CERTH

CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS

RESEARCH
DEVELOPMENT
INNOVATION

Mission

- Promotion of the threefold framework: Research-Development-Innovation

- Conducting High Quality Scientific Research

- Development of Innovative Products and Services

- Strong partnerships with the National and International Industry

- Strong collaboration with Research Centers and Universities in Greece and Abroad

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Overview

- **Foundation**: 2000

- **Legal form**: Legal entity governed by private law under the auspices of the General Secretariat for Research & Innovation of the Ministry of Development and Investment

- **Personnel**: >1100

- **Annual revenues:** >50 mil. €.(3-year average)
  - 77% from competitive research projects through open call for proposals
  - 10% from government institutional funding
  - 13% from bilateral industrial research contracts

- **Numerous distinctions and awards** (Descartes Prize, ERC Advanced Grant, Trading Agent Competition Award, etc)

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Geographical Presence

6

Regions

Attica, Central Macedonia, Western Macedonia, Thessaly, Epirus & South Aegean

8

Cities

Athens, Thessaloniki, Larissa, Volos, Ptolemais, Ioannina & Rhodes

Research and Innovation facilities

>47€ mil.

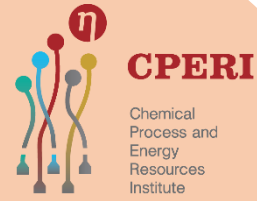Innovative research facilities and modern laboratory equipment worth >47 million €

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Institutes

INFORMATION & COMMUNICATION TECHNOLOGIES

SUSTAINABLE PROCESSES & ENERGY RESOURCES

SUSTAINABLE MOBILITY AND TRANSPORT NETWORKS
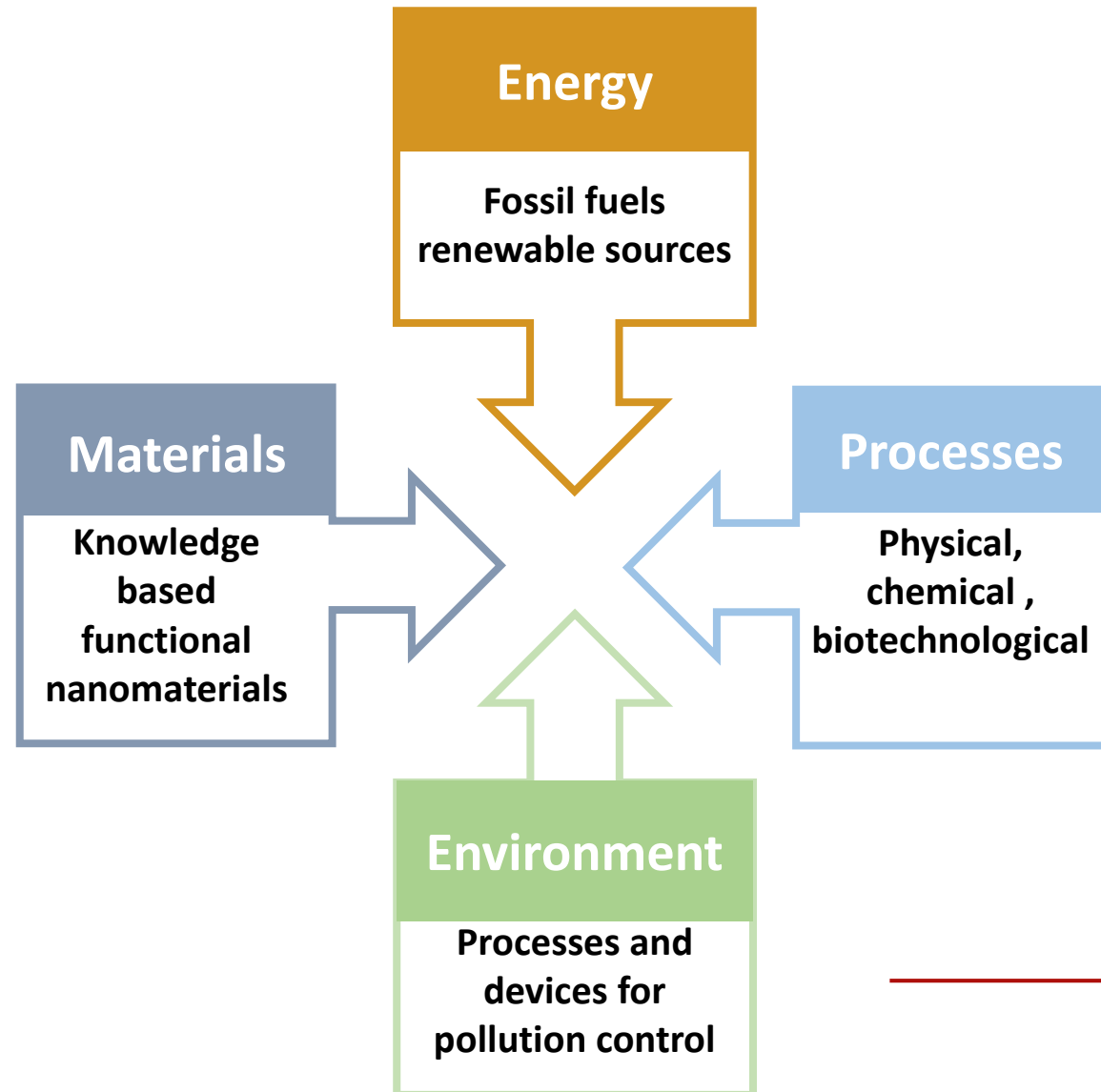
APPLIED LIFE SCIENCES

AGRICULTURAL TECHNOLOGY AND BIOSYSTEMS ENGINEERING

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Chemical Process and Energy Resources Institute - CPERI

Energy

Fossil fuels renewable sources

Materials

Knowledge based functional nanomaterials

Processes

Physical, chemical , biotechnological

Environment

Processes and devices for pollution control

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Information Technologies Institute - ITI

- Robotics, Visual Computing, Virtual and Augmented Reality

- Telecommunication, Energy and Sensors Networks, Internet of Things

- Internet Technologies, Multimedia, Social Networks Analytics, Fake News

- Artificial Intelligence, Machine Learning, Systems for Prediction and Decision making

