



3rd ReCharged Workshop

27 February 2025

📍 **Fundación Agustín
de Betancourt,
Madrid, Spain**

PROGRAM



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Foreword

Welcome to the **3rd ReCharged Workshop**, hosted in Madrid at the Fundación Agustín de Betancourt. This gathering embodies the spirit and objectives of the ReCharged project, a Marie Skłodowska-Curie Action, dedicated to advancing **climate-aware resilience** and **sustainable critical infrastructure systems**, powered by emerging digital technologies.

Our shared mission is to foster collaboration among experts, researchers, and stakeholders to address the pressing challenges posed by climate change and its cascading effects on infrastructure systems. This workshop is a vital step in realizing that mission, offering a platform to exchange ideas, share cutting-edge research, and build synergies across disciplines.

We encourage you to engage actively in today's sessions, culminating in the **highlight of our program**: the **Round Table Discussion** titled "Lessons from Spain's Floods – Addressing Emergency Response Gaps and Enhancing Resilience Governance Across Europe." This discussion will serve as a critical forum to reflect on recent experiences, identify gaps in emergency response mechanisms, and explore strategies for building resilient governance frameworks across Europe. Your contributions to this dialogue are invaluable as we aim to translate lessons learned into actionable insights that benefit communities and infrastructure alike.

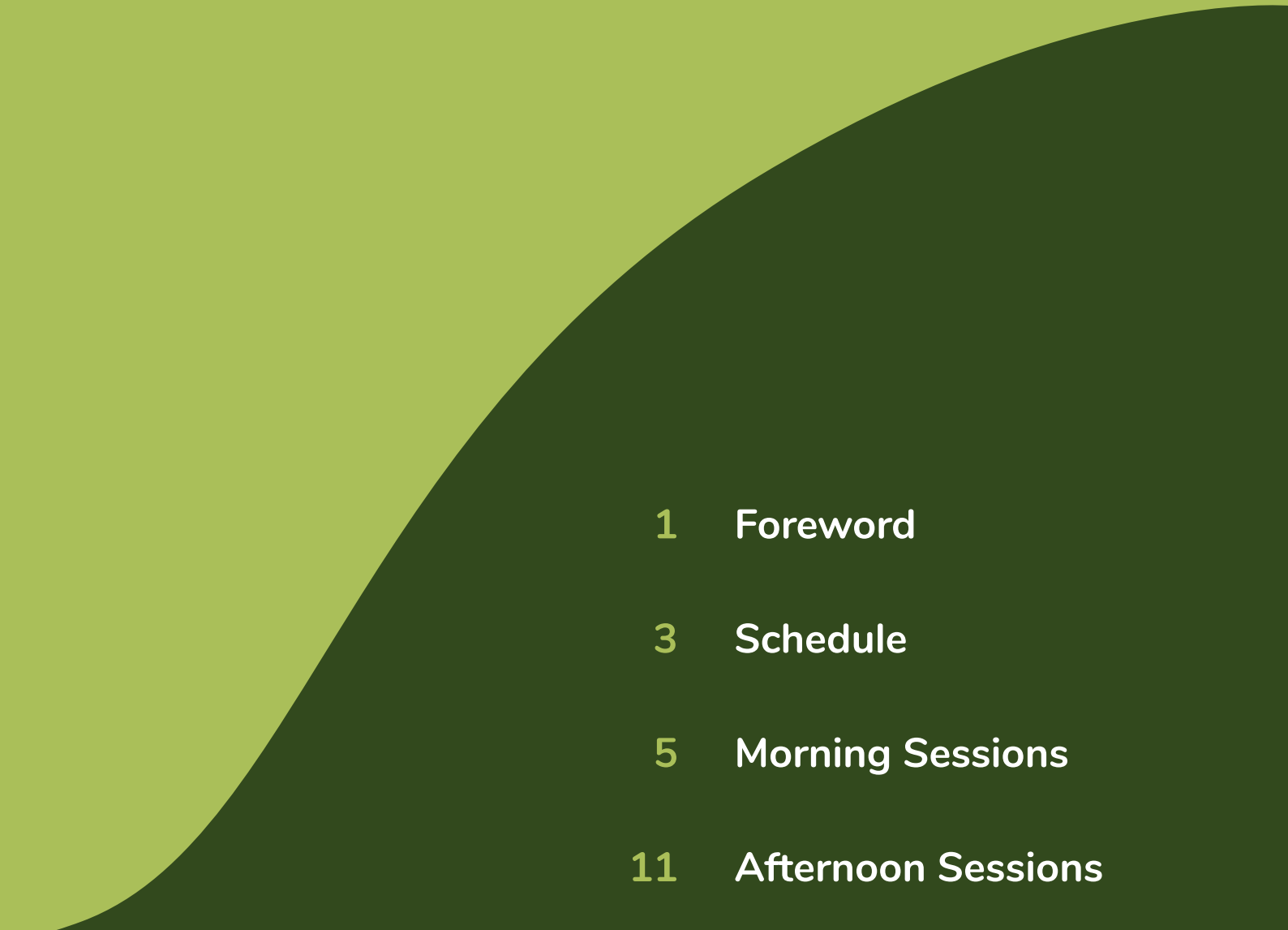
Thank you for being a part of this collaborative effort. Together, we can redefine resilience and pave the way for sustainable, future-proof infrastructure systems.

