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

Sep 2017
N°01

MESSAGE FROM THE PROJECT COORDINATOR

Dear Reader,

on behalf of the RE⁴ consortium, I warmly welcome you to the first edition of the RE⁴ Newsletter that will be published every six months during the project duration. It is a great pleasure and honour to be part of the RE⁴ project and its great and enthusiastic team! The main goal of this newsletter is to introduce the project in more detail and to provide you with an overview of its progress, as well as to establish a continuous communication between partners, stakeholders and end-users. For these reasons, your contribution and comments to our newsletters and other communication materials are always welcome.
One year after the official launch of RE⁴, the project is now progressing at full speed and on-track to reach its ambitious objectives. In this issue a general presentation of the project, including objectives, partners and achievements will be given. The full details about the project can be found on the project website at www.re4.eu.
I wish you all good reading and a good time with RE⁴.


RE⁴ project consortium

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RE⁴ Project Coordinator
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BASIC INFORMATION

PROJECT DURATION
42 months
Start date: September 2016
End date: February 2020

10 WORK PACKAGES
7 Technical work packages
1 Training, Dissemination & Exploitation
1 Management
1 Ethic requirements

13 PARTNERS
Partners from Belgium, the Czech Republic, Germany, Italy, Spain, Sweden, Taiwan and the United Kingdom

PROJECT BUDGET
5.1 million euro

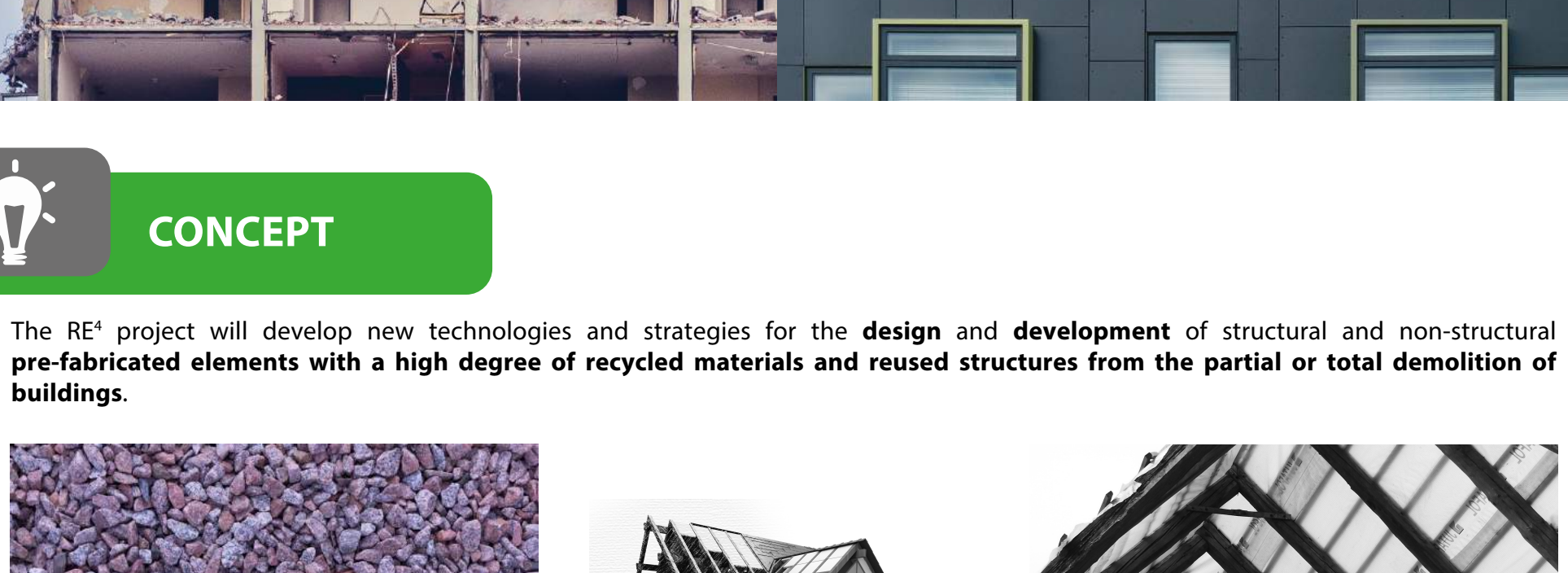
In Europe, around 750 million tonnes of CDW generated every year.