- Biometrics and Security Systems, Cybersecurity, Blockchain

- Remote Sensing and Environment

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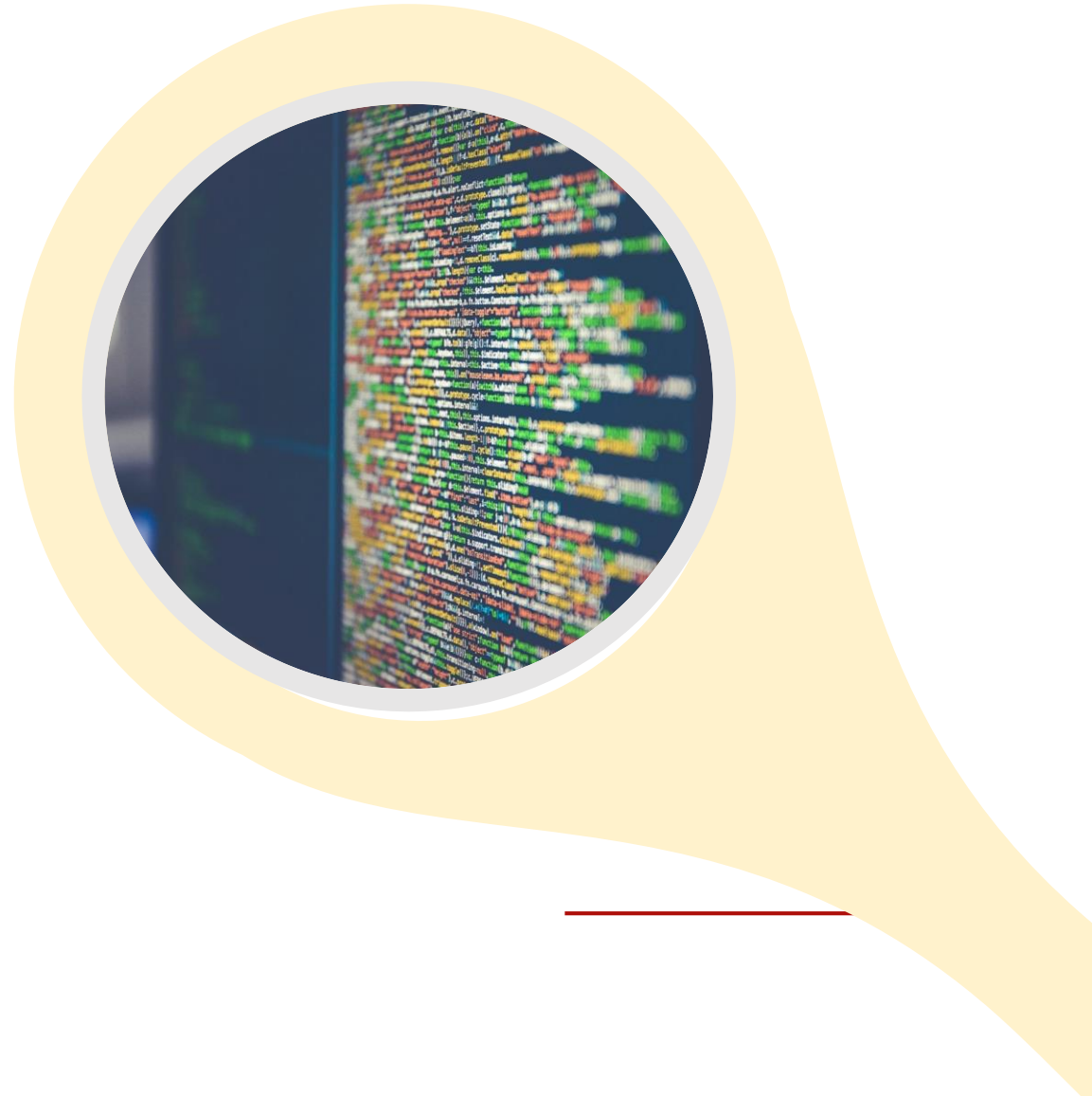
Hellenic Institute of Transport - HIT

- Intelligent transport systems for urban mobility and traffic management

- Real time information systems for human mobility (infomobility)

- Intelligent freight transport and logistics

- Risk analysis in road tunnels

- Safety in road construction work zones

- Systems for remote device management

Institute of Applied Biosiences – INAB
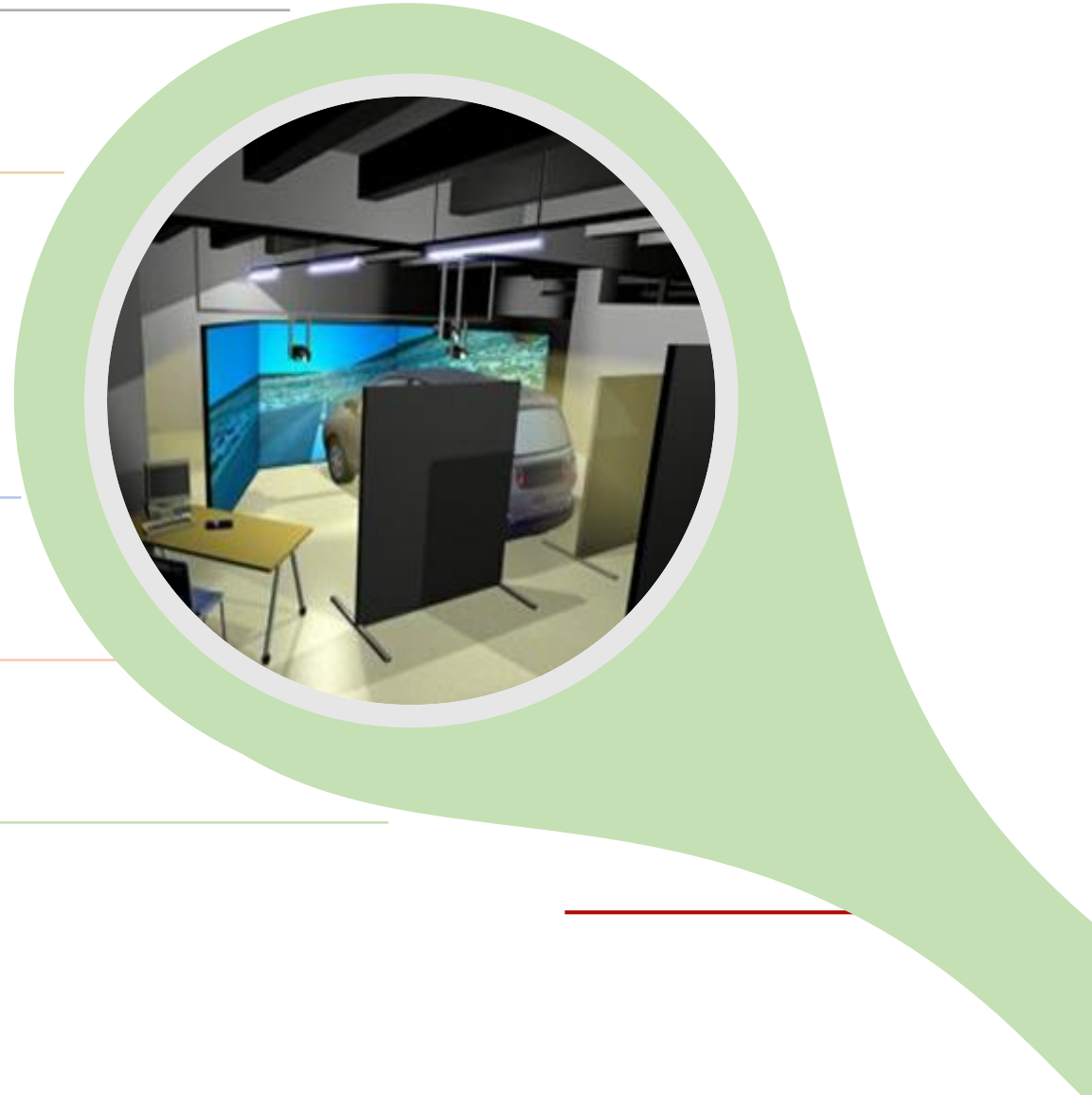
- Production, management and analysis of Big BioData using certified procedures (ISO15189, ISO22301, ISO27001)

