REuse and **RE**cycling of CDW materials and structures in energy efficient p**RE**fabricated elements for building **RE**-furbishment and construction.

BIM-compatible DSS tool

for estimation and management of C&D wastes

The tool supports construction/demolition companies by estimating types and quantities of CDW that will be generated during a project and by providing possible utilization options and related logistic references. The system also supports the general CDW market/management by:

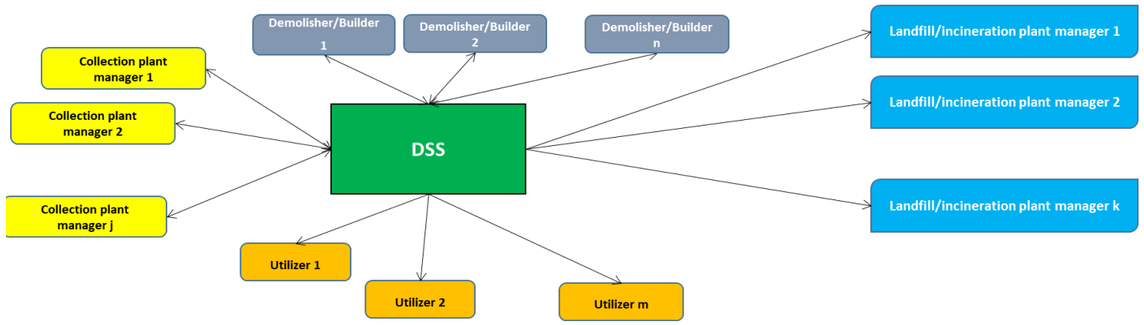
- Providing information to final CDW users (including prefabricators) about the CDW types and quantities available in the geographic zone of their interest;
- Providing timely information to Collection Plant Managers and Landfill/Incineration Plant Managers about the CDW types and quantities which final destination is relevant to them.

www.re4.eu

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723583.

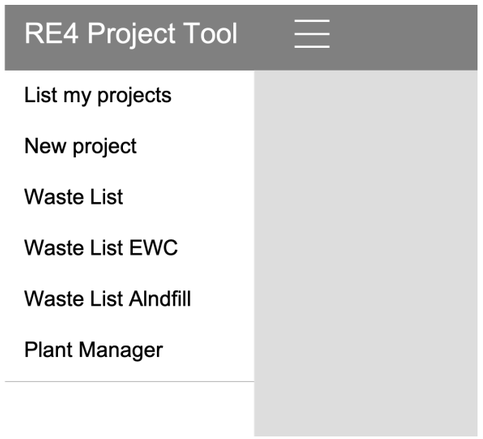
Support to:

- Efficient planning of CDW management, both on site and off site
- Logistic planning of waste Collection Plants and Landfill/Incineration Plants
- Production of components made with recycled materials from C&D waste



1 MAIN MENU

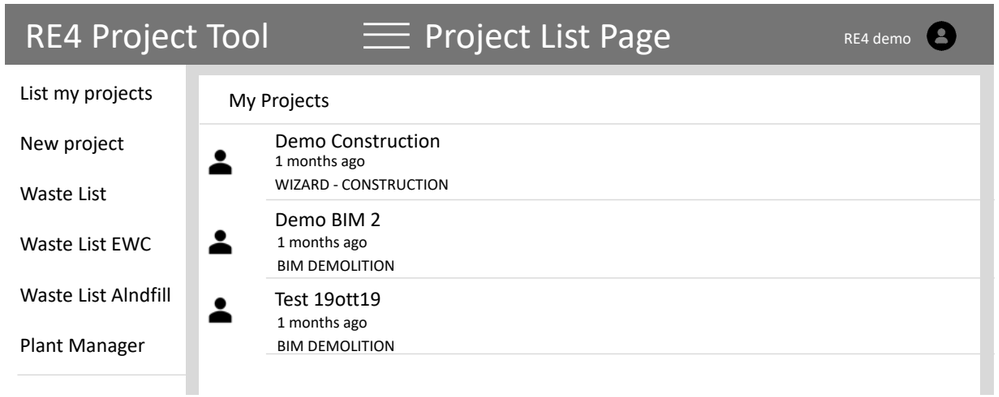
- **List My Project:** provide a list of all projects created by logged user. For each project, it is possible to visualize the different results and models.
- **New project:** display the page where a new project can be created.
- **Waste List:** list of waste quantities, calculated in each project, filterable by plant.
- **Waste List EWC:** list of waste quantities, calculated in each project, filtered by ewc code.
- **Waste List Landfill:** not working now.
- **Plant Manager:** not working now.



