MetaInfrastructure.org

July, 2025
Issue: 02

NEWSLETTER

our mission

We innovate for delivering future built ecosystems — encompassing cities, infrastructure, buildings, and services—through people-centric, sustainable, and resilient design. Our work supports equitable infrastructure aligned with the UN SDGs and Net-Zero goals. We assess the exposure of cyber-physical infrastructure to natural, climate, and anthropogenic threats—from sea-level rise to conflicts—using threat-agnostic resilience approaches. Leveraging AI, Generative Design, Digital Twins, IoT, and VR, we develop data-driven solutions to enhance decision-making in complex systems.

Our research promotes sustainability, inclusivity, and co-development, shaping green and blue infrastructure policies within the evolving metaCity. Through Counterfactual Engineering and Engineering for People, we explore innovative strategies to future-proof infrastructure—upholding the core mission of Civil Engineering: serving society by delivering safe, inclusive, and resilient infrastructure that enables communities to thrive.

top news

Dr Stergios-Aristoteles Mitoulis, leader of the MetaInfrastructure group, has been appointed Associate Professor at The Bartlett School of Sustainable Construction, University College London (UCL), which is ranked #1 in the world for Architecture and the Built Environment in the 2024 QS World University Rankings by Subject.

We are thrilled to share that our new project, PORTAL, has been awarded €1.8 million under the HORIZON-MSCA Staff Exchanges programme. This 48-month international initiative will develop threat-agnostic resilience strategies for port ecosystems, addressing cascading risks across infrastructure and socioecological systems.

our expertise

threat-agnostic resilience

- Real-time, resilience-based response framework and metrics
- AI-driven integration and digital twin technology
- Automated decision support systems for complex infrastructure systems
- Proactive mitigation of cascading failures

AI applications & digitalisation

- Advanced data integration and analysis
- Innovative monitoring and predictive technologies
- AI-driven digital twins for infrastructure
- Ethical and explainable AI for crisis management

sustainable development

- Comprehensive Life Cycle Assessment (LCA) frameworks
- Predictive and risk-integrated models
- Multi-criteria optimisation for circularity
- Time-dependent circular intervention planning

metaCity

- Resilient urban systems
- Coupled urban risk mitigation
- Innovative technologies for smart cities
- Sustainable and equitable urban environments

Counterfactual Engineering

- Hazard intensity assessment
- Fragility and recovery modeling
- Sustainability analysis
- Resilience quantification and cost assessment
- Resilience and sustainability trade-offs

engineering4people

- Integrated people-centric risk models
- Data-driven calibration
- People-centric strategies

- Education & capacity building
- Massive Open Online Courses
- Continuous Professional Development (CPD)

featured topic

MetaInfrastructure Secures €1.8M HORIZON Funding for PORTAL Project

We are thrilled to announce the successful funding of our latest research initiative, PORTAL – Adaptive Strategies for Enhancing Threat-Agnostic Resilience of Port Ecosystems, under the HORIZON-MSCA Staff Exchanges programme, with a total grant of €1.8 million.

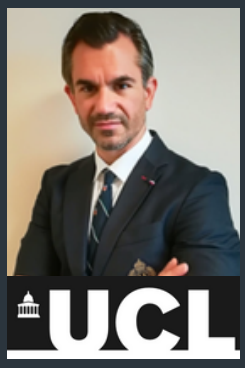
PORTAL is a 48-month international collaboration focused on pioneering adaptive, threat-agnostic resilience strategies to safeguard Port Infrastructure and interdependent SocioeCOlogical systems (PISCOs). The project embraces a transformative agenda—moving beyond traditional risk models to proactively mitigate cascading failures and establish robust resilience benchmarks for port ecosystems worldwide.

As climate threats, digital vulnerabilities, and geopolitical instabilities evolve, a threat-agnostic approach becomes essential. PORTAL rethinks port resilience from a systems perspective, offering fit-for-purpose adaptation strategies across technical, ecological, and social dimensions.

