.
- Completely **new localities** detected during the area inventory with a number of **1,491 records**.

Records	SEKM records			RS clues and records			New CSs records	Input records total	Output records total	Excluded records total
	SEKM input	evaluated	excluded	RS input	evaluated	excluded				
Input data as of 02/2019	12,982			17,038				30,020		
Output data as of 31/12/2021		6,839			1,804		1,491		10,134	
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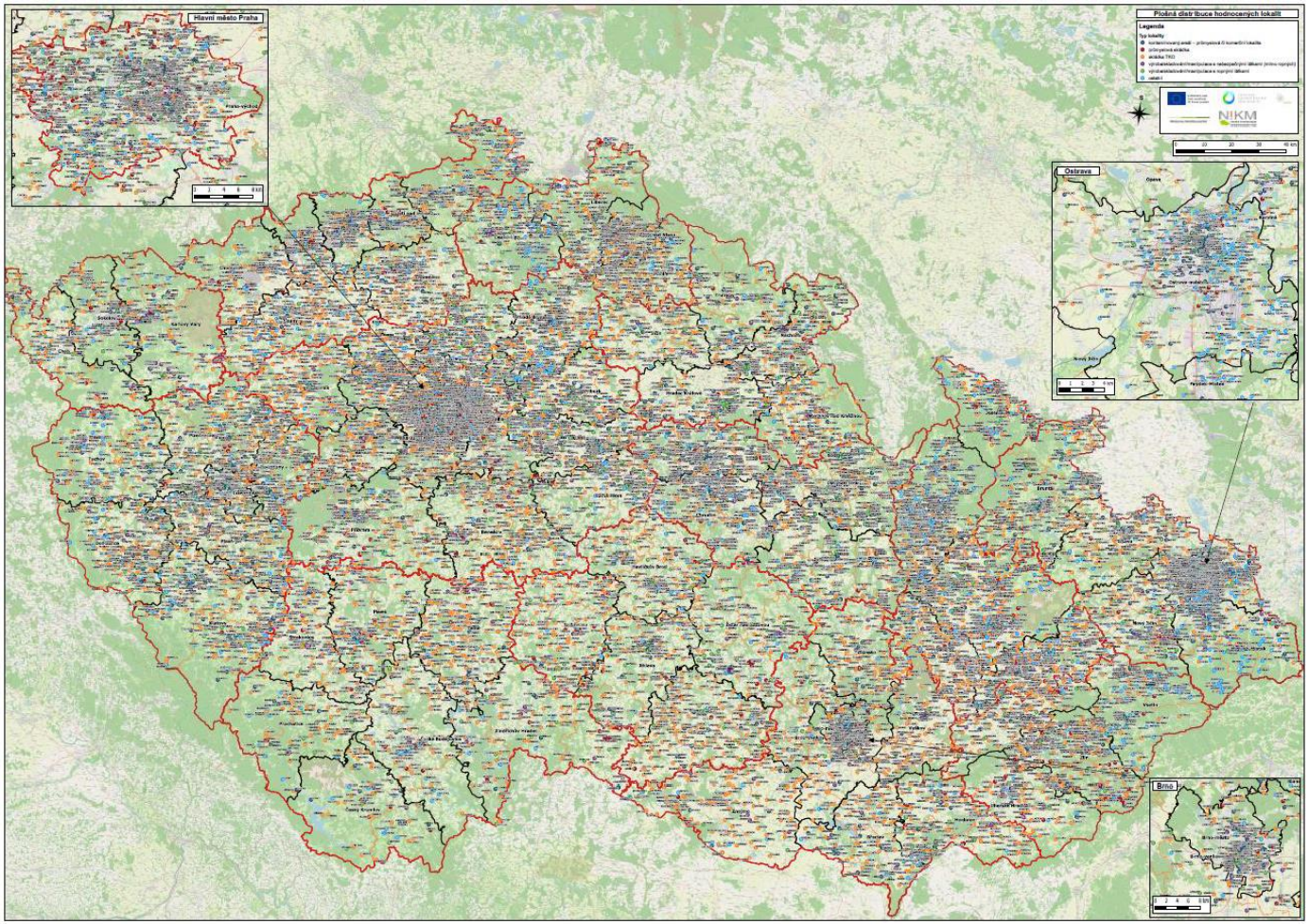
Territorial distribution of contaminated sites



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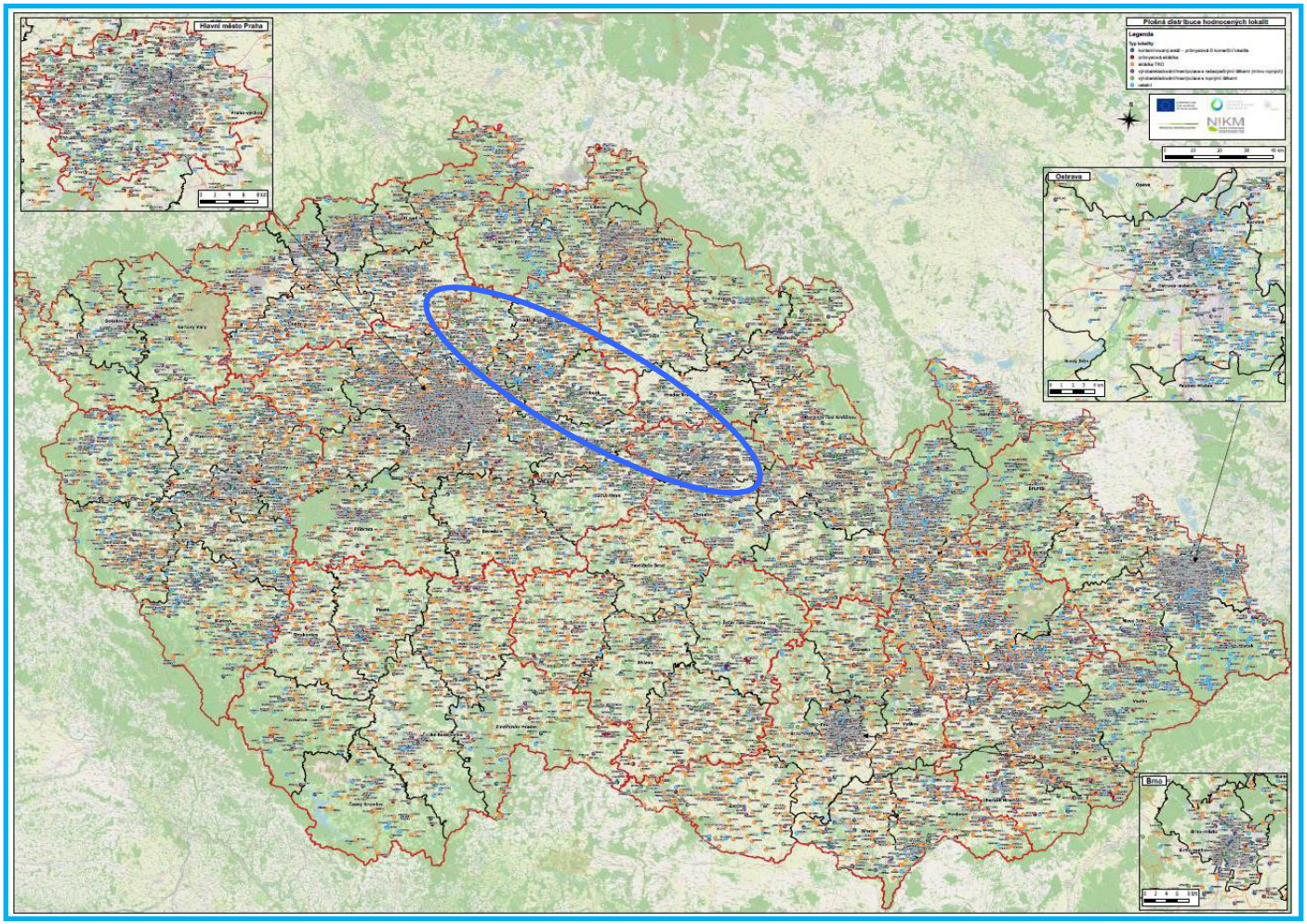
Territorial distribution of contaminated sites

- **Distribution in relation to industrial areas and cultural and economic centres**
- The dominant occurrence of CSs is in areas where **industrial production was and still is concentrated**, or in places where **dangerous substances were handled and accidental or systematic leaks** into the rock environment occurred due to their careless handling.
- These are, for example, the industrial areas along the river Elbe, the coal basins on the Northwest, the area of the Upper and Lower Moravian Valleys and the Moravian Gate. CSs are also accumulated in places of economic and cultural centres within the Czech Republic - in the capital city of Prague and Brno including their surroundings, in Ostrava and Pilsen.

Territorial distribution of contaminated sites



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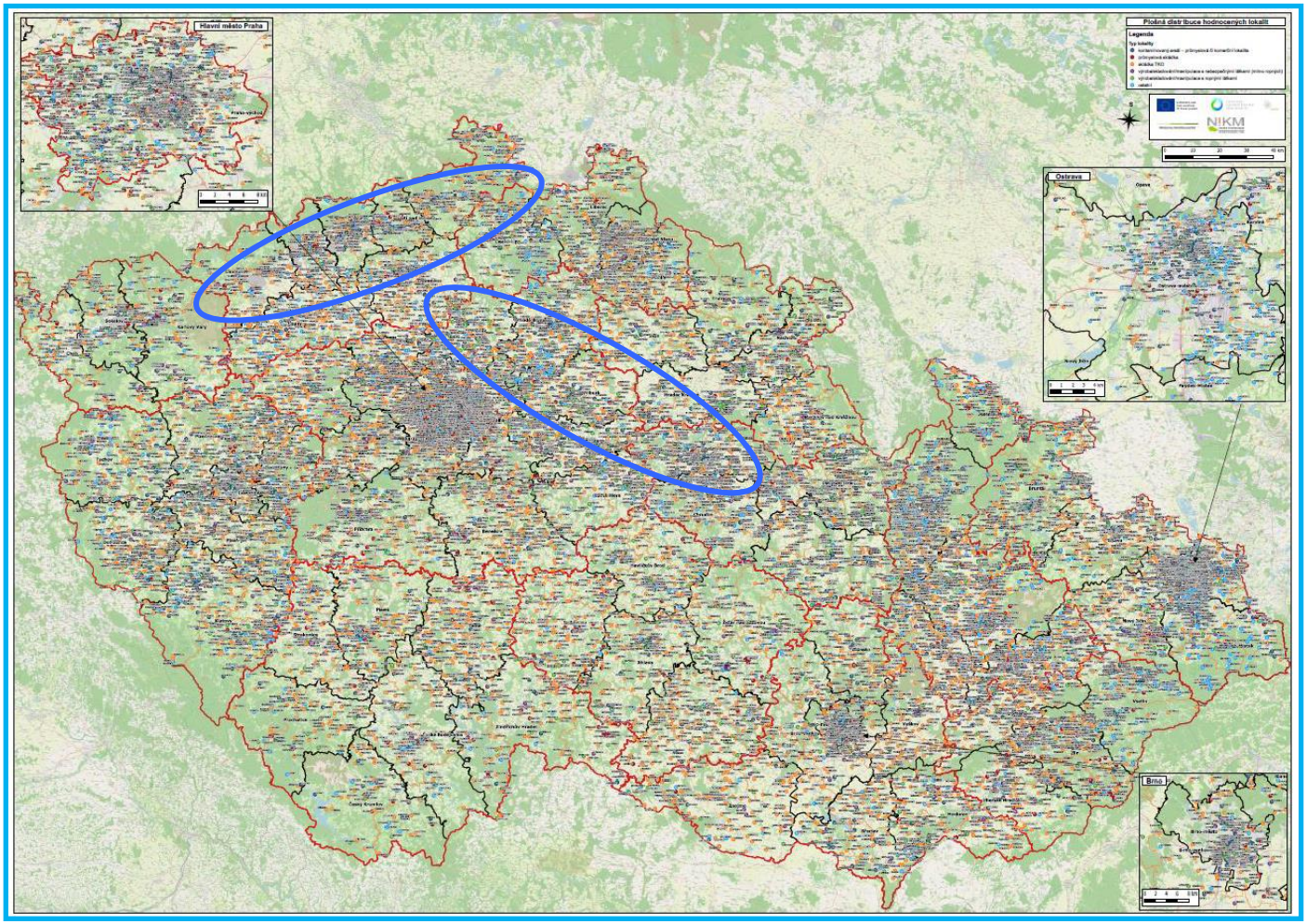