2 PROJECT LIST

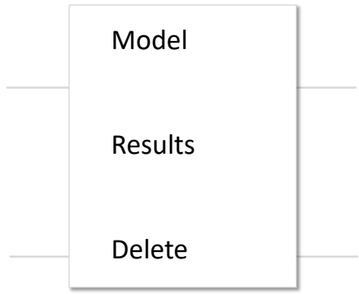
In the middle of the page is visible a list of projects created by the user.
For each project are be displayed the following basic information:

- **Creation date**
- **Type** (WIZARD/BIM)
- **Target** (CONSTRUCTION/DEMOLITION)



By clicking the menu button on the right of each project, it is possible to access to different functionalities:

- **Model:** open the page that describes the building elaborated in the project (empty for construction, a tree-model of building components for demolition.
- **Results:** show the results page with all the evaluated waste quantities.
- **Delete:** deletes the project.



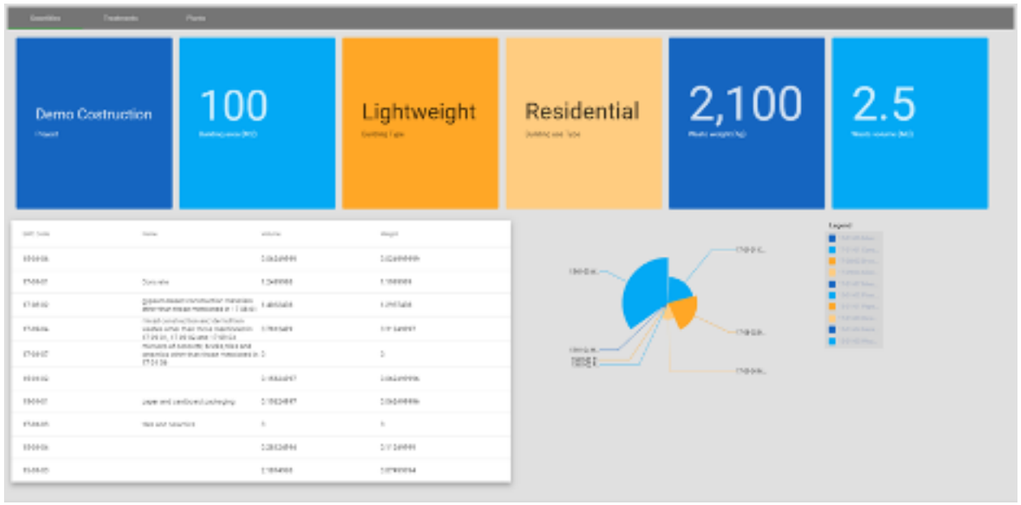
3 Results page

