Development of an Innovative Insulation Fire Resistant Façade from the Construction and Demolition Waste

DEFEAT

INTEGRATED/0918/0052

DELIVERABLE D2.2

INTERIM PLAN FOR USE AND DISSEMINATION OF RESULTS (PURD)

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DELIVERABLE INFORMATION

Deliverable No	D2.2	
Deliverable Title	1st Interim Plan for Use and Dissemination of the Results (PUDR)	
Work Package and Task Number	*Work Package 2*	*Task 2.1, 2.2, 2.3, 2.4*
Participants:	☒ PA5 - STRATA ☒ HO – FRC ☒ PA1- UCY ☒ PA2 – PLC ☒ PA3 - NETIATIS ☒ PA4- RECS ☒ PA6 – OSEOK ☒ PA7 - PWD ☒ PA8 - DoE ☒ FO1 - KUL	

Sign off	**Name**	**Date Approved**
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Dissemination Level [1]		
PU	*Public*	X
CO	*Confidential, only for members of the consortium (including the Commission Services)*	

[1] Enter a cross (X) in the appropriate cell.

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1. Project Summary

The management of Construction and Demolition Waste (CDW) in Cyprus faces several challenges and appears to be underperforming, as well as there is a lack of recycling technologies to be applied in this type of waste in order to increase the salvage value of the building. In addition, over the last decade, the construction activities in Europe were accelerated as well as the rehabilitation activities for energy saving, as a general need to facilitate the accommodation. Even though the construction works are ongoing, only in the recent years the safety of such infrastructures has gained increasing attention, particularly the issue of fire. Towards this end, the scope of the DEFEAT project is the innovative separation and transformation of CDW into an innovative insulation fire resistant facade.

The DEFEAT project will develop in pilot scale, and through detailed experimental study, an innovative separation method of CDW, as well as a composite material generated also from the CDW, which will gain low thermal conductivity, satisfactory mechanical properties and at the same time will be fire resistant. Initially, a novel method will be utilized for the optimization of the separation of the CDW in order to receive "Clean" materials after the CDW collection. On this purpose the technology of image processing will be applied to optimize the separation process. As a result, both recycled concrete aggregates and also the raw material that will be used for the development of the insulation and fire-resistant composite for building applications, will be obtained. For the latter, the technology of geopolymerisation will be applied. The optimization of the material density will be achieved by chemical and mechanical methods, while the production will be held by a conventional method and 3D-printing. In addition, the final products will be evaluated in terms of thermal, mechanical, fire resistance properties, as well as financial cost, to allow for their full market potential and uptake within 3 years after the end of the project. At the end of the project, an attempt will be carried out in order to establish a framework for utilizing CDW as a raw material in the building industry.

The social, economic, environmental, and scientific impacts of the project and the whole consortium of DEFEAT are summarized below:

Social impacts

- Utilization of waste and return to the production cycle as a high value-added material in the context of the circular economy.
- Developing products that have an impact on the building sector and benefits most of society.

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- Decrease of a waste with a simultaneous positive impact on the environmental footprint created by the deposition so far.

Economic impacts

- Stimulate the economy by introducing new materials in the building material sector that increase competition and lead to lower prices.
- Developing innovative materials by leveraging a number of companies wishing to mass-produce and sell them, creating growth conditions for the economy.
- Creating Net Added Value by investing and launching a high value-added product line and creation of a suitable environment for the further development of innovative building materials (geopolymers) by companies in Cyprus.

Environmental impacts

- Low energy consumption for the development of geopolymers, since the curing temperature is ambient.
- Low energy consumption for the waste separation.
- Reduced CO_2 emissions compared to the cement and concrete industry.
- The utilization of a waste for the production of an innovative product and the elimination of the relevant environmental impacts is related with the environmental and societal progress in Europe.

Scientific impacts

- Developing of know-how and transferring it to the industrial level in the recovery of construction waste materials through the production of recycled aggregates and development of composite fire-resistant insulation material as well as on the waste separation.
- Training of scientists and staff in an interdisciplinary environment related to materials engineering.

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2. Glossary of Terms

Acronym	Meaning
CDW	Construction and Demolition Waste
RIF	Research and Innovation Foundation
EC	European Commission
EU	European Union
HO	Host Organization

2.1 Definitions

Words beginning with a capital letter shall have the meaning defined either herein or in the Rules or in the Grant Agreement related to the Project.

2.2 Additional Definitions

Project refers to the DEFEAT project funded from the Research & Innovation Foundation (Programmes for Research, Technological Development and Innovation – RESTART 2016 – 2020).

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3. Description of Work

3.1 Purpose of the Plan for the Use and Dissemination of the Results (PUDR)

The purpose of this document is to present the first plan for dissemination and exploitation of the DEFEAT project's results. Moreover, in this document the achievements of the project consortium partners in terms of dissemination of the project's results, vision and ideas until the 18th month of the project duration will be summarized. An update of the first plan for the use and dissemination of the DEFEAT results and products will be provided in Month 36 of the project, in deliverable D2.3. Final Plan for Use and Dissemination of the Results (PUDR) which will be presented at the end of the DEFEAT project.

This document aims to present the project's progress on the planning of exploitation and dissemination activities, the progress on identifying, capturing and protecting IP and the conduction of specific market penetration strategies for the results of the project. In order to accelerate the implementation of the research findings, the DEFEAT partners intend to maximise the dissemination of results and to express them in terms that are readily understandable to stakeholders at public authorities, industry and suppliers. Additionally, the partners intend to promote the dissemination of the project findings through presentations at the project workshops, scientific publications and preparing/updating information for the project website.

The dissemination activities in the DEFEAT project aim to raise awareness in order to maximise its impact and encourage acceptance of its results by the targeted stakeholders. This plan is intended to ensure that the dissemination activities within DEFEAT project are closely oriented to the current and future market opportunities and to prepare the target audience including potential users, researches and strategic partners for the adoption of DEFEAT results and products.

*The dissemination strategy will be continuously adjusted to follow the European Union rules for the COVID-19 pandemic. All the planned activities will take place either physically or virtually depending on the virus spread.

3.2 Target Audience

DEFEAT's consortium partners are going to establish contact with a range of stakeholders in order to engage them at an initial project stage and ensure a closely aligned technical development. The most relevant communities have been identified and the dissemination strategy has been designed to evolve during the duration of the project aiming to reach:

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- Policy Makers, Industries and SMEs
- Potential End-Users, Inventors and Consultation Groups
- Sectoral Working Groups and Associations
- Academics
- Wider Public

3.3 Overview of the PUDR

The dissemination and communication plan is described in Section 4. It includes four stages:

- Planned use of the project results.
- Development of the dissemination and communication material and tools.
- Usage of dissemination channels
- Dissemination efforts for each of the various channels (during and after the run time of the project).

The dissemination and communication activities will respect the intellectual property rights as agreed and set down in the Consortium Agreement and Description of Work. Section 4 includes a chapter on the achievements related to dissemination made so far. The project results and IPR management strategy and the planned exploitation activities are described in the Exploitation Plan in Section 5.

The Exploitation plan consist of the following topics:

- Project results and Intellectual Property Registry per partner and the followed methodology.
- Patent application.
- Market analysis, identification of competitors and potential users.
- Description of the phases of the exploitation plan.
- SWOT and Porter's Five Forces analyses.

The report ends with a short conclusion in Section 6.

4. Dissemination and Communication Plan

The dissemination strategy is focused on raising general awareness about the generated technology and the achievements of the DEFEAT project, mainly in Cyprus and also across Europe. Dissemination activities are planned in a way to facilitate the realization of the project

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and maximize its impact. Additionally, it prepares the ground for an effective commercial exploitation of the DEFEAT products and technology. They will be based on scientific dissemination tools and communication measures, in order to reach the largest possible audience.

The dissemination activities include:

- Participation in the most important National, European and international scientific conferences relevant or dedicated to waste management, waste processing, construction sector, construction materials, environmental management and related research activities and applications.
- Awareness Programmes, including the publication of project results on the websites and social media.
- Publication of project results in scientific and technical papers, journals, technical magazines and National and international conferences, exhibitions and workshops.

4.1 Planned use of the project results

The project results have been and will be presented at conferences and published in scientific journals. The partner organizations participating in the project have been and will continue to disseminate the results within their business units and transfer the knowledge and experiences gained. All the members of the consortium will continue to disseminate the results of the project to the broader audience and publish them in technical and commercial magazines related to building & construction materials, CDW recycling, waste management, environmental management and related research activities and applications.

Focusing initially at the European market and especially the Cypriot market, the exploitation of the DEFEAT results and products, will start by contacting customers at the prefabricated buildings & constructions sector along with the building & construction materials sector. Furthermore, additional markets will be investigated (i.e. broader construction sector, CDW recycling, waste management, environmental management, etc.). Then the novel technology will be disseminated throughout the rest of the world, partners will be sourced and new distribution agents will be required to retail the technologies in secondary markets.

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4.2 Development of the Dissemination Material and Tools

Dissemination tools and activities are designed to reach the various target groups in an effective and at the same time efficient way. The dissemination activities foreseen during the duration of the DEFEAT project and after it are briefly described below:

- **Project website:** A project website where the project is presented to the general public has been launched. The website is in English where the most up-to-date details about project activity through a news feed, event calendar and publications list are provided. The website is included in the Host's Organization (HO) website and it can be accessed through this link: http://defeat.frederick.ac.cy/ .

- **Project social media platforms:** The use of social media for the DEFEAT project contributes to establish and maintain public engagement with the project. Facebook, Twitter and LinkedIn have been developed to approach a broader audience, to open/join discussions on advance in geopolymerisation technology, etc., and further promoting the results of the project. The social media accounts are available for access through the project's website and vice versa.

- **Project video:** A project video has already been developed by the consortium, to be disseminated to a broader audience and features on the project's Website, Social Media and YouTube channel. A Demonstration video of the operation of the innovative separation method will be developed and released on May of 2022 by the Frederick Research Center.

- **Project Leaflet:** A leaflet providing basic information about the project main goals, the technical approach, the expected achievements and a list of project participants and its consortium has been developed. This serves as the project's "business card" and is distributed, by the project beneficiaries, as widely as possible in any appropriate occasion. The leaflet is available on the public website here: http://defeat.frederick.ac.cy/docs/DEFEAT_leaflet.pdf .

- **Project Logo:** A project logo has been developed to address the perspective and the main goal of the project. The major focus is to provide a solid and coherent visual identity, to those who can contribute to evaluation and further exploitation of the DEFEAT project outcomes.

- **Project Newsletters:** There will be a regular e-newsletter to raise awareness of the DEFEAT project and communicate its outcomes and learnings. The newsletter is in English and it will

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be sent to identified stakeholders and interested people subscribing to it through the project website, and members/representatives of the media. All newsletters will be available in the DEFEAT website here: http://defeat.frederick.ac.cy/index.php/defeat-media/publications .

- **Press releases:** Press releases have already been used and will continue to be used to inform on the project's public activities, deliverables, milestones and achieved results to get the attention at European, national, regional and local level. Press releases are going to be written in English and Greek and distributed to recipients, such as international interest groups, RIF and European Union officials and other interested public and can be found in the website here: http://defeat.frederick.ac.cy/index.php/defeat-media/in-the-press .

- **Scientific and Technical Publications:** Throughout the project lifetime, scientific and technical publications on relevant journals (academic and industrial community), conference proceedings (academic and industrial community), technical magazines (entrepreneurs, researchers, wide public), will be used for the communication of the project results. At several occasions representatives of the Consortium and the Project Coordinator in particular, assist and assure presentations to promote and explain the aims of the project and if available publish the public results at these occasions. The published materials will be available on the project's website.

- **Non-scientific articles:** Other publications of non-scientific nature including general public oriented printed or online texts are foreseen through the project lifetime.

- **Participation at scientific conferences and workshops:** High-profile academic conferences and workshops organized by European, national and international organizations will be targeted. These conferences and workshops involve and/or represent waste management research communities, where the project and its outcomes will be presented, its activities will be promoted, as well as interaction and exchange of information will be made between interested groups and scientific community.

- **Participation in exhibitions, technical and industrial fairs:** Exhibitions and fairs provide a great opportunity to demonstrate the DEFEAT project's results and potential to interested parties, end-users and a wider audience for practical experience.

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- **Organization of a Scientific Information Day:** This event will take place on M34 and will target to industry's staff, students, researchers, public authorities' staff in order to promote the innovations (image processing and geopolymerisation) involved in the DEFEAT project.

- **Organization of a demo-event:** An event will be organized by the host organization for demonstration of the separation technology and pilot application of the composite material. The event will target to local stakeholders, industries, construction companies, SMEs.

4.3 Usage of Dissemination Channels

The Consortium's activities can be lined up along the following dissemination channels:

- Conventional and electronic publications.
- Participation and/or Organization of Events: Active participation (e.g. presentations) at international conferences, workshops, seminars and working groups meetings are encouraged.
- Press conferences and press releases.
- Knowledge transfer to other projects and networks.
- The World Wide Web: documentation will be circulated through the internet via the project website, news and e-mail to potential future users, without disclosure of classified information.

4.4 Progress Monitoring

The reach and impact of DEFEAT communication and dissemination activities for the first 18 months of the project duration is assessed and closely monitored using participants statistics, search metrics and other established indicators of media use. Unfortunately, due to the Covid-19 pandemic, various conferences, workshops and exhibitions were cancelled.