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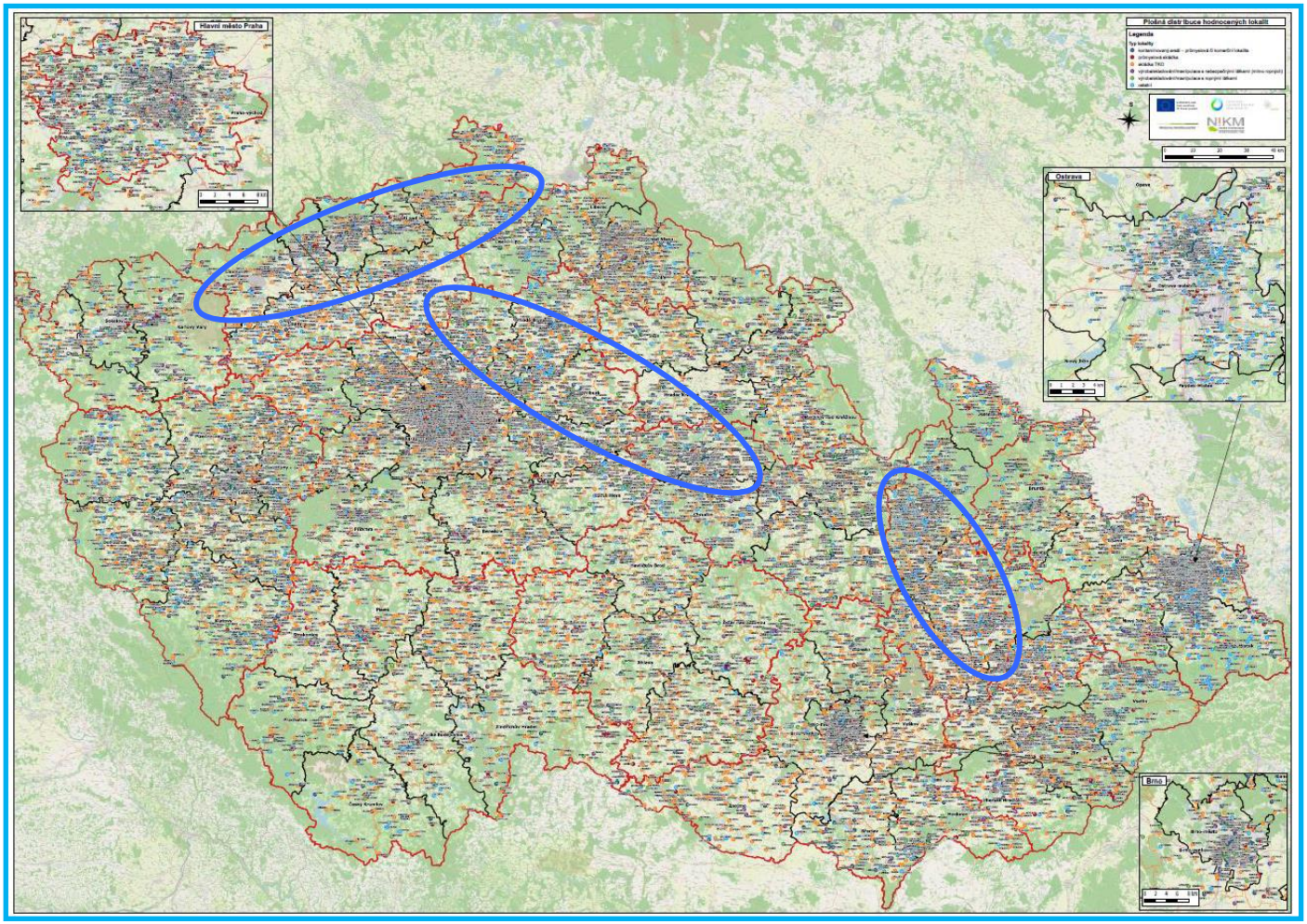

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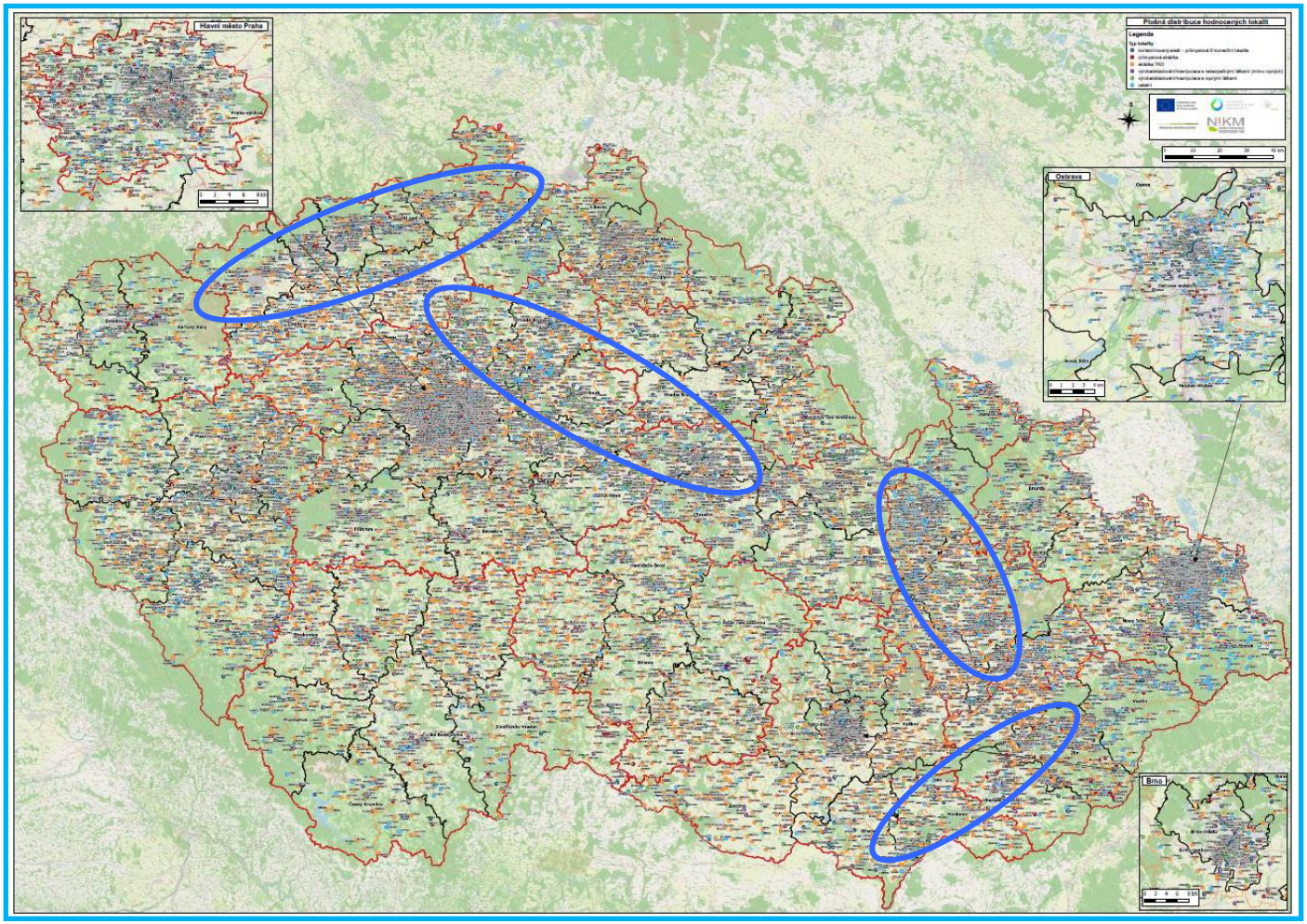