The average recovery rate for EU is below 50%.

Construction and demolition waste (CDW) has been identified by the European Commission as a priority target because of the large volume of generated waste and its high potential for **re-use** and **recycling**.

CONCEPT

The RE⁴ project will develop new technologies and strategies for the **design** and **development** of structural and non-structural **pre-fabricated elements with a high degree of recycled materials and reused structures from the partial or total demolition of buildings.**



OBJECTIVES

The main purpose of the project is to develop the RE⁴ prefabricated energy-efficient building that can easily be assembled and disassembled for future reuse, containing up to 65% in weight of recycled materials from CDW. The reusable structures will range from 15-20% for existing buildings to 80-90% for the RE⁴ prefabricated buildings.

OBJECTIVE 1
Maximisation of recycled CDW amount and value by advanced sorting technologies

OBJECTIVE2
Assessment of CDW-derived materials properties for the production of building elements

OBJECTIVE 3
Development of prefab elements integrating high level of CDW-derived materials for refurbishment and new constructions

OBJECTIVE 4
Development of innovative design concepts for smart installation and disassembly of the pre-fabricated elements into a prefabricated energy-efficient building unit

OBJECTIVE 5
RE⁴ demonstration in industrial environment, testing and evaluation, replication

OBJECTIVE 6
Enhancement of the sustainability and future applications of RE⁴ prefabricated products

OBJECTIVE 7
Development of a BIM-compatible tool (Building Information Modelling) and platform for CDW estimation and management

OBJECTIVE 8
Development of business models for industrial exploitation

WHERE WE ARE

We are here (Sept 2016 – Feb 2020 timeline: Start … End)

- **Milestone 11** – Project website creation
- **Milestone 12** – SAP approval by PMC
- **Milestone 1** – Availability of the CDW streams across Europe
- **Milestone 5** – Availability of comprehensive characterisation of CDW-derived materials for their recycle or reuse
- **Milestone 2** – Weight-criteria based CDW separating system
- **Milestone 3 & 6** – Robotic NIR sensors based CDW sorting system & availability of a system of quality classes and potential applications for recovered CDWderived materials
- **Milestone 4 & 10** – Design development of components & Specifications of the conceptual design of the scaled-up processes
- **Milestone 7** – Production of prefabricated building elements
- **Milestone 8** – Successful large scale production of the selected products and elements
- **Milestone 9** – Demonstration of the technical viability by means of building the demonstrators and performance analysis
- **Milestone 13** – Final report approval by PMC

Nov 2016
D8.1 Website creation

Dec 2016
D2.1 CDW specifications and material requirements for prefabricated structures

Feb 2017
D1.1 Data collection on CDW
D1.3 Overview on the current status of construction of prefabricated elements with recycled materials
D4.1 Composition of materials from demolition and available volumes of sorted fractions
D8.2 Communication and Dissemination Plan
D8.3 Promo material design
D8.4 Data Management Plan (DMP)

May 2017
D1.2 Statistics assessment
D1.4 Overview on the current status on policy measures and regulatory frameworks
D1.5 Certification framework
D8.5 Use of economic instruments
D8.6 Market Assessment

July 2017
D4.2 Geometrical, physical and chemical characterisation of CDW-derived materials

Feb 2018
D4.3 Effect of the variability of CDW batches

Apr 2018
D4.4 Quality classes and potential applications for recovered CDWderived materials