- Coordination of Hellenic Precision Medicine Network on Cancer

- Advanced molecular diagnostics | Flagship Action on SARS-COV-2 | Genomics surveillance

- Pharmacological research focusing on drug safety and pharmacovigilance

- Design, organization and coordination of international multi-center clinical studies

- e-Health for patients and citizens
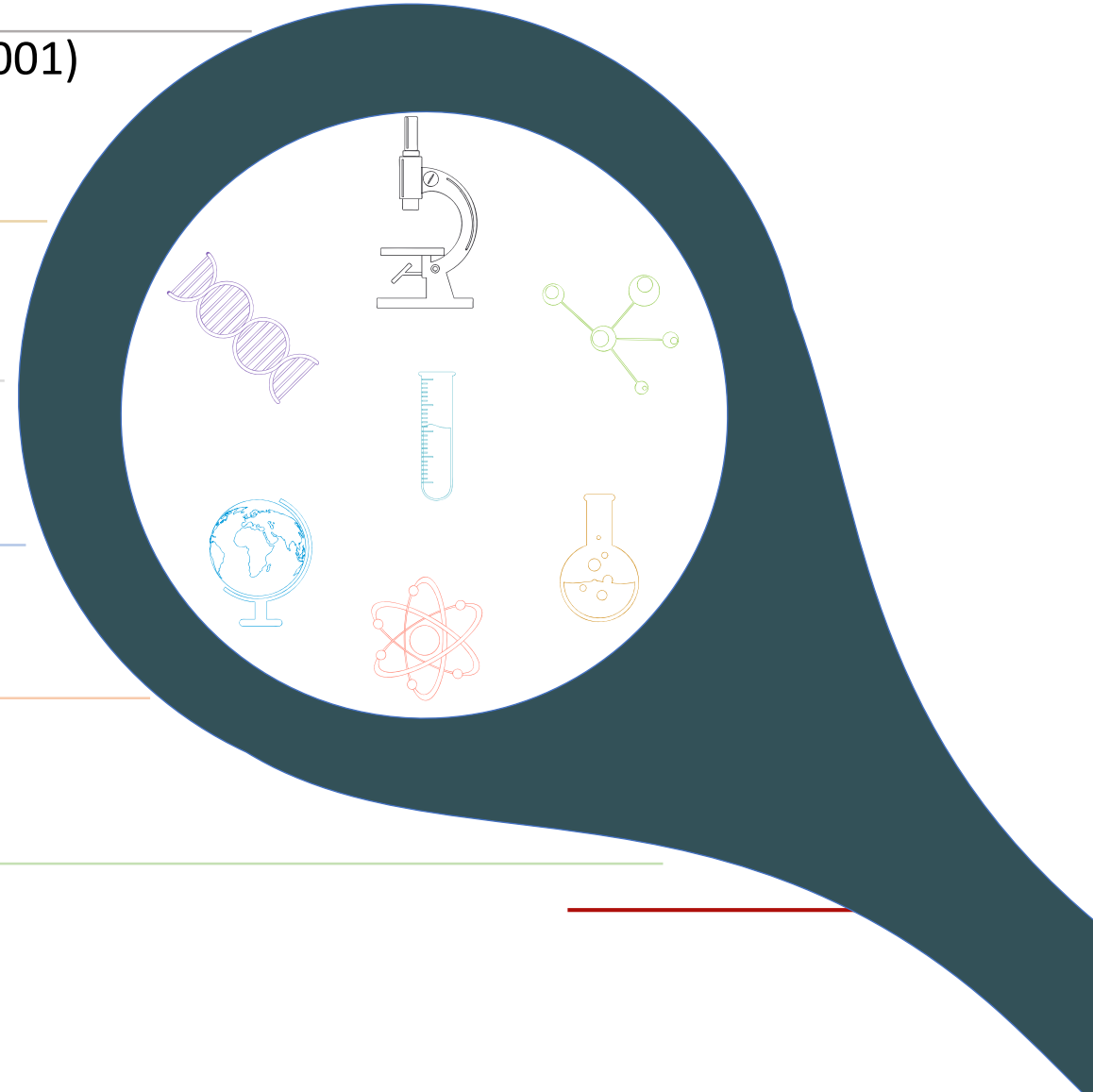
Institute of Bio-economy and Agri-technology – IBO

- Bio-economy

- Agri-technology

- Automation of agricultural production systems

- Farm management, Precision Agriculture

- Digital Agriculture

- Zero carbon footprint agriculture

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Promotion of Knowledge Based Entrepreneurship @ CERTH

Joint efforts of CERTH's
Institutes for the **creation of**
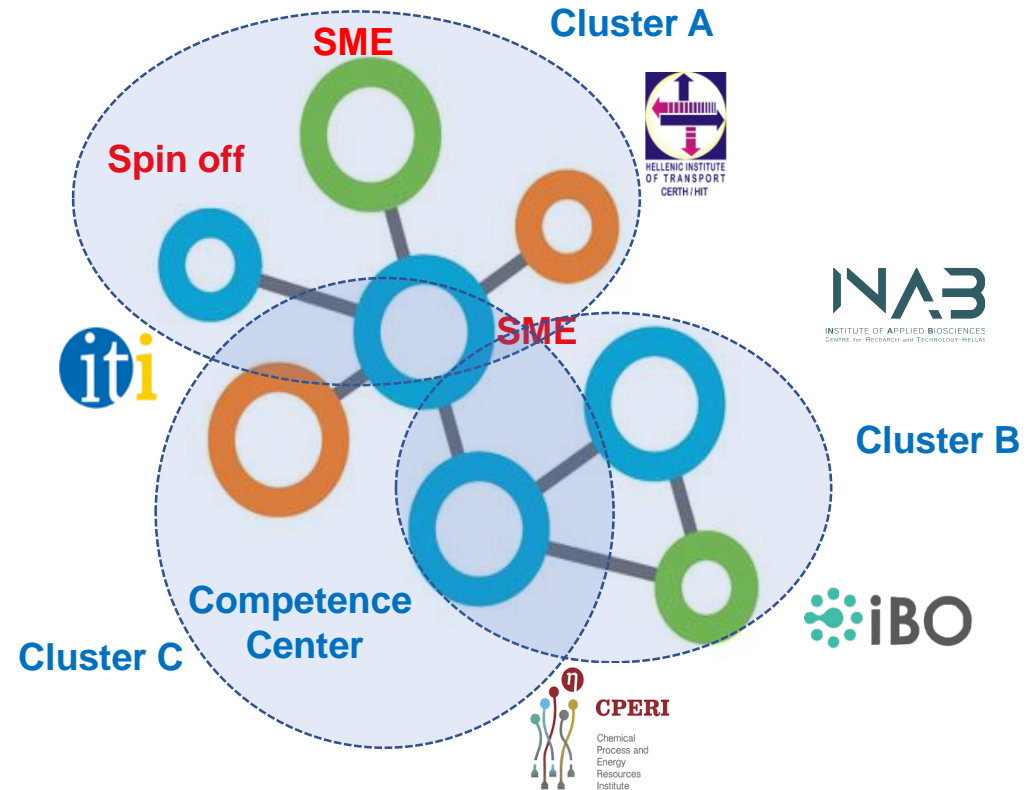**5 new European**
Digital Innovation Hubs

