

Dear Reader,  
we are proudly sharing with you the second newsletter of the RE<sup>4</sup> project. The aim of this newsletter is to provide you with a summary of the news and progress achieved so far in the project as well as to inform you about our plans for the next six-month period, including the events where you can meet the RE<sup>4</sup> representatives and learn more about the project.

## WHERE WE ARE



## PROJECT PROGRESS

### MAPPING AND ANALYSIS OF CDW REUSE AND RECYCLING

It is fully completed the nine-month activity concerning the mapping and analysis of CDW reuse and recycling. The first achievement was an in-depth study of the **CDW management situation in the participating countries against the background of national waste management plans and prevention programmes**, in order to identify obstacles to recycling and potential deficiencies in CDW management practices that could lead to non-compliance with EU waste legislation. From the collected data and statistics assessment, **lessons learned** were delineated:

- the presence of unfavourable market conditions for recycled CDW materials;
- low perceived quality of CDW derived materials;
- needs of improving the legislative framework for CDW recycling, revising the target for 70% recycling of CDW across Europe, and
- improving CDW data availability, quality and comparability at EU level;
- turning waste management into resource management for a Cultural revolution in construction.

In addition, several **recommendations** were provided in order to unlock recycled raw materials currently unexploited or underexploited within the EU (such as a stronger legislative framework, a harmonized use of economic instruments at EU level, a common definition of CDW in Europe, etc.).

In parallel, an extensive **overview on the status of prefabricated concrete and timber elements construction** made of recycled materials was completed. This study revealed that the use of prefabricated elements from CDW in Europe is still a relatively undeveloped topic and CDW is still not used for prefabricated structures. Furthermore, an overview of recycling technologies and plants for different CDW was provided, to identify potential shortcomings for an increased material recovery at an early stage of the project.

Finally, an outline of the current status of policy measures and regulatory frameworks at different levels (local authorities, national policies & legislation and EU policy & directives) related to prefabricated elements integrating recycled materials from CDW was performed. In terms of **barriers and drivers** linked to current measures, regulation and legislation, analysed it is revealed that European technical standards are in favor of the use of prefabricated elements with recycled materials from CDW, such as the case of standard EN 13369:2013 which provides rules about the use of recycled aggregates in prefabricated concrete elements.

The recommendations to promote the use of prefabricated elements with CDW materials in constructions, in short term at European level, are:

- establishing and effectively enforcing standards related to waste reuse targets, and codes to increase the efficient use of prefabricated elements and provide standard definitions about these in construction sector;
- transparently disclosing information and data to support informed decision making, to help build market demand for prefabricated elements in construction sector;
- supporting construction sector about materials recycling and promoting innovation that increases the reuse of them, significantly reduces costs, and increases utilization of prefabricated elements in the construction sector.

### DEVELOPING ADVANCED SORTING TECHNOLOGIES

In the RE<sup>4</sup> project, the maximization of recycled valuable materials from CDW for high-value applications will be pursued by the development of advanced sorting technologies based on classification systems and automated robotics equipped with advanced sensors and artificial intelligence software.

STAM is developing **sorting system** based on an automatic real time classification system exploiting innovative sensors providing input to a robot equipped with vacuum-end effector aiming at picking the objects and physically separating them to sort different lightweight and heavyweight materials as bricks, tiles, stone, glass, wood and plastics. The whole system was installed at the **SIIT (Sistemi Integrati Integrati Tecnologie)** laboratories in Genoa, where each component was assembled, wired and tested individually and subsequently integrated into the process. A set of hyperspectral sensors with halogen illumination is used in order to detect different features of the objects: like shape, position and the response to different electromagnetic wavelengths of the object surface, which flow on a conveyor belt.

All the information collected by the sensors is given as input to the real time computer-based classifier for the sorting of the objects. The classification is structured by a learning phase and a test phase, with the aim of making the system self-learning. The processed information on each object (position, orientation, shape, material) is then given to the robot that handles it, physically separating objects made by different materials.

At the time being, the installation of a the components has been completed. The development of the individual components is to be considered concluded, while the setup of the whole process is still ongoing. An intensive tuning and testing phase will start in the next months to evaluate the sorting system performance and, if necessary, refine it. The system will be finally transferred to the UK in mid-July 2018 to validate it in an industrial environment.