Aug 2018
D7.2 Framework for LCA/ LCCA/S-LCA

Feb 2019
D7.1 Scaled-up processes

Apr 2019
D6.2 Prefabric. elements production and testing
D7.3 Life cycle data collection

May 2019
D3.3 Structural modelling
D3.4 Hygrothermal modelling
D3.5 Fire modelling

Aug 2019
D6.4 Mock-ups execution
D6.5 Refurbishment

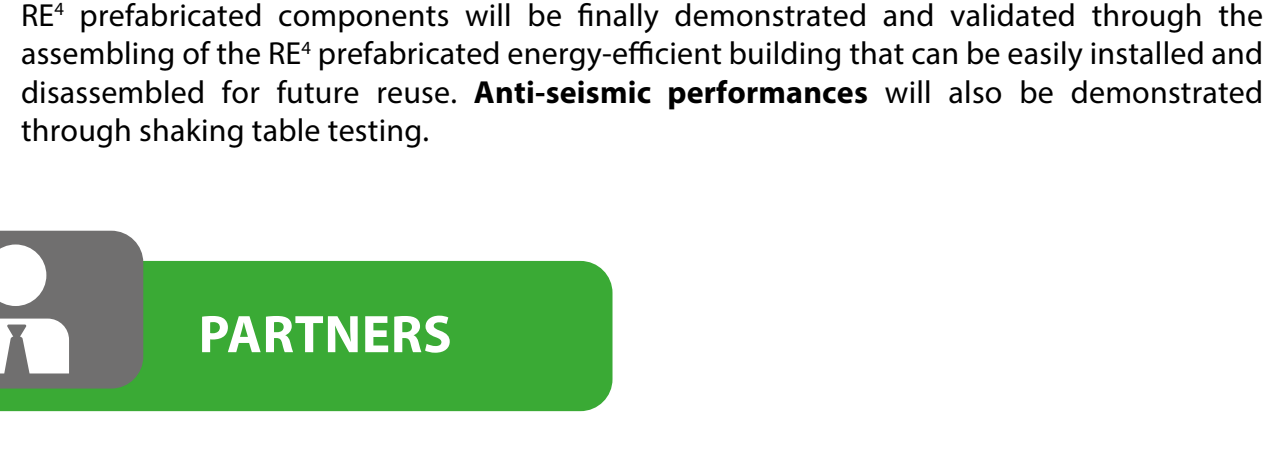
Dec 2019
D6.6 Disassembly RE4 disassembly Vs. conventional buildings
D7.4 LCA/LCCA analysis
D7.5 S-LCA analysis

Feb 2020
D7.6 Products HSE analysis
D7.7 Processes HSE analysis
D7.8 Certification and standardization
D7.9 Product documentation
D8.9 Business Models (BMs) and Business Plans
D8.10 Report on policy workshops and awareness campaign
D8.12 Report on Training activities

DEMONSTRATION

The approach and technology developed at the lab will be scaled-up through the set-up of pilot-scale manufacturing lines for the **innovative sorting of CDW** and the production of **structural, non-structural** and **lightweight prefabricated elements integrating CDW**, in order to validate the feasibility of industrial production in safe conditions. Using the pilot plants, representative prototypes of the final components will be designed, produced, tested and applied on real-scale structures for validation and demonstration purposes.

STRESS EXPERIMENTAL STATION | ACCIONA DEMO-PARK



RE⁴ prefabricated components will be finally demonstrated and validated through the assembling of the RE⁴ prefabricated energy-efficient building that can be easily installed and disassembled for future reuse. **Anti-seismic performances** will also be demonstrated through shaking table testing.