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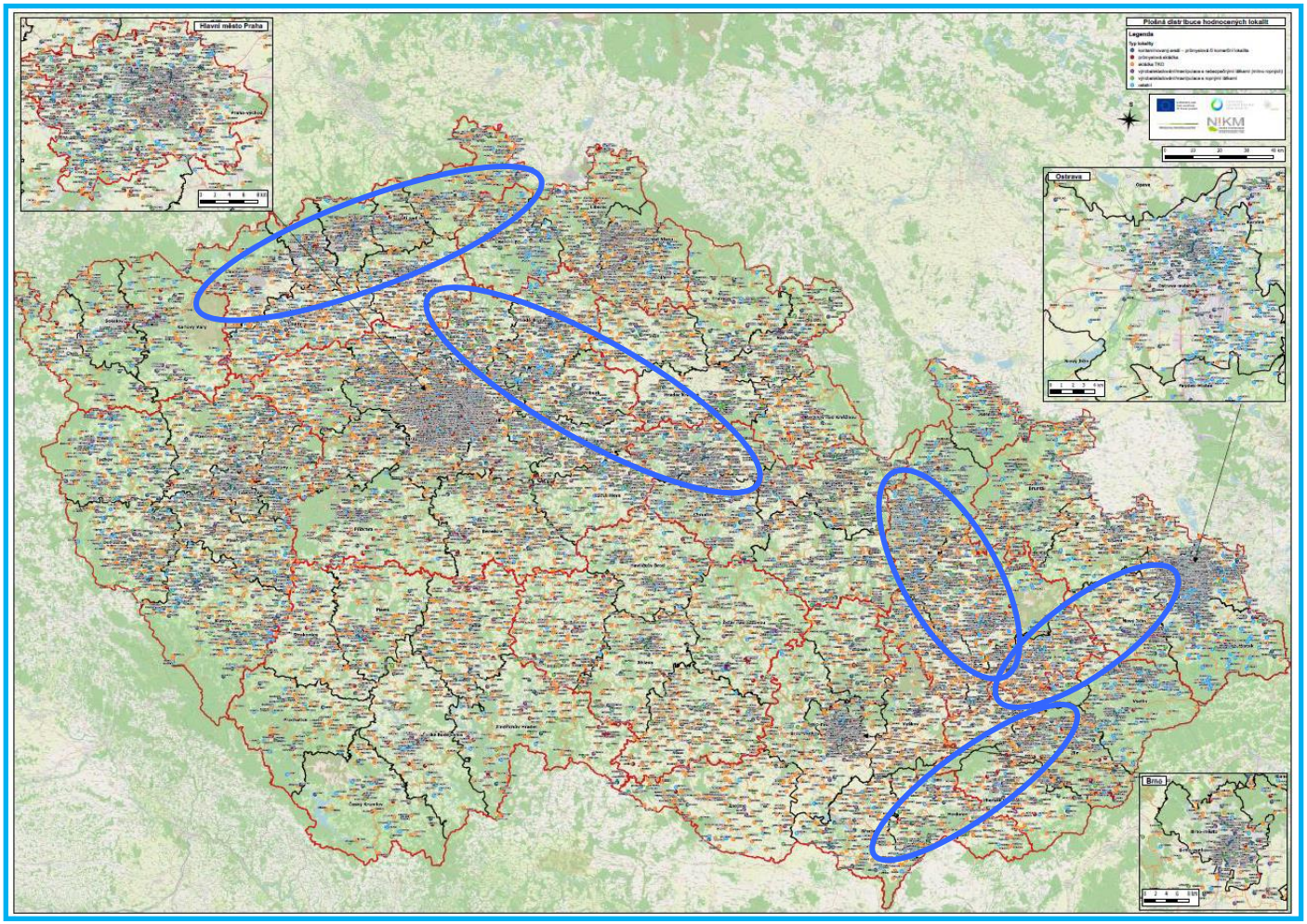

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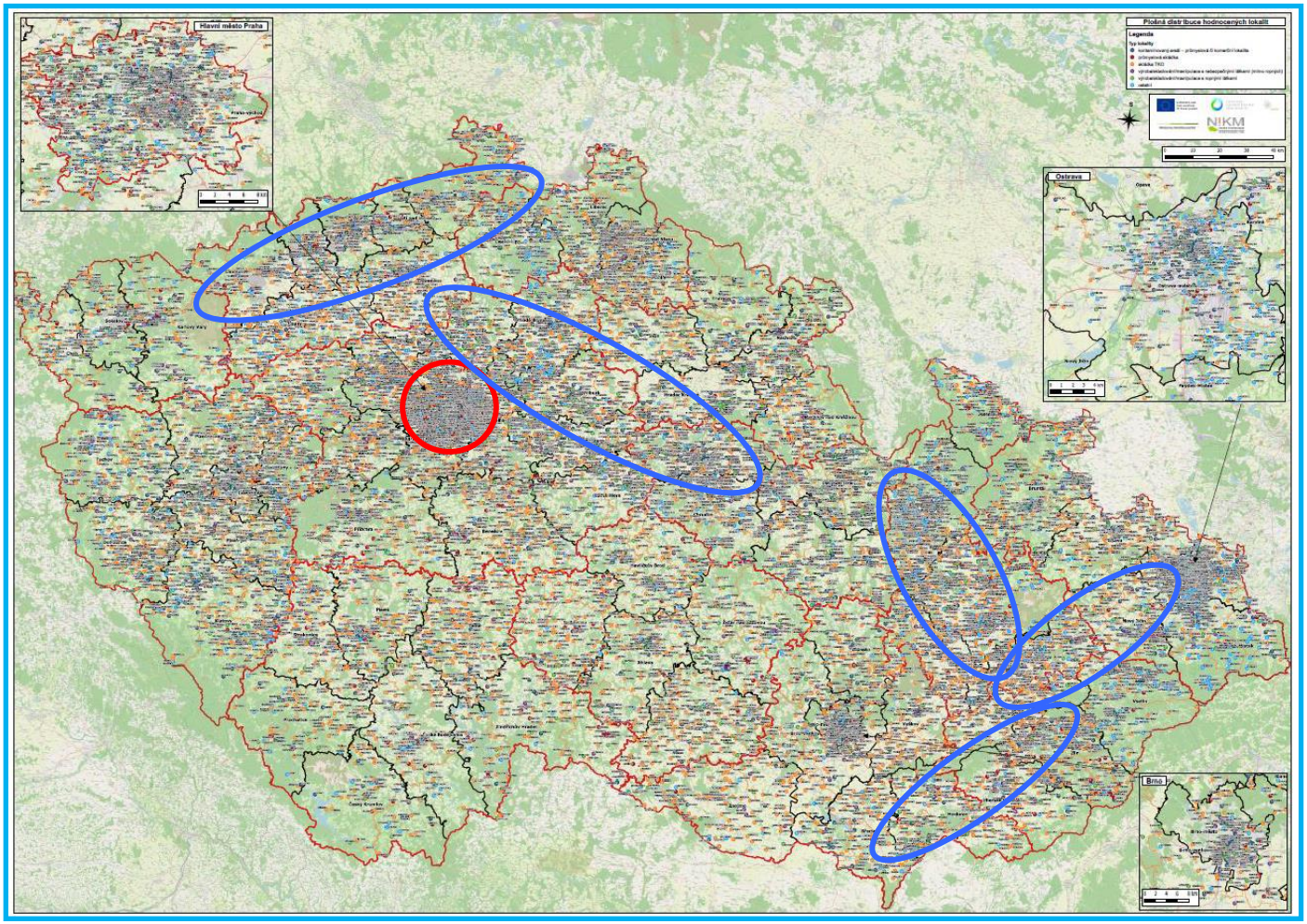

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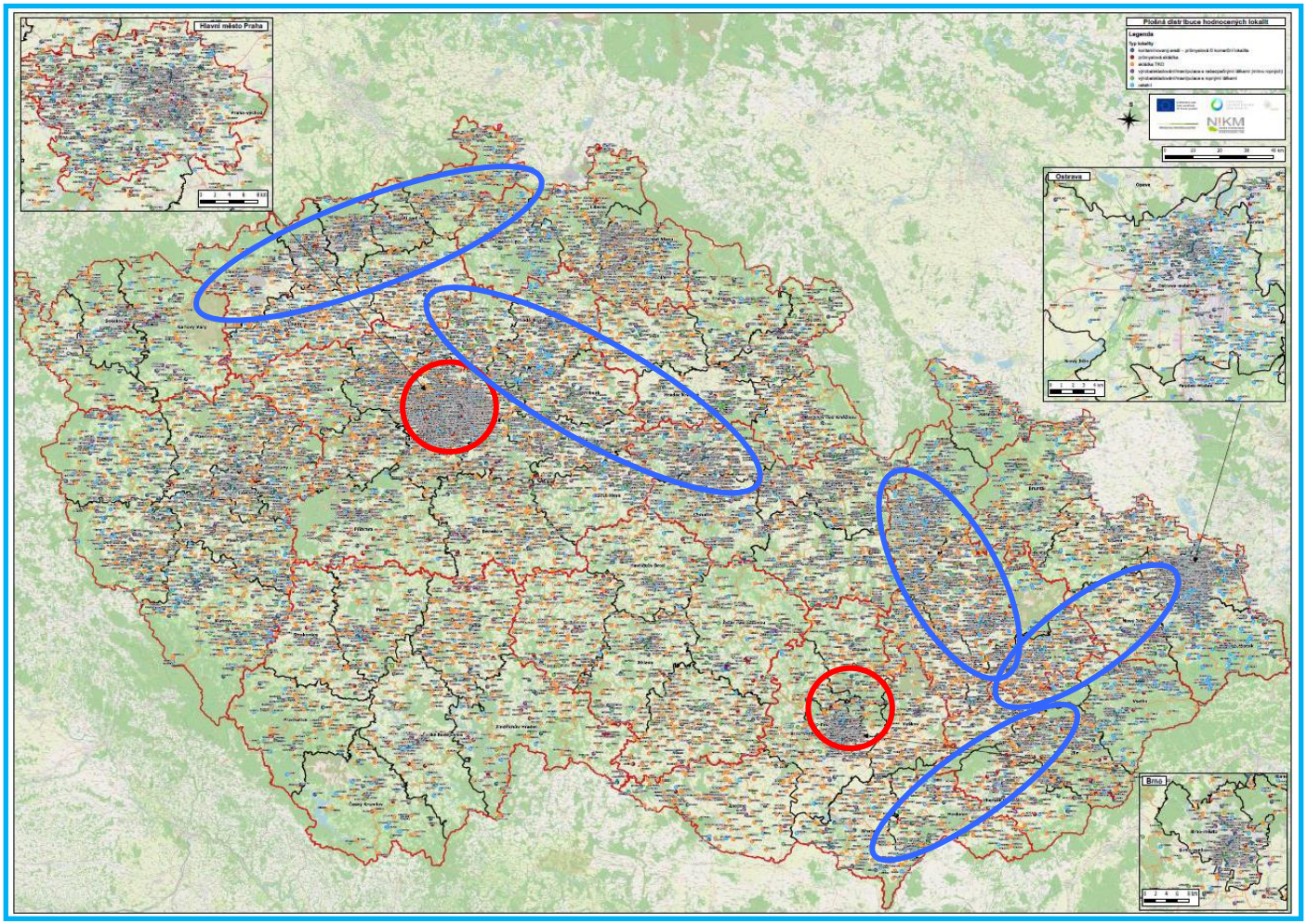