Partners:

Brunel University of London (Coordinator)
University College London-The Bartlett School
Politecnico di Milano
International Hellenic University
German Aerospace Centre
Factor Social
ARGO-E GROUP
CEMOSA
ENVIVA
Research Driven Solutions
University of California, Berkeley

our news Apr-Jun 2025



June, 2025: Dr Stergios-Aristoteles Mitoulis, head of the MetaInfrastructure group, has been appointed Associate Professor at The Bartlett School of Sustainable Construction, University College London (UCL), the world's top-ranked institution for Architecture and the Built Environment according to the 2024 QS World University Rankings by Subject. In recognition of his academic contributions, he has also been awarded an Honorary Professorship at the University of Birmingham.

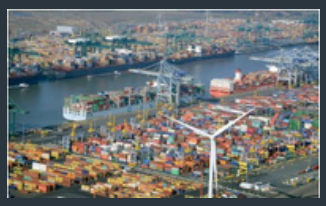
June, 2025: Secondment at European Commission's JRC in Ispra, Italy. In the context of the FIREWISE project, Dr Stavros Sakellariou completed a targeted secondment at the Joint Research Centre (JRC) in Ispra, collaborating with experts from the EFFIS and Built Environment divisions. The visit focused on linking wildfire simulation modelling with fragility analysis for critical infrastructure, private and public assets, reinforcing efforts to develop threat-informed resilience strategies tailored to Europe's built environment.

June 15-18, 2025: MetaInfrastructure at COMPDYN 2025
MetaInfrastructure was present at COMPDYN 2025 – the 10th International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering, held in Rhodes, Greece. Dr Stergios Mitoulis, together with postdoctoral researchers Dr Roberta Di Bari and Dr Raffaele Cucuzza, proudly represented the team—strengthening research ties and celebrating collaboration in a vibrant setting.

June 1-6, 2025: MetaInfrastructure is proud to be represented at ICOSSAR 2025- Advancing Resilience in Multi-Hazard Contexts, in Los Angeles, one of the world's leading conferences on structural safety and reliability. Dr Stergios Mitoulis presented two talks, focused on multi-hazard approaches to structural assessment and infrastructure design: 🔹 Threat-Agnostic Resilience – A Systems Perspective, 🔹 Sustainability and Resilience-Driven Prioritisation for Restoring Critical Infrastructure in Multi-Hazard Contexts: Conflict Case.

May 21, 2025: MetaInfrastructure participated in the 4th EU Mission Adaptation Forum, where experts and policymakers explored pathways to climate-resilient infrastructure. Key discussions focused on smart financing tools (e.g. insurance, taxation, PPPs) and the need for robust governance to ensure political continuity and combat greenwashing. The forum highlighted the urgency of building resilient, inclusive, and adaptable cities, aligning with MetaInfrastructure's mission to support sustainable urban transformation through collaboration and innovation.

our news Apr-Jun 2025



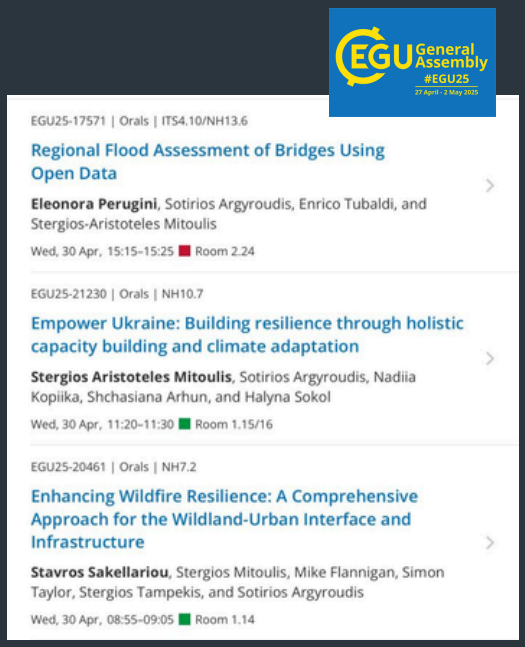
May 13, 2025: We are excited to announce that PORTAL—our new 48-month international project—has been awarded €1.8 million under the HORIZON-MSCA Staff Exchanges programme. PORTAL pioneers threat-agnostic resilience strategies for ports and interdependent socioecological systems, addressing cascading risks from climate, digital, and geopolitical threats. Coordinated by Brunel University of London, the consortium includes 11 partners from Europe and the US, including UCL-The Bartlett School, Politecnico di Milano, The German Aerospace Centre (DLR), CEMOSA and UC Berkeley.