I4byDesign
Industry4.0
Competence Center

Joint action of the 5 institutes
of CERTH (2020)

Creation of **4 National**
Competitive Clusters at CERTH

AI Cluster, Technopolis (2019)
Smart Buildings Cluster (2019)
Agile 4.0 – Industry 4.0 Cluster (2020)
MOBILOC – Smart Logistics Cluster (2020)

Founding
17 Spin-off Companies

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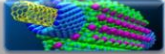HELLAS

CERTH @ Thess-INTEC – 2/6 of mature MegaProjects

Thess-INTEC : Flagship Infrastructure responding to the needs of research and business community

ITI is the coordinator of MP3, HIT coordinates MP5. CPERI co-coordinates MP4

- Next to Macedonia International airport
- Seafront location
- Size of international specifications
- Adjacent to residential environment
- Existing utility infrastructures

Thess-INTEC   700x10³ m²

Thess-INTFC

MP1- Advanced materials and manufacturing Processes

MP2- Flexible Organic Nanotechnology Applications

MP3- Artificial Intelligence and Simulation Applications

MP4- Renewable and zero/low carbon footprint technologies

MP5- Competence Center for business & Logistics challenges
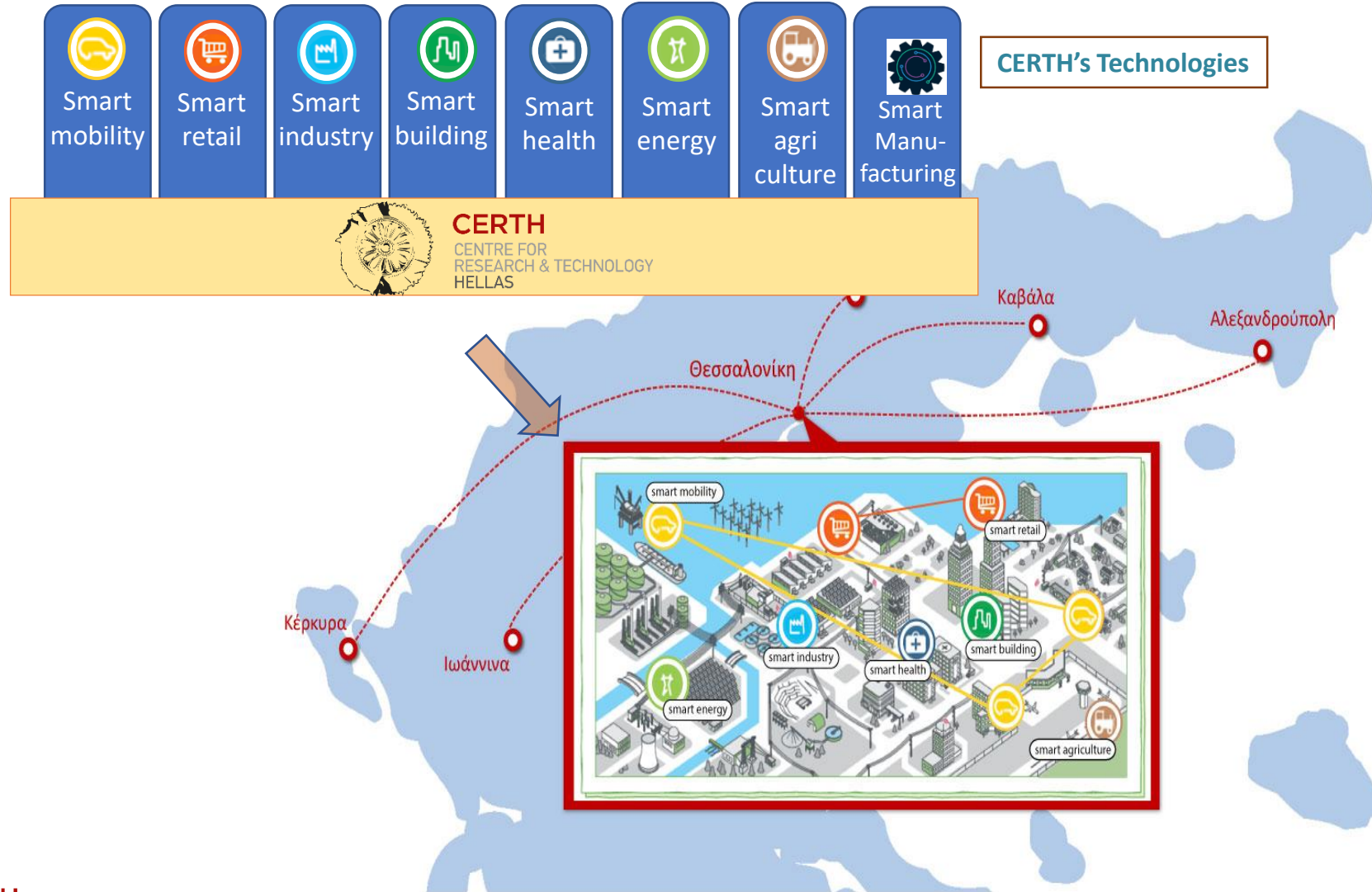
MP6- Future Mobility Applications

