

# OUTPUT FACT SHEET

## Pilot actions (including investment, if applicable)

Version 2

Project index number and acronym	3988685 AMIIGA
Lead partner	Central Mining Institute
Output number and title	Output O.T2.2.1 Remediation concept from drinking water perspective for diverse pollutants in Ljubljana FUA (SI)
Investment number and title (if applicable)	/
Responsible partner (PP name and number)	Geological survey of Slovenia (PP9) and VOKA SNAGA (PP10)
Project website	<a href="https://www.interreg-central.eu/Content.Node/AMIIGA.html">https://www.interreg-central.eu/Content.Node/AMIIGA.html</a>
Delivery date	31 <sup>st</sup> October 2019

Summary description of the pilot action (including investment, if applicable) explaining its experimental nature and demonstration character

Pilot action 2.2.1. tests and demonstrates the use of 11-steps approach to prepare a “Remediation concept from drinking water perspective for diverse pollutants”, using the example of Ljubljana - lg functional urban area FUA (SI). Effectuating 11 steps by variety of activities within the pilot action, remediation concept was built up as a comprehensive expert basis and decision support for the groundwater management plan of functional urban area.

The 11-steps approach was conceived in the frame of the preparation of AMIGA project. We used and further developed this approach for four the most significant contaminations of groundwater within Ljubljana - lg functional urban area. Each of those contaminations and pollutants are very typical for functional urban areas on general:

1. hexavalent chromium from old and actual industrial area,
2. nitrate and new emerging pollutants from sewage losses and agriculture,
3. boron from non-hazardous municipal waste deposit and
4. desethyl-atrazine from the past agricultural activities.

All four contaminations (4 working areas in pilot action) are representing different types of sources of groundwater contamination, i. e. point sources, multi-point sources and non-point sources. The procedure of all 11 steps was effectuated for each working area of contamination, however, different methods and details of evaluation were used to improve conceptual knowledge of the contamination in the given time frame.

The 11-steps procedure starts with step 1: Actual status assessment and ends by the step 11: Program of feasible measures. Step 8 provides Evaluation of risks, which defines priorities between working areas and relevant pollutants. In the case of this pilot action, the risk was evaluated from the waterworks perspective, namely all four contamination are situated on the area of the aquifer representing the main groundwater resource for water supply of the functional urban area.

Sequence of 11 steps:

Step 1: Actual status assessment

Step 2: Additional targeted sampling

Step 3: Improved mathematical model

Step 4: Mass balance of contaminant

Step 5: Statistical and environmental trends

Step 6: Natural attenuation potential

Step 7: Most probable scenarios threatening groundwater

Step 8: Evaluation of risks

Step 9: Pre-investment analysis of 12 remedial measures

Step 10: Feasibility of measures

Step 11: Program of feasible measures

Steps are not linked to certain methods or tools, so the procedure how to come to the remediation concept is not dependent by the technology. The main aim is to gather all existing or accessible data and compile the information on a structured way, so that outcome can as much as possible reflects the actual comprehension of status, risks, possible solutions and uncertainties. So, also the duration of procedure could be rationally adapted to the given time frame.

Max. 3.000 characters

#### NUTS region(s) concerned by the pilot action (relevant NUTS level)

The pilot action is effectuated on the territory of SI041 Central Slovenia Statistical Region.

Max. 500 characters

#### Investment costs (EUR), if applicable

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#### Expected impact and benefits of the pilot action for the concerned territory and target groups and leverage of additional funds (if applicable)

The 11-steps procedure was successfully tested and can be recommended, particularly for the scale of functional urban area with diverse types of contaminations and pollutants and the own local drinking water resource below the urbanized areas. Waterworks gains essential information to improve the Safety plan, while both communities can substantially improve the decision support basis to manage groundwater contaminations.

Waterworks (PP10) was actively involved in the pilot action implementation. Both municipalities, Ljubljana and local administrative authorities, were associated partners, providing relevant data, sharing local knowledge and experiences, explaining administrative procedures, helping to provide information to local inhabitants and institutions, and hosting the meetings. PP10 Geological Survey of Slovenia provided the capacities for investigations, field measurements and data management, and External experts provided expertise for assessment of costs and feasibility studies.

The 11-steps approach and the way of cooperation between involved institutions is representing a successful model for other functional urban areas in the country and wider.

The main added value of the 11-steps approach is the integrated well-structured guidance for compiling all the existing information that is needed in the decision support process. One of the most important decision support issue is to clear up and declare development targets and goals for contaminated groundwater and priority of measures.

The ambition of this pilot action is to be a lever to initiate improvement of national legislation and establishment of funding schemes for groundwater contaminations in medium scale of functional urban areas, which is not yet present in the country. This pilot action demonstrates how to ensure a comprehensive information of a certain contamination of groundwater to prepare thorough submission for funding remediation.