for Construction projects

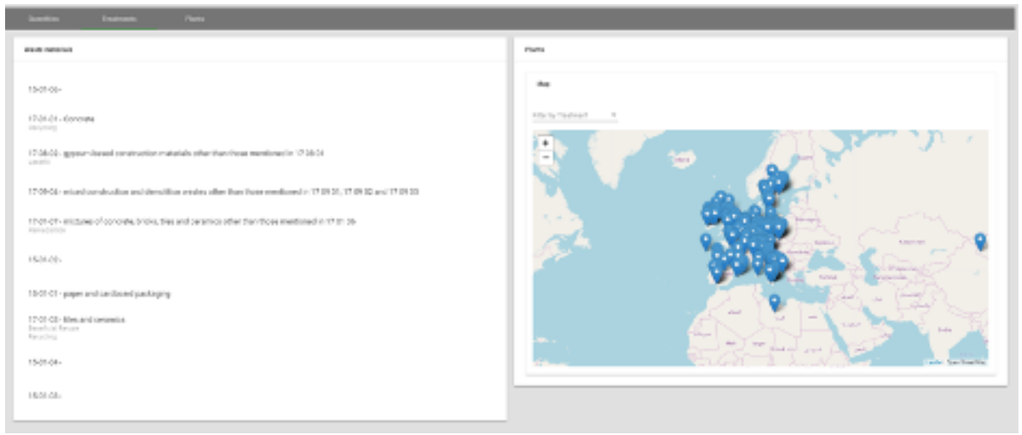
In this page, there are three sections:

1) Quantities: shows the quantities of waste evaluated for the project.
2) Treatments: shows the different treatments per plants available in the system
3) Plants: shows a page where the user assign each waste to its relative treat ment and destination plant.

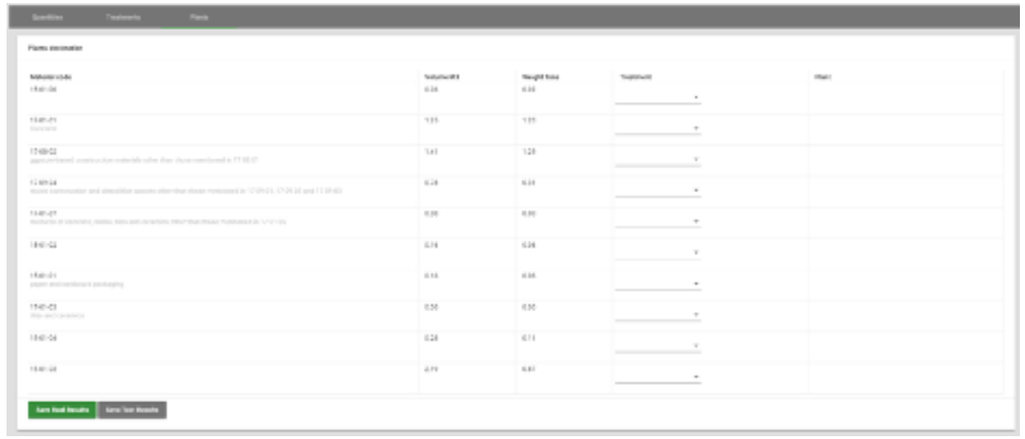
Quantities tab:



Treatments tab:



Plants tab:



By clicking save results, the system will made all of this information available in the waste list page.

New project

The new project page shows a wizard where the user creates a project by defining some details. In the platform can be created two kind of projects:

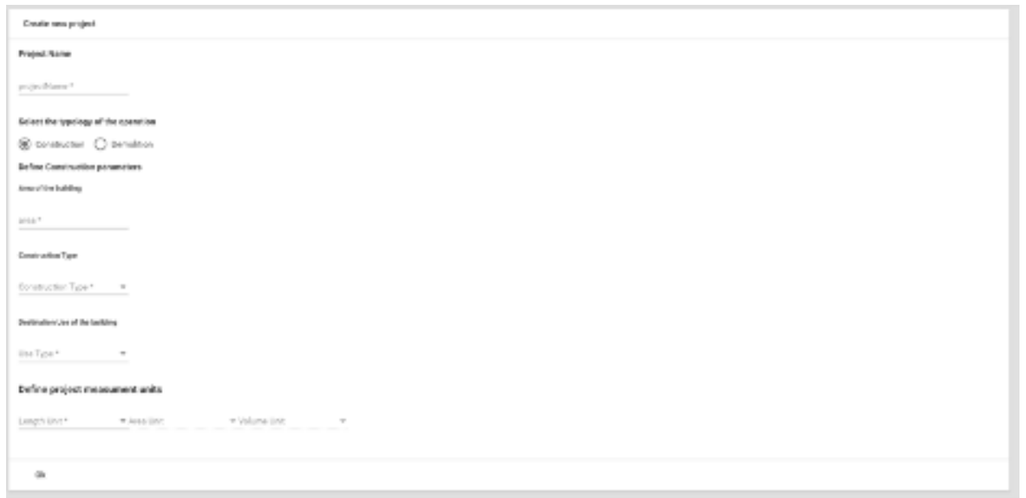
- Construction
- Demolition

Construction project

For the construction projects, it is required to fill the following information:

- Area of the building
- Construction type
- Destination use

The last selection required is for the measurements units that will be used in the project.



Demolition project

For the demolition projects, it is required to select if the data will be imported by a BIM file or will be edited manually by the user.

If the user selects to fill the data manually, he has to select the measurements unit of the project, otherwise for BIM project the measurements unit will be derived by the model.

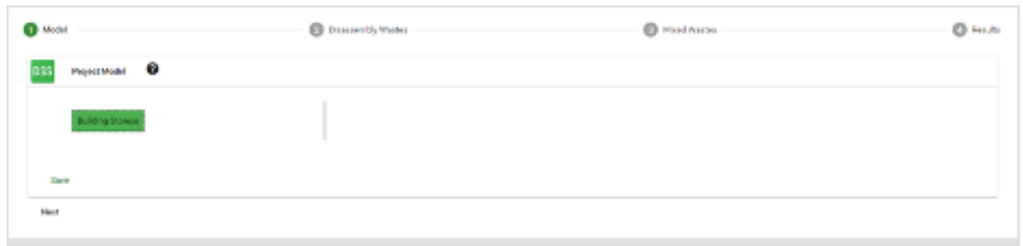
The last thing to set is the default action selecting from:

- **Reuse**: the component will be reused as is
- **Demolition with On Site Sorting**: the component will be demolished and wastes are separated on site
- **Demolition without On Site Sorting**: the component will be demolished and the wastes will be separated in the destination plant
- **Disassembly**: the component will be disassembled.
- **Nothing**: component will be treated as a mixed waste without performing any action.

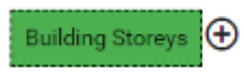
This option is the default assigned for each component in the building model, but can be changed before starting the waste evaluation.

New demolition project
with no data

When starting new demolition project with no data, the project model will be empty and the user have to define the tree-model of the building.



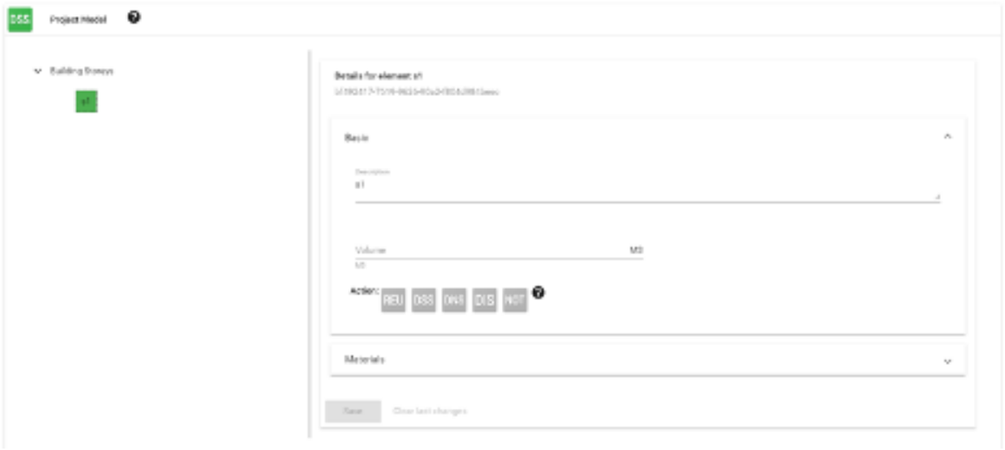
The users, moving the mouse over any element of the model, can create new element by clicking the “+” icon.