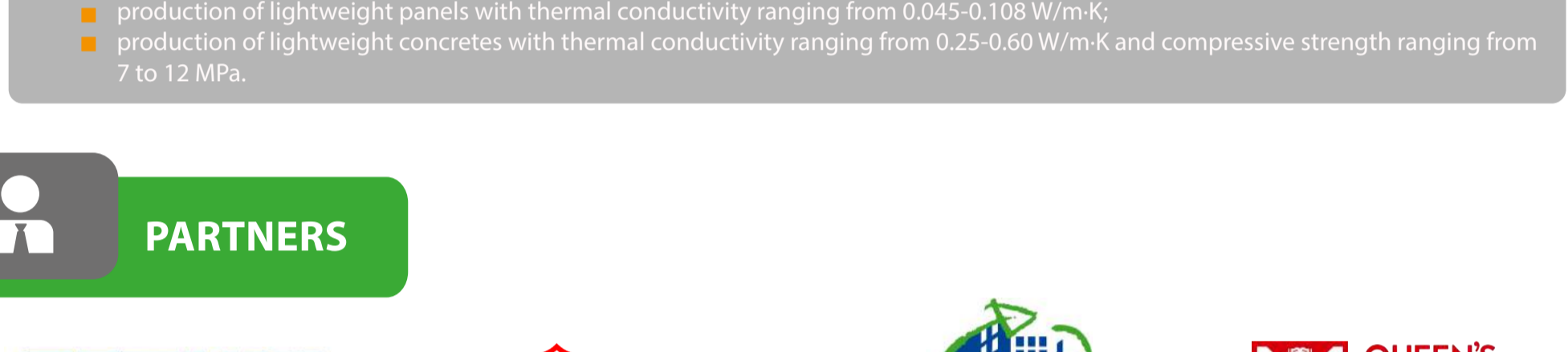


Sorting system installed at the SIIT laboratories in Genoa, Italy

### BEYOND CONVENTIONAL CDW: VALORIZATION OF LIGHTWEIGHT CDW FOR INSULATING BUILDING MATERIALS

Recycling mineral fractions from CDW in building materials with high mechanical performance is an important objective of RE<sup>4</sup> project. Another challenging objective of RE<sup>4</sup> project deals with the valorization of specific LW fractions from CDW for building applications.

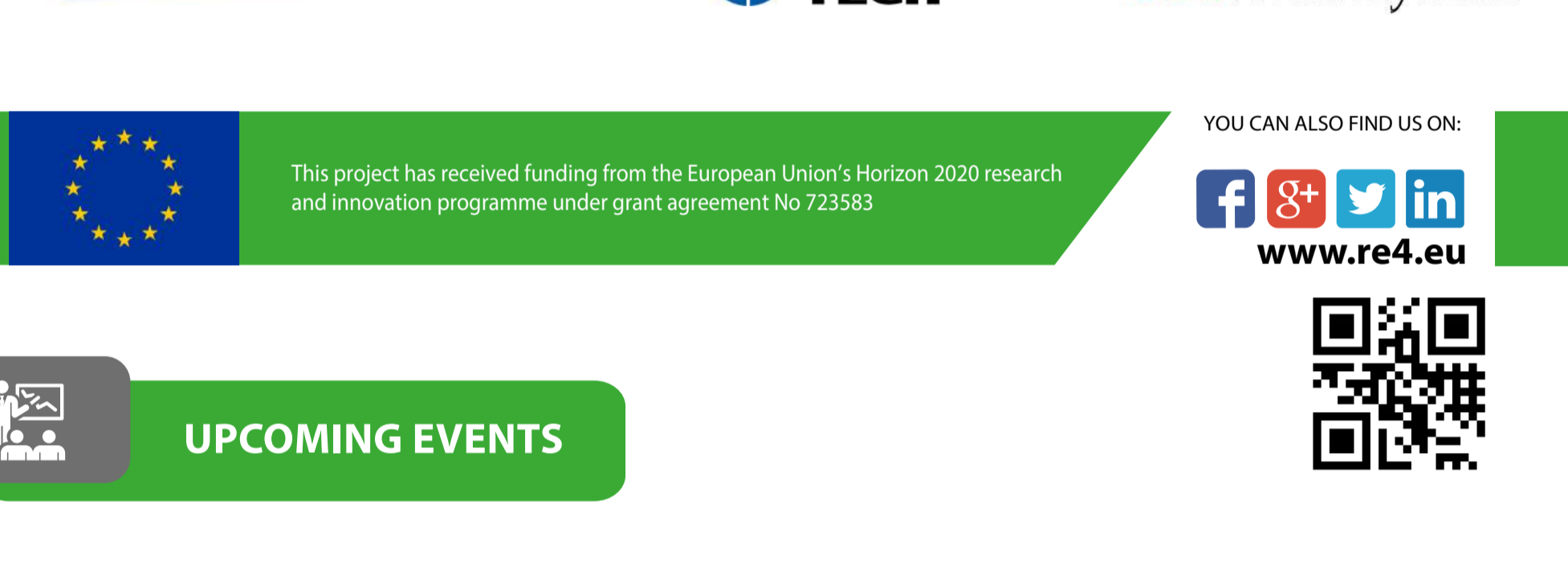
Lightweight CDW with non-mineral composition are not specifically mentioned in relevant regulations; with the aim to go beyond this "technical barrier" on non-conventional CDW materials, CETMA is developing building materials with reduced density and improved insulating performance based on wood scraps resulting from a chipping process, heterogeneous rigid plastics converted into scraps and aggregates by a shredding/sieving process, and heterogeneous material consisting in wood/expanded plastics a by-product resulting during CDW cleaning operations.