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**Sustainability of the pilot action results and transferability to other territories and stakeholders.**

Sustainability of the Ljubljana - Ig pilot action results is ensured:

- Waterworks company of Ljubljana has cleared up the main risks for safety of water supply and also an advanced conceptual model how to decrease the risks to medium or low stage in the next decade.

- Both communities were able to set up priorities of actions focused on development targets and goals regarding contaminations of groundwater. Furthermore, they will be able to find proactive synergies between institutions and funds in the frame of intersectoral conferences of local community level and national level in 2020, for the next decade.

- Highly scientific information was transferred to QGIS and clear graphical presentations. Waterworks company and both communities have got advanced non-compromising description of actual contaminations and risks that can be presented and disseminated to wider public to support a joint sense of ownership of decisions and actions.

Transferability to other territories and stakeholders:

- The pilot action, the 11-steps approach and the way of cooperation between involved institutions, is representing a transferrable model for other functional urban areas in the country and wider. The most representative environmental situations to transfer the results: high capacity aquifer system, groundwater flow velocities even higher than 10 m/day; divers pollutants in low concentrations; own water supply resource beneath the city, intercommunity (regional) regulation and management of local and multipoint contaminations of groundwater is not yet established. Nevertheless, the approach is adaptable to similar objectives in varying situations.

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**Lessons learned and added value of transnational cooperation of the pilot action implementation (including investment, if applicable)**

**Lessons learned of transnational cooperation:**

Very important advanced methods and experiences were used in the pilot action Ljubljana - Ig by the transnational cooperation. The most significant are, in the order of activity: the use of natural attenuation techniques (monitoring and remediation), the use of enhanced degradation techniques of pollutants, the innovative approaches of CSIA analysis to follow the degradation processes of pollutant, the possibilities of advanced bio-molecular analysis, inverse numerical modelling with statistical probability evaluation.

**Added value of transnational cooperation:**

Pilot action was implemented using experiences from environmentally, economically and socially very diverse situations on other pilot areas. This was encouraging to equally deal with high concentration pollutions as with low concentration new coming pollutions. All actual big pollutions were small pollutions at the beginning.

Socially and economically, there is no reason to lay aside the groundwater contaminations in any administrative circumstances, i.e. with very different funding schemes and practices. Remediation concept has to be set up based on specific targets, goals and risks.

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**Contribution to/ compliance with:**

- relevant regulatory requirements
- sustainable development - environmental effects. In case of risk of negative effects, mitigation measures introduced
- horizontal principles such as equal opportunities and non-discrimination

- Contribution to/ compliance with relevant regulatory requirements:
  - Pilot action contributes to the implementation of Water Framework and Groundwater Daughter Directives and their objectives of groundwater restoration on every single locality. It complies and contributes to demonstration that the “prevent and limit” objectives are applicable not only for local level point sources but also for medium scale contamination, i.e. functional urban area and multipoint pollution sources.
  - Pilot action contributes to the national level development of practices and regulation by implementing and demonstrating that local contaminations of groundwater should not be hidden in the groundwater body scale. It demonstrates how to provide that local and intercommunity’s groundwater contaminations can be recognized, characterized and not compromised for the appropriate management.
- Contribution to/ compliance with sustainable development - environmental effects. In case of risk of negative effects, mitigation measures introduced:  
Activities carried out within this pilot action project reflect positive effect on sustainable development. Pilot action demonstrates environmentally, economically and socially a “good practice” that tackles current needs of good quality groundwater as the essential need for inhabitants within the city core and in hinterland, without compromising the ability to address future needs and safety of water supply for both. It is emphasized that city core and hinterland are consisting functional urban area, making common remediation concept.
- Contribution to/ compliance with horizontal principles such as equal opportunities and non-discrimination:  
Pilot actions does not provoke or induce discrimination due to mobility, religion, ethnicity, sexual orientation, age or gender. Opposite, it demonstrates how actors, men and women, involved in the process, are able to improve their livelihoods by supporting the restoration of polluted groundwater at any location.

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References to relevant deliverables (e.g. pilot action report, studies), investment factsheet and web-links  
If applicable, additional documentation, pictures or images to be provided as annex

[AMIIGA WP2 Final electronic brochure](#)

D.T2.8.1: General overview of Pilot action FUA Ljubljana - Ig.

Deliverables D.T2.2.1. - D.T2.2.11:

1. The actual status of four contamination sites selected for remediation measures.
2. Additional targeted sampling campaign and laboratory analysis.
3. Improved transport and surface-groundwater interactions model.
4. Actualized contaminants mass balance and pressures-impacts model.
5. Presentations of statistical and environmental trends and long-term forecasts (I & II).
6. Natural attenuation potential assessment.
7. Results of the most probable scenarios threatening groundwater.
8. Evaluation of risks from waterworks perspective.
9. Pre-investment analysis of 12 remedial measures options.
10. Documentation of public tender for feasibility study.
11. Presentation report of feasible measures, milestones and indicators of progress.