1. Challenger companies

AFESA, BASOINSA, TEKNIMAP

2. Challenge

Which **technological applications** (sensor systems or other digital solutions) can be applied to **underground water and soil research** to make the field processes more efficient and thus complement conventional tools?

3. Possible applicable solutions

- New technologies/techniques for field data capture and/or their interpretation
- Advanced sensors applied to environmental monitoring
- Technologies for data modelling: Big Data and Artificial Intelligence

4. Background:

These challenger companies have a long track record in offering services with high technical content in the environmental field, for industry, the public administration and society in general. Even though each have different business lines, they share in common the **provision of advanced environmental services**, such as: preparing environmental technical consultancy work in natural and urban settings; providing environmental watch, assessment and inspection services for business activities, and technical assistance to implement civil works by means of support activities in project design and implementation.

Three entities – Afesa, Basoinsa and Teknimap – are **accredited to conduct soil research and recovery activities** in that field. They mentor their customers in different phases, from conducting soil quality assessments, to designing and providing support in the implementation of decontamination and upgrading projects.

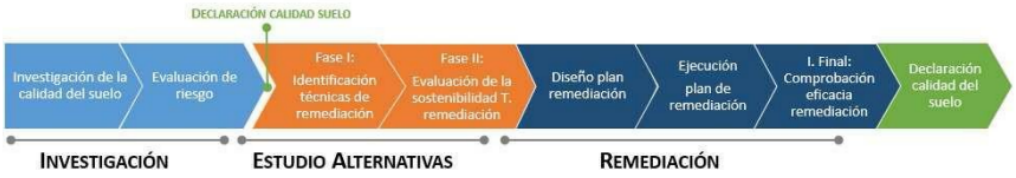

Fig 1. General soil quality declaration process, DECREE 209/2019, of 26 December, enacting Act 4/2015, of 25 June, for the prevention and correction of soil contamination.

During the **soil quality research phase**, studies, sampling, measurements and analyses are conducted to generate data and models, which will then be used to prepare the assessments and the remediation proposals to be approved by the administration.

This procedure involves a series of specialised activities in which different methodologies and techniques – duly accredited by the administration – are used; they include soil status and historical reports, **detailed and exploratory research by means of sampling and analyses**, risk assessment, studying remediation alternatives, and drafting and deploying underground water and soil restoration projects, along with verifying the final status of the soil after the restoration actions have been implemented.

Given that digital technologies can provide added value to those activities, the three companies are interested in identifying **technological applications and new developments that facilitate and enhance the efficiency of underground water and soil research, along with identifying improved and alternative remediation proposals for customers.**

5. Sub-challenges and targets

Despite the previous processes being subject to a standard and, therefore, to a rather circumscribed procedure regarding its implementation (regarding techniques and devices to be used), it is believed that applying new digital technologies such as **sensors will make the data obtaining processes in field researches more efficient**. On the other hand, there are also data modelling solutions of interest, which will allow the **internal data analysis** processes to be improved, along with the approach of alternative remediation improvements and scenarios that streamline approval of cases by the public administration.

Therefore, the main interest of the three companies is focused on:

- **Identifying new digital techniques and devices that may complement the conventional tools for underground water and soil research (probes, piezometers, sampling)**. These innovations must allow complementary information to be obtained on hydrogeological parameters and pollutants of the study sites in order to understand the hydrogeological functioning and behaviour of pollutants in the environment.

Furthermore, although to a lesser extent, the companies see an opportunity regarding:

- **(Historical) data modelling, in order to interpret values and obtain correlations and causalities of the measured parameters in future projects, with past ones of the actions implemented**. That will not only lead to more robust decision-making, but also to new alternative actions being considered, by means of analysing new hypothesis. That is why the current challenge does not lie so much in applying these smart technologies, but rather in **designing and creating a data intake and modelling structure that will allow more advanced models to be introduced in the future.**
    - Accordingly, it should be noted that the information of the hundreds of projects deployed by companies, along with the associated data, are currently housed in Excel format and in reports (with their relevant associated technical and GIS data).