The table below indicates the measures that are used to evaluate the output of the dissemination and communication activities and the impact that the DEFEAT project finally marked for the first 18 months of the Project running:

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Table 1. DEFEAT Communication Strategy Monitoring

Communication Tool	Quantification	Proof of Communication
Project Website (page)	No. of visitors (hits) and downloads on the project website/page	648 visitors
Scientific Newsletters	2 published newsletters:	1st was sent to 193 recipients & 2nd to 197 recipients
Social Media Actions	Facebook: 10 posts	135 reaches
	LinkedIn: 10 posts	22 reactions
	Tweets: 10 posts	7 reactions
Press Release	9	9
Scientific Articles and Technical Magazines	1 Journal Article: "Fire Resistance Behaviour of Geopolymer Concrete: An Overview", Buildings, 11, 82, 2021.	Scopus Metrics (by 20/12/2021): Citations: 5 Field-Weighted Citation Impact: 3.04 Mendeley - Readers: 27
Non-scientific Articles	2 Newspaper Articles	Article 1: Philelefthero Newspaper, Sunday, 25th October, 2020. Article 2: Cyprus Mail Newspaper, Wednesday, 5th May, 2021.
Conferences and Workshops	One conference paper was accepted to be presented in "The 2nd International Conference on Circularity in the Built Environment (CiBEn)" that was going to be held in Delft, in November 2022. The conference was postponed from Nov 24-26, 2021 to July 13-15 2022. 4 Abstracts were sent for conferences that will be organised in 2022.	The paper was accepted by email sent on: Mon, Aug 16, 2021 at 4:10 AM Abstracts Word Files
	Organization of 2 Workshops: Stakeholders' Workshop to Finalize Contents & Format of Drafted Questionnaires (WP10)	Photos of events and preparation of corresponding deliverables: Survey Questionnaires (WP10) Exploitation and IP Strategy

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	DEFEAT Exploitation and IP Management Workshop (WP2)	(WP2)
Exhibitions, Technical and Industrial Fairs	Participation in 2 Exhibitions European Researchers' Night in Cyprus, 2020 European Researchers' Night in Cyprus, 2021	Presentations and Videos

4.5 Dissemination Plan During and After the Project Lifetime

The project's results and progress will be disseminated to specific groups in Cyprus and Europe such as prefabricated buildings & construction companies, building & construction materials companies, CDW recycling companies, waste management companies, environmental management companies and companies in the wider construction sector.

As for the internal communication, all information (i.e. submitted deliverables to RIF) are distributed among the partners and are available via the dedicated private website section and the repository that has been created for the purposes of the project. Regular meetings, teleconferences and general project meetings with all the partners are held on a regular basis and whenever necessary since the beginning of the project.

The external communication and dissemination of the project takes and will continue to take place via:

- The public part of the website.
- Project presentation at national and international meetings.
- In-person meetings (virtually and physically) of people from the consortium with various interested stakeholders.
- Scientific and general awareness publications in journals.
- The project leaflet which partners from the whole consortium use.
- Social media channels such as Facebook and LinkedIn also available for access from the project's website.

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During the project, the consortium members will participate in several events, disseminating the project, its scope, its forthcoming results and its vision. These events range from conferences with European and international attendees from joining industry, to events with participants from other RIF and/or EU-funded projects. The goal behind the attendance of these events is to present the project to relevant stakeholders. The below table summarizes an indicative list of events where the partners will examine participation (based on relevance, costs and available resources) in order to present and promote the DEFEAT project:

Table 2. An indicative list with events that partners will examine participation.

No.	Type of event	Title	Objective	Date	Place
1	Exhibition	Demonstration of robotic separation of CDW	Small scale application / demonstration of image processing and neural networks on CDW separation (D3.4)	May 2022	Frederick Research Center, Nicosia, Cyprus
2	Conference – Conference Paper	Participate in 3rd RILEM International Conference on Digital Fabrication with Concrete (Loughborough University, UK)	Present the work related to the application of image processing and neural networks on CDW separation (D3.7a and D3.7b)	27-29 June 2022	International
3	Conference – Conference Paper	Participate in fib International Congress 2022 Oslo	Present the work related to the design and development of the composite material (D5.4)	12-16 June 2022	International
4	Conference – Conference Paper	Participate in Concrete Solutions 8th International Conference on Concrete Repair, Durability and Technology	Disseminate the work related to the characterization and properties of the developed material (D6.5)	11-13 July 2022	International

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		Leeds, UK			
5	Workshop	Stakeholders' workshop for discussion of questionnaires contents and format	Organization of stakeholders' workshop to finalize contents and format of drafted questionnaires (D10.1)	Completed on 19 May 2021	Online Meeting
6	Workshop	Stakeholders and constructors' workshop for presenting the results of robotic separation of CDW	Organization of workshop with local stakeholders and constructors for exploiting the results of image processing and neural networks application on CDW separation (D3.8)	June 2022	Frederick Research Center, Nicosia, Cyprus
7	Workshop	Stakeholders and consortium members workshop for exploiting the results of large-scale production of DEFEAT panels	Organization of workshop with stakeholders and consortium members for exploiting the results of large-scale production of DEFEAT panels.	February 2023	Latomia Pharmakas, Nicosia, Cyprus
8	Research Promotion Event	Valorization of construction & demolition wastes (CDW) for the development of innovative building materials	Event aimed at familiarizing the public with the world of science and research and at the same time strengthening the public image of researchers, as well as highlighting the important role they play in society	Completed in November 2021	Online Event

<u>After the project's runtime</u>, it is the intention of the consortium partners to make the novel DEFEAT results available to non-consortium members at commercial and competitive conditions to attract potential clients. The DEFEAT process is also promoted at the project's website and will be maintained and updated after the project's end. The website will act as a contact point for interested parties providing project summary and project participants information. It will inform

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the public with the ongoing and finished research activities; host the publications of the project for a general public (flyers and technical publications) and will provide links to research activities on prefabricated buildings & constructions, building & construction materials, CDW recycling, waste management, environmental management and the wider construction sector. Consequently, the website will also be the basis for dissemination.

4.6 Dissemination activities during the first 6Ms of the project

4.6.1 DEFEAT website & social media platforms

To ensure maximum visibility to the DEFEAT targets, objectives and results, the consortium has set up a project website (Deliverable 2.4) registered in the HO website, as well as social media platforms. The project public website has been set up for the general public and can be found at the web address: http://defeat.frederick.ac.cy/. The project website is one of the main communication tools of the dissemination of the projects funded under the Republic of Cyprus, the Cyprus Research & Innovation Foundation (RIF) and the European Regional Development Fund.

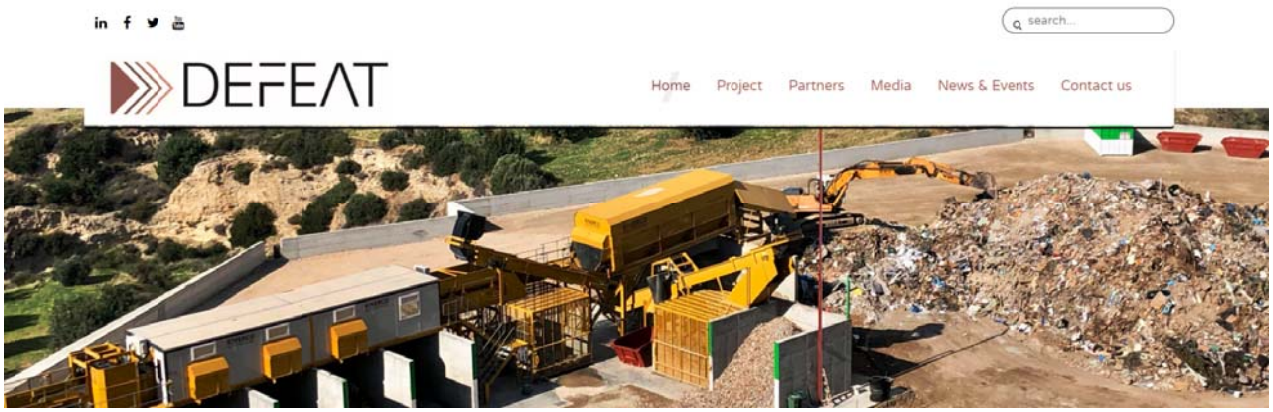

Figure 1. Header of DEFEAT website

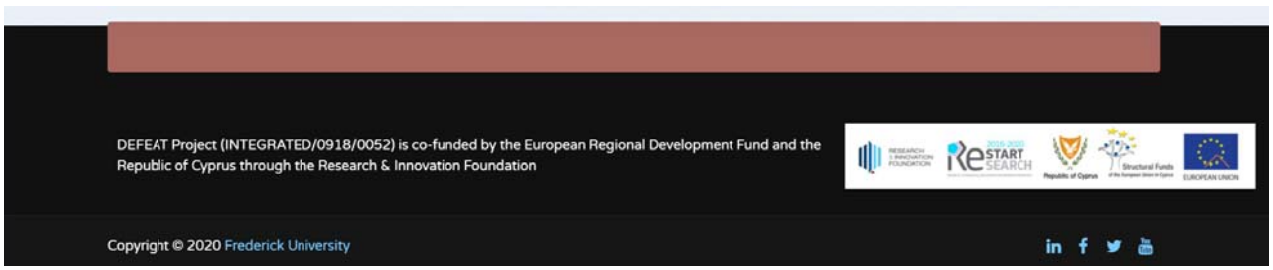

Figure 2. Footer of DEFEAT's website Homepage

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Facebook, Twitter and LinkedIn accounts have also been developed and regularly updated. The links of each account are presented below:

- Facebook: https://www.facebook.com/DEFEAT-105407267904655
- Twitter: https://twitter.com/DEFEAT85269725
- LinkedIn: https://www.linkedin.com/company/defeat-project

The DEFEAT YouTube channel has been developed and can be found through this link: https://www.youtube.com/channel/UCwmVxkiHDbq4ZBWx1Uevh0g?guided_help_flow=5. The video described in section 4.6.4 DEFEAT video is already uploaded and can be found here: https://www.youtube.com/watch?v=wLBsuwBCoDY&t=1s. The Demonstration video of the operation of the innovative separation method that will be developed in the future by the Frederick Research Center will also be uploaded in DEFEAT's YouTube channel. Any other video prepared by the project's partners, either as an educational material or as a promotional material, will be uploaded and disseminated through the project's social media platforms and website.

The design of the website builds upon the following criteria and considering suggestions given in the RIF and EU Project Websites – Best Practice Guidelines, which offer better quality and user-friendliness to the project website, triggering higher popularity and provide better visibility for the project. Best practices include:

- Visual communication: use of photos and colors, web pages are easy to browse, information is kept short and links are included to websites and publications.
- Verbal communication: the website uses simple phrasing, no jargon is used in order to attract the widest possible audience, e-devices are user friendly.
- Visibility: maximum use of free or affordable methods to increase page ranking on search engines, Webmaster Tools provided by search engines to check indexing status, good cross linking between the different pages of site and other sites, add keywords to the web page metadata; use frequently used keyword search phrases, both in the metadata and in the contents pages.
- Regular update of contents: the update of the current version of the webpage is regularly performed by STRATAGEM upon inputs of all the partners of the consortium. Moreover, the use of social media (Facebook, LinkedIn, and Twitter) are considered.
- Monitoring and feedback tools: the website includes: a counter of visitors or other statistical tools that will be used to measure the number of visits; a visitors' feedback form, to get a feedback on the usability of the web site and on the interest created by the project.

Ευρωπαϊκή Ένωση Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART SEARCH
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The website and social media are already updated throughout the project and contains a page with news items about the project. There will be a continuous update of the project website and social media platforms during the runtime of the project. The web and social media address will be widely advertised and it is intended to be of interest to potential end-users and to other interest audience, without revealing sensitive information.

4.6.2 DEFEAT leaflet

For the dissemination purposes of the project, a professional and attractive leaflet has been developed and further updated, in close collaboration with all the consortium partners.

Figure 3. Project leaflet - cover pages

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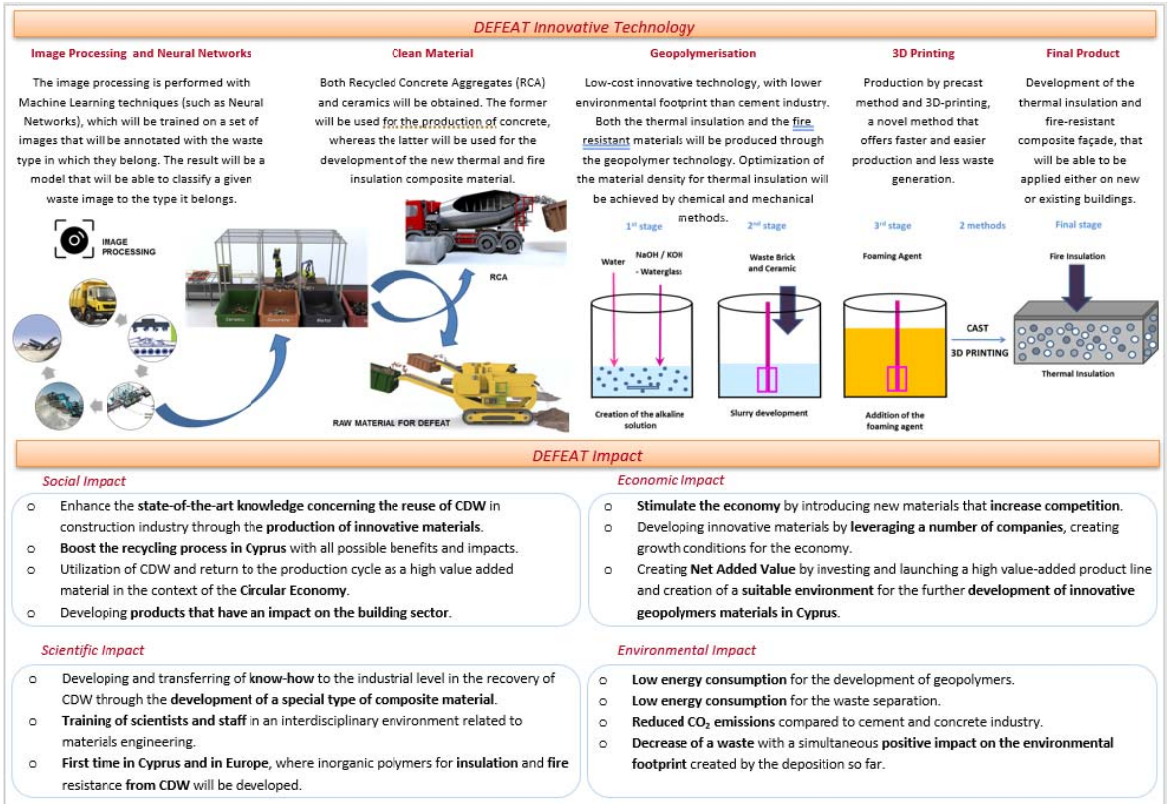

Figure 4 Project Leaflet - inside pages

The main purpose of this first project leaflet is to provide to the public audience with a written and attractive project overview and a descriptive summary of the main project objectives. The leaflet has been published in the project website and additionally it will be distributed during the various conferences and the events that the consortium partners will attend. Apart from the general information and the summary about the project, the content of the leaflet includes the website address and basic information regarding the DEFEAT project consortium. The logos of all the partners are disseminated also through the leaflet. The circulation of the leaflet takes place in printed form, e.g. by distribution at future conferences and other dissemination events, or in electronic form as there is an electronic version of the leaflet (PDF) that can be downloaded from the public area of website. As the DEFEAT results appear, this leaflet will be updated accordingly to inform the wider audience of the project achievements, while as well leading the way for the exploitation activities to happen after the project completion.