Most promising achievements on lightweight fractions from CDW:

- replacement of virgin materials up to 100%;
- conventional equipment/methodologies used;
- production of lightweight panels with thermal conductivity ranging from 0.045-0.108 W/m-K;
- production of lightweight concretes with thermal conductivity ranging from 0.25-0.60 W/m-K and compressive strength ranging from 7 to 12 MPa.

## PARTNERS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723583

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## UPCOMING EVENTS

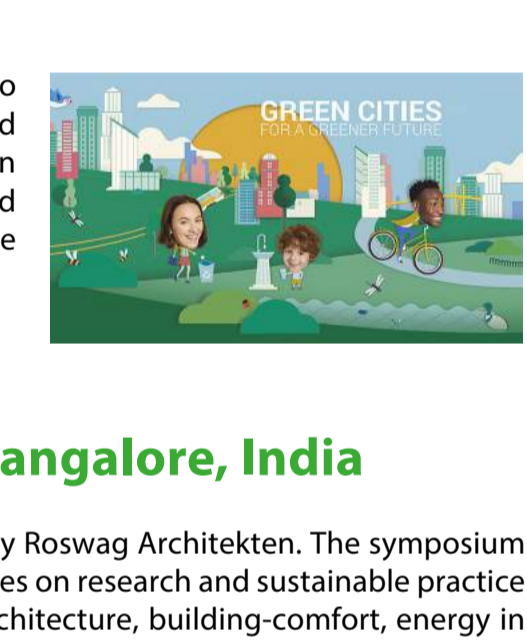
### Building Fairs in Brno

The RE<sup>4</sup> project will be presented by FENIX TNT during the **Building Fairs in Brno**, Czech Republic, from 24<sup>th</sup> to 28<sup>th</sup> April 2018. Fairs in Brno are well known for a unique presentation of all aspects of housing and house constructions, building management services, technical solutions, and equipment.