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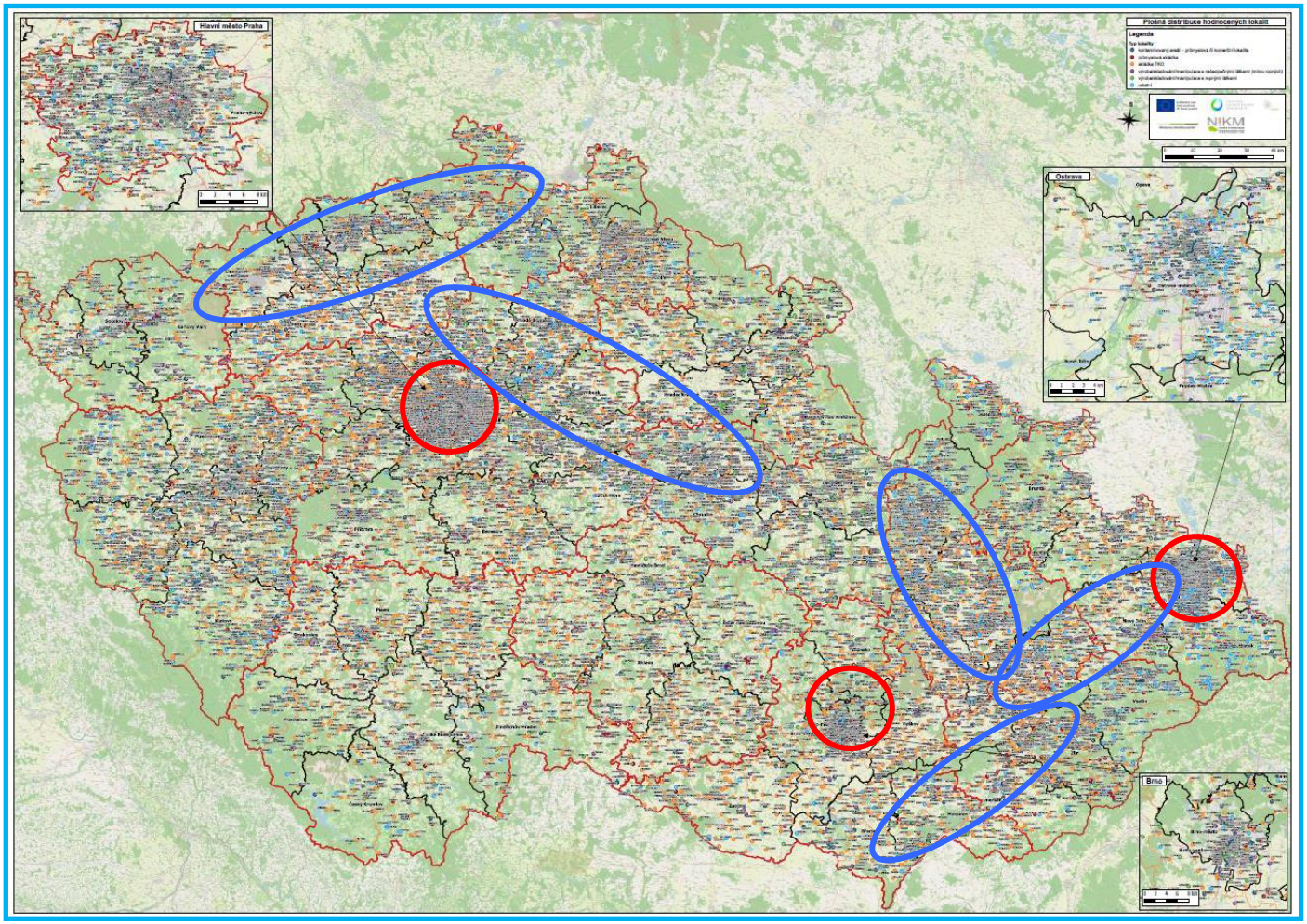
Territorial distribution of contaminated sites



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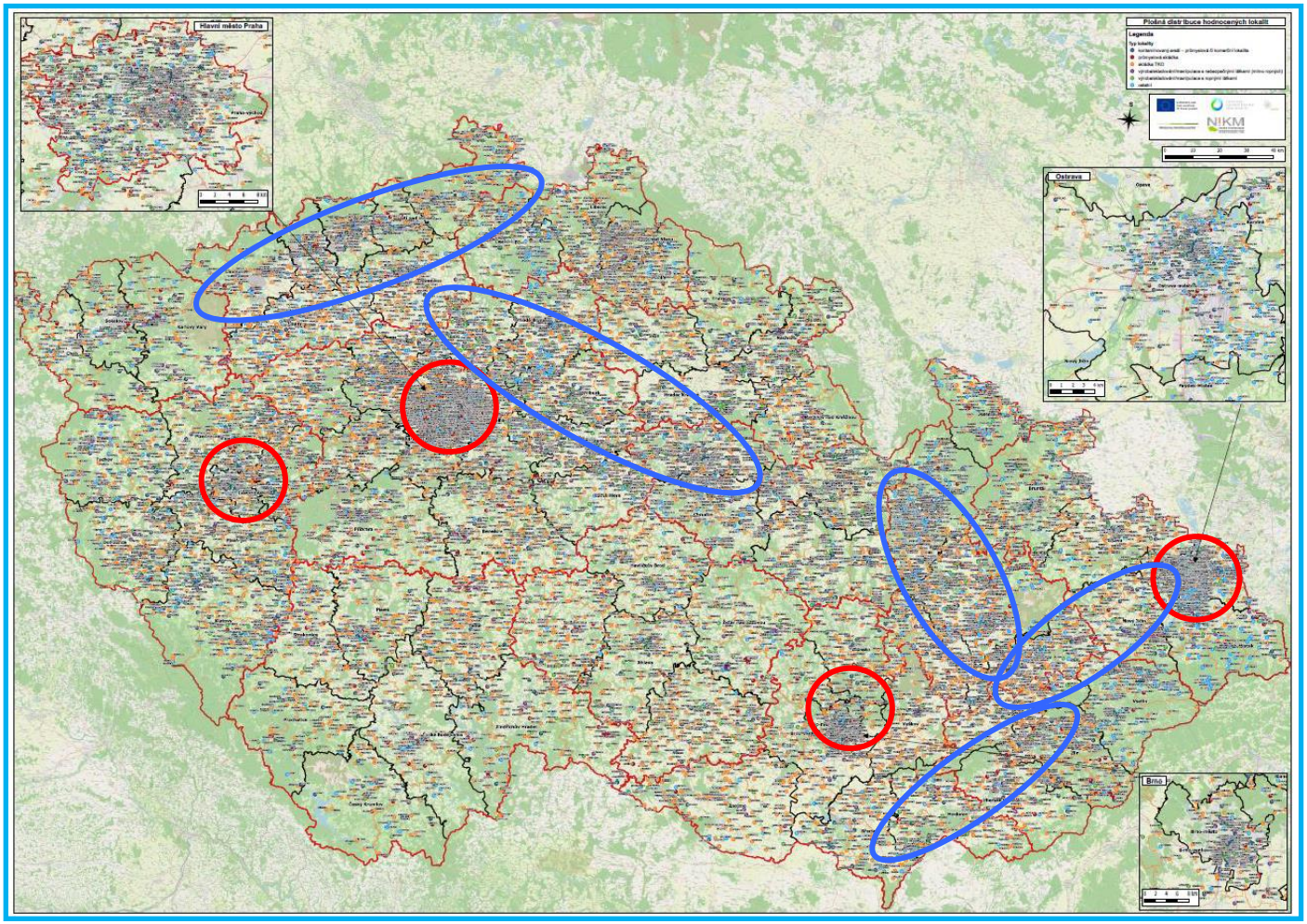
Territorial distribution of contaminated sites



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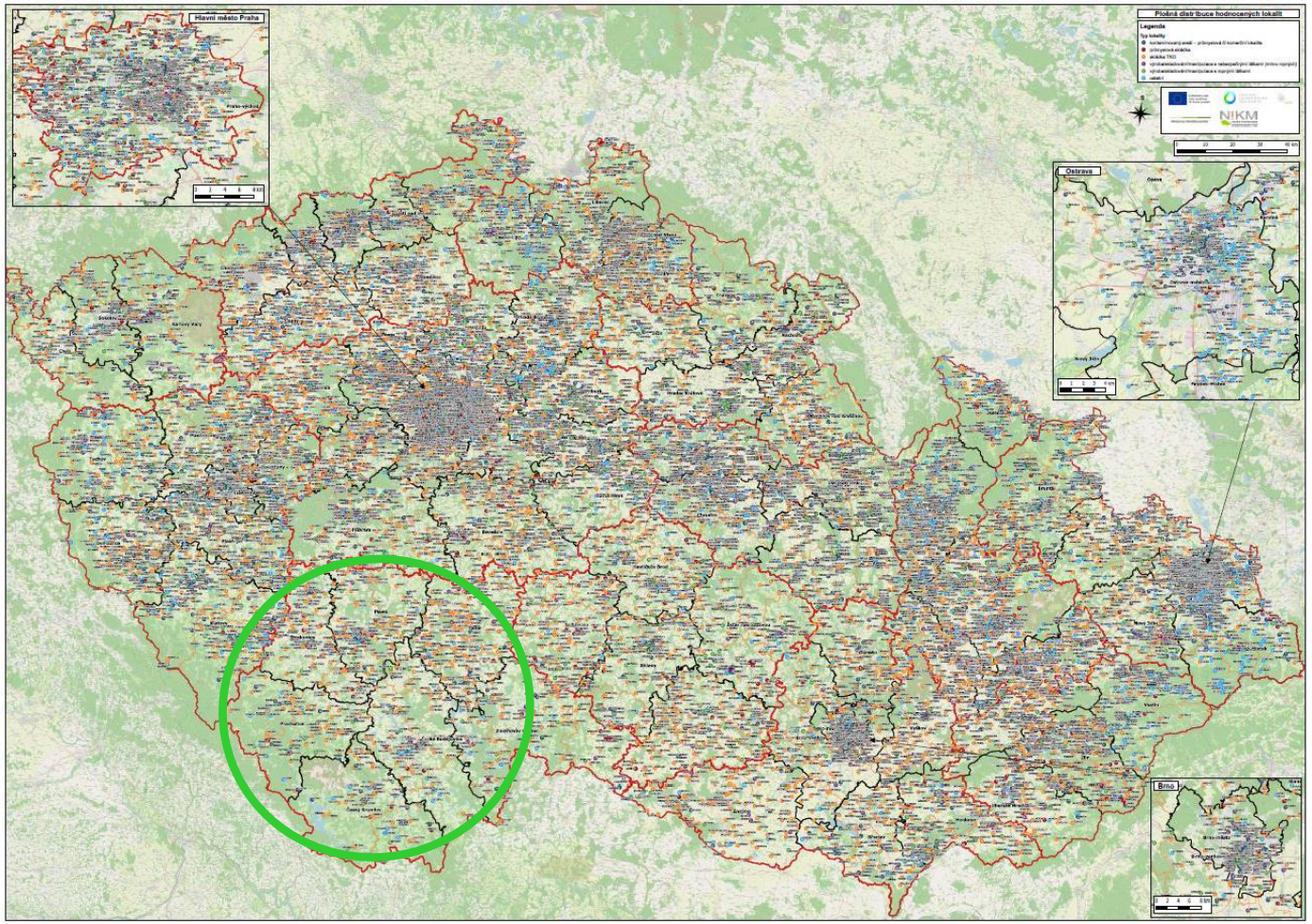
Territorial distribution of contaminated sites

- **Occurrence of CSs in agricultural areas**
- A smaller number of CSs are located in regions with agricultural production – e.g., the South Bohemian and the Vysočina regions, partially also the South Moravian region. The Karlovy Vary region in the west also has a low density of CSs.