Project PHASE A
Total Building Area : 24.000 m²
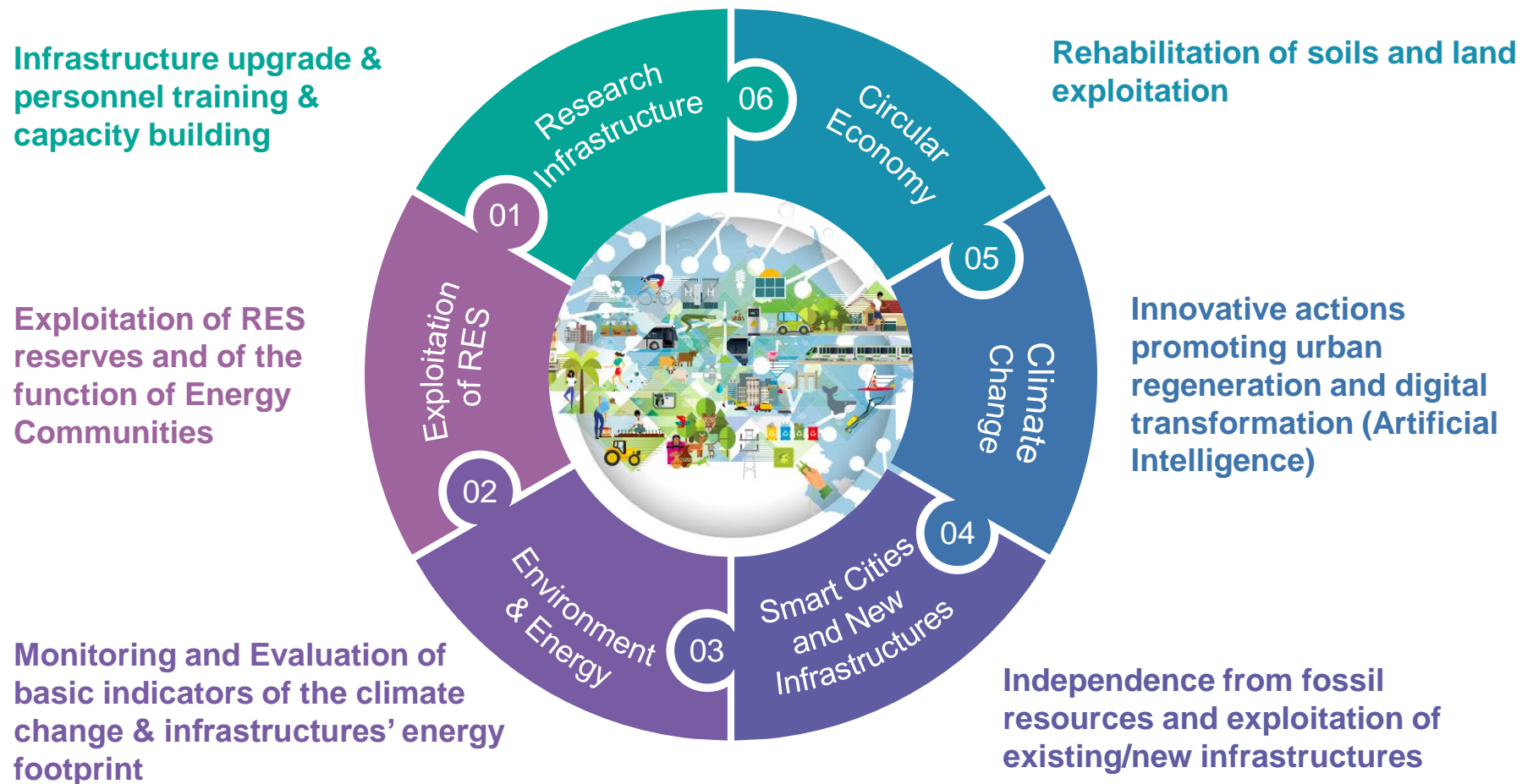Construction Budget : € 72 Meuro

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Northern Greece – a test field for CERTH's technologies

Smart mobility

Smart retail

Smart industry

Smart building

Smart health

Smart energy

Smart agri culture

Smart Manu- facturing

CERTH's Technologies

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Καβάλα

Αλεξανδρούπολη

Θεσσαλονίκη

Κέρκυρα

Ιωάννινα

smart mobility

smart retail

smart industry

smart health

smart building

smart energy

smart agriculture

CERTH
CENTRE FOR
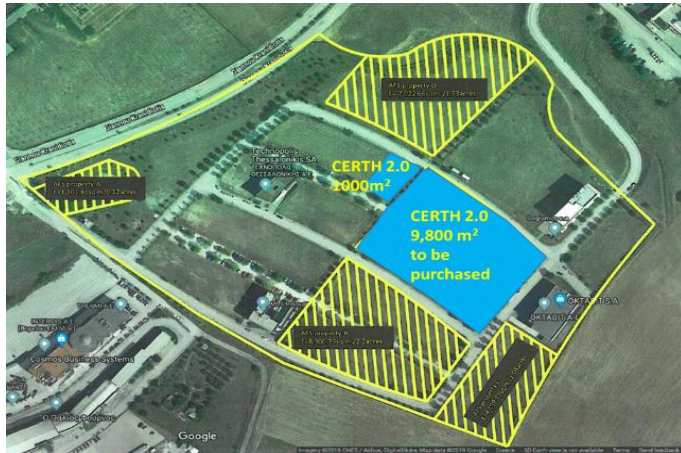RESEARCH & TECHNOLOGY
HELLAS

Actions for the post-lignite era in Western Macedonia

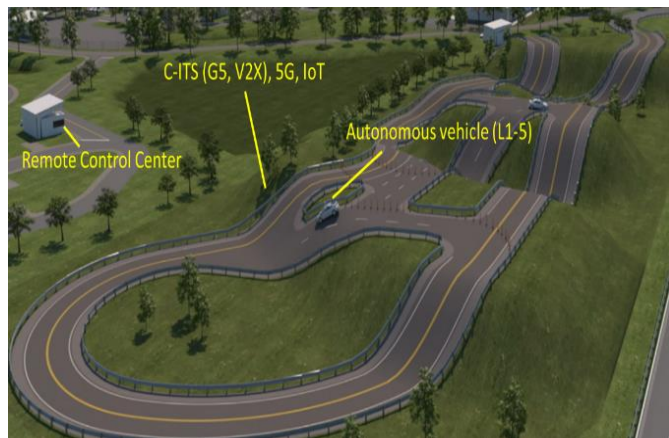**Proposals of 30 Meuros, in the framework of the Just Transition Development Plan, Region of Western Macedonia**
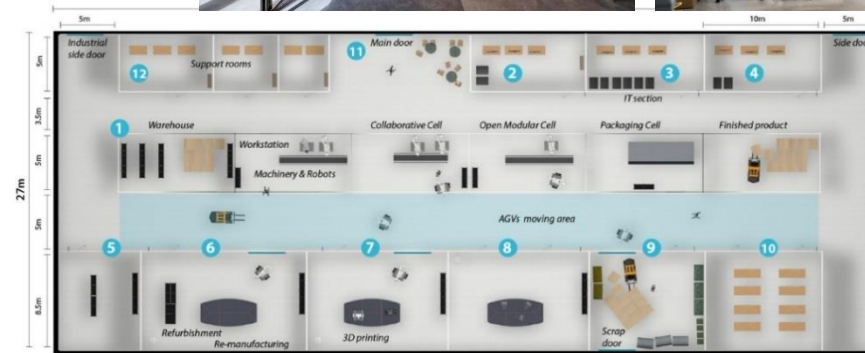

Infrastructure upgrade & personnel training & capacity building

Exploitation of RES reserves and of the function of Energy Communities

Monitoring and Evaluation of basic indicators of the climate change & infrastructures' energy footprint

Rehabilitation of soils and land exploitation

Innovative actions promoting urban regeneration and digital transformation (Artificial Intelligence)

Independence from fossil resources and exploitation of existing/new infrastructures

Research Infrastructure — 01
Exploitation of RES — 02
Environment & Energy — 03
Smart Cities and New Infrastructures — 04
Climate Change — 05
Circular Economy — 06

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CERTH 2.0 – R&I Infrastructures for the next decade

