



Introduction to ‘Boosting Research for a Smart and Carbon Neutral Built Environment with Digital Twins’ (SmartWins) project

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CERTH’s SmartWins Summer School

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CERTH SmartWins Summer School: Day 1

04 July 2023

Thessaloniki

The SmartWins Project

•Project Title	Boosting Research for a Smart and Carbon Neutral Built Environment with Digital Twins
•Project acronym:	SmartWins
•Programme	Horizon Europe Framework Programme (HORIZON)
•Call	Twinning (HORIZON-WIDERA-2021-ACCESS-03)
•Type of Action	HORIZON-CSA HORIZON Coordination and Support Actions
•Project Budget	1499974 €
•KTU Budget	571875 €
•Project Duration	01.10.2022-30.09.2025

Objectives

Form a research network and close collaboration between KTU and leading energy institutions and universities, to

Discover novel ways to high-quality research on the topic of next generation digital twins.

Applied for allowing the transition to a smart, sustainable, resilient and carbon neutral built environment

Overall objective:

Improve KTU research capacities, especially for the “Sustainable Energy in the Built Environment” Research Group (SEBERG) on the topic of next generation Digital Twins (DT)

SmartWins Consortium



SEBERG activities & SmartWins Concept



SEBERG fields of activities



SmartWins Concept Infographic

SmartWins Targeted Audience

TARGET AUDIENCE	COMMUNICATION OBJECTIVE (O) + MESSAGE (M)	COMMUNICATION MEASURES	PERFORMANCE INDICATOR & TARGET
RESEARCHERS & STUDENTS	O: Promote the academic excellence of SmartWins consortium. M: SmartWins partners are well-renown education and research institutions leading in the technological field applied to sustainable built environment projects	Video-recorded expert presentations from workshops (T2.3), international conferences (T2.2), summer schools (T4.2) and training sessions (T4.1), available on video hosting platforms and shared on social networks (T5.2). SmartWins summer/winter schools on digital twins and buildings assessment digitization. (T4.2)	At least 12 videos 3 summer/winter schools, 15+ participants in each school
	O: Demonstrate the added value of a Twinning action for research M: SmartWins will support KTU step up in research and innovation which leads to more innovative technologies reaching the market	Presentations to conferences acknowledging SmartWins (T2.2), available as well under SmartWins webpage Project promotional materials (leaflet or poster) (T5.3) distributed in SmartWins events (T2.2, T4.1, T4.2), shared on social networks and under SmartWins webpage International conference on the subject (T2.2), promoted online before (announcements) and by completion (review, photos)	3+ presentations to conferences 800+ leaflets distributed, 10+ posters displayed 20000+ views in social media 1 conference 50+ participants
	O: Raise awareness about sustainability within the construction industry and how the current tools could be used M: Constructing sustainable buildings has a positive impact on the environment and will contribute to a more efficient use of resources and energy	Citizen events (T3.3), promoted online before (announcements) and by completion (review, photos)	2 events, 40+ visitors each
	O: Networking with business partners M: KTU has strong research expertise and valuable technologies to transfer to consider partnership	Brokerage events to facilitate contacts (T3.1)	2 events 15+ participants each
POLICY MAKERS	O: influence policy makers for implementing adapted regulations M: KTU's team are experts in the subject and can recommend relevant policy directions	Production of policy report and distribution to local and national Governments (T3.4)	1 report Distribution to at least 2 government agencies
ALL AUDIENCES	O: Promote SmartWins and engage audiences in the project's actions. Transfer knowledge and technologies to the society. M: There are advanced technologies based on digital twins and Industry 4.0 practices, to enhance the buildings energy and sustainability assessment	Promotional material for SmartWins (leaflet, press releases) (T5.3, T5.4). Distributed during the citizen events and available online (T3.3, T5.2) Project news on the project website and shared in social networks (T5.2) Press releases (T5.4)	2000+ leaflets distributed 1+ news per month 3+ press releases (M3, M18, M36) distributed through press release platforms
	O: Foster public engagement in energy and sustainability performance of buildings and research M: Resource efficient buildings and tools to achieve them are an important research area to consider	Citizen events and online promotion (T3.3, T-2)	2 events, 40+ visitors each



SmartWins Impact



Key Element Of The Impact Section

SPECIFIC NEEDS

What are the specific needs that triggered this project?