PARTNERS

CETMA · acciona · ACR+ · Queen's University Belfast · RISE · CDE · CREAGH CONCRETE · FENIX TNT · ROSWAG ARCHITEKTEN · Stam · stress · TAIWAN TECH · Vortex Hydra

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

YOU CAN ALSO FIND US ON:
www.re4.eu

UPCOMING EVENTS

IGA BERLIN

One of our partners **Roswag Architekten** will present the **RE⁴ project** during the **IGA conference** which will take place the **14th September 2017 in Berlin, Germany**. The topic of the conference is the sustainable use of natural resources. The IGA Berlin 2017 is a source of ideas and inspiration, a place of learning and experimentation, a platform for intercultural dialogue and a laboratory for innovation.
www.bilress.de

PAST EVENTS

OSCE DAYS

The **Open Source Circular Economy Days** took place from the **29th June - 2nd July 2017 in Berlin, Germany. The RE⁴ project** was presented during this event by **Roswag Architekten** and there were also panel discussion. The presentation called: "ZIRKULÄRES BAUEN - Die Nachwachsende tadt" (**Circular Construction - The Regrowing City**) was dedicated to the general overview of challenges in building construction connected to the RE⁴ project.
Open Source Circular Economy Days is a global project and community about the development and use of open source solutions and methodologies to create a shift to a global sustainable circular economy.

HISER CONFERENCE

During the **HISER Conference** which took place from the **21st–23rd June 2017 in Delft, the Netherlands**, one of our partners **STAM** presented the paper connected with the **RE⁴ project: „Indexing and Sorting Robot Based on Hyperspectral and Reflectance Information for CDW Recycling"**. The conference was dedicated to advances in recycling and management of construction and demolition waste.

INTERNATIONAL CONFERENCE on APPLIED MINERALOGY & ADVANCED MATERIALS

CETMA (a senior researcher of Diagnostics and Civil Engineering Area) took part in the **Conference AMAM-ICAM 2017 – International Conference on Applied Mineralogy & Advanced Materials**, which was held on the **5th–9th June 2017 in Castellaneta Marina, Taranto, Italy.** Presentation, entitled "**Reduction of environmental impact of industrial and mining activities: viable solutions for eco-sustainable buildings**" was focused on the valorization of industrial and construction and demolition wastes (CDW) addressed to the production of sustainable materials for the civil sector and the reduction of the environmental impacts due to wastes streams and natural resources exploitation. Presented also included the overall concept and the main goals of the **RE⁴ project**.

RE⁴ PROJECT part of the EEB PPP PROJECT REVIEW 2017

We are proud that the **RE⁴ Project** is one of the **155 energy efficient H2020 and FP7 projects** presented in the **6th edition of the EeB PPP Project Review 2017**. This yearly publication presents the progress and results of 110 co-funded projects within the EeB PPP under the 7th framework programme (FP7) for 2010, 2011, 2012 and 2013 and 45 co-funded projects under the HORIZON 2020 programme for 2014, 2015 and 2016.

THE EUROPEAN WEEK FOR WASTE REDUCTION

The **European Week for Waste Reduction** (EWWR's) grand celebration, the last International Conference and Awards Ceremony within the framework of the LIFE funding programme, took place in **Barcelona, Spain on the 18th May 2017**. It was organised by the Catalan Waste Agency. During the conference, the **RE⁴ project** was presented by **ACR+**.
The conference focused on qualitative waste prevention, or more specifically on reducing the hazardous content of the waste.

BRIMEE SEMINAR

The **RE⁴ project** was presented by **FENIX TNT** during the **Brimee Project seminar "Circular Economy in the building construction sector"** which took place on the **17th May 2017 in Warsaw, Poland in Zamoyscy Palace**.
The seminar was dedicated to the dissemination of the idea of a new bio-renewable easy-to-use BRIMEE panels. Speakers from the University of Technology and organisations connected with "green buildings" as well as representatives of the **BRIMEE project** and other **EU projects** presented different topics related to the circular economy in the construction sector.
www.brimee.eu