May 8, 2025: MetaInfrastructure annual meeting and Workshop: Shaping Future Cities: Building Capacity for Resilient, Sustainable, and Digital Built Environments. The 2025 MetaInfrastructure Workshop brought together bold ideas for resilient, sustainable, and tech-enabled infrastructure. Highlights included a keynote by Prof. Priti Parikh (UCL), sessions on AI, Digital Twins, VR, funding proposals, and REF strategy. The workshop also introduced the upcoming META Awards, celebrating innovation and impact.

May 6-7, 2025: Dr. Stergios Mitoulis and Dr. Sotirios Argyroudis attended the SMI2G brokerage event in Paris, where they had the opportunity to engage with innovators and practitioners from across Europe. They discussed game-changing ideas and novel technologies aimed at addressing the challenges outlined in the Horizon Europe Civil Security for Society 2025 Work Programme, while exploring potential collaborations with prospective consortium partners.

May 6, 2025: Nadiia Kopiika represented the MetaInfrastructure group at the Horizon Europe Cluster 5 Info Day and GREENET Brokerage Event in Brussels. These events provided valuable insights into the 2024–2025 Work Programme priorities on climate resilience, energy transition, and sustainable mobility. Key topics included climate-resilient critical infrastructure, clean energy innovation, and inclusive, community-driven solutions. The brokerage event also offered excellent networking opportunities for building future Horizon Europe consortia.

our news Apr-Jun 2025



27 April–2 May, 2025: MetaInfrastructure at EGU General Assembly 2025: MetaInfrastructure members contributed to the EGU 2025 in Vienna, showcasing cutting-edge research across multiple sessions. Highlights include:

- Empower Ukraine: Building resilience through holistic capacity building and climate adaptation – Dr Stergios Mitoulis et al.
- Regional flood assessment of bridges using open data – Dr Eleonora Perugini et al.
- Enhancing Wildfire Resilience: A comprehensive approach for the Wildland-Urban Interface and infrastructure – Dr Stavros Sakellariou et al.

April 18, 2025: ARTISTE 2025 Keynote: Prof. Stergios Mitoulis on AI-Driven Bridge Monitoring: Prof. Stergios-Aristoteles Mitoulis, leader of MetaInfrastructure.org, will deliver a keynote at the ARTISTE 2025 International Conference on Artificial Intelligence in Structural Engineering, scheduled for September 14–17 at Politecnico di Torino, Italy.
Keynote Title: Non-destructive Bridge Damage Characterisation: From Traditional Approaches to Novel Ensemble Learning

featured publications

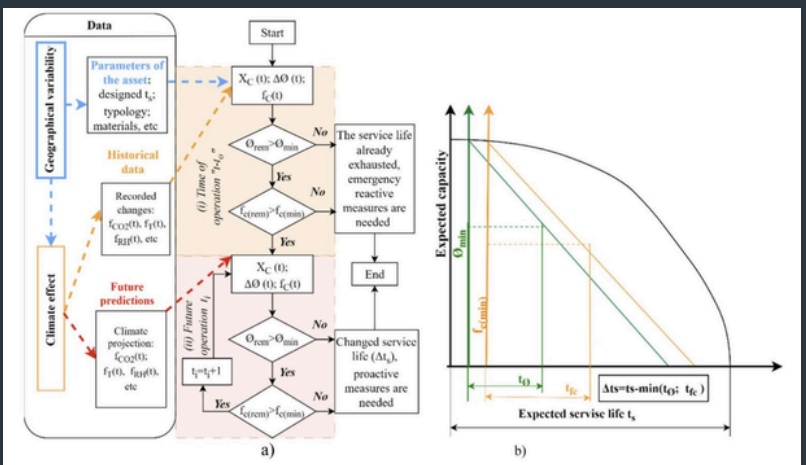


Fig. 3. The method for estimating the expected service life (t_s) decrease of the life span (Δt_s) of RC structures, considering reinforcement corrosion (t_Φ), and change of the concrete strength (t_{fc}): (a) general framework, (b) estimation of service life change due to reinforcement corrosion time (t_Φ), and change of the concrete strength time (t_{fc}): Dashed lines indicate impacts/data, taken into account at particular stages of the framework.

