TEMPLATE

Output factsheet: Innovative CSIA tools

Version 1

Project index number and acronym	CE32 - AMIIGA
Lead partner	Central Mining Institute (Główny Instytut Górnictwa)
Output number and title	O.T1.2 – Innovative tools CSIA and BMTs development for GW pollution assessment and remediation
Responsible partner (PP name and number)	PP7 – Politecnico di Milano (PoliMi)
Project website	http://www.interreg-central.eu/Content.Node/AMIIGA.html
Delivery date	09.2018

Summary description of the key features of the tool (developed and/or implemented)

Compound-Specific Isotope Analysis, CSIA, is a tool which allow to distinguishing between contaminants' sources, thus representing a valuable approach in identifying the parties responsible for the contamination at a target site. Besides, CSIA it is also useful to demonstrate degradation processes, being of great interest for remediation purposes. CSIA represent a new analytical technique which allow to measure stable isotope ratio of specific compounds, for example dissolved PCE or TCE in groundwater. CSIA can be applied coupled to other tools such biological molecular tools (BMTs), particularly for the design of enhanced bio-remediation strategies and for monitored natural attenuation (MNA) applications. Indeed BMTs can serve for evaluation of the capability of indigenous microbial consortia to degrade certain contaminants in situ. Moreover, BMT provide evidence about the progress of supported biological degradation or can describe impact of particular remediation methods on indigenous microorganisms over different remediation phases. Real-time PCR analyses are routinely used to detect specific bacteria or functional genes from soil and water samples. In order to characterize composition of the whole microbial consortia present at polluted sites, next generation sequencing is used. These two approaches were used for comprehensive characterization of the biodegradation potential and progress.

During the projects software for their implementation were developed for real cases applications, allowing expert but also non-expert users to use and handle such innovative data and information's.

NUTS region(s) where the tool has been developed and/or implemented (relevant NUTS level)

IT: Lombardy Region (ITC4), NUTS-3 Milano (ITC4C)
PL: City of Jaworzno, PL22
DE: Stuttgart DE11
CZ: Novy Bydzov CZ05
IT: Parma Municipality ITH5
SI: Geological Survey of Slovenia SI02

Expected impact and benefits of the tool for the concerned territories and target groups

Main goal of CSIA analysis implementation was to gain important information's with regards the conceptual models of the FUAs with regards contamination but also remediation assessment, and particularly to understand the responsibilities for contamination and the biological degradation processes and remediation effort in FUA. Particular objectives were as follows: a) find the presence of different sources/polluters and allocate responsibilities, b) to find out the microbial capability at the polluted locality to degrade certain contaminants and overall to estimate the natural attenuation processes, c) to determine the progress of biological degradation after substrate addition or impact of the selected remediation methods on indigenous microflora and stable isotope composition of the target contaminants to determine the efficacy of enhanced biodegradation. These objectives were tested on Novy Bydzov, Jaworzno, Stuttgart, Parma, Milano and Ljubljana based on the type of contamination and planned remediation treatment.

Sustainability of the tool and its transferability to other territories and stakeholders

CSIA and BMT is a very coupled useful and progressive approach for evaluation sources\responsibilities for pollution, to evaluate the contribution of natural attenuation processes and to test the efficacy of ongoing remediation processes at contaminated sites. CSIA a could be applied at almost all territories/localities with groundwater or soil pollution.
Sustainability and transferability are ensured by the several deliverables produced during the projects and available to be shared with any other territories and interested stakeholders, for example CSIA and BMTs Guideline and Technical Protocol (D.T1.2.4, D.T1.3.4) but also freely and easy to use software's (D.T1.2.3, D.T1.3.3).

Lessons learned from the development/implementation process of the tool and added value of transnational cooperation

A comprehensive lack of knowledge with regards CSIA data interpretation was noted at the beginning of the project. In reason of that special attention and more time for CSIA results presentation and discussion was devoted during the several project meeting apart from the dedicated internship and workshop. Moreover the 37Cl-CSIA application resulted very difficult because of several analytical pitfalls and difficulties which introduced important delays on results delivering. In general the use of 37Cl-CSIA data resulted still at research level and to our consideration, probably not appropriate for characterization, remediation and management purposes at this stage yet, where already the novelty of 13C-CSIA and other stable isotope were introduced to all components and stakeholders. All of these activities were summarized and reported in deliverables concerning WP T1 and WP T2.

References to relevant deliverables and web-links
If applicable, pictures or images to be provided as annex

D.T1.2.1 CSIA technical protocol for GW pollution assessment and remedial evaluation (draft)
D.T1.2.2 Report on CSIA analysis per FUA
D.T1.2.3 Freeware software for CSIA data analysis for remediation assessment
D.T1.2.4 Final version of the CSIA protocols: finalization, revision and update of the previous drafts
D.T1.4.2 Guideline for tools selection for GW pollution assessment and remediation (draft)
D.T1.5.1 1 training & 1 internship among all PPs for innovative CSIA tools & guideline development & implement
D.T2.3.7 Performance of 3 sampling campaigns including CSIA: report on analytical results