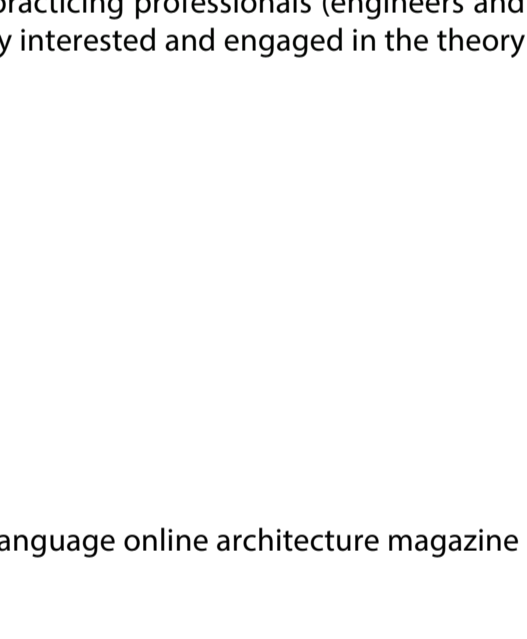
### ConWEEB Workshop

Our project is one of the four Horizon 2020 projects which will be presented during the workshop **ConWEEB - Converting construction waste into energy-efficient buildings** on 24<sup>th</sup> May 2018 in Brussels, Belgium, during the **EU Green Week**. ConWEEB Workshop will present innovative solutions for converting CDW into new prefabricated elements for better energy efficiency of buildings. The workshop will be divided into three thematic sessions: selection of CDW for recycling; characterization of the materials obtained from processing CDW; and presentation of the design of the new prefabricated solutions. Attendants will have a chance to see how CDW can be used easily again in innovative ways for energy-efficient aims.



### EU Green Week

**EU Green Week 2018** (21<sup>st</sup> - 25<sup>th</sup> May 2018, Brussels) will explore ways in which the EU is helping cities to become better places to live and work. Showcasing policy developments on air quality, noise, nature and biodiversity, waste and water management, it will promote participatory approaches to urban development, networking schemes, and tools for sharing best practices, engaging local authorities and citizens, and encouraging them to share their vision of a sustainable future. The RE<sup>4</sup> project will be presented by ACR+ via stand and presentation.



### ISES - International Symposium for Earthen Structures in Bangalore, India

The conference will take place from 22<sup>nd</sup> to 24<sup>th</sup> August 2018, and the RE<sup>4</sup> project will be represented by Roswag Architekten. The symposium will provide an **International Forum** for information dissemination and exchange, discussions and debates on research and sustainable practice in the broad field of earthen structures, including materials, building techniques, climate responsive architecture, building-comfort, energy in buildings, climate-change mitigation, and emission reduction. The symposium aims to bring together practicing professionals (engineers and architects), manufacturers, building professionals, designers, academics, researchers, and students keenly interested and engaged in the theory and practice of earthen structures for sustainability.

## PAST EVENTS

### RE<sup>4</sup> project at BauNetz Architekten website

You can find an article about the RE<sup>4</sup> project on the **BauNetz Architekten website**, the largest German-language online architecture magazine with more than 11 million page views a month and 1.4 million visits.



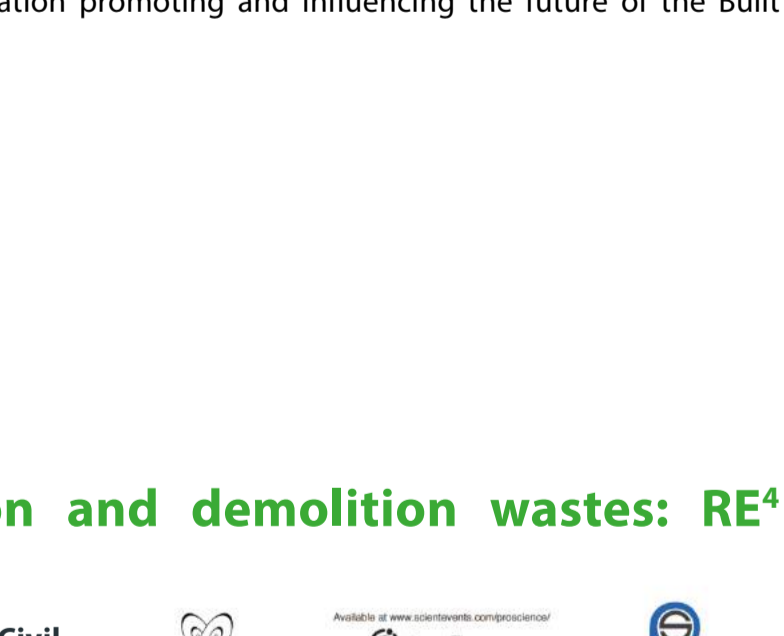
### RE<sup>4</sup> project presented to China Academy of Building Research

Acciona attended the one-day workshop with the **China Academy of Building Research** organized by ACCIONA Construction Technological Center on 1<sup>st</sup> March 2018. They took this opportunity to present several EU funded projects, including RE<sup>4</sup>.