Territorial distribution of contaminated sites



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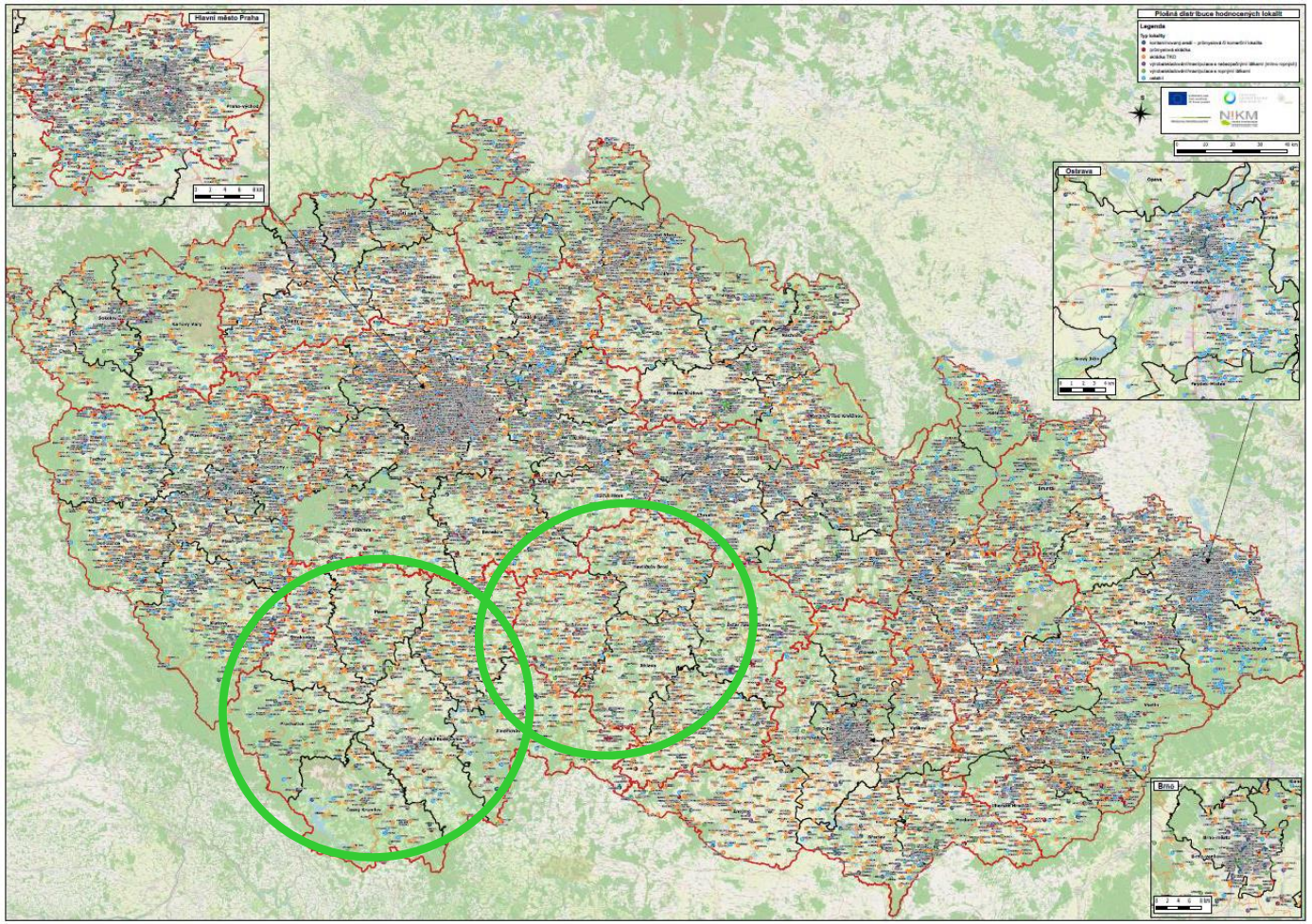
Territorial distribution of contaminated sites



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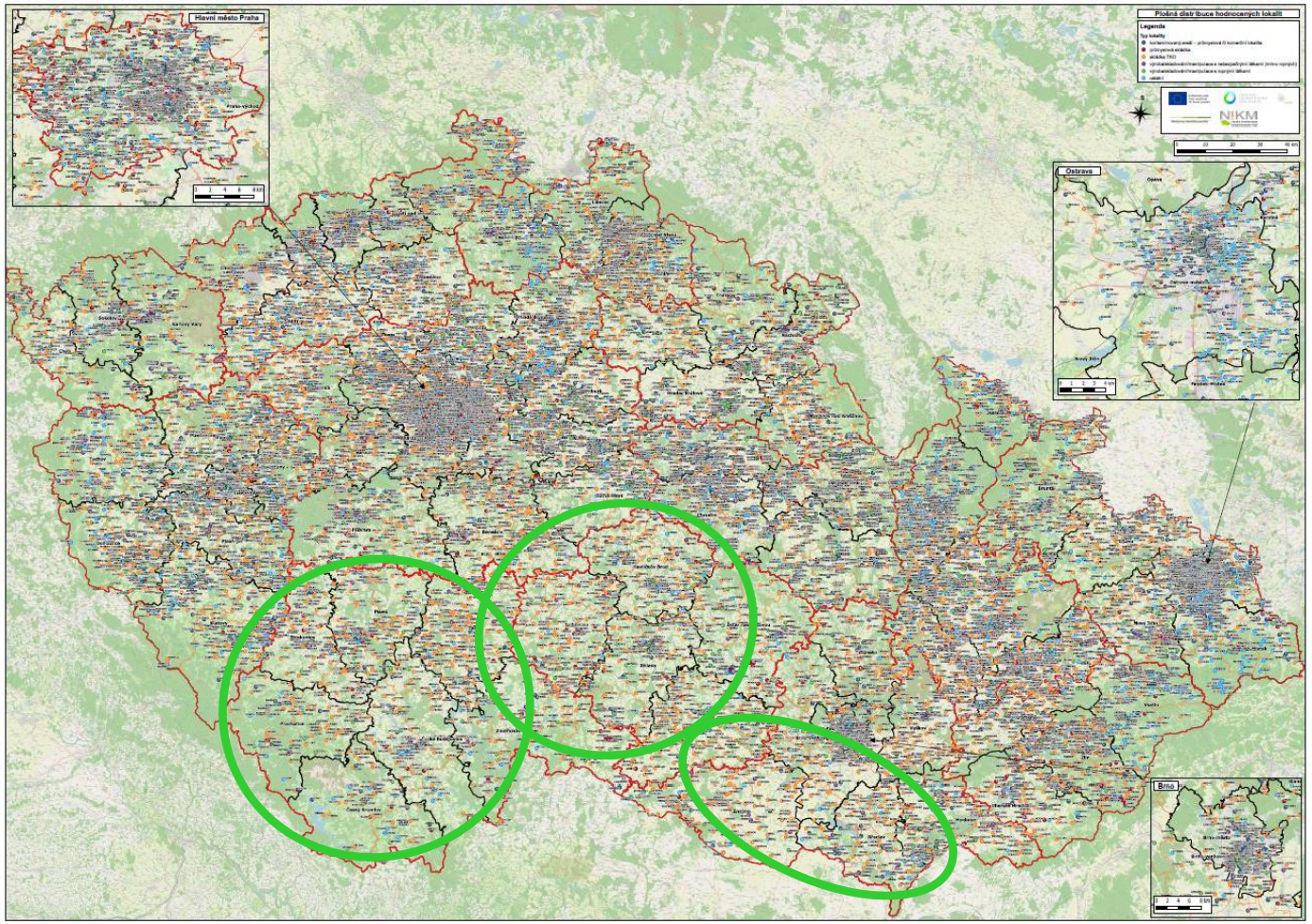
Territorial distribution of contaminated sites



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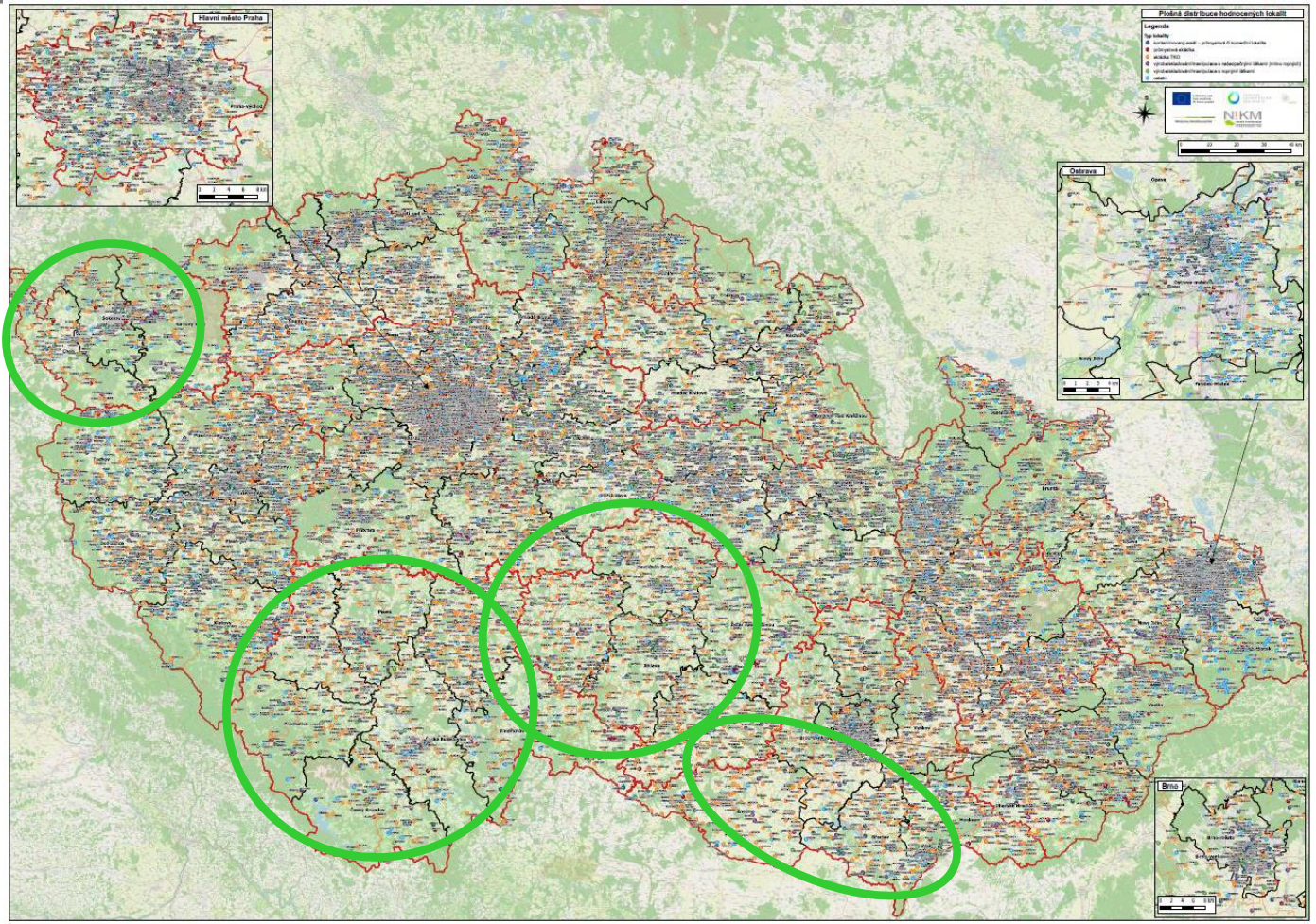
Territorial distribution of contaminated sites