Warm regards,

Marianna Loli, Grid Engineers — Project Coordinator, ReCharged

Partners





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WORKSHOP SCHEDULE



09:00 WELCOME & INTRODUCTION TO RECHARGED

MARIANNA LOLI (GRID ENGINEERS)
DAVID GARCIA SANCHEZ (TECNALIA)

09:30 CLIMATE PROJECTIONS AND THEIR APPLICATION IN THE DESIGN OF RESILIENT INFRASTRUCTURE SYSTEMS

JORGE PAZ (TECNALIA)

10:00 EMERGING DIGITAL TECHNOLOGIES FOR EMERGENCY RESPONSE AND DATA-DRIVEN RESILIENCE ASSESSMENTS

GIAN PAOLO CIMELLARO (POLITECNICO DI TORINO)
ELENI CHATZI (ETH ZURICH)

10:40 – 11:00 COFFEE BREAK

11:00 TAXONOMIES OF INTERDEPENDENT TRANSPORT-ENERGY ECOSYSTEMS

DAVID GARCIA SANCHEZ (TECNALIA)

11:30 CRITICAL INFRASTRUCTURE RESILIENCE: ADDRESSING CLIMATE HAZARDS, DATA GAPS, AND SOCIO-ECOLOGICAL INTERACTIONS

SOTIRIOS ARGYROUDIS (BRUNEL UNIVERSITY LONDON)

12:00 REFORMULATING THE RETURN PERIOD OF FLOODING

MANUEL DEL JESUS (IH CANTABRIA)

12:30 DIFFERENT DISASTERS, THE SAME HUMAN EFFECTS? THAT'S THE QUESTION

JOSE PALMA (FACTOR SOCIAL)



WORKSHOP SCHEDULE

13:00 THE RECHARGED MOOC EMPOWERS LEARNERS WORLDWIDE: RESILIENCE, SUSTAINABILITY & DIGITALISATION IN CRITICAL INFRASTRUCTURE

STERGIOS MITOULIS (UNIVERSITY OF BIRMINGHAM)

13:30 – 14:30 LUNCH BREAK

14:30 IMPLEMENTING EMERGING DIGITAL TECHNOLOGIES IN BRIDGE MANAGEMENT: THE PATH TO SUSTAINABILITY AND RESILIENCE

JOAN RAMON CASAS (POLITECNICA DE CATALUNYA)

15:10 THE EXPERIENCE WITH THE STAKEHOLDERS REFERENCE GROUP FOLLOWING THE FORESEE PROJECT RESULTS FOR THE RESILIENT TRANSPORT NETWORKS

JESÚS RODRÍGUEZ (UNIVERSIDAD POLITÉCNICA DE MADRID)

15:40 IMPACTS AND ADAPTATION MEASURES OF STATE ROADS IN SPAIN TO CLIMATE CHANGE

FELIPE COLLAZOS (ROAD AUTHORITY FROM CANTABRIA)

