

TAKING
COOPERATION
FORWARD

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Test and comparison of some remediation methods in the Old Cinkarna brownfield site

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BROWNFIELD OLD CINKARNA SITE

- Location of Old Cinkarna (17ha)
- polluted with emissions from lead, zinc and sulphuric acid production

Estimated environmental risk at the site of pilot area are:

- contaminated soil with **heavy metals**
- buried reservoirs and underground drainage technology,
- lack of information/research on soil contamination in depth and groundwater in the area.

MAIN PROBLEMS – LEAKING TO UNDERGROUND WATER + DUSTING



WHAT IS REMEDIATION?



METHODS

- Gradual re-urbanization of the Stara Cinkarna area
- Due to construction works, excessive earth excavations are expected in this area,
- The expected establishment of green spaces,
- Examination of the applicability of three methods



**Remediation with
immobilization**



**Remediation with
cold recycling**



**Mixture of organo - mineral
substrate**



- Mixing contaminated soil with a suitable additive,
- potentially toxic elements with chemical and physical mechanisms turn into low mobile, poorly soluble and non-toxic chemicals.

EXPERIMENT



Remediation with cold recycling



VOC Ekologija d.o.o.



Preparation of suitable mixture of organic-mineral substrate



the method of covering the soil with an active substrate, which is prepared from secondary raw materials: compost, mineral soils and zeolite minerals that bind TK.



TAKIN

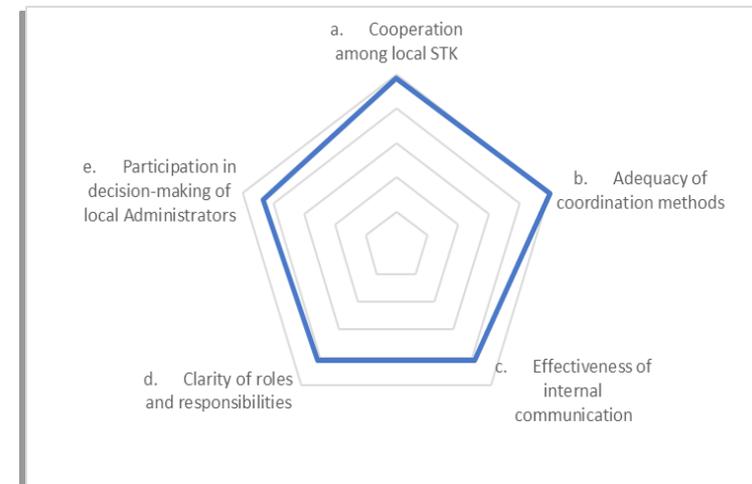
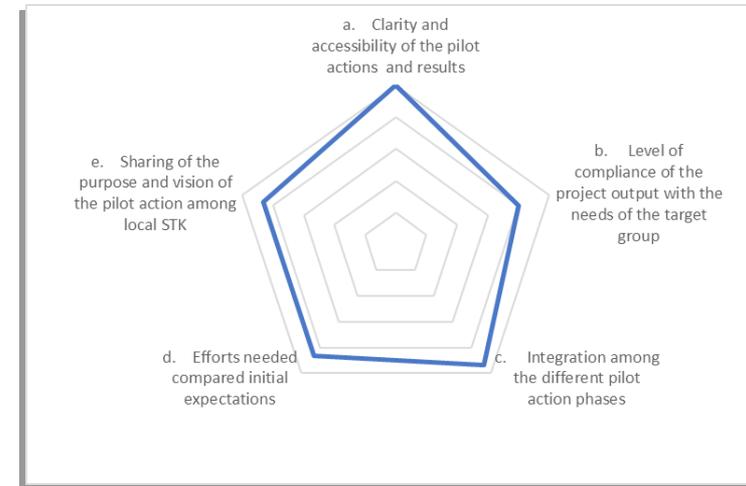
COST OF CHOSEN METHODS

Method	Unit	Estimated cost
Immobilization with calcium paper ash	m ³	100 EUR
Cold recycling		
a) only the field with foamed bitumen bonded carrier	m ²	20,75
b) layer in a thickness of 25 cm		19,85
c) added asphalt mixture in a thickness of 6 cm		
d) plowing 30 cm of ground layer with grass (for greenery)		19,45
Organic-mineral substrate		
Note: the price includes the preparation of the terrain, the preparation of the substrate, the execution of works with supervision and the cost of implementing the final landscape arrangement of the surface	m ²	341 EUR



Evaluation of remediation measures

- Results-Oriented-Monitoring (ROM)
- 5 components:
 - Relevance and quality of project design
 - Efficiency of implementation
 - Effectiveness of the actions carried out
 - Project impact
 - Project sustainability
- Delivered to officials of municipality of Celje
- Analysis



Summary of ROM analysis



- Pilot experiments well executed
- activities (the whole project) well represented (dissemination)
- cooperation of several sectors
- the project will raise awareness of the problem
- preparation of guidelines for the sustainable management of the area
- the project ensures the continuity of problem solving



- pilot activities carried out to a lesser extent
- poor responsiveness of the population to the dissemination of the project
- the area will not be repaired, since the cost of rehabilitation is too high
- doubt about the real value of remediation methods
- doubt on support for rehabilitation (professional and financial) at the national level



Thank you for you're attention!