- > Develop the research capacities of KTU on the topic of next generation digital twins, applied for allowing the transition to a smart, sustainable, resilient and carbon neutral built environment..
- > Create links between KTU and businesses with the aim to transfer technologies.
- > Educate KTU's students and researchers in smart sensor technologies..
- > Strengthen KTU's research management and administration capacities, as well as their capability to win competitive research projects and manage them

EXPECTED RESULTS

What do you expect to generate by the end of the project?

- > Improved KTU's research capacities, skills, and knowledge in next generation digital twins, applied for allowing the transition to a smart, sustainable, resilient and carbon neutral built environment.
- > Developed networks (businesses and academics).
- > More researchers and students are educated and have a new study curriculum.
- > Better research management and administration capacities and competences in grant writing and project management.

D & E & C MEASURES

What dissemination, exploitation and communication measures will you apply to the results?

- > Online communication (website + social networks + e-mail communication)
- > Offline communication (citizen events, brokerage events, training, workshops, summer schools, poster and leaflet distribution).
- > Links with media (press conferences, press releases)
- > Open access research publications
- > Presentation to international research conferences



SmartWins Impact

Key Element Of The Impact Section



TARGET GROUPS

Who will use or further up-take the results of the project? Who will benefit from the results of the project?

In priority

- > Researchers at KTU
- > Students at KTU
- > Lithuanian businesses
- > Lithuanian citizens.
- > Lithuanian policy makers.

Secondary priority:

- > Researchers, students, businesses and citizens abroad.

OUTCOMES

What change do you expect to see after successful dissemination and exploitation of project results to the target group(s)?

- > An integrated methodology developed
 - > New research knowledge gathered.
 - > Links with businesses established.
 - > New students trained.
 - > Citizen's feedback collected.
- Policy report written and submitted to Government

IMPACTS

What are the expected wider scientific, economic and societal effects of the project contributing to the expected impacts outlined in the respective destination in the work programme?

- > Improved R&I performance indicators for Lithuania.
- > New technologies developed in Lithuania.
- > KTU's reputation improved.
- > Economic impact through development of start-ups and jobs.
- > Increased public and private funding in Lithuania.



SmartWins Implementation Plan WP1

WP1

● Smart technologies for smart buildings: Digitization, IoT and Indoor Environment Quality

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

MS3 Research milestone

D1.3. Scientific report on IoT and digital twins in smart

CERTH

D1.4. Scientific report on the energy assessment of buildings in BIM environment

CON

D1.1 Scientific report on smart building whole life digitized assessment

KTU

D1.2. Scientific report on their indoor environmental quality assessment with the use of smart sensors

POLIMI

Task 1.1. Integral components of smart buildings whole life digitized assessment (leader: KTU; start: M01; end: M30)

Task 1.2. Indoor environmental quality assessment with smart sensors (leader: PoliMi; start: M01; end: M30)

Task 1.3. IoT and digital twins for assessing the performance of smart buildings (leader: CERTH; start: M01; end: M30)

Task 1.4. Energy assessment of smart buildings in BIM environment (leader: CON; start: M01; end: M30)