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4.6.3 DEFEAT newsletter

The Newsletters are aiming to disseminate in the best possible way periodical updates of the results as part of the work carried out by our consortium. STRATAGEM has already prepared the first two newsletters. The newsletters were distributed in February 2021 and September 2021 and include all sort of developments until the time of their distribution. It is important to point out that the information released was (and will be) verified multiple times to ensure no confidential information is released and all information, including text, graphics and schematics is accurate.

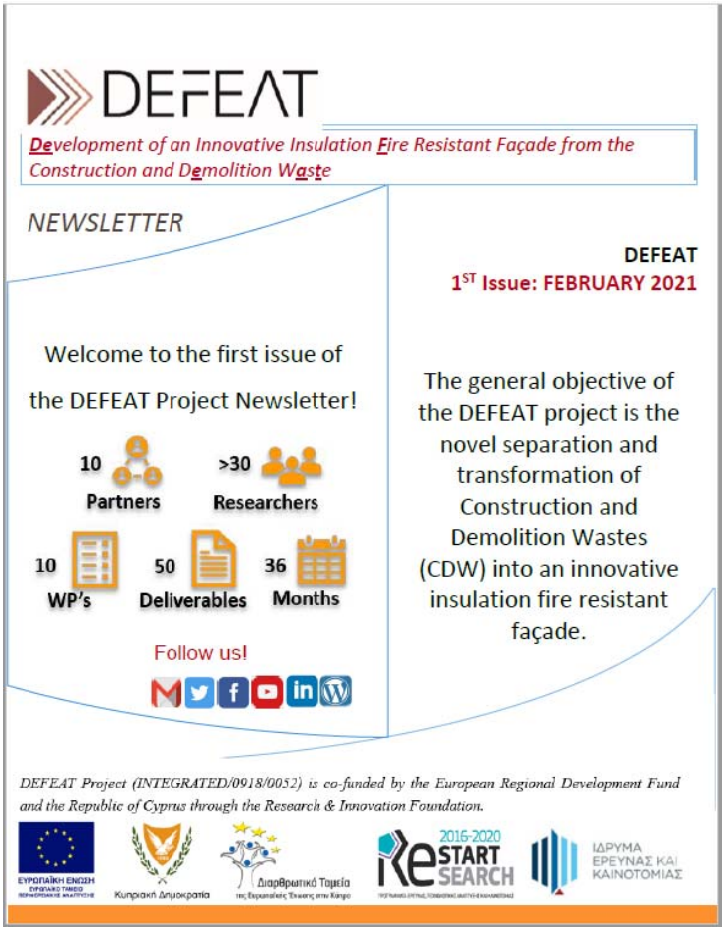

Figure 5. First page of the Newsletter #1

4.6.4 DEFEAT video

The first video was prepared by the consortium before the beginning of the project and it is demonstrating in a very simple way the project scope and objectives. The video aims to reach out to a broader audience and promote the projects aim and findings via the YouTube platform. Additionally, the video is posted on the website and to all the social media platforms.

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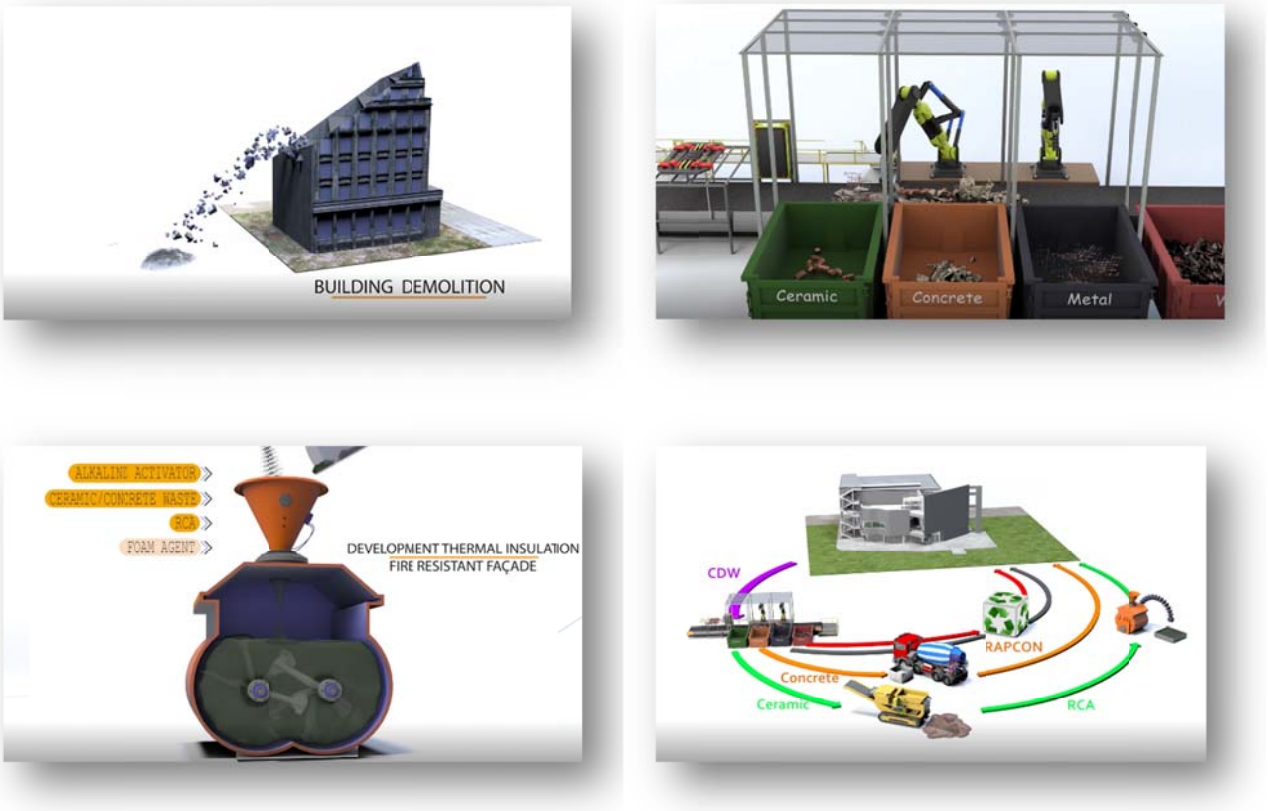

Figure 6. Screenshots from DEFEAT dissemination video

4.6.5 Participation at events and publications

During the first 18 months of the project and due to COVID-19 pandemic, the consortium partners attended most of the events virtually. Additionally, a lot of events have been cancelled. The following activities such as events and publications took place the first 6 months of the project's runtime:

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Table 3. Communication and Dissemination Activities took place the first 6 Months of the Project.

TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
Press release - Article	Published on 15/09/2020	Press Release "Έναρξη έργου DEFEAT από το Frederick Research Center-Που στοχεύει"	Announce the beginning of DEFEAT project to general audience	General Audience	Cyprus 15/09/2020	Frederick Research Center	General Audience: 1000	https://www.brief.com.cy/etairika-nea/enarxi-ergoy-defeat-apo-frederick-research-center-poy-stoheyei
	Published on 15/09/2020	Press Release "Ανάπτυξη καινοτόμου υλικού από απόβλητα για εφαρμογή σε προσόψεις κτιρίων"	Announce the beginning of DEFEAT project to general audience	General Audience	Cyprus 15/09/2020	Frederick Research Center	General Audience: 1000	https://dialogos.com.cy/anaptyxi-kainotomoy-ylikoy-apo-apovlita-gia-efarmogi-se-prosopseis-ktirion/
	Published on 15/09/2020	Press Release "Ανάπτυξη καινοτόμου υλικού από απόβλητα για εφαρμογή σε προσόψεις κτιρίων"	Announce the beginning of DEFEAT project to general audience	General Audience	Cyprus 15/09/2020	Frederick Research Center	General Audience: 1000	https://inbusinessnews.reporter.com.cy/business/property/article/256723/anaptyxi-kainotomoy-ylikoy-apo-apoblita-ga-efarmog-se-prosopseis-ktirion

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
	Published on 15/09/2020	Press Release "Ανάπτυξη καινοτόμου υλικού από απόβλητα για εφαρμογή σε προσόψεις κτιρίων"	Announce the beginning of DEFEAT project to general audience	General Audience	Cyprus 15/09/2020	Frederick Research Center	General Audience: 1000	https://www.kathimerini.com.cy/gr/oikonomiki/epixeirisеis/anaptyxi-kainotomoy-ylikoy-apo-apoblita-gia-efarmogi-se-prosopseis-ktirion
	Published on 15/09/2020	Press Release "Ανάπτυξη καινοτόμου υλικού από απόβλητα για εφαρμογή σε προσόψεις κτιρίων"	Announce the beginning of DEFEAT project to general audience	General Audience	Cyprus 15/09/2020	Frederick Research Center	General Audience: 1000	https://paideia-news.com/panepistimio-frederick/2020/09/15/anaptyksi-kainotomoy-ylikoy-apo-apoblita-gia-efarmogi-se-prosopseis-ktirion-new/
	Published on 15/09/2020	Press Release "Ανάπτυξη καινοτόμου υλικού από απόβλητα για εφαρμογή σε προσόψεις κτιρίων"	Announce the beginning of DEFEAT project to general audience	General Audience	Cyprus 15/09/2020	Frederick Research Center	General Audience: 1000	https://www.sigmalive.com/news/market-news/666734/anaptyksi-kainotomou-ylikou-apo-apovlita-gia-efarmogi-se-

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
								prosopseis-ktirion
	Published on 25/10/2020	"Καινοτόμα Προϊόντα από Οικοδομικά Απόβλητα"	Present the consortium's relevant research activities	General Audience	Cyprus 25/10/2020	Frederick Research Center, UCY, Pharmakas	General Audience: 1000	*Phileleftheros Newspaper, Sunday, 25/10/2020, p.25*
Leaflet	Has been developed	Leaflet	Presents the basic information and serves as the "business card" to be distributed by the project partners to any occasion.	Collaborator, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises, Municipalities, General audience	November 2020	STRATAGEM		*Can be found on the website*
Newsletter	Has been developed	Newsletter #1	Gives an overview of the project's objectives, mission, impact	Collaborator, EU projects, companies, Academic institutions,	February 2021	STRATAGEM	Sent to 193 recipients	*Can be found on the website and den d to the subscribers*

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
			and consortium partners.	Research Institutions and Innovative Enterprises, Municipalities, General audience.				
Social Media	Has been developed	LinkedIn account	Present our results and achievements through the LinkedIn platform to enhance the communication and dissemination strategy.	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises, Municipalities, General audience	September 2020	STRATAGEM		https://www.linkedin.com/company/defeat-project/?viewAsMember=true
	Has been developed	Facebook account	Present our results and achievements through the Facebook platform to enhance the	Collaborators, EU projects, companies, Academic institutions, Research Institutions and	September 2020	STRATAGEM		https://www.facebook.com/DEFEAT-105407267904655/?view_public_for=105407267904655

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
			communication and dissemination strategy.	Innovative Enterprises, Municipalities, General audience				
	Has been developed	Twitter account	Present our results and achievements through the twitter platform to enhance the communication and dissemination strategy.	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises, Municipalities, General audience	September 2020	STRATAGEM		https://twitter.com/DEFEAT85269725
Website	Has been Launched	Project website	Present the project overview, objectives, mission, impact, results and consortium.	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises,	December 2020	STRATAGEM		http://defeat.frederick.ac.cy/

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
				Municipalities, General audience				
Participation to an Event other than a Conference or a Workshop	Organized on 27/11/2020	Online Research Promotion Event "European Researchers' Night"	Event aimed at familiarizing the public with the world of science and research and at the same time strengthening the public image of researchers, as well as highlighting the important role they play in society.	General Audience	Cyprus 27/11/2020	Frederick Research Center	General Audience: 1000	*European Researchers Night (vfairs.com)*

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4.6.6 Internal Dissemination Activities

Internal dissemination activities include all the meetings in which the partners of the consortium gather to exchange ideas, disseminate the results from their work to the consortium partners and decide on the future activities.

4.6.6.1 DEFEAT Kick off Meeting

The DEFEAT kick-off meeting took place on the 1st of July 2020 virtually. The meeting was attended by all consortium partners.