### RE<sup>4</sup> at Circular platform

The **Circular platform** is managed by BusinessEurope and its national members that contributes to the EU's agenda on circular economy. It continuously brings new examples of innovative ways in which industry, SMEs and other business add to the circular economy in Europe. At the same time, it highlights the regulatory and non-regulatory challenges these businesses still face to upscale their current initiatives or to start new ones. The platform is a unique bottom-up business-led hub of knowledge and expertise.

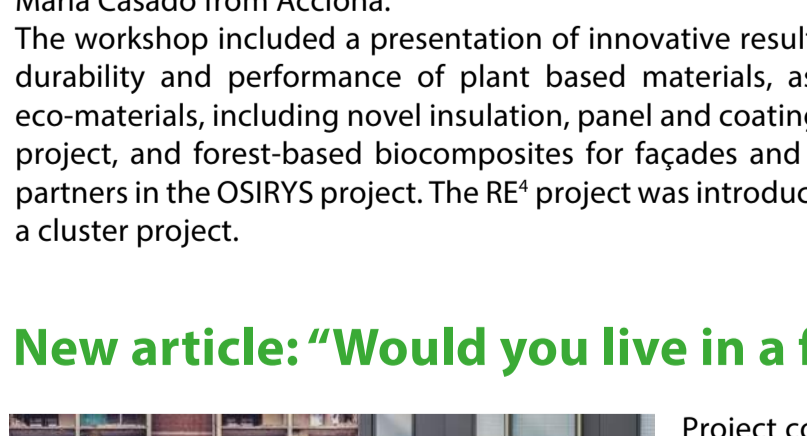


### BUDMA Fair in Poland

The RE<sup>4</sup> project was represented by FENIX TNT at **BUDMA Fair in Poznan, Poland** from 31<sup>st</sup> January to 2<sup>nd</sup> February 2018. BUDMA is the largest construction and architectural fair in Poland and Central and Eastern Europe with more than 800 exhibitors from all over the world. It is a unique opportunity to introduce new products to wide public and a rich source of latest market information. The RE<sup>4</sup> project was presented via booth, roll-up, and brochures.



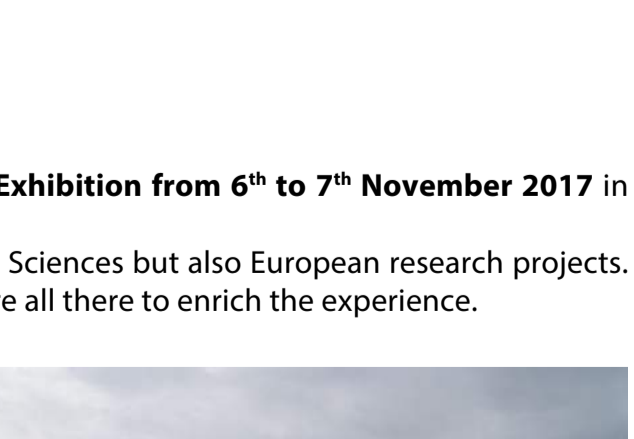
### RE<sup>4</sup> at ECTP portal



Read about our project at the **Technology Platform, built environment and energy efficient building Technology Platform (ECTP)**, which is a leading membership organisation promoting and influencing the future of the Built Environment.