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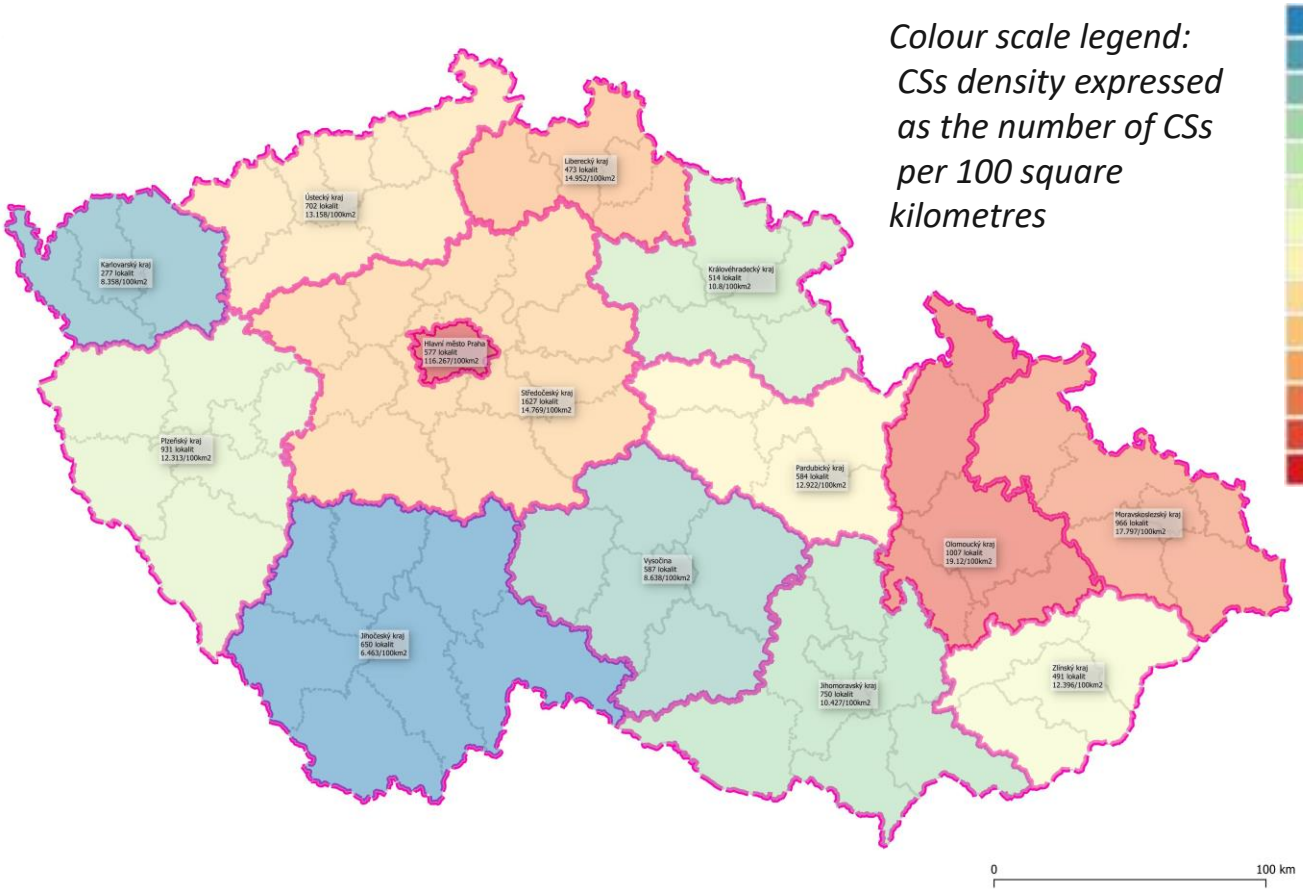
Territorial distribution of contaminated sites

Regions with the highest CSs density

The capital city of Prague has the highest density of CSs due to a small area of the city. The Olomouc and Moravian-Silesian regions have a higher density of CSs. There are several reasons:

- (1) the concentration of mining and heavy industry in and around Ostrava,
- (2) the concentration of industrial production in the area of the Moravian Valleys and the Moravian Gate.

Territorial distribution of contaminated sites
Regions



Colour scale legend:
CSs density expressed as the number of CSs per 100 square kilometres

- 6,46 - 8,22
- 8,22 - 8,6
- 8,6 - 10,04
- 10,04 - 10,69
- 10,69 - 11,77
- 11,77 - 12,36
- 12,36 - 12,66
- 12,66 - 13,02
- 13,02 - 13,73
- 13,73 - 14,82
- 14,82 - 15,56
- 15,56 - 17,99
- 17,99 - 26,06
- 26,06 - 116,27

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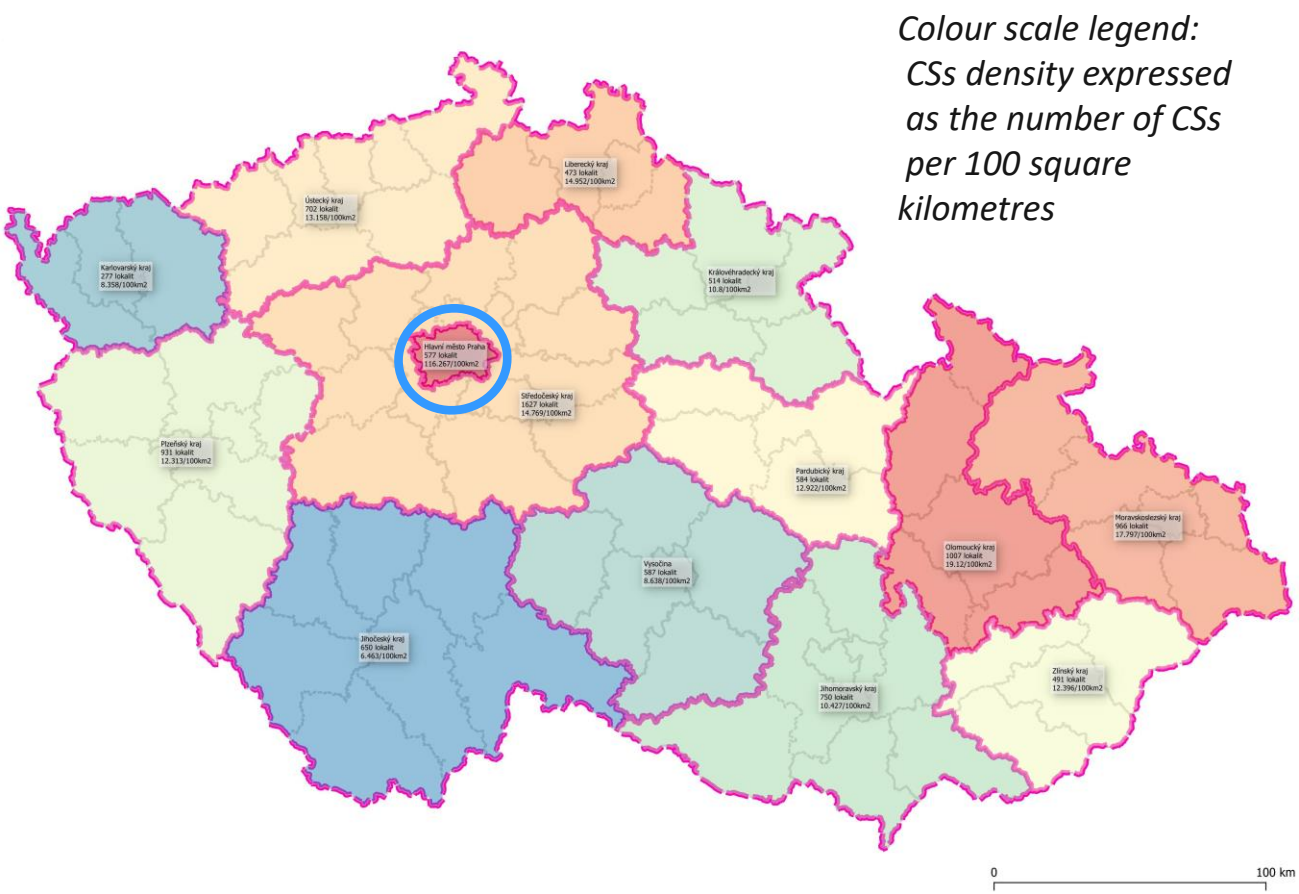
Territorial distribution of contaminated sites
Regions



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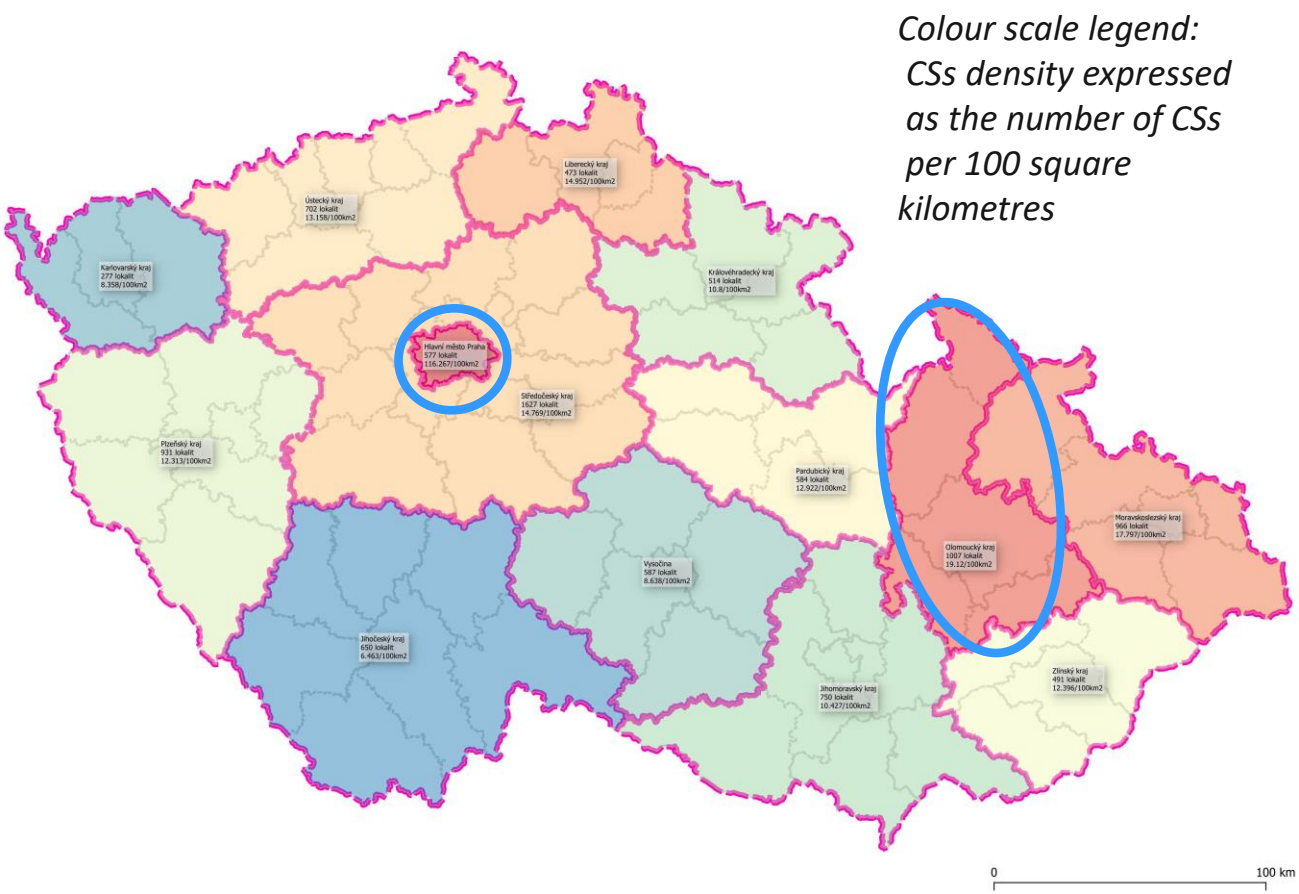
Territorial distribution of contaminated sites
Regions