Depending on the type of selected component, the system proposes a set of new element that can be added to the model. A name is required to add the new element. Available elements are: **Column; Plate; Railing; Ramp; Roof; Slab; Stair; Wall.**

By selecting an element in the tree-model, the details will be displayed on the right panel.

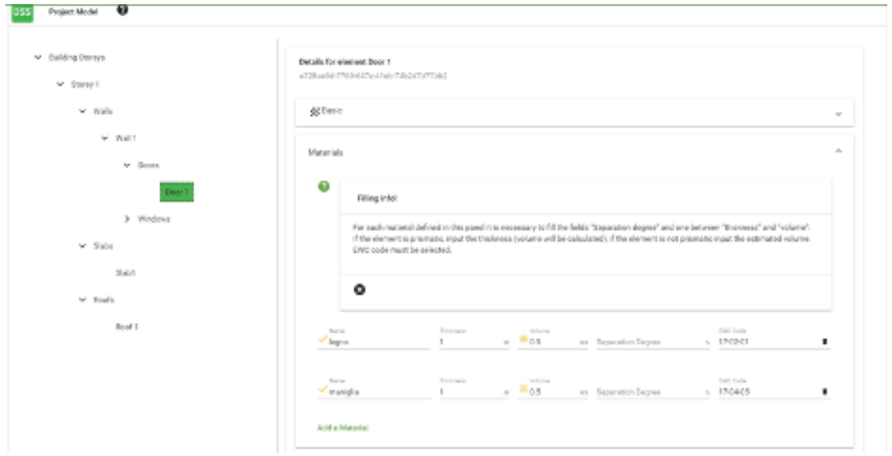
In the details the are information about the dimensions (volume) of the element, the associated action (if not selected the default will be applied) and the list of materials that composes the element.



New materials

new materials can be added to the element, and for each of them it is required to define the name, the thickness or the volume, the separation degree (default 100%) and the EWC code (picked by a defined list).

Once every element (storeys, walls, doors, windows) has been defined and each material checked and associated with the corresponding EWC code, it is possible to proceed to the waste evaluation steps.



The waste evaluation steps

Two steps are required to evaluate all the waste quantities defined in the building model.

Disassembly step

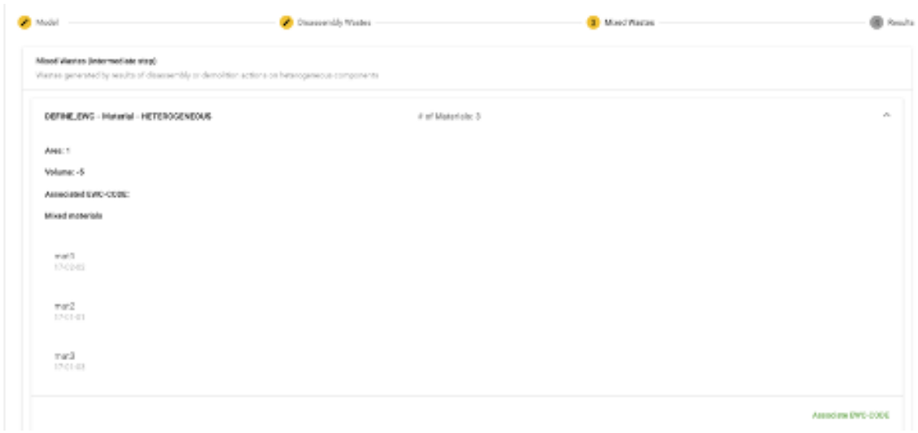
By clicking on the next button in the project creation page, the Disassembly wastes tab will be activated.

In this section will be listed all the elements that have the Disassembly action. For each element will be displayed the list of materials.

The user can select different materials and click generate sub-component to create a new mixed material.
The user has to repeat this action until all the materials have been selected.
It is possible to use the auto split button, which will generate a sub component for each material.

