



UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH

[INFRASTRUCTURES]

RESEARCH, DEVELOPMENT & INNOVATION AT THE UNIVERSITAT POLITÈCNICA DE CATALUNYA - BARCELONATECH (UPC)

The Universitat Politècnica de Catalunya - BarcelonaTech (UPC) specialises in the fields of engineering, architecture, science, and technology, including technologies applied to infrastructure. In this field, the main focus areas are:

- Types of infrastructure
- Digitalisation
- Sustainability

As a result of the UPC's recognised research track record in its areas of specialisation, we can offer a wide range of services:

- R&D technology transfer projects
- Consortia for national and Horizon Europe projects
- Patents
- Technology assessment
- Specialised facilities

The UPC is a leading university in Spain in volume of research and technology transfer to companies, and has become one of the major hubs of knowledge in Southern Europe.

[TYPES OF INFRASTRUCTURE]

TRANSPORT INFRASTRUCTURES

Roads, railways, airports, seaports and waterways. They facilitate the movement of goods and people.

- Improvement of structural behaviour to withstand earthquakes and fires by applying stainless steel.
- Reduction of creep and fatigue of structural elements in marine and/or coastal environments through concrete reinforced with polymer fibres.
- Extension of the lifespan of asphalt using new tools to measure the ductility of bituminous binders.
- Reduction of noise pollution and vibrations caused by railway infrastructures.
- Reduction of economic and environmental impact through tools to improve maintenance and renewal efficiency.
- Reduction of risk and increase in coastal areas' resilience to extreme hydrometeorological events.
- Integration and evaluation of Building Information Modelling (BIM) and the Value Model for Sustainability in bridge construction.

ICT INFRASTRUCTURES

Telecommunications networks: fibre optic cables, wireless networks, satellites, antennas and communication towers. They enable the transmission of information and data. This includes servers, data centres, network cables, computer equipment and information technologies.

- Monitoring of the cyber-physical security of critical infrastructures.
- Network planning.
- Antennas and communication infrastructures.
- Data collection systems (IoT).
- 5G, 6G and LoRa Mesh.

SOCIAL INFRASTRUCTURES

Schools, hospitals, health centres, cultural spaces and social housing, among others.

- Improvement of indoor air quality.
- Comfort and energy use in buildings and public spaces.
- Improvement of building safety against wind and earthquakes.
- Acoustic sensors to generate automatic noise maps.



[TYPES OF INFRASTRUCTURE]

ENERGY INFRASTRUCTURES

Power generation plants, distribution networks, hydroelectric power stations, wind farms, solar plants and others.

- Improvement of the performance and reliability of floating offshore wind technology.
- Optimisation of hydraulic infrastructures by increasing efficiency and reducing costs.
- Reduction of the impact of soil degradation on infrastructures.
- Rehabilitation and maintenance of hydraulic works and tools for comprehensive management and evaluation against expansive phenomena.
- New durable materials and sustainable methodologies for the repair of hydraulic infrastructures.

INDUSTRIAL INFRASTRUCTURES

Includes factories, industrial zones, business parks and all facilities necessary for the production and manufacture of goods.

- Assessment of the resistance of structural elements subjected to cyclic forces.
- Functionality, safety, and durability of structures under static, seismic loads and environmental actions.
- Automated warehouses.
- Intelligent manufacturing.

[DIGITALISATION]

DIGITAL TWINS, INTELLIGENT BIM MODELS

- Zero energy building.

REMOTE MONITORING

- Non-invasive tools to monitor large infrastructures (damage identification).
- Predictive modelling of behaviour, maintenance and safety improvement of infrastructures considering future environmental changes.
- Optimisation and monitoring products for critical infrastructure safety.
- Auscultation, conservation and maintenance of infrastructures.

ADDITIVE MANUFACTURING. 3D PRINTING OF RECYCLED CONCRETE



[SUSTAINABILITY]

Construction processes that take into account the minimisation of natural resources and concepts such as industrialisation or digitalisation, circularity and reduction of energy use.

MATERIALS

- New steel-concrete connection systems in mixed structures to improve load and fire resistance.
- Bio-based materials. Recycling of agricultural waste through the use of vegetable fibres as reinforcement in advanced construction materials.
- Agricultural waste for the design of high-efficiency insulation SATE panels.
- Neuromorphic and nociceptive materials for infrastructure sensorisation.
- Deformable piezoelectric materials applied to energy generation.
- High-durability concrete structures incorporating flexible thermoplastic reinforcement.
- Porous materials for sustainable drainage and water recovery.

CIRCULARITY

- Recycled textile materials for multifunctional panels for ventilated façades, floating floors and roofing slabs, and as reinforcement for masonry and ceramic structures.
- New bituminous binders from tanker waste.
- New cementitious materials from the fine fraction of construction waste.

GREEN ROOFS

- Optimisation of green roofs: structural study and feasibility.
- Analysis and monitoring of physical (energy, consumption, air quality) and social (justice, vulnerability, accessibility) effects of green roofs.

LIFE CYCLE

Planning, design, construction, service life and operation, maintenance and dismantling and recycling, considering economic, social, environmental, quality, and health and safety aspects.

- Remote monitoring and solutions for the effects of climate change on infrastructures (mass loss, accelerated ageing, fatigue, cracking, etc.).
- Life cycle assessment of large infrastructures on economic, social, environmental, quality and health and safety aspects relating to people, with a holistic perspective.

REHABILITATION

- New techniques for strengthening and rehabilitating urban heritage structures using lightweight materials.
- Identifying mechanisms to reverse degradation trends and reuse obsolete building stock as affordable housing.
- Minimal and reversible interventions on heritage sites.
- Decision support in the temporal planning of rehabilitation actions to improve building energy efficiency.
- Energy rehabilitation by reusing obsolete closing systems to mitigate the heat island effect.
- Seismic rehabilitation of reinforced concrete structures.

TERRITORIAL PLANNING

- Economic and territorial evaluation and planning.
- Study and recommendations to mitigate the heat island effect.
- Evaluation of green space quality using satellite images.
- Assessment of earthquake-induced risk.
- Sustainable and participatory post-disaster reconstruction in high seismic risk areas.

CIT UPC
Ed. K2M (Office106)
C/Jordi Girona 1-3
08034 Barcelona - Spain
Tel. +34 93 405 44 03
info.cit@upc.edu



www.cit.upc.edu



EUROPEAN UNION
European Regional
Development Fund



Generalitat de Catalunya
Departament de Recerca i Universitats
Secretaria General