SmartWins Implementation Plan WP2

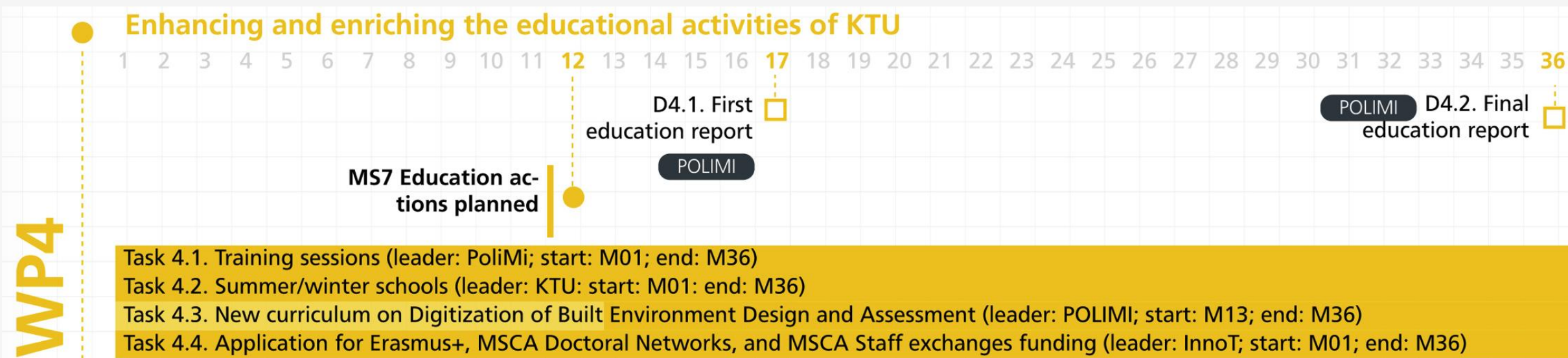
WP2



SmartWins Implementation Plan WP3



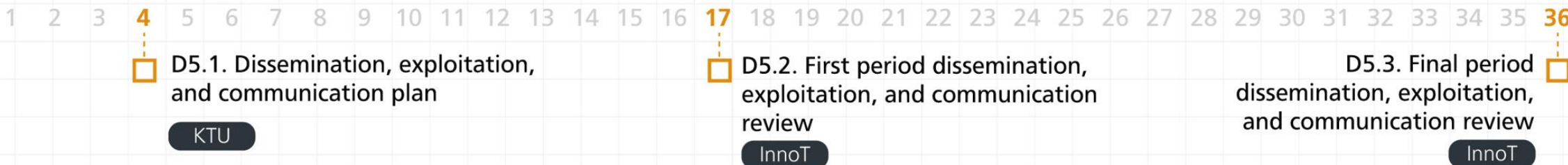
SmartWins Implementation Plan WP4



SmartWins Implementation Plan WP5

WP5

Dissemination, exploitation and communication



- Task 5.1. Dissemination, exploitation, and communication plan (leader: KTU; start: M01; end: M36)
- Task 5.2. Online communication (leader: InnoT; start: M01; end: M36)
- Task 5.3. Offline communication (leader: InnoT; start: M01; end: M36)
- Task 5.4. Press releases, press conferences and media relationships (leader: InnoT; start: M01; end: M36)
- Task 5.5. Dissemination and exploitation management (leader: CERTH; start: M01; end: M36)

CERTH Specific Tasks

- **Task 1.3: IoT and Digital Twins for assessing the performance of smart buildings**
 - Documentation of current practises for operational energy assessment of buildings w/ the use of smart sensors and Digital Twins.
- **Task 2.5: Upgrade research management units**
 - Support KTU to upgrade its research management and administration units at faculty level focus on external funding
 - identify gaps, needs and improvement opportunities of the research management unit
- **Task 5.5: Dissemination & exploitation management**

Introduction: CERTH's SmartWins Summer School

Specific Objective

Specific objective (SO) 3



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graph TD; SO3[Specific objective (SO) 3] --> Training[Train and educate KTU researchers and students on the topic of next generation digital twins]; Training --> Application[Applied for allowing the transition to a smart, sustainable, resilient and carbon neutral built environment.];
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Train and educate KTU researchers and students on the topic of next generation digital twins

Applied for allowing the transition to a smart, sustainable, resilient and carbon neutral built environment.

Task 4.2: Summer/Winter Schools

For Task 4.2, two summer and one winter school will be organized



The summer schools will be held in Thessaloniki and Milano, and the winter school will be organized in Kaunas – that is one school per year.



The events will be addressed to PhD students and post-doc students (up to 5 years after PhD).



Topics of the schools: focus on scientific and technological advances in the field of digital twins and the design and assessment of the built environment, and will aim to introduce the participants in the latest developments of the fields.



Also included: Social interactions events and cultural discoveries

CERTH SmartWins Summer School

- **Summer School Duration:** 04/07/23-07/07/23
- **Location:** Thessaloniki, Greece
- **Organizer:** CERTH/ITI
- **General focus:** Scientific & technological advances in the field of Digital Twins and the design and **energy** assessment of the built environment
- **Particular emphasis:** The past experiences & know-how of the CERTH to various related topics

Summary of planned activities

Presentations & seminars on various topics in relation w/ DT

Visit CERTH's Smart House/nZEB Infrastructure. Present its functions & technologies

Other seminars (w/ extended scope): Environmental impacts and opportunities for sustainable development, Life-Cycle-Analysis (LCA), Smart Cities, MicroGrids