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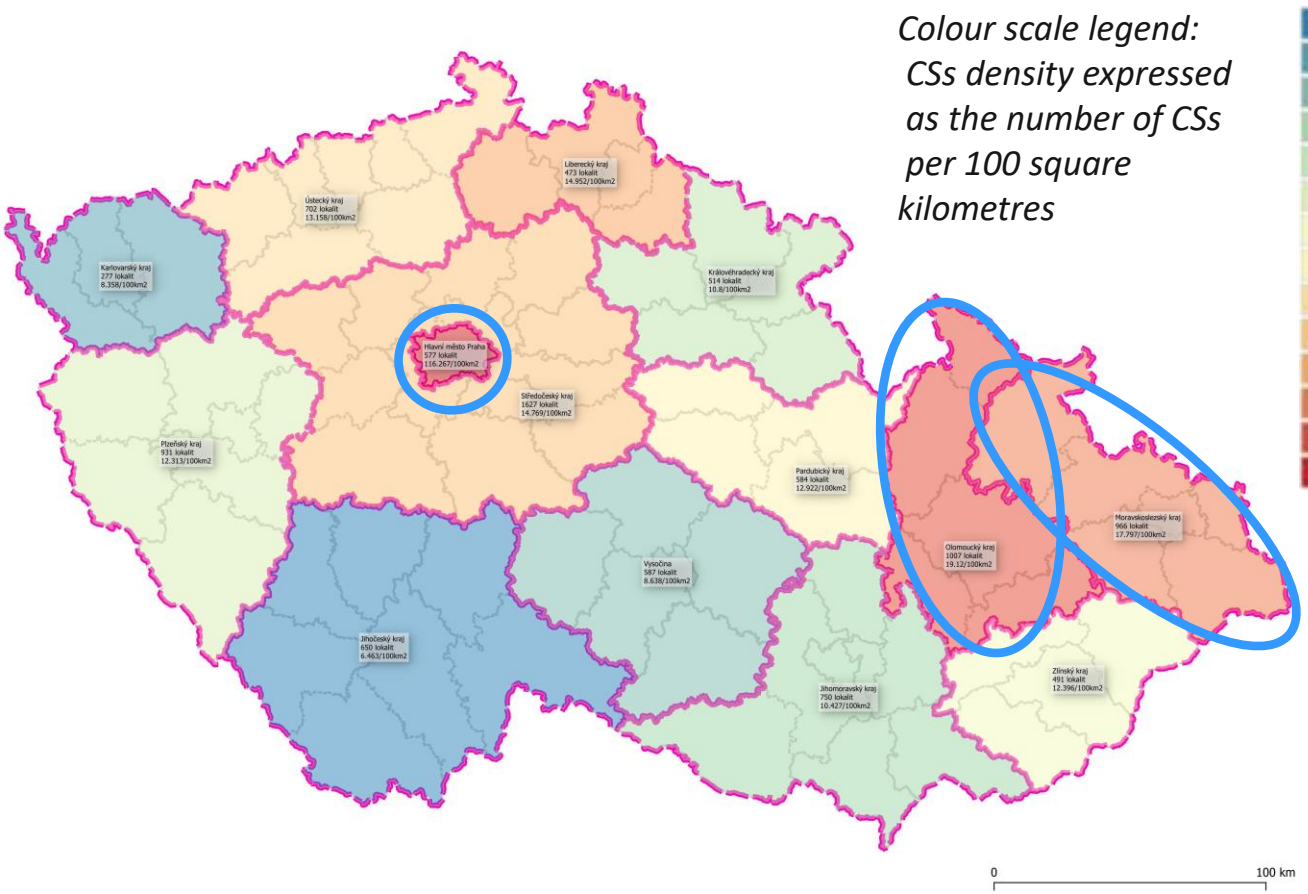

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- 17,99 - 26,06
- 26,06 - 116,27

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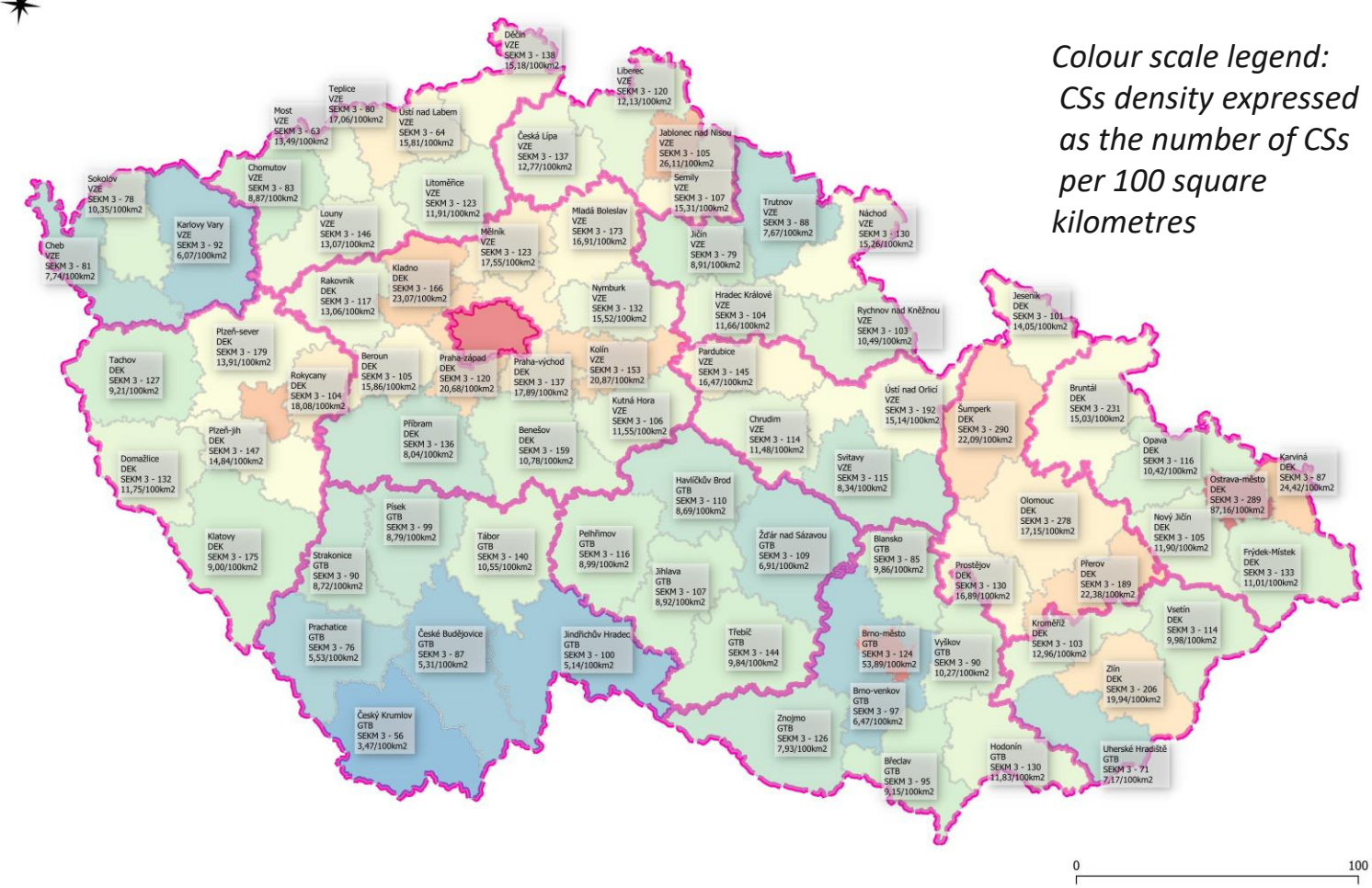
Territorial distribution of contaminated sites

Regions with the highest CSs density

- In the CSs density maps the main features of the CSs distribution are evident.
- In 14 posters, we evaluated the basic features of CSs distribution according to priority categories up to the districts and the “small districts” level.

Territorial distribution of contaminated sites
Districts



Colour scale legend:
CSs density expressed as the number of CSs per 100 square kilometres

- 1,8 - 3,5
- 3,5 - 5,4
- 5,4 - 6,6
- 6,6 - 7,8
- 7,8 - 8,8
- 8,8 - 9,9
- 9,9 - 11,1
- 11,1 - 12,4
- 12,4 - 13,8
- 13,8 - 15,3
- 15,3 - 16,9
- 16,9 - 18,5
- 18,5 - 20,3
- 20,3 - 22,6
- 22,6 - 25,3
- 25,3 - 28,7
- 28,7 - 37,2
- 37,2 - 41,1
- 41,1 - 85,4
- 85,4 - 116,3