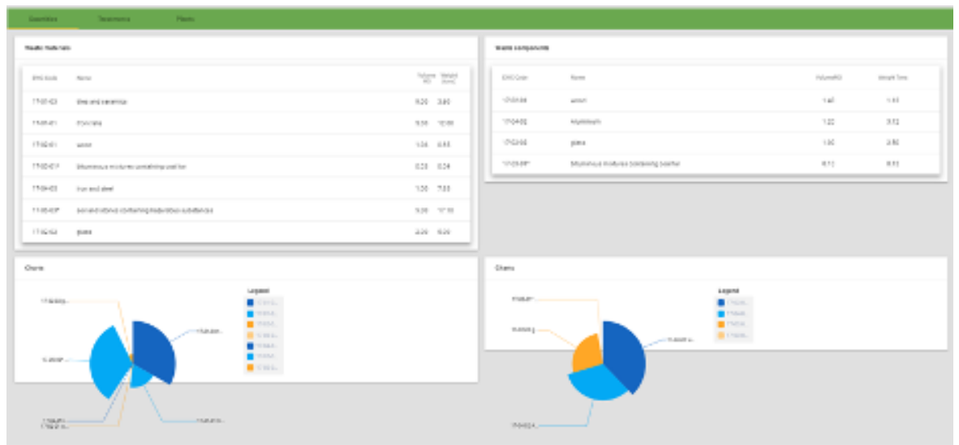
Mixed waste step

The next steps are related to managing mixed waste.
The user needs to associate a Ewc code to components that has not been demolished or disassembled. A list of sub component with two or more materials are listed in this section. For each of them the user select the appropriate ewc code.



Results step

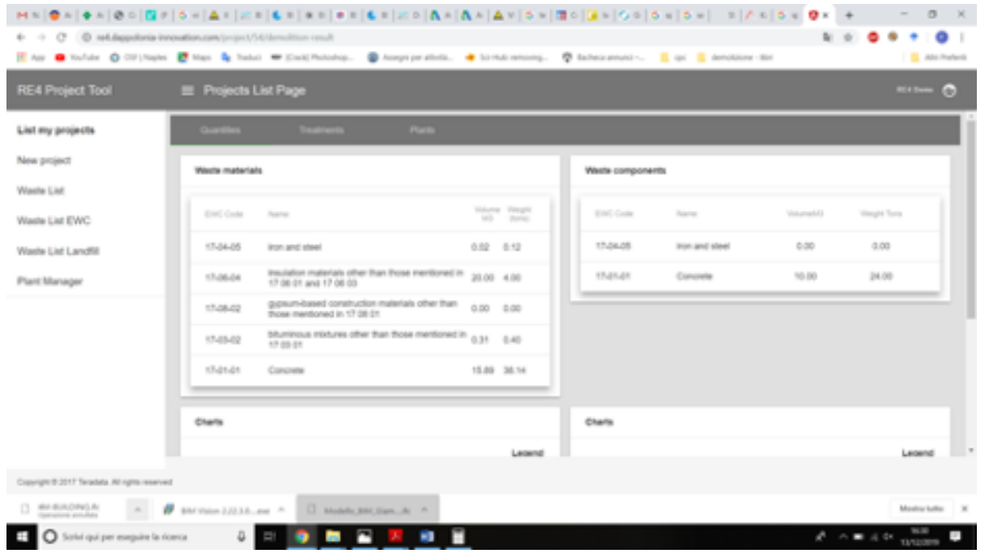
When all the disassembled waste and mixed components have been analyzed, it is possible to activate the results section where will be reported quantities both for material and component wastes.