Social interactions events : Lunch breaks, Dinner, Free time in the city

Goals of the Summer School

- **Introduce** participants to the latest developments in the fields of DT . Explore emerging technologies, tools, and techniques
- **Gain insights** about **state-of-the-art** hardware, software, data analytics, simulation models, practises, and other advancements that are transforming how we evaluate the built environment, in terms of energy efficiency
- **Future Directions:** The summer school will also discuss the future directions and potential impact of DT
- Explore the **role of emerging technologies such as AI, IoT**, and data-driven decision-making in shaping the future
- Gain insights into the potential **challenges, opportunities**, associated with these advancements
- Extend **scope to other related aspects** such as environmental impacts and opportunities for sustainable development → Provide a more holistic view and highlight potential interactions w/ Smart Building and Digital Twinning

Key aims of the summer school

Introduce participants to the latest developments in the fields of DT



Gain insights about state-of-the-art hardware, software, data analytics, simulation models, practices & other advancements



On how we evaluate the built environment, in terms of energy efficiency

Future directions and potential impact of DT



Explore the role of emerging technologies such as AI, IoT, and data-driven decision-making in shaping the future of the built environment



Gain insights into the potential challenges, opportunities, associated with these advancements.

SmartWins summer school in parallel w/ SMACCS summer school

- **Concurring event:** International Hellenic University's (IHU) Smart Cities and Communities (SMACCS) 3rd Summer School*
- **Day 2:** Joint session in IHU premises (near CERTH)
- Organized within the framework of the Erasmus Mundus Joint Master Degree on Smart Cities and Communities (www.smaccs.eu)

SmartWins -SMACCS summer school (2/2)

- Consortium: University of Mons(Belgium), Heriot-Watt University (UK), International Hellenic University (Greece) and Universidad del Pais Vasco (Spain)



Day 1 - Topics

- Opening & Agenda @ CERTH
- Welcome @ CERTH: *Presentation on CERTH/ITI and its structure, activities, projects*
- Introduction/Presentation to SmartWins project & SmartWins Summer School (Dr. Koukaras)
- *Introduction to Digital Twins Concept* (Mr. Tsalikidis)
- *Digital Twins in the context of energy assessment of the built environment & Notable case studies of Digital Twins* (Mr. Tsalikidis)
- *Presentation of other related research projects of CERTH* (Mr. Mystakdis)

Day 2 – Topics (Joint session @IHU)

- *Multidimensional procedure for mapping and monitoring urban energy vulnerability at regional level using public data (UPV/EHU Dr. Jon Terés)*
- *Provisional title Experiences in large scale smart city projects (Mr. Papastergiou, Mr. Siskos, Mr. Vagionas and Ms. Spyratou, Deloitte)*
- *Study of the industrial waste heat potential and design of District Heating networks in built environment (UPV/EHU Dr. Pello Larrinaga)*
- *Life Cycle Analysis (LCA)*

Day 3 – Topics

- Presentations on Topics :
 - Data transmission techniques , protocols, connection architectures
 - Data integration/interoperability (Mr. Sidiras, Mr. Piperagkas, Mr. Klonis)
- Visit CERTH's Smart House/nZEB (Mr. Katsaros)
 - CERTH's IoT Platform
 - Presentation of its functions & technologies
- Presentations on Topics (Mr. Mystakidis & Mr. Tsalikidis) :
 - Data filtering & analysis techniques
 - ML-based forecasting engines

Day 4 – Topics

- Presentations on Topics (Dr. Gkaidatzis):
 - *Demand-Side Management*
 - *MicroGrids, Smart Buildings, Energy Communities*
- *Smartness and Energy Efficiency in buildings: The SRI methodology tool and the IsZEB Standard* (Ms. C. Mykoniou)
- *Future Directions-Challenges of Smart Buildings & IsZEB Hub* (Ms. Z. Boutopoulou)
- End of Summer School-Concluding remarks