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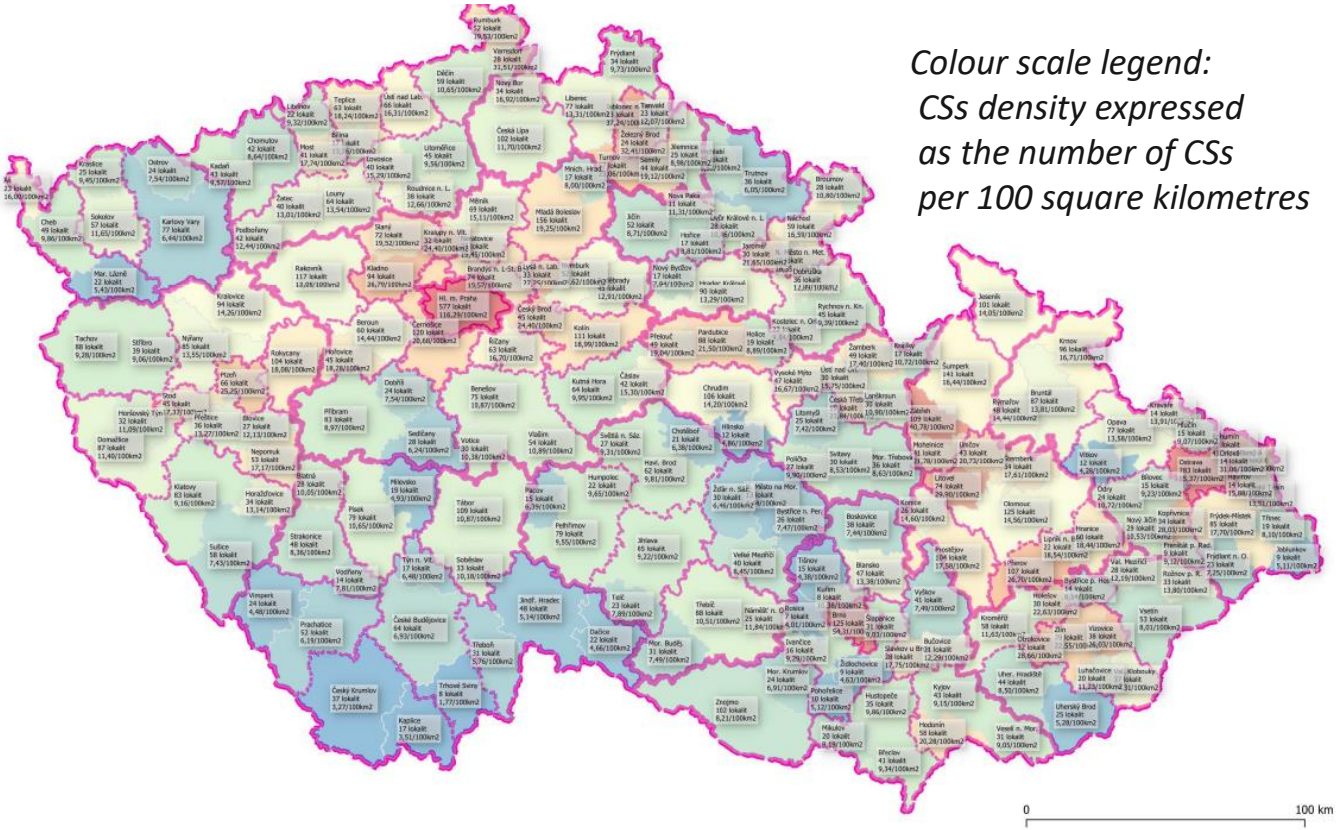
Territorial distribution of contaminated sites
Small Districts



Colour scale legend:
CSs density expressed as the number of CSs per 100 square kilometres

1,77 - 4,69
4,69 - 6,05
6,05 - 7,35
7,35 - 7,79
7,79 - 8,38
8,38 - 8,88
8,88 - 9,29
9,29 - 9,82
9,82 - 10,27
10,27 - 10,72
10,72 - 11,68
11,68 - 12,68
12,68 - 13,39
13,39 - 14,19
14,19 - 15,95
15,95 - 17,26
17,26 - 18,59
18,59 - 21,46
21,46 - 26,34
26,34 - 85,07
85,07 - 150

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Project sustainability and follow-up activities

- During the five-year project sustainability, the results and SEKM data will be extracted for publishing and conference activities and for the CENIA research program.
- The maintenance of the SEKM database will be supported.
- Topics such as
  - *evaluation of remediation costs,*
  - *evaluation of remediation technologies,*
  - *analysis of knowledge about CSs in spatial planning and*
  - *legal problems of CSs registration*

  will be proposed for grant programs.

MAIN OUTPUTS OF THE PROJECT

- The completed SEKM database,
- 14 reports on the inventory in regions, and
- the report on the inventory on the territory of the Czech Republic.
- 30,020 locations or indications were checked from the two basic sources of the IS SEKM and RS, of which 8,643 locations were evaluated as CSs. The remaining 21,377 sites or indications were excluded or found not to be CSs.

MAIN OUTPUTS OF THE PROJECT

- An additional 1,491 assessed CSs were identified from other sources, i. e. there are a total of **10,134 assessed CSs** as of December 2021.
- These CSs have a record in the SEKM database, at least in the scope of the so-called summary form, including the **evaluated priority of corrective measures**.

MAIN OUTPUTS OF THE PROJECT

- More than **70% of sites** (7,102 out of 10,134 sites in total) are evaluated as sites with **insufficient information** on contamination, on the possible spread of contamination and on the possible consequences of contamination, for which it is not yet possible to define the method and scope of remedial measures.
- At approximately **30% of locations** (a total of 3,032 out of 10,134 locations) **the work** associated with the removal of the old ecological load has either **been carried out**, **is in progress, or is being prepared, or it was not necessary to carry it out at all.**

MAIN OUTPUTS OF THE PROJECT

With regard to **the site type,**

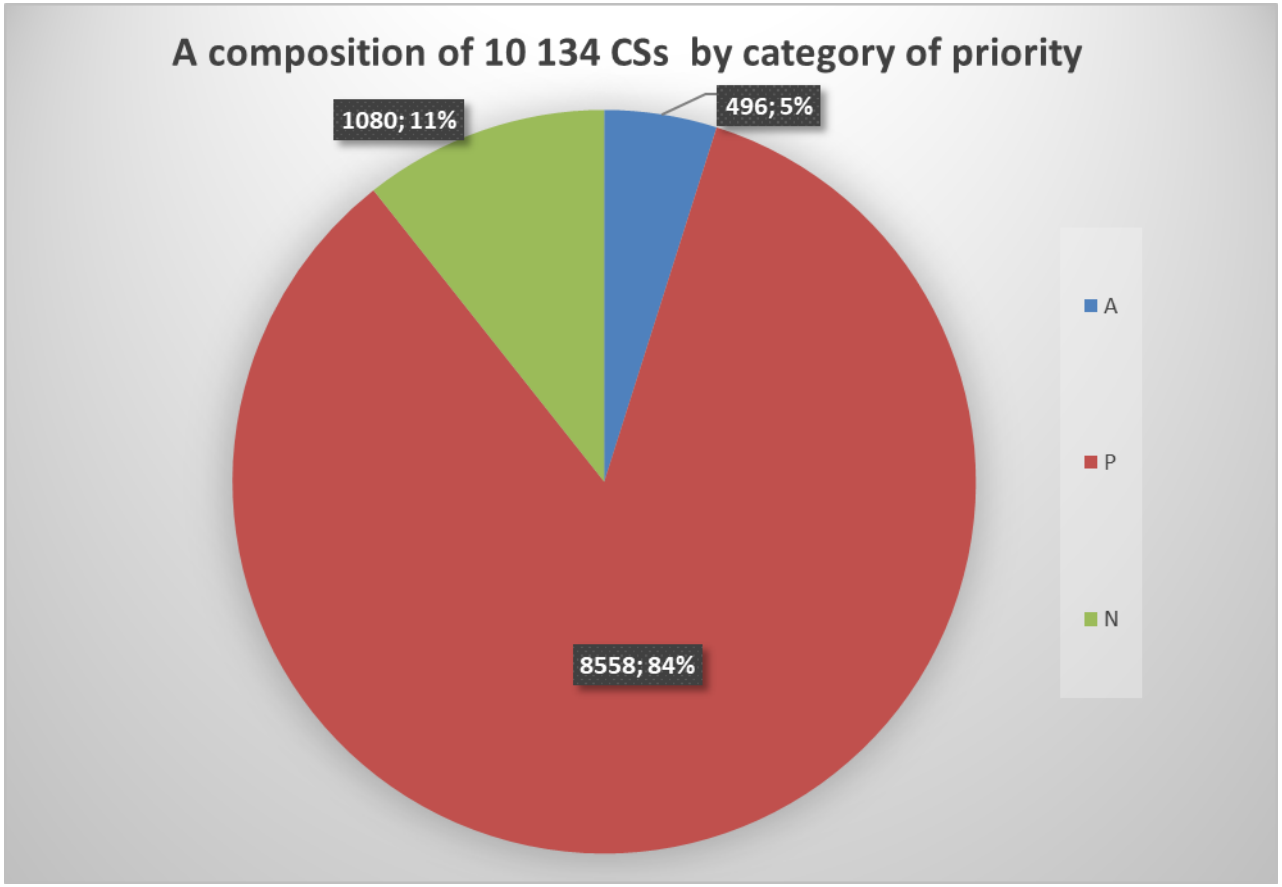
- **municipal waste landfills predominate**, which make up almost **46%** of CSs.
- Over **17%** of CSs are of the **contaminated area CSs type**, i.e. sites where multiple activities occurred concurrently, which led to the creation of an old ecological burden.
- More than **10%** of CSs are places where **oil substances** were manipulated and where substances systematically leaked into the rock environment.
- These three types of sites make up **almost ¾ of all CSs**.

MAIN OUTPUTS OF THE PROJECT

- As to **the urgency of the solution**, a total of 446 CSs require a timely solution (survey or implementation of corrective measures). Out of the total number, these CSs occupy 4.40% of all evaluated CSs.
- All sites have a record including the evaluated priority of needed corrective measures expressed as priority categories A, P, N.

Priority category	Number	%
A	496	4,9
P	8558	84,4
N	1080	10,7
total	10134	100,0

MAIN OUTPUTS OF THE PROJECT



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MAIN OUTPUTS OF THE PROJECT

Status and financing of corrective actions:

- At **667 CSs** (approx. **6.5%**), **remedial work is in progress** or is about to start or has been interrupted/was not successful.
- In total, for **more than 72.5%, corrective measures are not yet known**,
- and for the remaining some **21% of locations, measures are not necessary or have been completed.**

MAIN OUTPUTS OF THE PROJECT

Financing of corrective actions:

- **Funding of remedial measures is needed for 8,024 CSs** (no funding is needed for the remaining 2,110 evaluated CSs).
- Out of 8,024 CSs, **funding is not secured for 6,757 locations (approx. 84%).** For the remaining 1,267 CSs, financing for at least one of the stages of remediation is or has been secured.

MAIN OUTPUTS OF THE PROJECT

Financing of corrective actions

Financing is most often from

- **Ministry of Finance** through environmental contracts,
- **EU funds (OPE)**,
- **budgets of the municipalities, cities, regions**,
- **other ministries' funds, state-owned enterprises or from private sources**.

CONCLUSIONS

1. Project implementation work was completed by 31/12/2021 totalling costs of **CZK 116,741,353 (EUR 4,669,654)** and with fulfilment of the project indicator by up to 112% (**10,134 evaluated CSs**).
2. In the following **5-year period**, the results of the project will be **maintained by CENIA** - the grant recipient.
3. Support for the sustainability of the SEKM IS in order to use the results of the inventory as a priority tool for the relevant authorities to effectively manage the process of the gradual reduction of old burdens, for the needs of spatial planning and reporting of various types .

Industrial Contaminated Sites

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EVROPSKÁ UNIE
Fond soudržnosti
Operační program Životní prostředí

N!KM
národní inventarizace
kontaminovaných míst

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MANY THANKS FOR THE ATTENTION

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