Kopiika, N., Robery, P., Ninic, J., & Mitoulis, S. A. (2025). Remaining Life of Ageing RC Infrastructure for Sustainable development: Deterioration Under Climate Change. *Case Studies in Construction Materials*, 22, e04757.

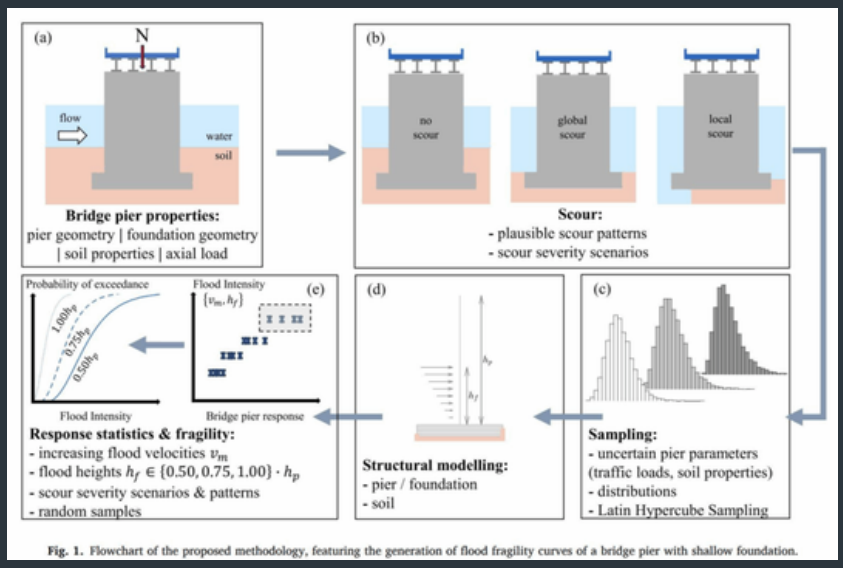
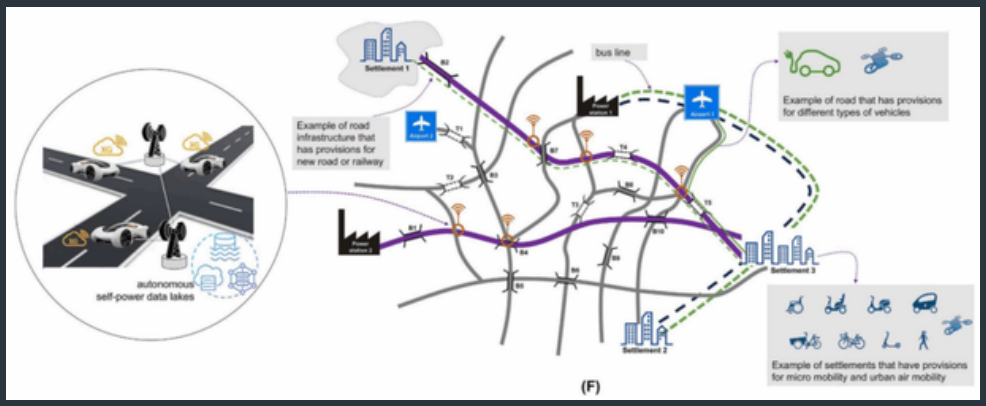


Fig. 1. Flowchart of the proposed methodology, featuring the generation of flood fragility curves of a bridge pier with shallow foundation.

Kazantzi A, Bakalis K, Mitoulis S-A (2025). Flood fragility assessment of bridges—Unified framework. *Reliability Engineering and System Safety*, 262 111196.