Funding from **EIB/RRF**, 34 Meuro

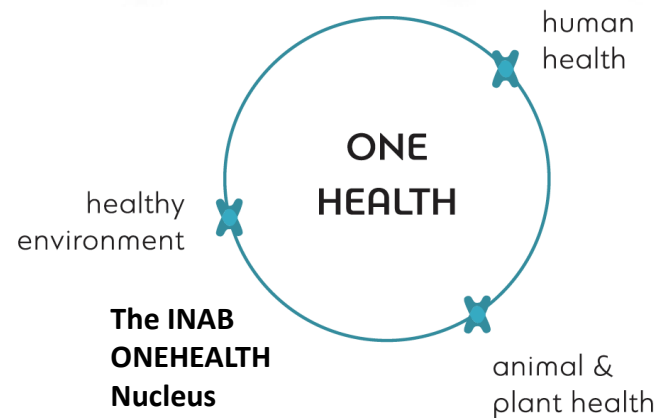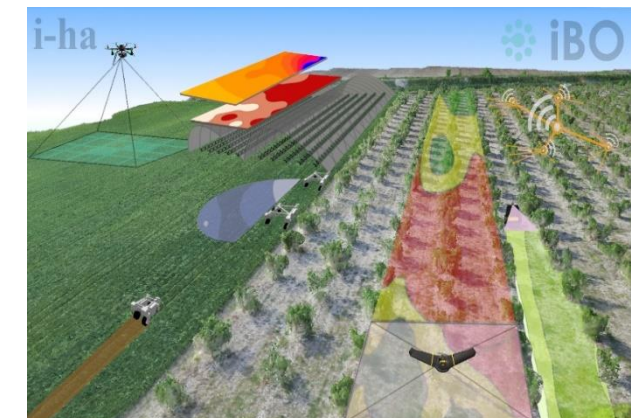"The Factory" CPERI

ITI - Industry 4.0 test facility
AI Nucleus

1. Experimental Production Line
2. Digital Twin
3. HPC / AI Infrastructure
4. Security & Safety
5. Material Characterization
6. Maintenance
7. Additive Manufacturing
8. Co-creation VR/AR
9. Circular Economy
10. Education & Training
11. Reception area
12. Other facilities

The HIT i-MILE | Intelligent Transport Systems Test Bed

i-HECTARE (i-ha) | Arable-Orchard-Greenhouse Autonomous Farming Facility

ONE HEALTH

human health

healthy environment

animal & plant health

The INAB ONEHEALTH Nucleus

Information Technologies Institute

Project 1.1: Industry 4.0 Testbed

Experimental Production Line

Additive Manufacturing Lab
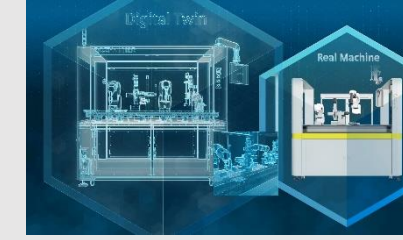
Materials Characterization Lab

Materials Chemistry Lab

Co-creation VR/AR

Digital Energy Lab

**Digital Twin infrastructure**

Robotics Infrastructure

nearly Zero Energy Building
(4.940m²)

Thessaloniki Innovation and
Technology Centre (Thess INTEC),
Municipality of
Thermaikos, Thessaloniki

❖ **Advanced** testbed facilities, rich in diverse and sophisticated **robots, additive manufacturing, AI and ICT technologies** for the experimentation with a plethora of novel Industry 4.0 solutions forming **a highly sophisticated Digital Innovation Hub**.

❖ **Adaptive**, **real** production line/shop floor with state-of-the-art industrial systems, robots and software tools for the **testing, verification and validation** of diverse Industry 4.0 processes, prior to **their introduction into real-world manufacturing supporting the whole lifecycle** (from design, engineering to commissioning and end-of-life support).

Information Technologies Institute

Project 1.2: AI Nucleus
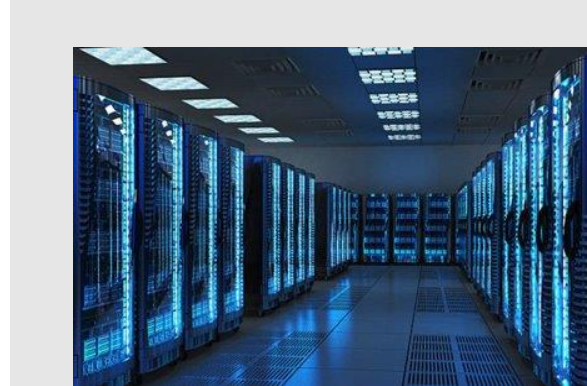
HPC Infrastructure

Deep Learning Infrastructure

AI Infrastructure

nearly Zero Energy Building (1.340m²)

Technopolis ICT Business Park,
Thermi, Thessaloniki

❖ **High-Performance Computing and AI Infrastructure** that will support and further enhance:

- **Big Data** Storage and support for **Exascale** data computing
- **Distributed** Deep Learning Networks computations
- **Federated learning** operation for AI application on edge devices, of **low energy consumption**
- Scalable **Interconnected** IoT networks
- Novel services provision in the fields of **analytics**, AI **explainability** and **decision optimization**
- **Benchmarking** Industry 4.0 solutions and operations

P4.2 The Factory

- Basic and applied research activities for the development of innovative technologies for the production of products and services to achieve technological excellence in the fields of Energy, Environment, Materials Technologies

- Creating start-ups. The infrastructure will also host start-ups from the other CERTH institutes.

Building (almost) zero energy consumption(3.560 m^2)

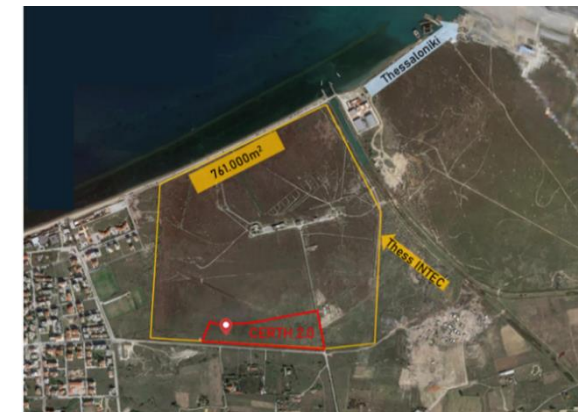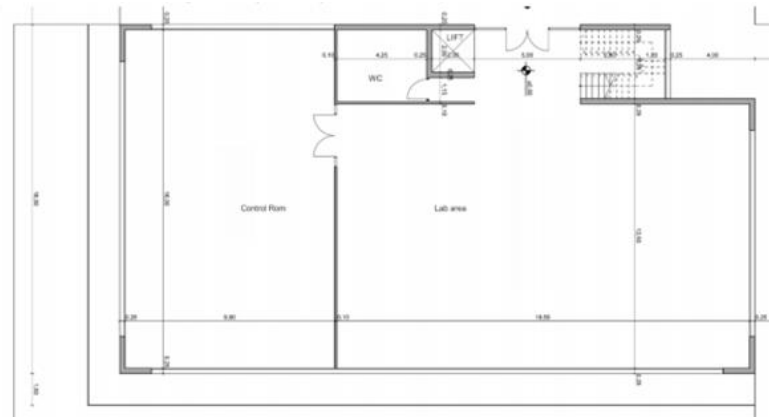Technopolis Thessaloniki, Municipality of Pylaia-Hortiatis, Prefecture of Thessaloniki

- **Research areas :**

  > Membrane technologies for energy and environmental applications

  > Innovative / zero carbon fuels and chemicals

  > Utilization and sequestration of CO$_2$

  > Production of green hydrogen

  > Materials technology for biotechnology and health applications

- **Lab infrastructures :**

  > Open space of 11 m height for development of pilot units

  > Machine shop

  > Laboratories (8)