16:10 - 16:30 COFFEE BREAK

16:30 ROUND TABLE DISCUSSION: LESSONS FROM SPAIN'S FLOODS – ADDRESSING EMERGENCY RESPONSE GAPS AND ENHANCING RESILIENCE GOVERNANCE ACROSS EUROPE

MODERATORS: DAVID GARCIA SANCHEZ (TECNALIA)
MARIANNA LOLI (GRID ENGINEERS)



Morning Sessions

09:30 | Jorge Paz

Climate projections and their application in the design of resilient infrastructure systems

There is currently a wide range of climate simulations that, under different global warming scenarios, allow us to anticipate scenarios that critical infrastructures will have to face. However, the incorporation of this information in the design and management of infrastructures presents certain limitations and barriers that are delaying its incorporation into decision-making. The presentation will briefly describe how climate projections originate, their potential contribution to the resilience of critical infrastructure systems and the existing limitations regarding their application in infrastructure design, raising considerations to overcome them.



Jorge Paz has a Master in environmental management and a degree in biological sciences with more than 15 years of experience in the field of climate change, both in adaptation and mitigation. He works at TecNALIA in the analysis of climate change risks and their associated impacts, collaborating in the definition of policies and adaptive pathways for governments and infrastructures. He has led the development of climate services in sectors such as infrastructure, energy, health, etc. He has participated in ISO and CEN technical committees aimed at the standardization of adaptation to climate change and climate services. He teaches at the Universidad Pontificia Comillas.



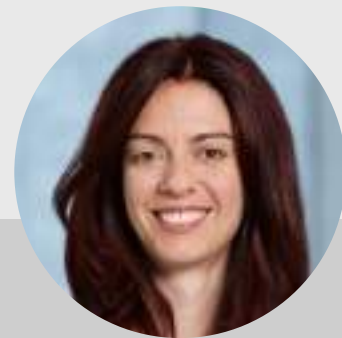
10:00 | Gian Paolo Cimellaro Eleni Chatzi

Emerging digital technologies for emergency response and data-driven resilience assessments

The increasing complexity and frequency of natural and man-made hazards necessitate innovative approaches to emergency response and infrastructure resilience. This talk focuses on how digital technologies—such as sensor networks, structural health monitoring, digital twins, and AI-driven analytics—are reshaping resilience assessments and enabling rapid, informed decision-making during emergencies. We will discuss the integration of physics-based models with data-driven methods, leveraging advancements in machine learning, including graph neural networks and physics-informed AI, to generate actionable insights from complex data. Through case studies, including applications in wind turbine monitoring and bridge emergency management, we will demonstrate how these tools enhance risk mitigation, optimize maintenance strategies, and improve infrastructure resilience across life cycles. This synthesis of digital technologies represents a significant step toward sustainable and secure infrastructure systems capable of withstanding future challenges.



Gian Paolo Cimellaro is currently Professor of structural engineering at the Politecnico di Torino. He has been Visiting Professor at the University of California, Berkeley (2014-2016). He obtained his M.S. (2005) and Ph.D. (2008) from the University at Buffalo (SUNY) in USA. Graduated cum laude in Civil Engineering, University of Rome La Sapienza, 2001. He is the Chair of the SHMII Committee on Resilient Structures and Infrastructure (CORSI) of the International Society for structural Health Monitoring of Intelligent Infrastructures. He is also SHMII Council member of the Governing body of the International Society for structural Health Monitoring of Intelligent Infrastructures. He has been invited to 11 Keynote lectures and 30+ seminars worldwide. He has authored 85 journal papers, 199 conference papers, 17 book chapters and 5 books. Research interests: community disaster resilience and sustainability to natural disasters. He has been awarded with a grant of 1.3 M € by the European Research Council for the project "IDEAL RESCUE - ERC-2014-StG. He is Editorial Board member of several ISI-journals. Selected awards: Fib Achievement Award for Young Engineers (2011); Seed Grant Award from the Siebel Energy Institute of UC Berkeley (2015), Best Presentation Award (2017) at SHMII8, Brisbane. www.cimellaro.org.