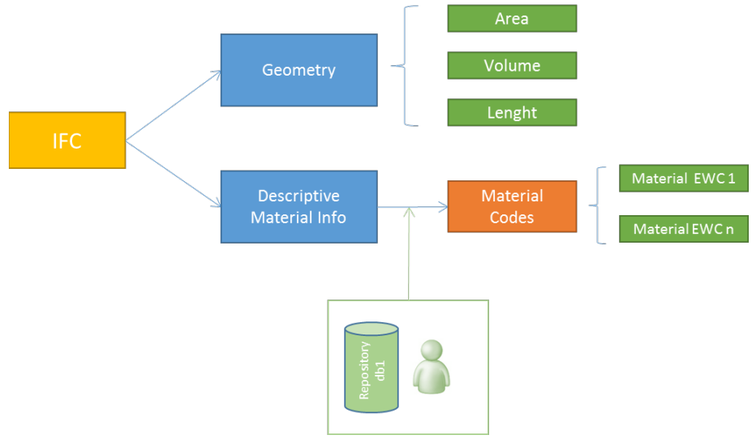
The section shows the list of material waste and a pie chart to better represent them on the left; on the right there are the list of component waste and the relative pie chart.
These are composed of materials that could not be disassembled.
In the plant section the user can select the destination treatment and plants for each waste.

The waste evaluation steps

If a BIM model (ifc file) is present, the user can load the tree-modal by parsing the bim file. The system automatically define all the element and materials in the model so the user has only to define the ewc code for each material and to analyze and check the volumes. After that, the system works as in the case of demolition with no data.



DSS: Data extraction from BIM



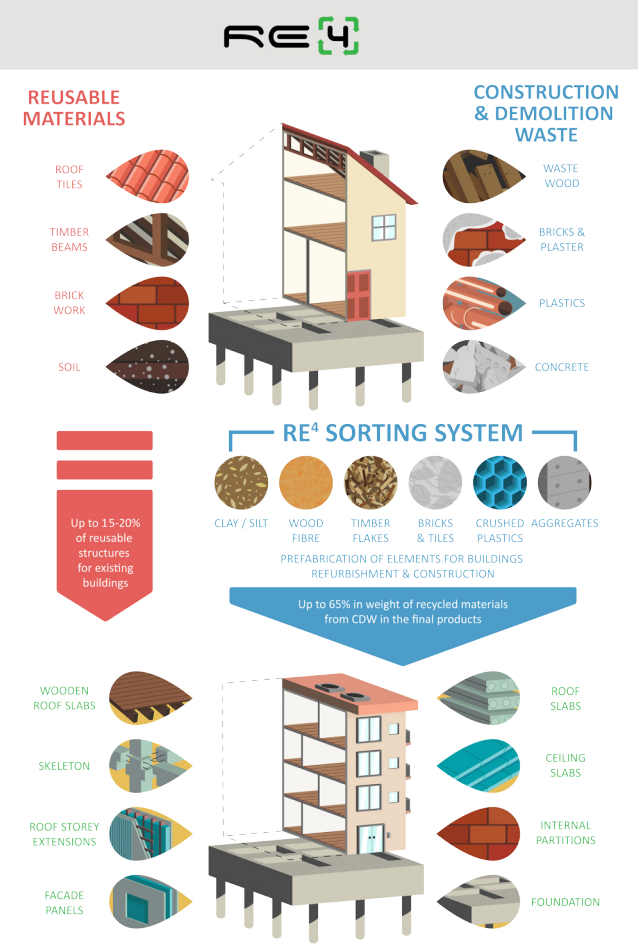
Project description

The RE⁴ project aims to radically modify the construction process and off-site production by promoting the development of a fully prefabricated energy-efficient building made of components containing up to 65% by weight of CDW-derived materials and structures. The RE⁴ building can be easily assembled and disassembled for future reuse.

This goal is achieved building upon a set of self-standing industrial results, like:

an innovative CDW sorting system based on automated robotics to increase the quality of CDW-derived aggregates a number of prefabricated building elements (including connections) based on CDW-derived materials and structures, suitable for both new construction and building refurbishment, and the related production processes and equipment.

The materials flows will be managed by a new BIM-compatible ICT tool.



Up to 80-90% of reusable structures for RE⁴-prefabricated building concept

Partners and contact

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