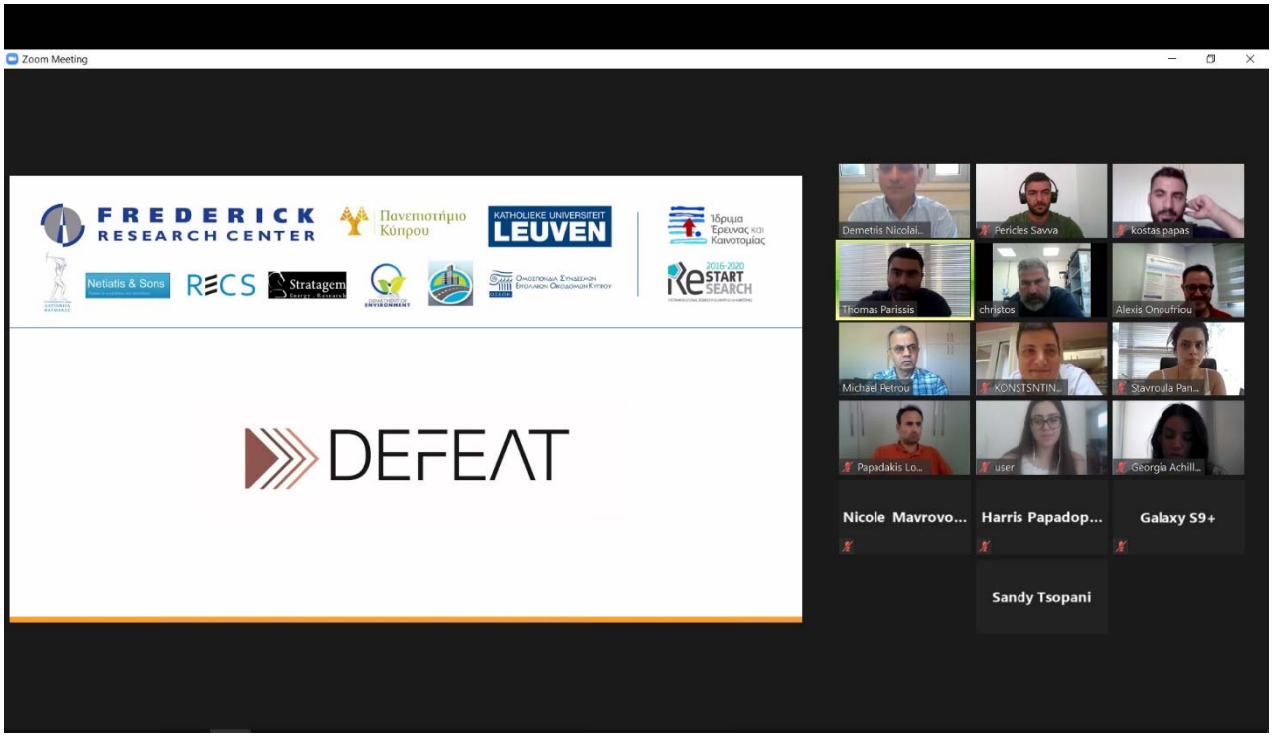

Figure 7. DEFEAT virtual Kick off Meeting

The goals of the meeting were to clarify contractual obligations – towards RIF and between partners (Consortium Agreement - CA), to present objectives, work structure (work packages), organization and management of the project, to clarify financial issues and administrative tasks (reporting), to present exploitation and management of the results and last but not least to initiate good communication, good collaboration, working relations and enthusiasm.

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The meeting started with the coordinator presenting the scope of the project, the work packages, the milestones and the deliverables. After that, each partner presented their entity, their role to DEFEAT project and their expectations of the project's results. Additionally, issues related to the commencement, management, finance and technicalities of the project were presented and discussed. Before the end of the meeting a fruitful discussion regarding the project was conducted.

4.7 Dissemination activities from M6 to M18 of the project running

4.7.1 DEFEAT newsletter

The first 6 months of the project, the first newsletter was developed and distributed to 193 recipients on February 2021.

During September 2021, the second newsletter was developed and distributed to 197 recipients. The second newsletter emphasized on the progress of the work during the latest months, as well as the new equipment purchased. Moreover, the most important meetings and events were listed.

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DEFEAT

Development of an Innovative Insulation Fire Resistant Facade from the Contruction and Demolition Waste.

Newsletter

2nd Issue: September 2021

DEFEAT Highlights

Work Progress

Despite the difficulties and limitations deriving due to the Covid-19 pandemic, the DEFEAT project is progressing well, with small deviations from the original timeframe:

√ Several deliverables have been prepared and submitted on time.

√ The Project Management and Monitoring is progressing and reports such as Consortium Agreement, Project Management Plan, and Risk and Mitigation Plan have been developed.

√ The Initial Dissemination, Exploitation and Innovation Management strategies have been defined.

The optimization of the Construction and Demolition Waste (CDW) separation process in order to produce "clean" wastes, through the image processing has been moving forward. The necessary equipment consisted by a 3D-camera and two robots have been purchased from specialized companies from abroad. The equipment has been assembled and research is currently being conducted on the "training" of the robots through machine learning techniques. A small-scale application of the image processing on the CDW separation will be organized as soon as the technical work will be completed.

CDW Robotic Separation System

Robotic Arm

The "in-lab" full characterization of the waste concrete and ceramics derived from the CDW separation is fully completed.

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Figure 8. First page of the Newsletter #2

Both newsletters can be accessed from the website via this link:

http://defeat.frederick.ac.cy/index.php/defeat-media/publications .

4.7.2 Participation at events and publications

From M6 to M18 of the project and due to COVID-19 pandemic, the consortium partners attended most of the events, which were not cancelled, virtually. The following activities such as events and publications took place from M6 to M18 of the project's runtime.

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Table 4. Communication and Dissemination Activities took place from M6 to M18 of the Project's running.

TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
Press release - Article	Published	Turning waste from Construction into something useful	Inform general audience about DEFEAT project and its objectives.	General audience	Cyprus Mail, 05/05/2021	Frederick Research Center (FRC)	Approx. 1000	https://cyprus-mail.com/2021/05/05/turning-construction-waste-into-something-useful/
Leaflet	Distribute leaflet on the 3rd Conference on the Design and Construction Buildings	Leaflet	Distribute the leaflet to the audience and inform them about the Project.	Contractors, Land Development companies, architects, civil engineers, geotechnical engineers, mechanical engineers, transport engineers, environmental engineers, electrical engineers, surveyors, urban and regional designers, etc.	11/11/2021 Nicosia, Cyprus	STRATAGEM	Approx. 200	http://defeat.frederick.ac.cy/index.php/news-events/128-defeat-in-the-3rd-conference-on-the-design-and-construction-of-buildings
Newsletter	Distribute	Newsletter #1	Gives an overview of the project's objectives, mission,	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative	February 2021	STRATAGEM & FRC	193	http://defeat.frederick.ac.cy/docs/DEFEAT_newsletter.pdf

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
			impact and consortium partners.	Enterprises, Municipalities, General audience				
	Develop and distribute	Newsletter #2	Gives an overview of progress, new equipment purchased, internal communication and dissemination	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises, Municipalities, General audience	September 2021	STRATAGEM & FRC	197	http://defeat.frederick.ac.cy/docs/DEFEAT_newsletter_2.pdf
Social Media	Launched	Posts on LinkedIn account	Present our results and achievements through the LinkedIn platform to enhance the communication and dissemination strategy.	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises, Municipalities, General audience	From M6 to M18	STRATAGEM		https://www.linkedin.com/company/defeat-project/?viewAsMember=true
	Launched	Posts on Facebook account	Present our results and achievements	Collaborators, EU projects, companies, Academic institutions,	From M6 to M18	STRATAGEM		https://www.facebook.com/DEFEAT-

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
			through the Facebook platform to enhance the communication and dissemination strategy.	Research Institutions and Innovative Enterprises, Municipalities, General audience				105407267904655/?view_public_for=105407267904655
	Launched	Posts on Twitter account	Present our results and achievements through the twitter platform to enhance the communication and dissemination strategy.	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises, Municipalities, General audience	From M6 to M18	STRATAGEM		https://twitter.com/DEFEAT85269725
	Launched	YouTube account	Present the Project's demonstration video for the moment	General Audience	December 2020	STRATAGEM		https://www.youtube.com/channel/UCwmVxkiHDbq4ZBWx1Uevh0g

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
Website	Launched	Posts and updates on the Project website	Present the project overview, objectives, mission, impact, results and consortium.	Collaborators, EU projects, companies, Academic institutions, Research Institutions and Innovative Enterprises, Municipalities, General audience	From M6 to M18	STRATAGEM & FRC		*http://defeat.frederick.ac.cy/*
Participation to an Event, Conference, Workshop, exhibition	Participated	3rd Conference on the Design and Construction of Buildings	Analyze the latest data and the future trends of the construction industry.	Contractors, Land Development companies, architects, civil engineers, geotechnical engineers, mechanical engineers, transport engineers, environmental engineers, electrical engineers, surveyors, urban and regional designers, etc.	11/11/2021 Nicosia, Cyprus	STRATAGEM	Approx. 200	*https://www.imhbusiness.com/3%CE%BF-%CF%83%CF%85%CE%BD%CE%AD%CE%B4%CF%81%CE%B9%CE%BF-%CE%AD%CE%BA%CE%B8%CE%B5%CF%83%CE%B7-%CF%83%CF%87%CE%B5%CE%B4%CE%B9%CE%B1%CF%83%CE*

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
								%BC%CE%BF%CF%82-%CE%BA%CE%B1%CE%B9-%CE%BA%CE%B1%CF%84%CE%B1%CF%83%CE%BA%CE%B5%CF%85%CE%AE%CF%82-%CE%BA%CF%84%CE%B9%CF%81%CE%AF%CF%89%CE%BD
	Organized	Stakeholders' workshop for discussion of questionnaires contents and format	Organization of stakeholders' workshop to finalize contents and format of drafted questionnaires (D10.1)	DEFEAT Project's partners and other stakeholders (Public entities, Standardization Bodies, Architects, Civil Engineers, Academics, Commercial Federations, etc.)	19/05/2021 Online	Frederick Research Center	Approx. 20	Online Event

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
	Organized	Internal Exploitation and IP Management Workshop	Organization of project's partners workshop to inform regarding their contribution for the preparation of Exploitation and IP Strategy	DEFEAT Project's partners	4 sessions during October 2021	STRATAGEM	Approx. 10	Online Events
	Participated	Researcher's Night in Cyprus	Event aimed at familiarizing the public with the world of science and research and at the same time strengthening the public image of researchers, as well as highlighting the important role they play	Students and General Audience	November 2021	Frederick Research Center (FRC)	Approx. 500	Online Event

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TYPE	Status	Title	Objective	Type of Audience reached	Date & Place	Partner involved	Audience size (Approx.)	Website/Link
			in society					
Non-scientific and non-peer-reviewed publication								
Journal Publications	Published	Fire resistance behaviour of geopolymer concrete: An overview.	Review the state-of-the-art related to fire resistant geopolymer materials	Scientific audience, researchers, etc.	Buildings, 11, 82, 2021.	Frederick Research Center (FRC)	Approx. 50	*https://www.mdpi.com/2075-5309/11/3/82*
Other (not listed)								

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4.7.3 Internal dissemination activities

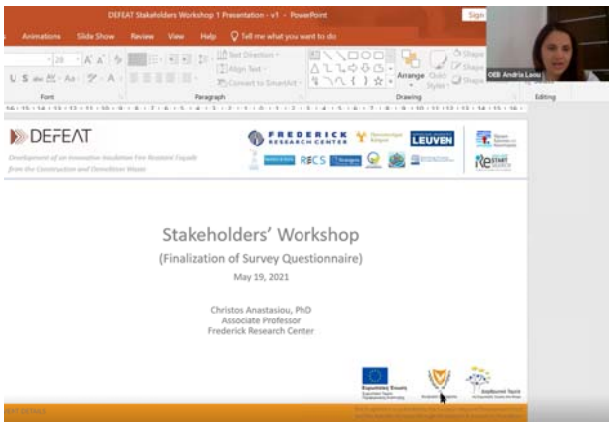
Internal dissemination activities include all the meetings or workshops in which the partners of the consortium gather to exchange ideas, disseminate the results from their work to the consortium partners and decide on the future activities.

4.7.3.1 1st Steering Committee Meeting

The 1st Steering Committee Meeting of the DEFEAT Project took place on the 1st of December 2020. The aim of the meeting was to review the project's progress, make decisions related to project's technical and other issues as well as synchronize the technical research progress across the WPs. All the Work Package leaders along with the Task Leaders presented their Work Package status, technical or other issues, delays, planned actions and deliverable status.

4.7.3.2 Stakeholder's Workshop

A workshop organized by Frederick Research Center (FRC) took place virtually on the 19th of May 2021, in which the research team presented the draft version of the questionnaire prepared for the needs of WP10.



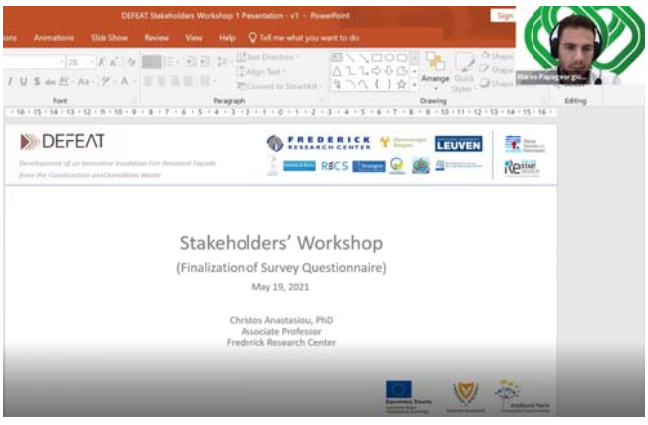


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Figure 9. Stakeholder's Workshop

A number of stakeholders attended the workshop and expressed their ideas regarding the finalization of the questionnaire. The questionnaire aimed to solicit the opinions and perceptions of important stakeholders related to the reuse of CDW in Cyprus. The questionnaire is divided into different sections; general information, social, economy, feasibility, environment, political, technical, awareness and participation, CDW recycling and reuse. The questions are mainly structured so that the resulting analysis will generally follow standard statistical approaches. The content and format of the questionnaire was extensively discussed among the partners and stakeholders to ensure that is understandable and comprehensive. The attendees of the workshop expressed their concerns for some points and their suggestions were incorporated into the questionnaire, which was disseminated among the targeted stakeholders' groups during October 2021. The stakeholders' groups which need to answer the questionnaires include CDW contractors, construction companies, waste management experts, private organizations and agencies, as well as related governmental entities. The stakeholders spread the questionnaire to their networks in order to have a representative sample.