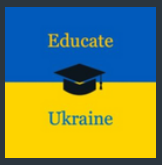


Trump, B. D., Mitoulis, S., Argyroudis, S., Kiker, G., Palma-Oliveira, J., Horton, R., ... & Linkov, I. (2025). Threat-agnostic resilience: Framing and applications. *International Journal of Disaster Risk Reduction*, 105535.

ongoing projects

PORTAL – Adaptive strategies for enhancing threat -agnostic resilience of port ecosystems
Funding: HORIZON-MSCA-SE-2025

Empower Ukraine – Capacity building for critical infrastructure restoration in Ukraine
Funding: UK Charity-2024



FIREWISE - Proactive wildfire resilience assessment and management
Funding: UKRI/HORIZON-MSCA-PF-2024

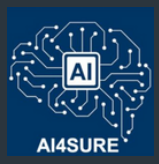
META-GRID– Climate resilience assessment and adaptation of the European power grid
Funding: HORIZON-MSCA-PF-2024

REACT – Reusing steel for emission reduction through AI-driven cutting-stock tool
Funding: HORIZON-MSCA-PF-2024

ZEBAI - Innovative methodologies to design zero-emission and cost-effective buildings based on AI
Funding: HORIZON-CL5-2023-D4-01-01

bridgeAdapt - Sustainable adaptation of bridges deteriorated to climate and human-induced damage
Funding: British Academy-2023

AI4SURE – AI-empowered data-mining techniques for sustainable and climate-resilient infrastructure peacebuilding. Funding: British Academy-2023



WINDTUNE - Efficiency of natural ventilation toward zero-energy residential buildings
Funding: British Academy-2023

ReCharged – Climate-aware resilience for sustainable critical and interdependent infrastructure systems enhanced by emerging digital technologies. Funding: HORIZON-MSCA-SE-2021

RISKADAPT – Asset-level modelling of risks in the face of climate-induced extreme events and adaptation. Funding: HORIZON-MISS-2021-CLIMA-02

completed projects

- DiRect - Digitally enhanced resilience of critical transport infrastructure
  Funding: HORIZON-TMA-MSCA-PF-EF-2021
- ReBounce - Integrated resilience assessment framework for bridges and transport networks exposed to hydraulic hazards
  Funding: H2020-MSCA-IF-2019
- BriFace - Novel assessment of bridge retrofitting measures through interface efficiency indices using a guided wave-based monitoring method
  Funding: H2020-MSCA-IF-2018
- TRANSRISK - Vulnerability and risk assessment of transportation systems of assets exposed to geo-hazards
  Funding: H2020-MSCA-IF-2016

our team

Prof Stergios Aristoteles Mitoulis, *Head*
The Bartlett School of Sustainable Construction (BSSC), University College London (UCL) and Honorary Professor, University of Birmingham
PhD, DiplEng, MSc, CEng MICE, M.ASCE, M.EAEE, FHEA
resilience of transport assets; monitoring-driven resilience of infrastructure; damage-free; zero-maintenance bridges; Eurocode expert

Dr Sotirios Argyroudis, *Global Deputy Head*
Associate Professor (Reader), Brunel University of London, PhD, DiplEng, BSc, CEng MICE, FHEA
risk and resilience assessment of critical infrastructure and networks; multiple hazards & climate change effects

Nadiia Kopiika, *BSSC, UCL Deputy Head*
Research Fellow, British Academy/CARA
strength and reliability; strengthening; retrofitting, material properties; probabilistic approaches; non-destructive methods

Dr Ivan Izonin, *AI/ML Lead*
Associate Professor, British Academy/CARA
S.M.IEEE, M.ACM, M.INNS
AI/ML; high-speed computational intelligence; neural-like structures; non-iterative training algorithms; ensemble models; meta learning and small data analysis

Dr Nataliya Shakhovska, *Leadership Development*
Professor of Artificial Intelligence and Deep Learning
AI; big data; database and data warehouse integration; distributed systems; integrated systems and dataspaces; VR/AR