VEEP FIRST INTERNATIONAL WORKSHOP WITHIN BIBM CONGRESS

The **RE⁴ project** was presented by **ACCIONA** during the **First VEEP International Workshop "Engaging with Stakeholders"**, which has been held in the framework of the **BIBM Congress** (17-19 May 2017) on **May 17th in Madrid, Spain**. Different industrial stakeholders from more than 20 countries participated the event!
More info about VEEP project: www.veep-project.eu

INTERNATIONAL BUILDING FAIR in Brno

The **RE⁴ project** was exhibited by **FENIX TNT** at the **Building Fairs in Brno, the Czech Republic**. The event took place on the **26th–29th April 2017**. Visitors could find in depth and comprehensive information during the building fair in Brno about the latest developments, trends, products and services in various fields like construction features, the building trades and construction technologies, building materials and products, construction machinery, building structures and much more.

RE⁴ PROJECT on BUILD UP PORTAL

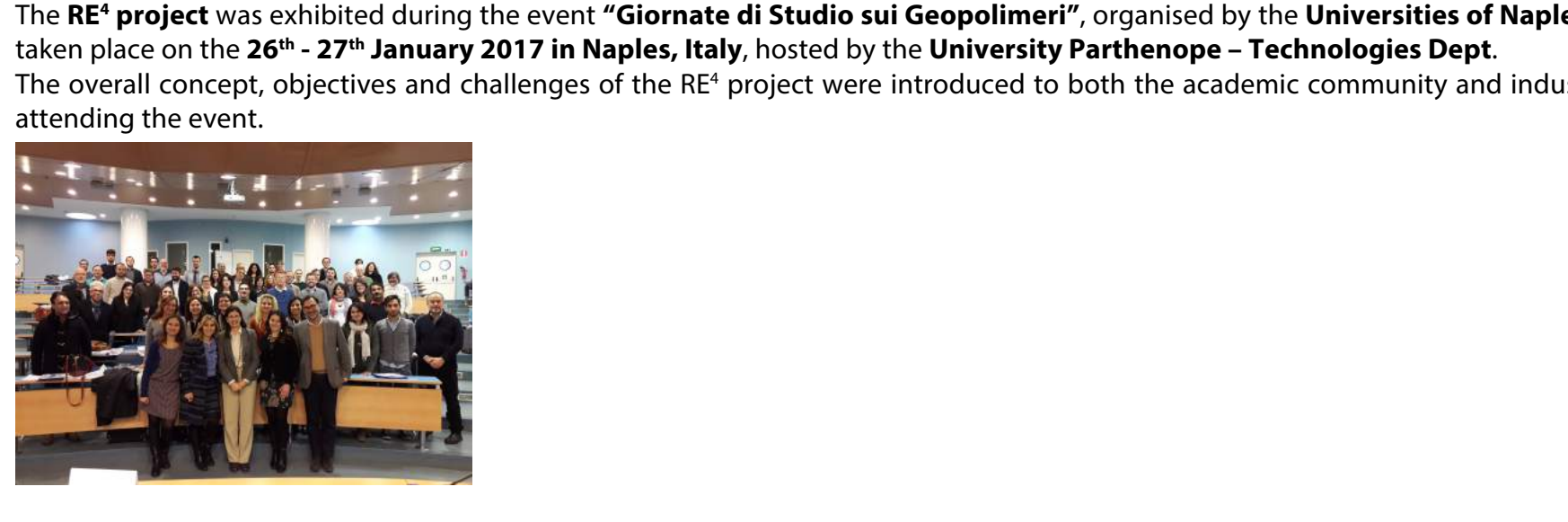
The **RE⁴ project** can be found on the **BUILD UP portal**. The BUILD UP portal is an interactive web portal targeting professionals in the building sector with interests in the latest developments on technical and practical levels, policy legislations, financial issues, and innovative ideas.