4.7.3.3 2nd Steering Committee Meeting

The second Steering Committee Meeting of the DEFEAT Project took place virtually on the 30th of September of 2021.

Figure 10. 2nd Steering Committee meeting

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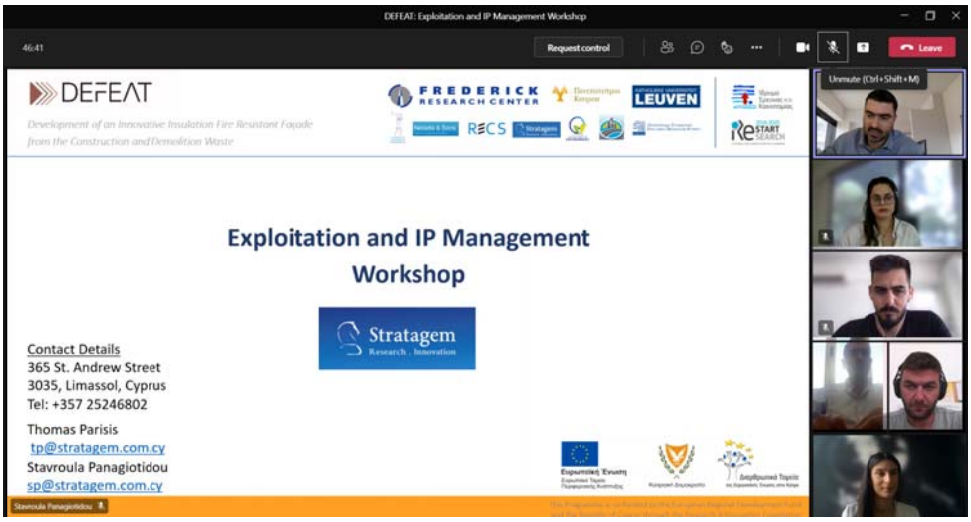
The main meeting's objective was the control of deliverables progress and review process. Work Package Leaders presented their Work Package status, technical or other issues, delays, planned actions and deliverable status. At the end of the event, participants discussed further actions to set in place to ensure the quality of deliverables.

4.7.3.4 Internal Workshop on Exploitation and IP Management

STRATAGEM, Innovation Manager of the DEFEAT Project, organized 4 sessions during October 2021 with the thematic topic "Exploitation and IP Management Workshop". The workshops aimed to provide the essential fundamental knowledge regarding the Innovation Management and how to prepare the exploitation, dissemination and communication strategy of the Project's results.



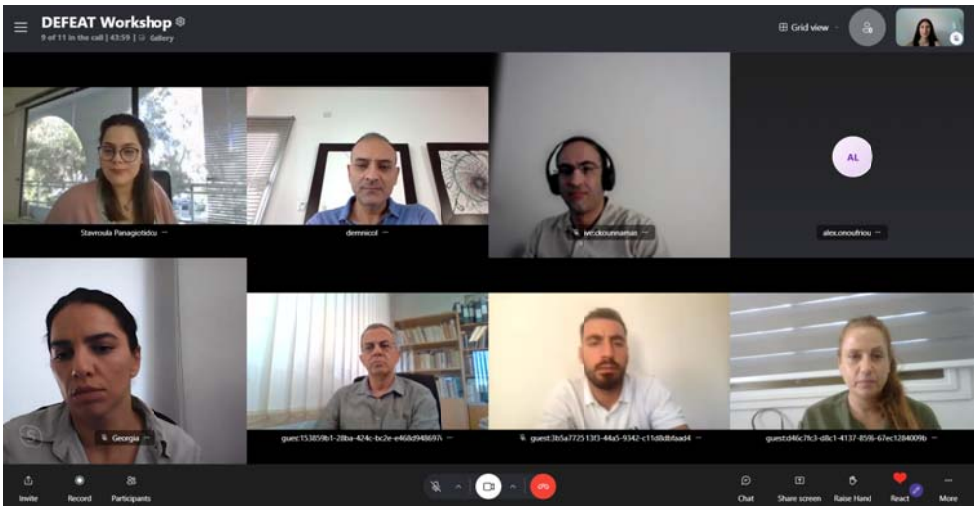


Figure 11. STRATAGEM's workshop session

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Moreover, the purpose of the workshop was to provide the consortium Partners with background knowledge so as to design and prepare their organization's preliminary Exploitation Strategy and identify the protection routes of their Intellectual Property Rights within the frame of the DEFEAT project.

During the workshop, the Project Partners discussed about the Exploitation Routes which can be followed for the results of the DEFEAT project and also, about their strategy for the management and protection of Intellectual Property which will be created in the project and which is also an integral part of Innovation Management.

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5. Exploitation Plan

The outcomes of the DEFEAT project are expected to find several uses in major segments of the building and construction industry and related fields, such as prefabricated buildings & constructions companies, building & construction materials companies, CDW recycling companies, waste management companies, environmental management companies and companies in the wider construction sector. The new insulation fire resistant façade will have a high innovation potential and market impact as it will provide a sustainable product into an existing industrial segment.

Focusing initially on the Cypriot market, the exploitation of the DEFEAT technology and façade will start by contacting customers at the prefabricated buildings & constructions sector. Furthermore, additional markets will be investigated (i.e. broader construction sector). As a later step, the novel technology will be disseminated throughout the rest of the Europe, partners will be sourced and new distribution agents will be required to retail technology in secondary markets.

The DEFEAT product and technology exploitation will provide growth opportunities and competitive advantages to every involving participant. All the participants will be able to outsource research results, acquire technical know-how and train their members or employees to incorporate new developments, while contributing to EU strategy for economic growth. It will also provide significant economic impact, initially to the Cypriot and secondly to the European economies, from increase of exports and reduction of imports. Moreover, it will provide clear economic and environmental impact on Cypriot economy from conservation of raw materials and reduction of energy, as well as restriction of hazardous materials.

5.1 Market analysis, identification of competitors and potential users

Prefabricated Buildings Market

The building prefabrication is the process of developing buildings by using certain building systems, in order them to be ready to install onsite when needed[2].

[2] Future, M. R. (2020, October). Prefabricated Buildings Market Information Report by Product. Retrieved from https://www.marketresearchfuture.com/reports/prefabricated-buildings-market-5171

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The global prefabricated buildings market estimated at US$106.1 billion in 2020[3] and the projections show that it is about to reach US153.7 billion until 2026, growing at a CAGR (Compound Annual Growth Rate) of 6.4 % over the analysis period. The biggest players of the market are recorded to be the USA and China, as they are currently the world's two strongest economies. The US market is estimated at US $20.2 Billion in the year 2021, offering to the country a share of 18.3% in the global market. China, is the world's second largest economy and it is projected to reach a market value of 38.2 billion by year 2026, recording a CAGR of 7.9% through the analysis period.

The European prefabricated buildings market was valued USD 24 billion in 2020[4] and it is forecasted to reach USD 32 billion by 2026, growing at a CAGR of almost 4% during the reporting period. The United Kingdom and Germany seem to gain the largest European market shares. The European market is oriented in satisfying the market needs of sustainable and ecofriendly prefabricated buildings and it is growing respectively to this demand.

The global economies and consequently the prefabricated buildings markets in 2020 seem to be affected by the global COVID-19 social and health crisis, which has affected the growth rates and the market size, as the uncertainty that the virus outbreak caused and the lockdown restrictions leaded to the interruption or postponement of lots of housing and other projects. However, the immediate need of hospitals and other quarantine buildings has caused an increase in prefabricated materials for these kinds of projects. In addition, analysts believe that the development of the global real estate and housing markets will depict the growth of the prefabricated buildings, as well. In addition, the extended renovation activities that are observed globally as well as the trend to building aesthetic improvement interventions, is believed that will increase the acceptance and demand of prefabricated buildings globally, as well as the increase in urbanization and industrialization[5]. Analysts have also shown that, the latest years globally, the prefabricated construction companies appear a trend to develop buildings oriented in energy

[3] Global Industry Analysts, I. U. (2021, December). *STRATEGYR.COM*. Retrieved from https://www.strategyr.com/market-report-prefabricated-buildings-forecasts-global-industry-analysts-inc.asp

[4] Markets, R. a. (2021, April 30). *Europe Prefabricated Building Market Outlook Report 2021*. Retrieved from https://www.globenewswire.com/news-release/2021/04/30/2220436/28124/en/Europe-Prefabricated-Building-Market-Outlook-Report-2021-Market-Size-was-Valued-at-24-Billion-in-2020-and-is-Likely-to-Reach-32-Billion-in-2026.html

[5] Linker, R. (2021, December). *Modular and Pre fabricated non residential building construction global market report 2022*. Retrieved from https://www.reportlinker.com/p06193671/Modular-and-Prefabricated-Nonresidential-Building-Construction-Global-Market-Report.html?utm_source=GNW

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efficiency, less development time, cost and energy saving, green construction, CO_2 reduction and less waste.

The research has also revealed that there are three main factors which are going to play major role in the configuration of the prefabricated buildings market in the following period. Firstly, the high demand for turnkey solutions, ranks the prefabricated buildings as one of the most suitable choices of providing complete an end-to-end integrated building solution. Also, the space constraints in big cities is a key factor of the prefabricated buildings market size. The urbanization rates constantly increase and the demand for buildings constructions is increased respectively. Countries such as China, India and Nigeria appear to be the countries with the highest urban growth, when in North America 83.6% of the population was urban in 2020. Furthermore, the constant increase of the demand for high-end customized buildings[6] is another important factor which is projected to boost the prefabricated buildings market growth in the following years.

Some of the major players who have presence in the prefabricated buildings industry globally, are the following:

- Lindal Cedar Homes Inc
- Red Sea Housing Services
- Astron Buildings
- United Partition Systems
- Butler Manufacturing Company
- Ritz-Craft Corporation
- Champion Home Builders
- Kirby Building Systems LLC
- Par-Kut Internationals
- Algeco Scotsman
- Modern Prefab Systems
- GRAITC Groups

[6] Markets, R. a. (2021, April 30). *Europe Prefabricated Building Market Outlook Report 2021*. Retrieved from https://www.globenewswire.com/news-release/2021/04/30/2220436/28124/en/Europe-Prefabricated-Building-Market-Outlook-Report-2021-Market-Size-was-Valued-at-24-Billion-in-2020-and-is-Likely-to-Reach-32-Billion-in-2026.html

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Fire Resistant Insulation Materials for the Construction Industry Market

Fire resistant insulation materials are materials that are no combustible or limited combustible, under certain circumstances and their usage is essential in residential and nonresidential buildings as they are able to offer a reasonable amount of time to the humans to abandon the flaming building, as well as to the firefighting services to eliminate and control the fire.

Global fireproof insulation market size valued USD 25.9 billion in 2020 and is projected to exceed a CAGR of 4% from 2021 to 2027[7]. The global fireproof insulation market is projected to grow rapidly in the following years and several factors will be combined to achieve this growth. The high rise of the residential and nonresidential construction sector has as consequence the increase of the usage of fireproof insulation materials. Also, the use of fire-resistant insulation materials is expected to increase in areas where forest fires is a major concern and danger. Forest fires affect highly the flora and the green lunges and atmosphere of the planet, when the gas emissions seem to affect the climate change and greenhouse phenomenon[8,9]. Another important factor is that the increased fire incidents in the building and construction sector have led governments to tighten the existing safety regulations related to the fireproof protection, especially in the commercial and manufacturing sectors, where flammable materials such as gas and oil are widely used.

Europe held a share of about 40% of the global fire-resistant insulation materials market in 2020, classified as the biggest market worldwide, when Italy, Germany, UK and France are estimated as the biggest markets within Europe, respectively. The European market is also expected to grow more until 2027, as a consequence of the tightened government safety regulations and notes in the construction sector (residential, commercial and industrial) as well as of the continuous growth of the construction sector especially in the most developed countries.

North America also accounts a large cumulative share in the global market, when Asia Pacific is predicted to have an extremely high CAGR until 2024, as many safety-related government initiatives are being given. Asia Pacific countries, driven by India, Japan and China seem to make

[7] Insights, G. M. (2020). *Fireproof Insulation Market Size By Material*. Retrieved from https://www.gminsights.com/industry-analysis/fireproof-insulation-market

[8] Insights, G. M. (2020). *Fireproof Insulation Market Size By Material*. Retrieved from https://www.gminsights.com/industry-analysis/fireproof-insulation-market

[9] FIORMARKETS. (2021, 11 01). *Global Fireproof Insulation Market Is Expected to Reach USD 24.93 billion by 2028 : Fior Markets*. Retrieved from https://www.globenewswire.com/news-release/2021/11/01/2324936/0/en/Global-Fireproof-Insulation-Market-Is-Expected-to-Reach-USD-24-93-billion-by-2028-Fior-Markets.html

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an effort to enforce the environmental concerns through these initiatives, in order to eliminate the greenhouse gases emissions[10].

The fireproof insulation market can be segmented by various characteristics, such as the materials application (residential or commercial buildings), the region that they are being marketed (Europe, North America, Asia Pacific, Middle East and Africa and Latin America) and the kind of this material. The most common materials that are currently used in order to offer fire insulation are:

- Cellulose
- Fiberglass
- Polystyrene (EPS)
- Polyurethane Foam and
- Mineral Wool[11].