Dr Marianna Loli, *Innovation*
principal researcher (Marie-Curie), PhD, DiplEng, MSc, project coordinator Grid-Engineers, Associate at Innovation Center on Natural Hazards & Infrastructure (ICONHIC); seismic risk assessment; geotechnical design; numerical and experimental modelling

Dr Shchasiana Arhun, *Education & Energy Efficiency Lead*
Teaching Fellow, BSSC, UCL
sustainable transport; energy-saving and energy-efficient technologies in transport; renewable energy integration in transport; vibration diagnostics of electric machines

Dr Raffaele Cucuzza, *Circularity in Structures Lead*
Postdoctoral Research Fellow (Marie-Curie), BSSC, UCL, PhD, DiplEng
structural optimisation; data-driven design of infrastructure; LCA-driven design; eco-design; steel structures; reusing steel

Dr Eleonora Perugini, *Scientific Dissemination Lead*
Senior Researcher, BSSC, UCL, PhD, MSc, CEng
remote sensing; bridge-scour; risk assessment; field monitoring; numerical modelling; floods; nearshore morphodynamics; estuarine and river environment

Dr Khrystyna Myroniuk, *Building Physics Lead, Dissemination Operations*
Associate Professor, British Academy/CARA
heating, ventilation, and air conditioning; energy-saving buildings; EU standards; resource-saving technologies

Dr Stavros Sakellariou, *GIS Lead and MetaNewsletter*
Postdoctoral Research Fellow (Marie-Curie), Brunel University of London, PhD, MSC, DiplEng
wildfires simulation and management; GIS & remote sensing; spatial resilience, planning and climate change

Dr Yiming Xiang, *LLMs for Research Facilitation Lead*
Senior Researcher, BSSC, UCL, PhD, MSc
sustainable constructions; energy efficiency; LCA

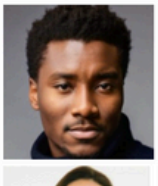
Dr Roberta Di Bari, *R&D and Sustainable Buildings Lead*
Research Fellow, BSSC, UCL, PhD, MSc
sustainable constructions; LCA; building physics

Dariia Berestok, *Operations Lead*
Project Manager, BSSC, UCL
project management; communication; coordination; stakeholder engagement; process optimisation

Henrry V Rojas Asuero, *International (S America) Lead*
Doctoral researcher (Pontificia Universidad Católica de Chile), MSc in Civil Engineering
vulnerability and fragility assessment; civil engineering systems analysis

Francesco Pentassuglia, *Dissemination Lead*
Doctoral researcher, structural engineer, MEng, MSc
FEM; risk assessment and safety; low-carbon; energy efficiency; structural engineering; remote control

Mohammed Almousa, *Communications Manager & Website Lead*
Doctoral researcher, architecture & building science, BSc, MSc
integration of micro-mobility with the public transportation



John Adah Agbo, *Event Organisation Lead*
Doctoral researcher, quantity surveyor, BTech, MSc
climate-resilience and sustainability; optimisation; transport infrastructure; adaptation

Seyyed Mohammad Hosseini, *Content & Communications Assistant*
Doctoral researcher, MSc, BSc in Civil Engineering
seismic design; infrastructure resilience; Finite Element Modelling, Building Information Modelling (BIM)

María Montiel Durá Aras, *Urban Development Specialist*
Doctoral researcher, DegreeEng, MBA
civil construction and urban transports and services; urban development of cities

Dr Jinsheng Wang, *Reliability & Uncertainties Specialist*
Researcher, PhD, MSc, BEng
structural reliability; uncertainty quantification; machine learning; bridge engineering

Morgan Breen, *GIS and Flood Risk Specialist*
Researcher, PhD, BSc in Geography
GIS and geospatial analysis; agent-based modelling; socio-economic and socio-spatial assessment; flood risk management

Dr Jelena Ninic, *Associated Member*
Associate professor of digital engineering, University of Birmingham, MEng, PhD, FHEA
Computational methods and tools; advanced numerical methods and novel information technologies

MetaInfrastructure.org

For more information about our team and research project portfolio visit:
https://metainfrastructure.org