P4.1 CPERI Innovation Cell

- Co-coordinator of MP4. Renewable and zero/low carbon footprint technologies

Building (almost) zero energy consumption (1000 m^2)

ThessIntec Technology Park (Municipality of Thermaikos, Prefecture of Thessaloniki)

- **Research areas :**

  > Development of new catalytic technologies for the production of fuels, biofuels and biochemicals of low carbon footprint

  > Materials and methods of hybrid/thermochemical energy storage

  > Integrated solutions for the maritime sector

  > Infrastructure of automation and control via internet

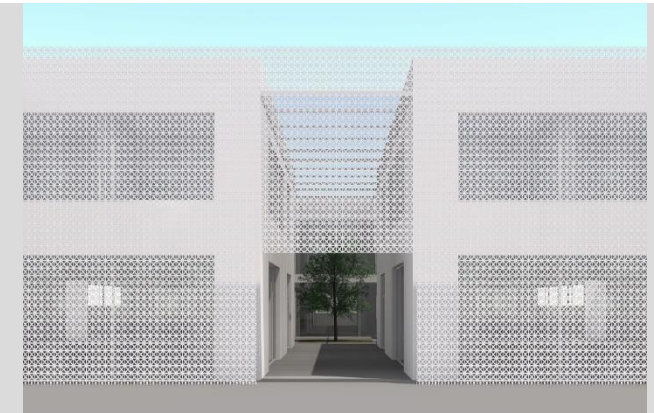 > Regeneration system for fuel cells
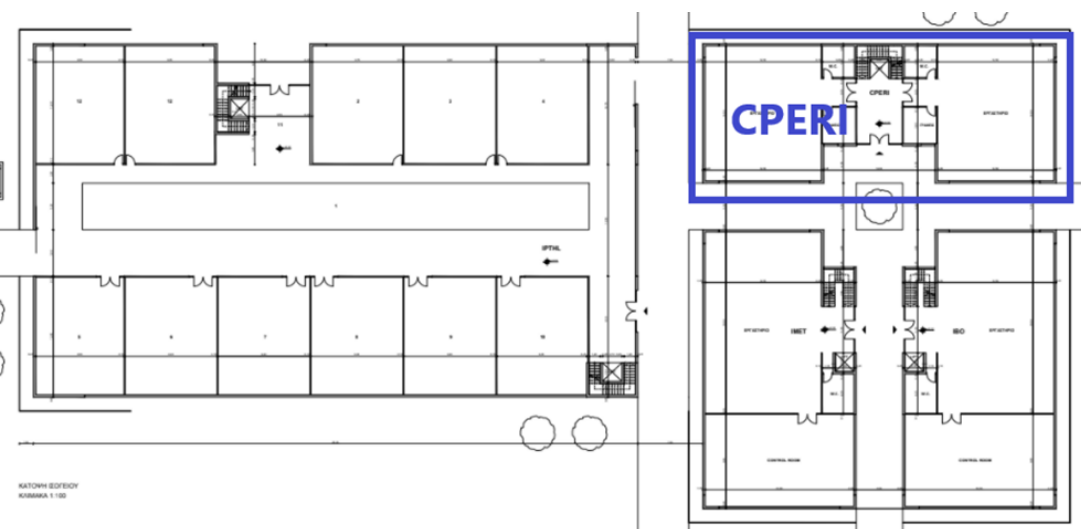
Hellenic Institute of Transport
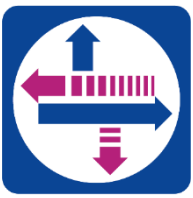
Project 3.1: "HIT's new zero-footprint building and Research Infrastructures"

❖ Development of new building and research infrastructures for CERTH-HIT:
   ❖ **New Building** of a total area of 960 sq.m. that will also host the Control Tower of the new Protected Test (Project 3.2)
   ❖ **5 research laboratories**

Data Analytics LAB

*Digital Twins LAB*

Intelligent Logistics LAB

L & PLEV Certification LAB

A-test LAB

✓ *Combined capabilities in established transport research domains of CERTH-HIT, towards the accomplishment of new goals within the Smart Cities context*
✓ *Interfaces between the transport domain and other sectors (development of new vehicles, monitoring of road infrastructures)*
✓ *Development of an integrated environment for extending the knowledge about smart future mobility in smart cities*

Hellenic Institute of Transport
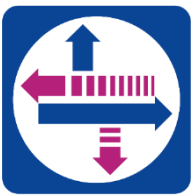
Project 3.2: "iMile: Protected Test Track Circuit &Testbed in Real-world network"

❖ **Protected** test track:
  - ❖ i-mile test track circuit (1,5 kms)
❖ **Real-world** environment**:**
  - ❖ i-mile real-world test bed (5,5 kms)

- ✓ *Increased understanding and testing of new technologies in the transport domain (autonomous vehicles, Vehicle-to-Vehicle and Vehicle-to-Infrastructure digital connectivity technologies)*
- ✓ *Support of test cases for the use of connected and automated vehicles related to road safety, traffic efficiency and levels of service provided*
- ✓ *Further development of Cooperative Intelligent Transportation Systems aiming to enhance dynamic traffic management and support sustainable mobility objectives*
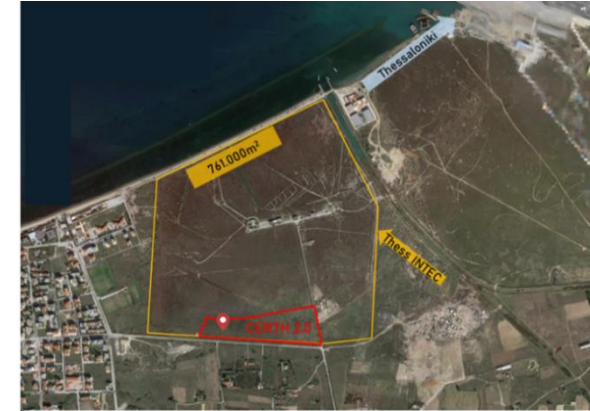
Institute of Applied Biosciences

P2.1 OneHealth Nucleus

State-of-the-art research ecosystem for innovative applications in Life Sciences

- modeling of biological processes
- pharmacological research
- planning (and elaboration) of clinical trials
- advanced diagnostic
- e-health

Building (almost) zero energy consumption (3.000m^2)

ThessIntec Technology Park (Municipality of Thermaikos, Prefecture of Thessaloniki)

Lab infrastructures :

➢ Animal house with related workshops

➢ Next generation sequencing unit

➢ Metabolic analysis unit

➢ Microbial Cell Factory Facility

➢ Biobanks

➢ High performance computing units

➢ End user interaction area

➢ Forum, a place of interaction with its partners and the general public
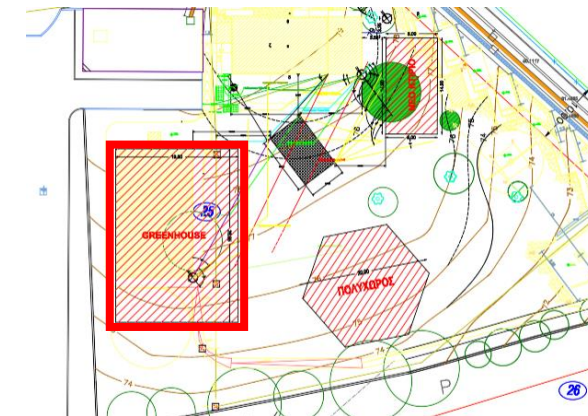
P6.2 INAB SMART Agri-Food pilot facility (Greenhouse)