The global fire-resistant insulation market is characterized by the presence of big players in the role of manufacturers. These manufacturers, produce fireproof insulation materials that are used globally in the construction sector and the most important of them are the following:

- Knauf Insulation GmbH
- Rockwood International A/S,
- Owens Corning Corporation
- Saint-Gobain SA
- BASF SE
- Berkshire Hathaway Inc.
- Paroc Oy

[10] Research, T. M. (2016). *Fireproof Insulation Market - Global Industry Analysis, Size, Share, Growth, Trends, and Forecast 2016 - 2024*. Retrieved from https://www.transparencymarketresearch.com/fireproof-insulation-market.html

[11] FIORMARKETS. (2021, 11 01). *Global Fireproof Insulation Market Is Expected to Reach USD 24.93 billion by 2028 : Fior Markets*. Retrieved from https://www.globenewswire.com/news-release/2021/11/01/2324936/0/en/Global-Fireproof-Insulation-Market-Is-Expected-to-Reach-USD-24-93-billion-by-2028-Fior-Markets.html

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Structural Insulated Panels Market

Structural Insulated Panel is a high-performance building system, which is used in the construction sector. The panels are consisted of 2 outer sheathings which are covering an inner sleeve of insulating foam. These panels result insulation, energy efficiency, cost effectiveness and shorter construction time periods, combined with lower labor costs[12].

The global structural insulated panels market is estimated USD 405 million in 2020 and it is expected to record a CAGR of 5% until 2025[13]. Even though the structural insulated panels industry is one of those which were badly impacted by the COVID-19, the characteristics of the structural insulated panels are going to be the main factors that will boost the market's growth in the following years. More specifically, the panels' energy efficiency adapts perfectly to the green trend the governments follow globally. In order to achieve a greener construction industry with less energy construction and manufacturing emissions, Governments set construction standards and regulations, which empower the structural insulated panels use. Also, the fact that structural insulated panels reduce the overall construction cost, in terms of man hands, energy, materials cost and installation cost and time, is also a key factor that will affect the market performance[14].

North America has been leading the global market in 2019, accounting a market share of about 38%[15]. The North American market is expected to witness wider growth in the following years, mainly because of governmental and commercial initiatives; the government updates the social infrastructures (governmental buildings, hospitals etc.) when the US Census Bureau provides continuously more permits for residential building developments because of the trend in the US of multi – family buildings as well as because of the high increase of migration in big cities. At the same time the raised awareness about the benefits of insulation boosts the growth of the structural

[12] SIPA. (2021). *What are SIPs*. Retrieved from https://www.sips.org/what-are-sips

[13] Markets, M. a. (2020). *Structural Insulated Panels Market*. Retrieved from https://www.marketsandmarkets.com/ResearchInsight/structural-insulated-panel-market.asp

[14] Research, G. V. (2021, 02). *Structural Insulated Panels Market Size, Share & Trends Analysis Report By Product (Polystyrene, Polyurethane), By Application (Walls & Floors, Roofs), By Region (APAC, North America), And Segment Forecasts, 2021 - 2028*. Retrieved from https://www.grandviewresearch.com/industry-analysis/structural-insulated-panels-market

[15] Research, G. V. (2021, 02). *Structural Insulated Panels Market Size, Share & Trends Analysis Report By Product (Polystyrene, Polyurethane), By Application (Walls & Floors, Roofs), By Region (APAC, North America), And Segment Forecasts, 2021 - 2028*. Retrieved from https://www.grandviewresearch.com/industry-analysis/structural-insulated-panels-market

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insulated panels in the residential constructions, the cold chain infrastructures, and the commercial industry too – mainly in the logistics sector[16].

The Asia Pacific market is predicted to be the most fast-paced growing market in the following years, mainly because of the residential and commercial construction development. Middle East and Africa market are expected to record an important CAGR because of the development of the cold storage and cold chain infrastructures, constructions that require a highly effective insulation system to be applied.

Different materials are being used in order to compose the structural insulated panels. The most usually used are the following[17]:

- Polyisocyanurate (PIR)
- Polyurethane (PU)
- Expanded Polystyrene (EPS)
- Extruded Polystyrene (XPS)
- Metal Sheets

The above-mentioned materials lead to the development of structural insulated panels, which can be segmented by product type as following:

- Polystyrene Panels
- Polyurethane and Polyisocyanurate Panels
- Glass Wool Panels
- Others

By application, the structural insulated panels are categorized in three segments:

- Walls & Floors
- Roofs
- Cold Storage

[16] Intelligence, M. (2020). *STRUCTURAL INSULATED PANELS MARKET - GROWTH, TRENDS, COVID-19 IMPACT, AND FORECASTS (2021 - 2026)*. Retrieved from https://www.mordorintelligence.com/industry-reports/structural-insulated-panels-market

[17] Research, A. M. (2021, 07). *Structural Insulated Panels Market by Product Type (Polystyrene, Polyurethane Panels & Polyisocyanurate Panels, Glass Wool, and Others), Application (Walls & floors, Roofs, and Cold Storage) and End User (Residential and Nonresidential): Global Opportunit*. Retrieved from https://www.alliedmarketresearch.com/structural-insulated-panels-market-A12443

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It is recorded that the application of the structural insulated panels on walls and floors appear to be their most important application, as they significantly improve a building's energy efficiency. The obstacles in the transmission of the extreme temperatures (heat or cold) from the outside atmosphere to the inside area of the building also lead to energy cost savings.

Thousands of companies sell structural insulated panels globally, however the key players of the global market appear to be the following[18]:

- Owens Corning
- PFB Corporation
- Premier Building System
- Rautaruukki Corporation
- T. Clear Corporation
- ACME Panels
- American Insulated Panel
- Extreme Panel Technologies, Inc.
- In Green Systems
- Kingspan Group PLC

Construction industry

The global construction market was valued almost USD 11.7 trillion in 2020, and it is anticipated to witness a CAGR of 3.5% within the period 2022-2027 and it is expected to reach about USD 14.4 trillion value, until 2026. There are several factors that affect the market size and support its growth. The most significant of them are the rising disposal incomes, the constantly rising population, the urbanization rising, the growing residential infrastructure planned by governments,

[18] Markets, M. a. (2020). *Structural Insulated Panels Market.* Retrieved from https://www.marketsandmarkets.com/ResearchInsight/structural-insulated-panel-market.asp

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the rising foreign direct investments (FDI) flows in developing countries such as India, the growth in industrial and manufacturing infrastructure globally and others[19].

Asia Pacific was the first regional market in 2020, in terms of market shares, recording a cumulative share of 41% of the global market value[20]. Asia Pacific is also forecasted to keep the highest growth rate globally, in the following years, mainly because of the rapid economic growth in certain countries of the region which leads to numerous construction projects. In addition, the increase in the region's population is also a factor which empowers the market's growth. The rapid growth in industrial, commercial, and residential construction projects in the Middle East, which are also depicting the growth that is driven in the Middle East & Africa cluster[21].

European construction market is projected to keep a stable growth rate in the following years, driven mainly by increased renovation and residential needs. The United Kingdom is the leader of the region, in terms of projects volume[22].

Based on type, the global construction industry is divided in the following segments[23]:

- Building Construction
- Heavy & Civil Engineering Construction
- Specialty Trade Contractors
- Land Planning & Development

[19] EMR. (2021). *Global Construction Market: By End Use: Commercial, Residential, Industry, Education and Research, Medical and Health, Others; Regional Analysis; Historical Market and Forecast (2017-2027); SWOT Analysis; Porter's Five Forces Analysis; Competitive Landsca*. Retrieved from https://www.expertmarketresearch.com/reports/construction-market

[20] Research, E. (2021, 06). *Construction Market By Type (Building Construction, Heavy and Civil Engineering Construction, Specialty Trade Contractors, Land Planning and Development), By Building (Residential Building, Non-Residential Building), By Construction Machinery, By End-Use,*. Retrieved from https://www.emergenresearch.com/industry-report/construction-market

[21] Research, E. (2021, 06). *Construction Market By Type (Building Construction, Heavy and Civil Engineering Construction, Specialty Trade Contractors, Land Planning and Development), By Building (Residential Building, Non-Residential Building), By Construction Machinery, By End-Use,*. Retrieved from https://www.emergenresearch.com/industry-report/construction-market

[22] Research, E. (2021, 06). *Construction Market By Type (Building Construction, Heavy and Civil Engineering Construction, Specialty Trade Contractors, Land Planning and Development), By Building (Residential Building, Non-Residential Building), By Construction Machinery, By End-Use,*. Retrieved from https://www.emergenresearch.com/industry-report/construction-market

[23] Research, E. (2021, 06). *Construction Market By Type (Building Construction, Heavy and Civil Engineering Construction, Specialty Trade Contractors, Land Planning and Development), By Building (Residential Building, Non-Residential Building), By Construction Machinery, By End-Use,*. Retrieved from https://www.emergenresearch.com/industry-report/construction-market

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Building construction owns the biggest share in the construction market and is projected to have a stable growth until 2028. The building construction can be divided into residential and nonresidential building. The rise of the disposable income, the rise of the urban population and the trend to develop greener, environmentally friendly homes are three main factors that depict the sector's projected growth until 2028. The nonresidential segment is expected to keep growing with a lower but stable growth rate than the residential one.

Land planning and development segment is forecasted to record a higher revenue growth between the four segments until 2028. This growth will be driven by the increasing awareness regarding the optimal utilization of the environmental resources, paired with the continuously updated governmental environmental directions in the constructions sector.

The term "construction" refers to the procedure of creating commercial, institutional or residential infrastructures like bridges, buildings, roads, and other structures. Based on end-use, the construction industry can be divided into[24]:

- Housing
- Commercial
- Industry
- Education and Research
- Medical and Health
- Others

The housing segment is expected to gain the biggest share between the others in terms of revenue, until 2028 and this is because of factors like urbanization, trend of the citizens to own their own house, need of housing buildings equipped with the latest technological trends. The commercial segment is anticipated to face an expeditious growth rate, mainly because of the increase in the investments in commercial activities, driven by the increase of the global disposable income. The healthcare segment is expected to record a rapid increase as well. This is because of the extended

[24] EMR. (2021). *Global Construction Market: By End Use: Commercial, Residential, Industry, Education and Research, Medical and Health, Others; Regional Analysis; Historical Market and Forecast (2017-2027); SWOT Analysis; Porter's Five Forces Analysis; Competitive Landsca*. Retrieved from https://www.expertmarketresearch.com/reports/construction-market

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needs of healthcare facilities due to the high urbanization as well as to the trend to wellness and wellbeing. Covid-19 crisis has revealed an extra need of development of healthcare facilities.

The global construction market is constituted by major organizations which share a huge amount of revenues and market shares respectively. Some of the key players in the global market are:

- China State Construction Engineering Co., Ltd.
- Al Habtoor Group LLC
- Larsen & Tourbo Ltd.
- Bauer Group Ltd.
- China Communications Construction Group Ltd.
- Skanska AB
- Vinci SA
- Actividades de Construccion Y Servicios SA
- Bechtel Corporation
- Samsung C&T Corporation

The key players of the market are strategy makers, early adopters of new technologies and in general compete each other in an advanced level, driving the whole market beyond.

5.2 Patent application

According to the pilot results, the consortium will apply for a national patent to protect its right over the whole procedure, as well as the final application, to protect the intellectual property. A way to safeguard the intellectual property is by timely filing for patent applications. Deliverable 9.1 “Patent application” which will be submitted on M36, will include the activities required for preparing the necessary information for submitting patent application for the new products.

A crucial step before that process is to carry out extended patent searches on existing patents, as well as on patents published across the duration of the project, as the partners need to have a clear picture on whether their results resemble already patented innovation. This is precisely the scope of this scope; identifying the most important patent applications which are related with the DEFEAT target. According to the European Patent Office, Article 52 states: “European patents

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shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application.[25]"

The basic principles of patentability are:

- Article 54 [26], An invention is considered to be new if it does not form part of the state of the art. The definition of the state of the art in the EPC reflects the principle of absolute novelty: the state of the art comprises everything made available to the public anywhere in the world by means of a written or oral description, by use, or in any other way, before the date of filing or priority. However, novelty is prejudiced only by something which is clearly disclosed to a skilled person in a single source of prior art, e.g. in a patent application published before the date of priority.
- Article 55 [27], An earlier disclosure of the invention is non-prejudicial only if it occurred no earlier than six months before the filing of the European patent application and was due to an evident abuse in relation to the applicant or to display at an exhibition falling within the terms of the Paris Convention on international exhibitions. Except in these two cases, the second of which is rare in practice, any disclosure of the invention before the date of filing or, if applicable, the earliest priority claimed can be cited against the applicant as forming part of the state of the art, even if the applicant himself was responsible for the disclosure.

The importance of the patent search lies mostly on the following reasons:

- to detect opportunities
- to define exploitable results of the project
- to ensure that all new knowledge and intellectual property generated by the DEFEAT project is managed correctly and adequately protected
- to identify any prior disclosures, complementary IPR or other relevant data, assessing novelty and patentability

Therefore, this study will provide the consortium with an overview of what already exists as a patent. The benefits out of this search is to ensure that there are some chances of patentability of the results, to prove the uniqueness of the invention, improve the probabilities of patent success by modifying the invention to be more unique compared to what already exists.

[25] European Patent office, 14/12/2021 https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ar52.html
[26] European Patent office, 14/12/2021 https://www.epo.org/law-practice/legal-texts/html/epc/2020/e/ar54.html
[27] European Patent office, 14/12/2021 https://www.epo.org/law-practice/legal-texts/html/epc/1973/e/ar55.html

Ευρωπαϊκή Ένωση Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
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The patent search was realized via the online service "Espacenet", a service for searching patents and applications. This service was developed by the European Patent Office (EPO) in cooperation with the member states of the European Patent Organization. By using the advance search of Espacenet service, it was selected as the desired collection to search in, the Cypriot collection of published applications at first, and second for the rest of the World. Additionally, the different combination of keywords was selected to be searched in the title and/or title or abstract.