Eleni Chatzi is an Associate Professor and Chair of Structural Mechanics and Monitoring at the Department of Civil, Environmental and Geomatic Engineering of ETH Zurich, Switzerland. Her research interests include the fields of Structural Health Monitoring (SHM) and data-driven assessment for engineered systems. She has authored more than 300 papers in peer-reviewed journals and conference proceedings, and further serves as an editor for international journals in the domains of Dynamics and SHM. She led the recently completed ERC Starting Grant WINDMIL on the topic of "Smart Monitoring, Inspection and Life-Cycle Assessment of Wind Turbines". Her work in the domain of self-aware infrastructure was recognized with the 2020 Walter L. Huber Research prize, awarded by the American Society of Civil Engineers (ASCE).

11:00 | David Garcia Sanchez

Taxonomies of interdependent transport-energy ecosystems

Critical infrastructure includes systems vital to society, such as energy, transport, and water. The iTESLA framework organizes these into a "system-of-systems" model with three categories: Physical Assets (tangible components), Functions & Operations (processes supporting assets), and Infrastructure Services (delivery to end users).

This presentation introduces the climate-exacerbated hazards' impact on infrastructure resilience through case studies in Setubal (Portugal), Chur (Switzerland), and the Polyfytos bridge (Greece). It combines geospatial hazard mapping with infrastructure analysis, considering dependencies, socio-ecological systems, and regional vulnerabilities to enhance understanding of resilience challenges in these areas.



David is the Head of Structural Engineering & Fluid-Structure Interaction/Energy, Climate, and Urban Transition at Tecnalia, bringing over a decade of experience in bridges and structures design, structural health monitoring, bridge inspection, civil engineering, and offshore projects from his tenure at Louis Berger International Design Center (a WSP Company). Since 2016, he has served as a Senior Researcher in the Infrastructures Area of Tecnalia, contributing to various national and international research endeavors such as H2020 RAGTIME, FASSTbridge project, H2020 FORESEE, ReCharged, and LIAISON HE. David has co-directed multiple Master's Theses at the University of Cantabria and supervised several PhD students. He is an active member of professional associations including ACHE (the Spanish Scientific-Technical Association of Structural Concrete) and AEND (Non Destructive Testing Spanish Association), and he is a founder member of the Spanish IABMAS group (International Association for Bridges, Management and Safety). Additionally, David serves as the Coordinator of the Journal Reviewer.



Dr Sotirios Argyroudis is a Reader of Infrastructure Engineering at the Department of Civil & Environmental Engineering, College of Engineering, Design and Physical Sciences at Brunel University London. He is the Deputy Scientific Coordinator of the Horizon/UKRI ReCharged project. Sotirios has over 20 years of experience in vulnerability, disaster risk and resilience assessment of critical infrastructure and urban systems exposed to multiple hazards (e.g. floods, earthquakes, wildfires) and climate change effects. He won and participated in several European research projects. He co-founded the www.bridgeUkraine.org initiative, aiming at accelerating Ukraine's critical infrastructure recovery and co-leads the www.metalInfrastructure.org initiative. Sotirios was awarded the EU's Marie-Sklodowska-Curie fellowship (TRANSRISK project, 2017-2020). He is at the top 2% most highly cited scientists for 2021 and 2022 according to the Elsevier/Stanford list. He is Vice-Chair of the IABSE Task Group 1.8 on 'Design requirements for infrastructure resilience', a Fellow of the Higher Education Academy, UK (FHEA) and member of the Institution of Civil Engineers (UK), Eng, MICE.

11:30 | Sotirios Argyroudis

Critical infrastructure resilience: addressing climate hazards, data gaps, and socio-ecological interactions

Critical infrastructure is exposed to a variety of hazards, both exogenous (e.g., floods, storms) and endogenous (e.g., aging infrastructure), which not only threaten its resilience but also affect human well-being, particularly in vulnerable communities. While the resilience of infrastructure is shaped by its internal systems and interconnections, it is also heavily influenced by the environmental and ecological context in which it operates.

