

1. Challenger companies

De Diego, Gutram, Fhimasa and Zabalandi

2. Challenge

How can the management and processing of construction & demolition waste and materials be optimised? Which technologies can be applied to increase traceability of the materials and increase the circularity of the work processes?

3. Possible applicable solutions

- Predictive systems for smart waste estimates
- Digital solutions for efficient material inventories and other Business Analytics solutions
- Advanced waste separation and sorting technologies

4. Background:

These challenger companies account for a significant part of the value chain of the construction sector. First, De Diego specialises in **land excavation and preparation** projects for civil works, as well as in the field of **urban development**, where Fhimasa and Zabalandi also operate; the latter two are companies that **design and execute civil works and building projects**, while offering **infrastructure upkeep and maintenance** services in different areas such as industry, hydraulics etc. All three generate works and construction waste, which must be treated by a **sorting and processing specialist**, such as Gutram; they also manufacture and **market the secondary material** generated.

According to the European Commission, construction and demolition waste (CDW) account for a third of the total waste generated by the EU. They include stone waste, such as concrete, **bricks, excavated earth**, which are the **basic raw material** of the recycling plants to produce aggregates and recycled materials for the construction sector. There are also many other types of **other waste** (known as mixed) such as **timber, metal, plastic, bulky waste**, etc., which are generally **mixed** together, along with types of stone waste; they **can only be treated and turned into waste** with optimum separation at source. Therefore, the principles of the circular economy and the new digital technologies can help the challenger companies to meet the targets set below.

5. Sub-challenges and targets

In order to efficiently undertake the circular transformation of the construction sector, its companies must tackle several **problems related to managing CDW**, including:

- **Separation of waste at source** that is not effective or optimum
- **Very poor quality of the measurements** made prior to the work, given that the data on the amounts extracted/generated in works are usually **rough estimates**
- **Non-existence of waste traceability and monitoring**, partly due to a lack of communication between stakeholders
- **Incorrect sorting** of the waste for its subsequent processing, as the waste is very mixed and few European Waste Codes (EWC) are applied together to identify the different types of waste

Accordingly, it should be stressed that the **quality of the pre-works reports is rather inaccurate**, as they are produced based on **estimates**, as the amount of waste that is going to be generated in the demolition or extraction is not exact.

In order to better understand the challenge, it is important to know that when a developer requests a quote for works, **the measurements are provided by the project specifier** (in this case, a planner who can be an engineer or architect), **and who uses the available tools for their calculations and estimates, and who generates a works plan and a waste management plan.** Operations related to the management of construction and demolition waste is currently calculated in the Basque Country using the **EHH-Aurrezten tool**, which helps the different stakeholders to calculate the Waste Management Plan, and where concise data are not generally used.

The challenger companies budget their interventions and design their field interventions based on these measurements and requirements. Given that those measurements are estimates, and not always accurate, they **condition and create variances in all the following phases of the projects**, from budgeting to the quantity of materials and waste to be managed and treated, which are usually subject to significant variances.

At the end of the process, the only way that the challenger companies have to know the waste generated is from the waste recovery company on the DSC (waste shipment identification document).

In this vein, and in order to tackle this major challenge, the intention is to be a main challenge (data analytics) and an alternative sub-challenge (separation and sorting):

- **Challenge. Supporting the pre-works management activities by means of ex-ante audits (or alternative estimates) that allow the waste plans and budgets proposed by the planner to be assessed and recommendations made as applicable.**
 - By means of **data analytical solutions** that allow better control and visualisation of the CDW management data: baseline data, variances, comparisons of CDW measured on-site and CDW managed and recovered, etc.
 - In other words, **smart solutions that allow pre-works estimates to be calculated** for variables such as materials, weights, volumes, densities, and for post-works traceability of whether the initial forecasts were true, along with detecting potential deviations and causes. And if possible, their connection to the business management software (ERP).
- ⊖ **Sub-challenge. Improving separation at source on-site**
 - This is expected to be achieved by means of advanced **waste separation and sorting technologies**, using some (or other solutions) of the following applicable technologies: sensor systems to visualise and quantify waste, separation techniques using optic sensors, smart containers, online characterisation and automatic sorting equipment...