The scope of the Patent Search was to find the most important patent applications or granted patents which are related with DEFEAT target. An initial patent search was conducted first for the main product of this project, the DEFEAT insulation fire resistant façade made out of CDW, which derives from the innovative separation and transformation method.

Table 5. Patent search results in Cyprus

Patent search among Cypriot published patent applications[28]			
Keyword	insulation fire resistant façade	**No of total results**	0
Keyword	fire resistant	**No of total results**	0
Keyword	façade	**No of total results**	0
Keyword	πυράντοχη πρόσοψη	**No of total results**	0
Keyword	πρόσοψη	**No of total results**	4 / irrelevant
Keyword	πυρίμαχη πρόσοψη	**No of total results**	0
Keyword	Θερμομόνωση	**No of total results**	0
Keyword	Θερμομονωτικά υλικά	**No of total results**	0

[28] https://www.epo.org/searching-for-patents/technical/espacenet/national.html

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Table 6. Patent search results Worldwide

Patent search among Worldwide published patent applications			
Keyword	insulation fire resistant façade	**No of total results**	15
Application Number	**Title**		
GB2590769 (A)	Thermal insulation cladding of the outer wall of a building with increased resistance to fire risk and the panel for making such cladding		
CN208981643 (U)	Assembly type light steel skeleton prefabricated composite outer wall		
GB2573385 (A)	Fire stopping thermal break balcony bracket		
CN208698040 (U)	High -efficient thermal -insulated heat preservation pressfitting machine		
WO2019011361 (A1)	SYSTEM OF COMPONENTS FOR CONSTRUCTING A HIGH-RISE BUILDING FAÇADE THAT COMBINES HIGH FIRE-RESISTANT THERMAL INSULATION WITH A LOW AREA REQUIREMENT, AND METHOD FOR PRODUCING SAID SYSTEM		
CN207194355 (U)	Isolated fire prevention external thermal insulation system		
WO2017076122 (A1)	FRAME-MOLD INTEGRATED LIGHTWEIGHT EARTHQUAKE-RESISTANT WALL PANEL		
WO2016074658 (A1)	FAÇADE SYSTEM FOR THE RENOVATION OF OLD BUILDINGS BY MEANS OF FIRE-RESISTANT FAÇADE ELEMENTS OF HIGH THERMAL INSULATING EFFECT ON AN UNEVEN GROUND OF THE BUILDING WALL, AND METHOD FOR PRODUCING THE SAME		
WO2015193338 (A1)	FAÇADE SYSTEM HAVING FIRE-RESISTANT FAÇADE ELEMENTS HAVING A HIGH INSULATING EFFECT FOR FAÇADE CONSTRUCTION FOR HIGH-RISE BUILDINGS AND METHOD FOR PRODUCING SAID FAÇADE SYSTEM		
EP3015620 (A1); EP3015620 (B1)	Panel for the enclosure and external thermal insulation of façades and roofs, and the installation procedure		
DE102012020108 (A1)	System for fire protection of buildings, has overlying layer of insulation boards to face inclined surface of fire bolt inclined downwards in direction of building outer wall, and inclined surface is coated with fire retardant		
WO2012156765 (A1)	FACADE INSULATION BLOCK		
WO2011101439 (A2); WO2011101439 (A3)	OUTER BUILDING ELEMENT		
FR2582698 (A1)	Fire-resistant movable partition element, which may be filled with a fluid material, with acoustic and thermal insulation		
CN201053159 (Y)	Frame type sandwich thermal insulation board		
Keyword	Construction and demolition waste utilization	**No of total results**	0
Keyword	Construction and demolition waste	**No of total results**	24
Application Number	**Title**		
CN213529046 (U)	Demolition and construction waste sand making line		
US2021163354 (A1)	A NOVEL MASONRY MATERIAL UTILIZING RECYCLED		

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	CONSTRUCTION & DEMOLITION WASTE
US2021002174 (A1)	METHOD FOR OBTAINING RECYCLED AGGREGATES, MATERIALS AND PRODUCTS FOR CONSTRUCTION BY THE RECYCLING OF CONSTRUCTION AND DEMOLITION WASTE
CN110976478 (A); CN110976478 (B)	Resourceful treatment process for demolition and construction waste and decoration waste
CN110348096 (A)	Carbon emission calculation method and system for demolition of construction waste, and storage medium
CN109967201 (A)	Novel construction waste treatment and sorting system of demolition and demolition of illegal construction
US10695806 (B2); US2018056344 (A1)	METHOD OF UTILIZING CONSTRUCTION AND DEMOLITION WASTE
WO2018029087 (A1)	PROCESS FOR TREATING HOUSEHOLD WASTE AND EXPLOITING CONSTRUCTION AND DEMOLITION RUBBLE AND PLASTIC WASTE FOR THE PURPOSE OF RECYCLING SAME AND CONVERTING SAME INTO VARIOUS CONSTRUCTION MATERIALS
CN106643365 (A); CN106643365 (B)	Tunnel waste second lining blasting demolition and repairing construction method
WO2015081402 (A1)	UNIT FOR PRODUCING POZZOLANIC CEMENT OF LOW ENVIRONMENTAL IMPACT, OBTAINED FROM MIXED CONSTRUCTION AND DEMOLITION WASTE (CDW), PROCESS AND RESULTING PRODUCTS FOR CIVIL ENGINEERING
KR101396548 (B1)	THE ESTIMATION DEVICE AND METHOD FOR GENERATION OF CONSTRUCTION WASTE DURING CONSTRUCTION AND DEMOLITION PHASE
US2014068963 (A1); US9239187 (B2)	PROCESS FOR EXTRACTION OF WATER FROM MUNICIPAL SOLID WASTE, CONSTRUCTION AND DEMOLITION DEBRIS, AND PUTRESCIBLE WASTE
US2008041998 (A1)	Material processor apparatus and method for recycling construction and demolition waste
US6382425 (B1)	Mobile system for recovering material from construction waste and demolition debris
US2008041982 (A1)	CONSTRUCTION AND DEMOLITION WASTE RECYCLING SYSTEM AND METHOD
KR20050050320 (A)	SORTING METHOD AND EQUIPMENT OF CONSTRUCTION AND DEMOLITION WASTE
KR100546459 (B1); KR20040090633 (A)	WATER SPRINKLING APPARATUS FOR PREVENTING DUST SCATTER WHEN TREATING CONSTRUCTION/DEMOLITION WASTE
KR100504329 (B1); KR20040090632 (A)	APPARATUS FOR SEPARATING FOREIGN MATERIALS FROM CONSTRUCTION/DEMOLITION WASTE AFTER THE CONSTRUCTION/DEMOLITION WASTE BEING FIRSTLY SORTED
KR100523244 (B1); KR20040078976 (A)	METHOD FOR CRUSHING AND SORTING OUT CONSTRUCTION AND DEMOLITION WASTE
KR100404922 (B1)	DEVICE FOR RECYCLING SAND BY USING CONSTRUCTION

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	AND DEMOLITION WASTE
JP2004255362 (A)	METHOD OF PRODUCING FUEL FOR BURNING CEMENT BY DRYING CONSTRUCTION AND DEMOLITION WASTE AND ITS DEVICE
JP2003028409 (A)	METHOD FOR UTILIZING CONSTRUCTION/DEMOLITION WASTE WOOD AS FUEL ALTERNATE
JP2002001293 (A)	RECYCLE SYSTEM FOR CONSTRUCTION AND DEMOLITION WASTE AND HOUSEHOLD SOLID WASTE
GB2291397 (A); GB2291397 (B)	Magnetic Device For Construction/Demolition Machinery

Patent search among Worldwide published patent applications			
Keyword	image processing to optimize separation process	**No of total results**	0
Keyword	facade from CDW	**No of total results**	0
Keyword	facade from construction and demolition waste	**No of total results**	0
Keyword	facade from construction waste	**No of total results**	0
Keyword	facade from demolition waste	**No of total results**	0
Keyword	Wall from waste	**No of total results**	14

Application Number	**Title**
WO2020048402 (A1)	METHOD FOR PREPARATION OF WALL BRICKS FROM SLUDGE COMPOSITE MINERALIZED WASTE
JP2016141492 (A)	DISPOSAL BAG DEVICE FOR COMPRESSING AND BAGGING CLOTH WASTE RESULTING FROM MATERIAL REPLACEMENT ON INDOOR WALL AND METHOD THEREFOR
SI23839 (A)	DISTRIBUTION SYSTEM OF WASTE WATER FROM BATH TUBS, SHOWER TUBS AND WASH BASIN TO THE WASTE WATER TREATMENT PLANT IN THE BARRIER MULTIFUNCTION WALL
SU1674691 (A3)	METHOD AND APPARATUS FOR PRODUCING WALL PROFILE ARTICLES FROM WOOD WASTE AND ANNUAL PLANTS
KR100381887 (B1); KR20010057756 (A)	METHOD FOR REMOVING WASTE MATTER FROM ARTIFICIAL INTERNAL ORGANS AND INTERNAL WALL OF THE ORGANS
JP2004025044 (A)	METHOD OF MAKING FEED, FERTILIZER AND SOIL CONDITIONER FROM ORGANISMIC WASTE BY USING CELLULAR WALL CRUSHING PR0CESS
JP2001295364 (A)	METHOD FOR UTILIZING SCRAP WASTE MATERIAL FROM CONSTRUCTIONAL BOARD AND WALL OF BUILDING UTILIZING THE SAME
JPS5371126 (A)	PROCESSED ARTICLE AND WALL MATERIAL COLORED WITH SOOT FROM INDUSTRIAL WASTE
JPS531225 (A)	WALL MATERIAL FROM WASTE CALCIUM SULFATE
JPS51127122 (A); JPS5331493 (B2)	PRODUCTION METHOD OF CONSTRUCTION WALL AND CONSTRUCTION MATERIAL FROM INDUSTRIAL PULP WASTE AND DOMESTIC WASTES

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CN1033361 (A)	METHOD OF MAKING WALL-AND GROUND BRICKS WITH WASTE RESIDUE FROM BORAX PRODUCTION
CN87101036 (A); CN87101036 (B)	PROCESS FOR MFG. INNER WALL FACE BRICK FROM FULL WASTE SLAG
CN85107429 (A)	DECORATION PASTE FOR INNER WALL OF BUILDINGS FROM PULP WASTE OF PAPER MILL
WO2008121822 (A1)	WASTE RECEPTACLE WITH A BUMPER TO MAINTAIN THE WASTE RECEPTACLE A PREDETERMINED DISTANCE FROM A WALL OR OTHER VERTICAL SURFACE

Keyword	Building material development	**No of total results**	10

Application Number	**Title**
CN112957988 (A)	New building material research and development proportioning equipment
CN212360393 (U)	Die for environment-friendly building material research and development test
CN111687909 (A)	Cutting and sampling device for building material research and development
KR20200053113 (A)	PS PE Reinforcement insulationsuper insulation and finishing method of exterior wall of old buildings and recycling method of styropor various PS PE insulation materials and foamable synthetic waste development of building material using this and there-of building construction method
CN111189961 (A)	Fire simulation device for research and development of fireproof building material
CN208771501 (U)	Environment -friendly building material research and development are with smashing recovery unit with clean function
CN107023109 (A)	Building block material for building component development and prefabricated building component applying building block materials
CN104707846 (A); CN104707846 (B)	Method for solving urban refuse landfill through building material resource development
JP2005282021 (A)	CRACK-DEVELOPMENT PREVENTIVE TOOL FOR WOODEN-BUILDING STRUCTURAL MATERIAL
FR2798376 (A1); FR2798376 (B1)	Production of ready-to-use building material preventing cryptogam development while drying involves mixing crushed crude hemp, lime paste and water

After a thorough study and analysis of the above patents, it can be deduced that the specific facade differs from the patented ones in terms of composition, manufacturing method and application. It can be concluded that the thoroughly patent search resulted that there is a significant potential to grant a patent application.

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5.3 DEFEAT exploitable results and Intellectual Property Registry analysis per partner

The 1st round of the collection of the DEFEAT exploitable results was completed after the completion of the internal workshops carried out by STRATAGEM. The next step is to categorize the results and then monitor their involvement during the project. Characterizing and categorizing exploitable results serves the cause of better targeting the relevant markets and their insights. Collecting the exploitable results, contribute to define target market, market size and growth, customer segments, IPR protection, competitive advantages, pricing models and other useful information.

Background knowledge for the action has been clarified with the Consortium Agreement. Concerning foreground, 'Results' means any (tangible or intangible) output of the action, such as data, knowledge or information - whatever its form or nature, whether it can be protected or not - that is generated in the action, as well as any rights attached to it, including IP rights.

To achieve the essential objective of IP (Intellectual Property) protection and management, a template for an IPR registry has been developed by STRATAGEM in .xls form. The IPR (Intellectual Property Registry) presented in table below has been filled with: the list of results, their short description, their relation to the work structure (WP, Task, Deliverable & Dissemination Level, Scientific Goal/Technical Objective), background IP for each result, names of the partner(s) that will be developing each result and shares of ownership, their preferred IP protection route (patent, trade secret) and exploitation route (academic, commercial). Also, information is provided with respect to the current and the expected Technology Readiness Level (TRL) to assist the exploitation plans. Continuously updates are taking place in case of a change or new additions.

For the Joint Ownership cases, shares of ownership of IP rights have been based on the nature of the contribution of each partner. These shares have been agreed between the joint owners and they have been accepted as fair and reasonable and in proportion to their involvement in the development of the results.

A draft version of the exploitable results and IPR will be presented on this chapter. Deliverable 2.3 (final PUDR) will include all the exploitable results as well as the ownerships that the partners will define till the end of the project. STRATAGEM, responsible for the innovation management activities of the Project, assists all partners to better define their exploitation roadmaps.

