4.30 Aquifer surface ratio with excessive arsenic

Project Name: NAIAD (Grant Agreement no. 730497)

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Aquifer Surface Ratio with Excessive Arsenic (ASREAs)	Water management
Description and justification	Provides an indication of groundwater quality referred to excessive arsenic concentration. The ASREAs addresses directly the good quality status mandate of the European Groundwater Directive. The ASREAs can be used to control the spatial (X, Y, and Z) evolution of groundwater inadequate quality due to As. It is also a powerful tool to report the general status of groundwater quality at River basin and Nationwide scales.
Definition	Ratio of aquifer/groundwater body surface with arsenic concentrations not complying with water quality standards (As above 0.010 mg/L) with respect to total aquifer/groundwater body surface.
Strengths and weaknesses	+ It is a simple and easy to understand indicator of groundwater inadequate quality for domestic uses. - Quite frequently, data bases have poor quality with respect to three main aspects: depth representativity of data within the aquifer/groundwater body; low spatial density of data; inadequate analytical resolution to monitor possible temporal changes (sometimes the labs use as detection limit just 0.010 mg/L, which difficult to observe increasing/decreasing trends below this value).
Measurement procedure and tool	Measurement: Water sampling in specifically designed/selected boreholes and wells at different depths and analysis of As content in accredited laboratories; quantification of groundwater body/aquifer surface with As concentration above 0.010 mg/L at different depths and estimation of ASREAs with the support of GIS.

	Tools: simple spreadsheets and GIS
Scale of measurement	Groundwater body/aquifer scale, with emphasis on domestic supply wells.
Data source	
Required data	Arsenic concentration in groundwater samples taken and analysed after standard international methodologies and in adequately designed/selected observation points. Data can be retrieved from the official databases from water quality monitoring networks of water management authorities; trained groundwater users; public and private research institutions.
Data input type	Arsenic (As in mg/L or microg/L) data with indication of X,Y (georeferenced), depth of sampling and depth of screened stretch in the borehole/well, and date of sampling.
Data collection frequency	In urban-supply wells, the collection frequency is usually biweekly to monthly. In non-supply monitoring points, the frequency is usually biannual.
Level of expertise required	To calculate the indicator: expert level on GIS. To understand the rationale behind and use the indicator it: low to medium expert level on hydrogeology.
Synergies with other indicators	With Correction Cost of Groundwater Quality.
Connection with SDGs	With SDG 6
Opportunities for participatory data collection	Groundwater sampling for arsenic analysis must be performed following specific methods of international standards, which advises to be collected only by adequately trained personnel.
Additional information	
References	NAIAD, Deliverable D6.2, From hazard to risk: models for the DEMOs. Part 1: Spain– Medina del Campo. SC5-09-2016 Operationalising insurance value of ecosystems. Grant Agreement nº 730497