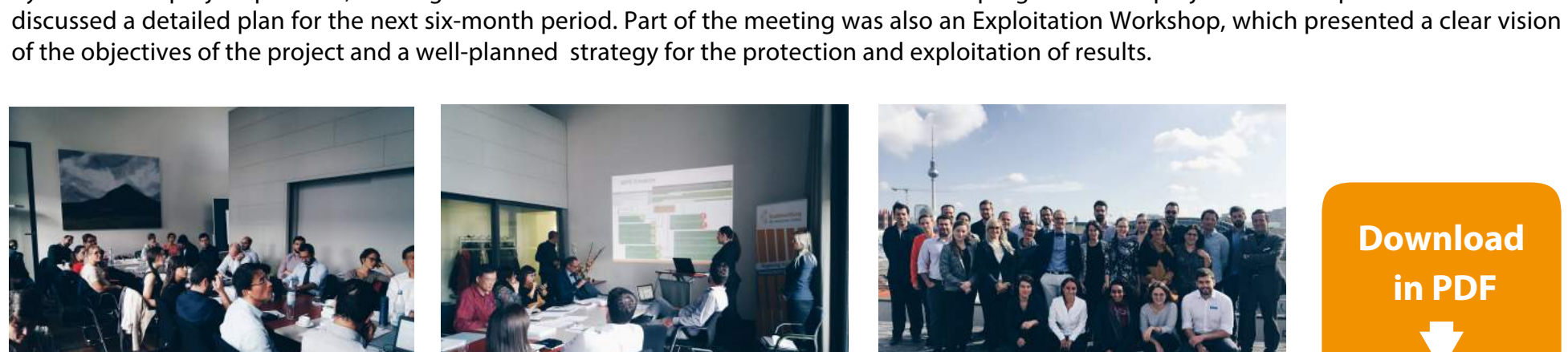
### New publication: "Valorization of construction and demolition wastes: RE<sup>4</sup> building solutions"

We are glad to share with you the scientific work provided by **Diagnostics and Civil Engineering Area** (authors Agnese Attanasio and Alessandro Largo) uploaded on the open access platform of ProScience. This work, entitled "**Valorization of construction and demolition wastes: RE<sup>4</sup> building solutions**", focuses on the main challenges of the RE<sup>4</sup> Project, which aims at the valorization of construction and demolition wastes to be used as raw materials for novel and sustainable building solutions.



### EKOinnovation Forum

The RE<sup>4</sup> project was introduced within a FENIX's presentation at the **EKOinnovation Forum** on 30<sup>th</sup> November 2017 in Krtyny, Czech Republic. The forum aimed to accelerate the emergence of modern solutions into everyday life. Participants were provided with an interesting discussion of current and future trends in this area and introduced modern sustainable technologies that can provide the European Union countries with global competitiveness.



### "Eco-materials for low carbon construction" Workshop

The RE<sup>4</sup> project was presented at the **ISOBIO project workshop "Eco-materials for low carbon construction"** in Madrid on 21<sup>st</sup> November 2017. The RE<sup>4</sup> project was introduced by Maria Casado from Acciona. The workshop included a presentation of innovative results ISOBIO aimed at increasing the durability and performance of plant based materials, as well as presentations of other eco-materials, including novel insulation, panel and coating products, developed in ECO-SEE project, and forest-based biocomposites for façades and interior partitions, developed by partners in the OSIRYS project. The RE<sup>4</sup> project was introduced in the ECO-SEE presentation as a cluster project.



### New article: "Would you live in a fully recycled house?"



Project coordinator Alessandro Largo (CETMA) wrote an article entitled "**Would you live in a fully recycled house?**" about the RE<sup>4</sup> project. Click here to access the whole text.

### The RE<sup>4</sup> project at CAE conference

The RE<sup>4</sup> project was presented by FENIX team at the 33<sup>rd</sup> **International CAE Conference and Exhibition** from 6<sup>th</sup> to 7<sup>th</sup> November 2017 in **Vicenza, Italy**. The conference and exhibition covered the rich landscape of Simulation Based Engineering and Sciences but also European research projects. Distinguished speakers, sponsors, exhibitors, training courses and dedicated Research Agora were all there to enrich the experience.



### General Assembly Meeting after 12 months

The RE<sup>4</sup> consortium met during the **General Assembly Meeting**, that took place from 20<sup>th</sup> to 21<sup>st</sup> September in **Berlin, Germany** and was hosted by one of the project partners, Roswag Architekten. The consortium shared the overall progress of the project over the past six months and discussed a detailed plan for the next six-month period. Part of the meeting was also an **Exploitation Workshop**, which presented a clear vision of the objectives of the project and a well-planned strategy for the protection and exploitation of results.



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