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	Results Information					Results' Ownership and IPR strategy			Technology Readiness Level (TRL)
No.	**Title**	**Description**	**Relation to the work structure**	**Dissemination level of this Deliverable**	**Relevant Background knowledge& IP**	**IPR rights (foreground)**	**Shares of IP rights (%)**	**Preferred protection route/ preferred exploitation route**	**Current / Expected Technology Readiness Level**
Instructions	WHAT (including new ideas, concepts, knowledge, methods)	Please explain with 1-2 short sentences what this Result is	Please explain here under which WP(s) and Task(s) you will be developing this Result	Please write here the dissemination level of this Deliverable (Where applicable) (Confidential/ Public)	Please state here if you have relevant IP for each result	Please write here which partner(s) will be developing this result	i) who owns what, ii) how much of it iii) under which conditions it is applicable (in joint ownerships cases)	Please state here your preferred IP protection route (patent application, trade secret, no protection, etc.)	Current/Expected TRL (if applicable or if it can be stated)
1	DEFEAT innovative insulation fire resistant façade from the Construction and Demolition Waste	A façade made out through an innovative separation and transformation of Construction and Demolition Wastes (CDW) into an innovative insulation fire resistant facade.	All WPs. Main integration and validation	Public	Different background knowledge for each partner	All partners	Equal shares	Will be individually explained for each result	TRL6

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2	CDW Robotic Separation System	A method based on image processing technologies and neural network techniques will be applied for the innovative robotic separation of CDW. This will result in "clean" materials that will be utilised for the development of the new products.	WP3 / Tasks 3.1-3.2 D3.1, D3.2, D3.6, D3.7	Public	FRC: knowhow on image processing techniques and neural networks. Netiatis: knowhow on CDW separation. Netiatis: We have over 2 years of experience through manual sorting, which has helped us know exactly what to expect from robots and weather are effective or not	FRC	90% - assembly of robotic system, application of neural networks and image processing.	Publication of results in Journals and Conferences	TRL 4 - TRL 6
						Netiatis	10% - supply of CDW		
3	Characterization of Construction and Demolition Wastes (CDW)	A variety of analyses (chemical, mineralogical, density, particle size, dissolution tests, etc.) will be conducted	WP4 / Tasks 4.1-4.5 D4.1, D4.2	Public	UCY and FRC: knowhow on building materials characterisation	UCY	70% - characterization of raw materials	use of further research	TRL 3

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		for the full characterization of the raw materials. The characterization will be carried out in 5 different batches of the received waste, in order to cover a range of the existed elements.				FRC	30% - characterization of raw materials		
4	Design and Development of Thermal and Fire Insulation Materials	Through geopolymerisation technology 2 different materials will be developed and tested, i.e. a thermal insulation material and a fire resistant material. The 2 materials will be adhered on each other to form the final composite.	WP5 / Tasks 5.1-5.3 D5.1-D5.4	D5.1: Confidential, D5.2-D5-4: Public	FRC and RECS: know how on the development of porous geopolymeric materials. RECS: knowhow on the design f fire-resistant materials.	FRC	60% - design and development of geopolymer composites	Patent and CE Marking of new materials	TRL 3
						RECS	40% - design and development of geopolymer composites		
5	Material and Properties Engineering	The aim of this part of work is the engineering of the properties	WP6 / Tasks 6.1-6.2 D6.1, D6.3-D6.5	Public	FRC: knowhow materials testing and properties	FRC	60% - development of geopolymer composites	use of further research	TRL 5

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		for the material production and the full characerizatio n of the developed material in terms of physical, mechanical and thermal properties.			characterisatio n.	RECS	40% - development of geopolymer composites		
6	Production of 3D-Printed Geopolymer Materials.	Research will be conducted on gaining expertise regarding the development of 3-D printed geopolymer composites, by modifying appropriately the material's mix design.	WP6 / Tasks 6.1-6.2 and WP7 / Task 7.2 D6.2, D7.2-D7.6	Public	FRC: knowhow on 3D-printing of cement-based materials.	FRC	100% - development of 3D-printed geopolymer composites	use of further research	TRL 4

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5.4 SWOT and Porter's Five Forces analyses

To define the areas of optimization for the first steps of the development of the commercial product, a SWOT analysis is conducted for the main DEFEAT product, i.e. "the innovative insulation fire resistant façade from the Construction and Demolition Waste", to define strengths, weaknesses, opportunities and threats. This categorization will also help to specify the objectives of any business venture and to identify the internal and external factors which will play a significant role for the successful venture for each product.

For the DEFEAT innovative insulation fire resistant façade from the Construction and Demolition Waste it has been investigated the Strength - Weak - Opportunities - Threats of the main DEFEAT product as a unit. Thus, a first iteration of a SWOT analysis was prepared for the DEFEAT main product and is depicted on the table below.

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Table 7. SWOT analysis of the DEFEAT facade

First Iteration of SWOT ANALYSIS DEFEAT innovative insulation fire resistant façade from the Construction and Demolition Waste			
Strength Points	**Weak Points**	**Opportunities**	**Threats**
⇒ Developing insulation fire resistant materials lacking the requirement of high strength. ⇒ By applying the image processing technology on the CDW separation: a) reduces the potential risks b) provides homogeneous raw material c) achieves lower energy consumption and d) delivers a clean raw material (concrete, ceramic, metal, plastic, wood) which can be then recycled. ⇒ Products with superior properties compared to the existing ones (increased fire resistance insulation, 100% recyclable). ⇒ Modularity - High customization possibilities to meet a wide array of goals. Either material changes or geometrical. ⇒ More efficient production processes (less energy-intensive). ⇒ Less environmental hazardous processes. ⇒ Potential development of new or conformation to existing European standards and norms in CDW management by the participation in the consortium partners of public entities which can guide the regulation to consider CDW as a raw material that can be utilized in the construction sector. ⇒ Internationalization of SMEs through European co-operation for after project partnership.	⇒ Modularity – changes in materials and geometries carry additional certification procedures. ⇒ Limited financial resources for production, marketing and distribution. ⇒ Product is completely new and therefore not enough experience in this market. ⇒ Low name recognition and awareness level. ⇒ Suppliers for every material might not be available in each EU country, and price points may differ greatly from one country to another. ⇒ Not available data on purchase willingness of customers. ⇒ Legislatorial framework in Cyprus and EU member states not consistent.	⇒ Availability for advanced separation processes for even more production swiftness and better competitiveness. ⇒ Availability for new and better materials that might enter the market. ⇒ Ever developing recycling market for CDW. ⇒ Megatrend - sustainable, green technologies. ⇒ Sustainable and environmentally friendly business model on the market, where raw resources demand is growing rapidly. ⇒ Differentiation from competitors through innovative production and separation technology combining fire resistant function. ⇒ Possibilities of further product development and efficiency as well as cost optimization. ⇒ Huge potential on the market through improving marketing/ distribution. ⇒ Expansion into overseas markets.	⇒ Even though recycling is one of the golden words of the current era, many might not be so keen on having recycled materials in their walls/ facades. ⇒ Trying to maximize just short-term profits (investors avoid financial commitment in long/medium-term sustainable technologies). ⇒ Displacement of the product by other substitutional products. ⇒ New competitors' entry to the market or existing companies' extension of their product range. ⇒ General economic downturn and associated therewith, low demand for premium products. ⇒ Dependency on legislation.

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Porter's 5 Forces and SWOT analysis are both tools used to analyse and make strategic decisions. While they both help in assessing a company's or product's strengths and weaknesses relative to industry opportunities and challenges, a primary difference is that SWOT focuses more on company-specific elements. At the same time, Five Forces involves a look at five important competitive factors when making a strategic decision. In other words, Porter's 5 Forces is used to analyse the competitive environment within an industry, while a SWOT analysis tends to look more deeply within an organization to analyse its internal potential. Each of the models seeks to define the company's position in the market. Porter's 5 Forces are generally more of a micro-tool, while SWOT analysis is comparatively macro[29].

Therefore, additionally to the SWOT analysis, the Porter's Five Forces Analysis was developed to analyze the competition existing in regards with the DEFEAT facade.

First Iteration of PORTER's FIVE FORCES ANALYSIS DEFEAT innovative insulation fire resistant façade from the Construction and Demolition Waste	
Competition in the Industry	Being a cladding solution, although, a state of the art one, the most significant direct competitor is the well-established brick wall. Being quite inexpensive, it's a widely spread solution. However, the time needed to install a brick wall correctly and the time it takes for the mortar in-between bricks and over finished walls to cure is a clear disadvantage; not to mention the high energy needed for cement production and water waste along all of the process. The thermal performance of brick walls is often inferior and hence very inefficient, generating cold zones which rapidly degrade the quality of the mortars and the finishes of brick walls. Still, brick walls, take the most significant chunk of the market and are, therefore, DEFEAT biggest competitor. Other smaller competitors can be the Y-tong blocks and light steel framing. Even though they can be stand-alone solutions their applicability on the rehabilitation market is very strong as well, and as for LSF, it can also be quite swift during the installation, as well as have the same benefits that DEFEAT proposes, so it is a serious competitor. Typically, the rivalry in the construction business is very high, mostly with contractors. However, there's always room for *niche* products, and the fire resistance is trending. At the same time, people tend to spend more time indoors, rather than on the outside, which generates the need for bigger comfort inside the home. Rising raw materials prices are also something that the costumers are starting to feel and recycling

[29] Investopedia, Accessed 16/12/2021: https://www.investopedia.com/ask/answers/041015/whats-difference-between-porters-5-forces-and-swot-analysis.asp

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	solutions are starting to seem more feasible.
Potential of New Entrants into an Industry	The technological developments in construction, due to the bigger environmental awareness and better economy needs, grew exponentially in the last decade. Nanotechnologies and material engineering greatly boosted the development of new materials/solutions, and the construction market has never been as overwhelming as it is now with hundreds of solutions appearing every year. While one of DEFEAT strength is the recycling of CDW, new technologies/processes/materials are just around the corner and DEFEAT may rapidly become obsolete or economically not feasible.
Power of Suppliers	DEFEAT suppliers are recycling industries that can provide the raw materials to the partners that can produce the required facade. These suppliers cannot raise their prices for their competition who are companies who supply the already prepared materials (e.g. fire resistant materials). Hence, if the recycled raw material becomes too expensive, their competitiveness is lost to the pristine material vendors.
Power of Customers	It's challenging to predict the costumers' power on a non-existing product, but DEFEAT will enter the market with premium figures, and this market understands the price to pay for quality. The market has many solutions and combinations of solutions; however, none with the whole of DEFEAT proposed benefits. The procurement for partnerships will be crucial to get a price point and from there, work on pricing and thus, understand how DEFETA is, monetarily speaking, placed in the market. Only from there the power of the costumers can be more accurately predicted. Nonetheless, it will be challenging for DEFEAT to be "stuck-in-the-middle".
Threat of Substitutes	The threat of a substitute product is intimately related to the entrant of new players on the market as, often, when a new product/solution is developed, companies are generated solely for that purpose. Hence, what was said to the aforementioned point, is also valid here.

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5.5 Planned exploitation activities for next period

The outcomes of the DEFEAT project are expected to find a lot of uses in major segments of the building & construction industry and related fields such as buildings & constructions companies, building & construction materials companies, facades, CDW recycling companies, waste management companies, environmental management companies and companies in the wider construction sector.

The exact ways which the DEFEAT products will be exploited are yet to be concluded but, some initial strategies have been investigated by the consortium on that matter. The details of ownership and exploitation routes will be re-evaluated during the entire project's life, especially from month 30 till the end of the project onwards, when results will start to become clearer.

The exploitation and commercialization of the DEFEAT products will occur in several distinct phases, covering product development, initial exploitation, Cypriot expansion and European expansion. An exploitation strategy is outlined below and is continuously revised as the project progresses.

Project Duration (2020-2023): The project started on 01/07/2020 and will finish on 30/06/2023. During the project's duration, and as the project will be coming to an end, all the characteristics of the DEFEAT products/results will be identified, analyzed and the key advantages will be revealed. The results that can be published will be presented in conferences and published in scientific journals. The project's partners will disseminate the results within their business unit and transfer the knowledge and experiences gained. The members of the consortium will also disseminate the results of the project (with care in order not to harm the patentability of the results) in a wide audience and publish the publishable results of the project in more technical magazines. Moreover, the results which need to be patented will be identified, agreed within the DEFEAT consortium and the gathering of the appropriate documentation will start to take place. Additionally, a market segmentation analysis will be updated (if necessary) and the first lists of potential customers and other interested stakeholders will be developed which will be separated by sector/category.

Product Development and Initial Exploitation (2023+): During the product development phase the sample products which were developed during the project phase will be used in order to demonstrate the technology to potential customers and conduct extensive use cases and tests,

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resulting in more detailed case study material. Their characteristics and their USPs (Unique Selling Points) will be settled and used in the further promotion of the DEFEAT products. The members of the consortium will continue to disseminate the results of the project in a wider audience and publish the results of the project in more technical magazines.

Further Exploitation (2024+): There will be efforts to establish a pipeline with distributors and agents providing similar products to the market. Additionally, there will be made efforts to promote the several research results of the DEFEAT project to companies dealing with relevant building and construction applications and materials. The sales price will be higher but competitive and the customers will have strong incentive to buy it, as they will be able to observe great operational savings. Successful use of the DEFEAT facade by the first users will give the proof of concept which will help DEFEAT product to uptake the market.

The market uptake will increase the demanded volumes of DEFEAT products and will lead to the demand for establishing more production lines for similar products, enabling the consortium to give licenses (max 5 at European level) for the development of the same products. The publicity through web marketing and articles in journals and magazines that will focus in the target market will increase the possibility of market penetration.

6. Conclusions

This document presents the first "Interim Plan for Use and Dissemination of the Results" of the DEFEAT project through its lifetime and after the end of the project. The Second Interim PUDR will be revised and updated during the entire duration of the project and will delivered by the end of the project.

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