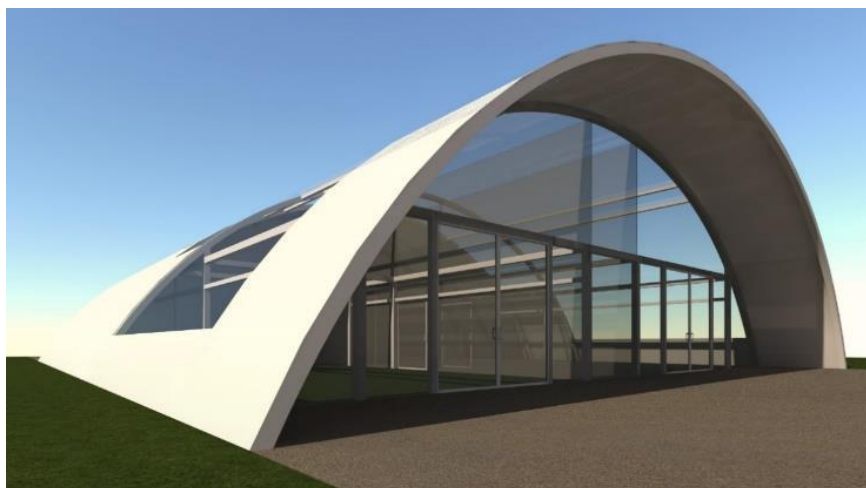Intelligent greenhouse for simulating climatic conditions

- development of innovative crops
- development of multi-trophic systems
- selection of genetic material
- yield studies of new improved varieties
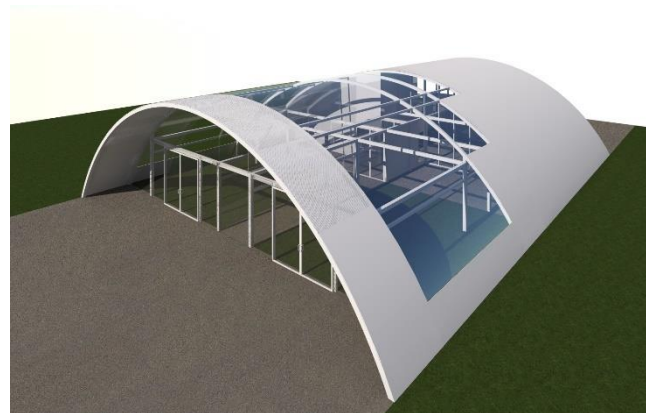
Building (almost) zero energy consumption (420 m^2)

CERTH Headquarters, Thermi, Thessaloniki

Lab infrastructures

➢ aeronautical and multifunctional systems infrastructure

➢ phenotyping systems

➢ new marine organisms development infrastructure

➢ recording infrastructure, yields of plant and marine organisms

Bio-economy and Agro-technology Institute

P5.1 iBO-Tech

- Fusion of all technological developments in agriculture and other applied sciences.

- Digitization and automation of production systems leading to sustainable and environmentally safe agriculture.

- State-of-the-art infrastructure for the design and development of intelligent systems and automation for agriculture.

Building (almost) zero energy consumption (1.080m^2)
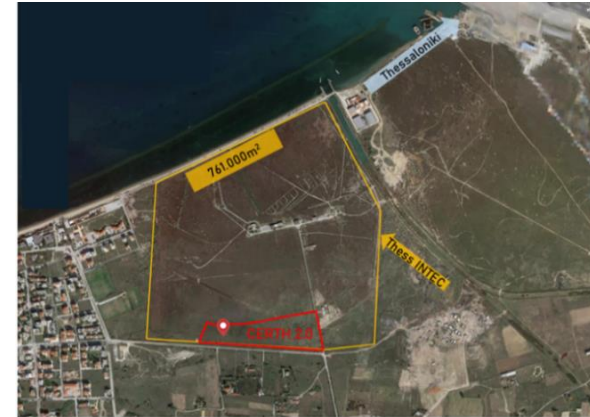
ThessIntec Technology Park (Municipality of Thermaikos, Prefecture of Thessaloniki)

- **Lab infrastructures:**

  > Digital Agriculture Infrastructures

  > Agro-Robotics Infrastructures

  > IoT development and support infrastructure

  > Data analysis and artificial intelligence laboratory

# Bio-economy and Agro-technology Institute

P5.2 iBO-Hive

- Cell of innovation, research and development in the field of Agro-Technology and Agro-Robotics.
- State-of-the-art infrastructure with laboratories and a pilot farm for applied research on the agriculture of the future.
- Fusion of all technological developments in an ecosystem of interdisciplinary research units
- Business innovation center for the dissemination of research results

Building (almost) zero energy consumption (2.300m^2)

Thessaly
Municipality of Rigas Feraios,
Prefecture of Magnisia
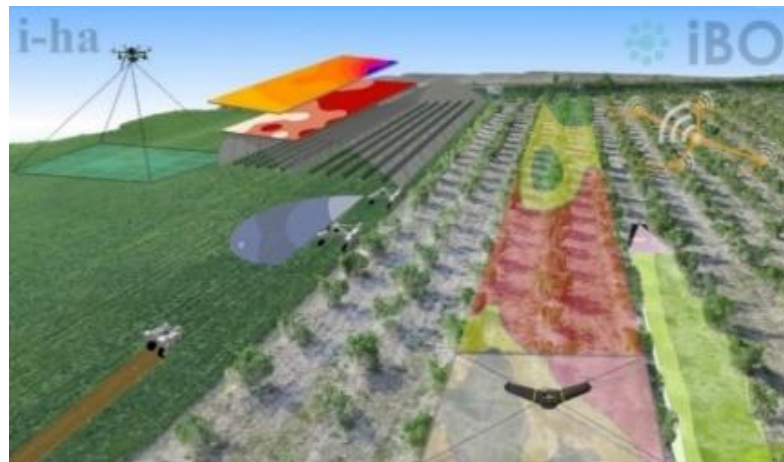
i-hectare
- Pilot farm
- Area for the study and control of cutting-edge technology applications in agriculture
- Demonstration area for research and applications of new technologies results dissemination

Total area 50.000m^2

- **Research units :**

  > **Agri-UAV:** agricultural unmanned vehicles - test and benchmarking facilities for aerial vehicles

  > **Agri-robotic:** agricultural unmanned vehicles - test and benchmarking facilities for ground vehicles

  > **Agri-Sustain:** Environmentally Sustainable Agriculture - Sustainable Agriculture and Zero Emissions

  > **Agri-Human:** Human-machine interaction / Ergonomics-Biomechanics

  > **Agro-intelligent:** Data analytics center