M6 GENERAL ASSEMBLY MEETING

6 months after the kick-off meeting, the consortium met again on the **21st - 22nd March 2017** at **Queen's University Belfast, UK**. Partners from across Europe came together to review, discuss and evaluate the project's progress and to plan next steps. Besides 32 participants from the consortium, the meeting was attended by Mr Carlos Saraiva Martins, the **Project Officer** from the **European Commision**.
The first day of the meeting was dedicated to several parallel meetings during which partners discussed the progress in particular areas of the project. Later that day, participants had a chance to visit the **CDE Global** and the **Creagh** premises. The work package (WP) leaders' presentations were scheduled for the second day of the meeting. Each of the WP leaders presented what has been achieved until then and what is planned for upcoming 6 months in their work packages. The meeting was round off with the visit of the **QUB's labs**.

APULIA-NET INTERNATIONAL NETWORKING EVENT

The **RE⁴ project** was presented as a case study for the Session TS2 "**Energy, Environment and Natural Risks Management**" during the **Apulia-Net International Networking Event** which took place on **14th March 2017 in Brindisi, Italy**. The presentation was delivered by **CETMA**. The International Networking Event gave all the participants the opportunity to share new ideas and concepts with the aim of paving the way for future cooperation within the Programmes.

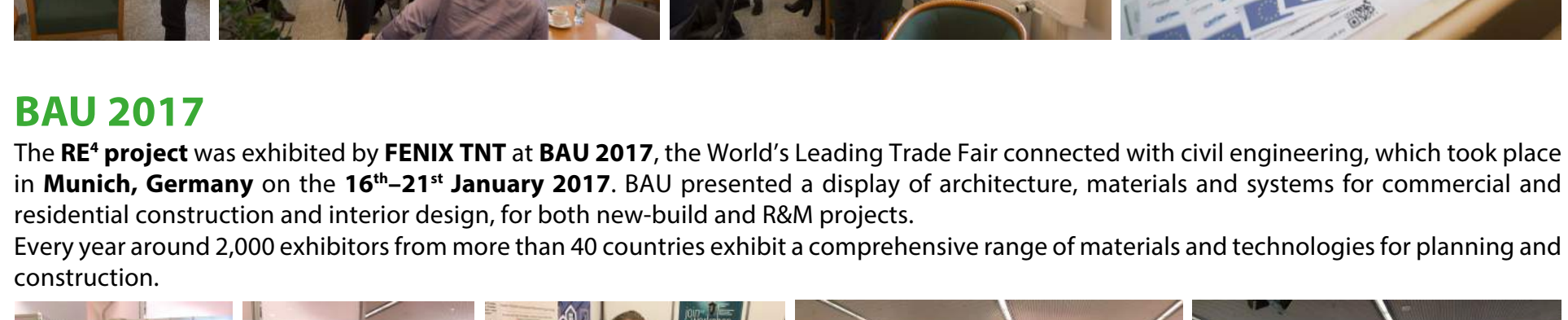


GIORNATE DI STUDIO SUI GEOPOLIMERI

The **RE⁴ project** was exhibited during the event **"Giornate di Studio sui Geopolimeri"**, organised by the **Universities of Naples**, which has taken place on the **26th - 27th January 2017 in Naples, Italy**, hosted by the **University Parthenope – Technologies Dept**.
The overall concept, objectives and challenges of the RE⁴ project were introduced to both the academic community and industrial experts attending the event.