Complete Agenda

	Tuesday 4 th of July 2023	Wednesday 5 th of July 2023		Thursday 6 th of July 2023		Friday 7 th of July 2023	
Rooms	CERTH premises-Room:Αιολος-Aiolos	IHU Premises-Room: B1		CERTH Premises-Smart House & Amphitheatre		IHU Premises-Room: B3	CERTH premises-Room: Ζεφυρος-Zefiros
<div></div>	SmartWins	SMACCs	SmartWins	SMACCs	SmartWins	SMACCs	SmartWins
9:00	Opening & Agenda @ CERTH	1. Multidimensional procedure for mapping and monitoring urban energy vulnerability at regional level using public data (UPV/EHU Dr. Jon Terés)		Presentations on Topics: 4.Data transmission techniques , protocols, connection architectures (Mr. Sidiras, Mr. Piperagkas, Mr. Klonis) 5. Data integration/Interoperability (Mr. Sidiras, Mr. Piperagkas, Mr. Klonis)		The smart city's agile development. Tools for effective and "smart" project management (Dr. Magnisalis)	12. Demand-Side Management (Dr. Gkaidatzis)
9:30	Welcome @ CERTH Presentation on CERTH/ITI and its structure, activities, projects - Short tour of premises (Dr. Ioannidis or Dr. Koukaras)						13. MicroGrids, Smart Buildings, Energy Communities (Dr. Gkaidatzis) (1/2)
10:00							
10:30	Coffee break	Coffee break		Coffee break		Coffee break	Coffee break
11:00	Introduction/Presentation to SmartWins project (scope,objectives, activity) & Introduction to SmartWins Summer School (scope,objectives,agenda) (Dr. Koukaras)	Provisional title Experiences in large scale smart city projects (Mr. Papastergiou, Mr. Siskos, Mr. Vagionas and Ms. Spyratou, Deloitte)		Presentations on Topics: Topic: 10. CERTH's IoT Platform Visit CERTH's Smart House/nZEB Infrastructure. Presentation of its functions & technologies (Mr. Katsaros)		Let's make our smart cities safer too - how data and AI can help (Mr. Karayannis, CTO Space Hellas)	13. MicroGrids, Smart Buildings, Energy Communities (Dr. Gkaidatzis) (2/2)
11:30							Smartness and Energy Efficiency in buildings: The SRI methodology tool and the IsZEB Standard (IsZEB Cluster Ms. C. Mykioniou)
12:00	Introduction to Digital Twins Concept (Definitions, Characteristics) (Mr. Tsalikidis)	2. Study of the industrial waste heat potential and design of District Heating networks in built environments (UPV/EHU Dr. Pello Larrinaga) (1/2)	Sustainable cities and communities: environmental impacts and opportunities for sustainable development (UPV/EHU Estibaliz Saez de Cámara)		Future Directions-Challenges of Smart Buildings & IsZEB Hub (IsZEB Cluster Ms. Z. Boutopoulou)		
12:30	Digital Twins in the context of energy assessment of the built environment & Notable case studies of Digital Twins (Mr. Tsalikidis)						
13:00	Lunch Time	Lunch Time		Lunch Time		Lunch Time	Lunch Time
13:30	Presentation of other related research projects of CERTH (Mr. Mystakdis)	2. Study of the industrial waste heat potential and design of District Heating networks in built environments (UPV/EHU Dr. Pello Larrinaga) (2/2)		Lunch Time		Energy forecasting with ML (UMONS Jérémie Bottieau)	Discussion, debate, Q&A with rest of the audience AOB
14:00							
14:30	Discussion, Q&A	Life Cycle Analysis (LCA) 1st Session (Fundamentals): Opening Speeches Prof. D. Aidonis Prof. C. Achillas		Presentations on Topics: 7. Data filtering & analysis techniques & 8. ML-based forecasting engines - (Mr. Mystakidis & Mr. Tsalikidis)		ITS Europe (Tzanidaki + Colleague)	End of Summer School-Concluding remarks (Dr. Ioannidis or Dr. Koukaras)
15:00							
15:30							
16:00	Coffee break	Coffee break		Coffee break		Coffee break	Coffee break
16:30	Free Time	LCA 2nd Session (Hands-on): Dr. C. Koidis Mr. A. Kalaitzidis		Follow-up discussions, Q&A		Closure Ceremony	Free Time
17:00		Academic Meeting		Free Time			
17:30							
18:00		Free Time					
18:30							
19:00							
19:30							
20:00		SOCIAL EVENT- Casual dinner		Gala Dinner	SOCIAL EVENT- Casual dinner		
20:30							
21:00							
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22:30							
23:00							
23:30							

Project Partners



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS



POLITECNICO
MILANO 1863



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