This presentation explores the effects of climate-related hazards on infrastructure resilience, data gaps in current assessment practices, and the importance of a threat-agnostic approach to resilience. The Recharged case studies are used as illustrative examples, covering topics such as hazard intensities and mapping, the use of open data for infrastructure risk assessments, and the role of demographic data in evaluating psycho-social impacts. Additionally, the socio-ecological system framework is introduced, examining the complex interactions between human (social) and ecological (environmental) components, with a focus on its application in the Recharged case studies.

12:00 | Manuel del Jesus

Reformulating the return period of flooding

Flooding is normally analyzed through the return period of the inducing dynamics. In the case of fluvial flooding, a design storm for a given return period is used to derive the flooding related to that return period. In this talk, I will present how multivariate statistics and model emulators help in computing the return period of flooding itself, which is the real value of interest for risk assessments and design purposes. I will also compare these results to the ones normally used to illustrate the important differences that may exist between both definitions.



Prof. Del Jesus is a Civil Engineer with a PhD on Environmental Hydraulics. After studying the interaction of water waves with porous coastal structures using CFD models in my PhD thesis, he got interested in Hydrological problems during his postdoc at Princeton University. He is a Professor of Hydraulic Engineering at Universidad de Cantabria and Head of the Hydroclimatology Group at the Instituto de Hidráulica Ambiental (IH Cantabria), where he devotes one part of his time to research and another to technological transfer.

12:30 | Jose Palma

Different Disasters, the Same Human Effects? That's the Question

Within the scientific community, it is widely accepted that both HILP (High Impact Low Probability) events and climate-related hazards have a significant impact. These events are strongly linked to increased levels of aggression, depression, suicide, and, most notably, acute and chronic Post-Traumatic Stress Disorder. Such events can have an impact even in the absence of losses. When disasters result in tangible losses, such as the destruction of infrastructure, the negative consequences tend to be far more extensive. However, data suggests an unexpected consistency in the percentage of individuals affected, regardless of the type of disaster. This observation underscores the need for an agnostic approach to resilience - one that focuses on addressing social and infrastructure vulnerabilities, rather than tailoring strategies exclusively to specific disaster.



Prof. Palma-Oliveira, funding partner of Factor Social and a distinguished professor at the University of Lisbon, is renowned for his expertise in risk perspectives within human-environment interactions. With a plethora of accolades, including the Society of Risk Analysis Presidential Merit Award, he's a leading figure in environmental science and policy. Prof. Palma-Oliveira's extensive contributions span academia, consultancy, and advocacy, focusing on environmental history, risk communication, and community resilience. He has played pivotal roles in environmental NGOs, governmental councils, and private consulting firms, overseeing complex environmental impact studies and fostering community engagement. With a global reach, he continues to shape environmental discourse and enhance resilience in communities and critical infrastructure worldwide.

13:00 | Stergios Mitoulis

The ReCharged MOOC empowers learners worldwide: Resilience, Sustainability & Digitalisation in Critical Infrastructure

This Massive Open Online Course (MOOC), developed by the HORIZON Recharged project (GA no. 101086413), offers free, world-class education to global learners. Designed by senior academics and continuously updated, the course provides professional and lifelong learning opportunities for general and specialised audiences. It includes comprehensive university-level components such as learning outcomes, assessments, and case studies, delivered via interactive lectures, podcasts, and videos. The MOOC fosters collaboration through forums and discussions, enabling learners to access high-quality academic content and enhance their skills in an accessible, flexible format.



Stergios is the leader of the MetalInfrastructure and bridgeUkraine initiatives. Stergios has a sustained record of grant-winning with more than £6.5 million of funding which he received by the UKRI and Horizon Europe. He is the Editor in Chief of the ICE Journal of Bridge Engineering. Stergios' expertise is in climate resilience, sustainability, and digitalisation of critical infrastructures. During his academic career he has supervised more than 30 doctoral and postdoctoral researchers. He has published extensively with a publication record exceeding 200 papers in leading scientific journals and conferences. He is known for his expertise in bridges.