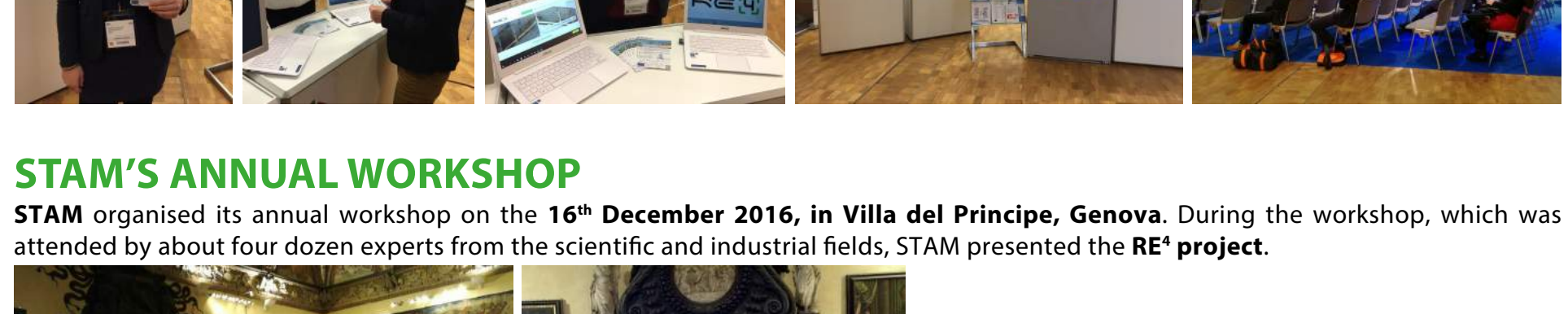
BRIMEE CONFERENCE

The **RE⁴ project** was exhibited during the **BRIMEE Conference** organised by **FENIX TNT**. The conference took place on the **25th January 2017** at the **Rectorate Brno University of Technology in Brno, the Czech Republic**.
Participants of the conference had a chance to see presentations about various topics linked to green materials, new technologies and innovations in the construction sector. The event was concluded with the BRIMEE project demo site visit, where panels made of the Nano Crystalline Cellulose foam have been installed.
www.brimee.eu



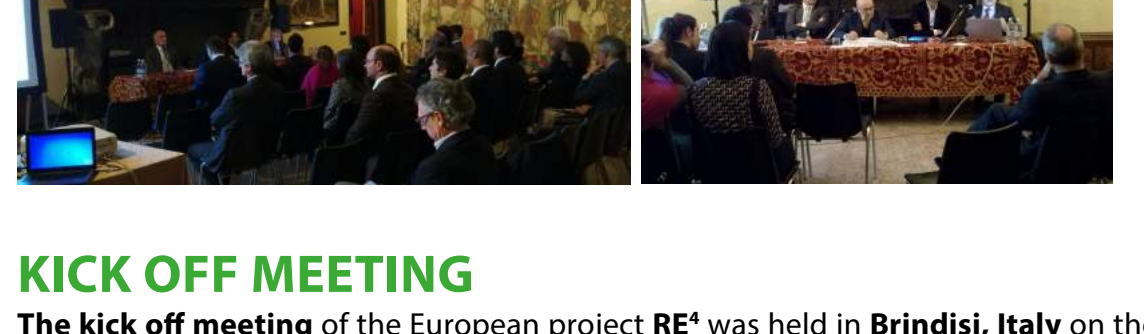
BAU 2017

The **RE⁴ project** was exhibited by **FENIX TNT** at **BAU 2017**, the World's Leading Trade Fair connected with civil engineering, which took place in **Munich, Germany** on the **16th–21st January 2017**. BAU presented a display of architecture, materials and systems for commercial and residential construction and interior design, for both new-build and R&M projects.
Every year around 2,000 exhibitors from more than 40 countries exhibit a comprehensive range of materials and technologies for planning and construction.



STAM'S ANNUAL WORKSHOP

STAM organised its annual workshop on the **16th December 2016, in Villa del Principe, Genova**. During the workshop, which was attended by about four dozen experts from the scientific and industrial fields, STAM presented the **RE⁴ project**.



KICK OFF MEETING

The kick off meeting of the European project **RE⁴** was held in **Brindisi, Italy** on the **15th September**. Project coordinator **CETMA** hosted 12 partners from 7 European countries and 1 partner from Taiwan.
Partners discussed how set objectives can be achieved and how the expectations of the end users and interest groups can be met with respect to the intended project outcome. The plan for the first six months of the project was introduced and all partners could see interesting premises of CETMA and get to know each other better.

DISCLAIMER

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