Afternoon Sessions

14:30 | Joan Ramon Casas

Implementing emerging digital technologies in bridge management: the path to sustainability and resilience

The presentation shows how sustainability and resilience and better performance versus climate change can be improved by the implementation of new digital technologies in the actual Bridge Management Systems (BMS) by the application of an optimal management process based on the adoption of a performance-based criteria and a predictive maintenance policy instead of a corrective one. The most adequate implementation effort in the actual management will be discussed taking into account the singularities and specificities of the bridge as a valued asset and the educational and human factors to be considered in the transition from the standard methodology to the new based on digitalization.



Joan Casas, is a professor of bridge engineering and structural management at the Technical University of Catalunya (UPC-Barcelona-Tech) in Barcelona. Main expertise related to bridge design and management, specially focusing on safety assessment and structural health monitoring and management of existing bridges. Founder member and Secretary General of IABMAS (International Association for Bridge Maintenance and Safety) since 1999 and Chair of IABMAS conferences in Barcelona in years 2002 and 2022. Author or co-author of 39 books and chapters of books, 180 papers in refereed technical journals and over 350 conference proceedings. Among other editorial boards, he is Managing editor of the journal Structure and Infrastructure Engineering, Associate editor of the Journal of Bridge Engineering from ASCE and Specialty Chief Editor of Frontiers in the Built Environment, Bridge Section. He has received several awards, including the Bill Curtin Medal, the IABMAS-Senior Prize and the T.Y. Lin medal in recognition of outstanding contributions to bridge engineering.

15:10 | Jesús Rodríguez

The experience with the Stakeholders Reference Group following the FORESEE project results for the resilient transport networks

FORESEE European R&D project on resilient transport networks against extreme events developed some approaches for providing short- and long-term resilience schemes against traffic disruption due to flooding, landslide and structural damage for rail and road corridors and multimodal terminals. It included a data acquisition system, satellite and terrestrial, a system for the prediction and alert of extreme events; new materials and systems regarding permeable pavements; drainage and culvert systems, and slope stabilization systems, a decision support system to provide better informed resilience schemes. A Stakeholders Reference Group at the early stages of the project allowed the accounting for the demands and the acceptance of all end users. Several workshops and webinars were organized throughout the life of this project with the participation of SRG and FORESEE members and some feedback was summarized and reported after each of these events.



PhD in Civil Engineering. Past R&D Director of Dragados (ACS Group) and Associate professor in structures (UPM). Publications on the structural effects of corroded reinforcement in concrete structures. Chairman of the Spanish Mirror Group Eurocode 2 on Concrete structures and of the groups of external experts to follow the results of European R&D projects on transport infrastructures: Foresee on resilience of networks of roads and railways; Omicron on automation and intelligent platforms for maintenance and repairs of roads; Liaison for sustainability & circularity at roads and railways; Bridgitise on industrial doctoral network on bridge digitalised lifecycle management.

15:40 | Felipe Collazos

Impacts and adaptation measures of state roads in Spain to climate change

This communication studies the main actions aimed at adapting roads to the effects of extreme rainfall in Cantabria, a circumstance aggravated by climate change. The damage caused by continuous rainstorms and adverse weather conditions from 2010 to 2022 affected and caused various types of damage, with the necessary repair works being declared an emergency in order to restore road and pedestrian safety and the stability of the road itself at the service of society.



His qualifications as a Doctor in Civil Engineering and his role as an associate professor for 12 years at the University of Cantabria provide him with a deep understanding of construction engineering. Additionally, his involvement in research groups (Giteco-University of Cantabria) and international committees (as PIARC, IABSE, IABMAS, ISSGME) highlights his interest in staying updated with the latest trends and advancements in the field. His research areas include Technology in construction processes, reflecting his dedication to the preservation and improvement of public infrastructure, including bridges and EarthWorks. PIARC Prize "Resilience" 2022 and PIARC Prize "Climate Change and Resilience" 2023.





The Venue

The Venue

📍 Fundación Agustín de Betancourt

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For additional
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Climate-aware Resilience for Sustainable Critical and Interdependent Infrastructure Systems enhanced by emerging Digital Technologies



More info

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