

## NEWSLETTER CERIS Feb-Jul 2020

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### EDITORIAL TEAM

Inês Flores-Colen (coord.)  
António Aguiar Costa  
Ana Soares  
Bruna Silva  
Carlos Tiago  
Maria Paula Mendes

## 01 PRESIDENT'S NOTE



### Professor Luís Picado Santos

The most of the 2020 first semester was marked by the pandemic, involving severe health risks for all of us and determining a less expressive research activity, at least the one supported by laboratory testing plans. Also, we have had during this period the very sad notice of our colleague, Prof. Luís Tavares Ribeiro, decease. This Newsletter gives the desert underline to his life contribution and also to CERIS' external recognition through his work.

Nevertheless, the Centre was not closed, and all the necessary follow up of several essential issues were secured. Namely, the foster of the "information database" about the research activities, connected to

the required adaptation of the site to new features and all this connected and spread through several social networks stands. We believe that in September we will have all these aspects on track to be used and enjoyed by all the members and collaborators, promoting the Center visibility and growth. Of course, several of our colleagues earned the right to be news, and this has the meaning that the Centre was moving ahead. Despite all the pandemic constraints we are working to organize another digital invited talks and in October our CERIS Day Out for researchers. It will be different, but it will continue to be a mark in the year's life of the Centre. Be safe and have a nice transition to the fall semester and the next challenges.

## 02 SPOTLIGHT ON



### **Professor Dinar Camotim**

Dinar Camotim is a (retired) Full Professor of Structural Engineering at Instituto Superior Técnico (University of Lisbon). He conducts research on Thin-Walled Steel Structures at CERIS, leading worldwide in the areas of Generalised Beam Theory (GBT) and Coupled Instabilities in Cold-Formed Steel Members. He (i) supervised 6 Post-Doctoral, 25 PhD (3 in progress) and 30 Master students, (ii) co-authored 2 books on Structural Stability, 8 book chapters and about 700 papers (200 in journals), (iii) delivered 22 keynote lectures in international conferences, (iv) organised four International Conferences, (v) is Associate Editor of the ASCE Journal of Structural Engineering (Metals), and Editorial Board Member of 13 other journals, including Thin-Walled Structures, Journal of Constructional Steel Research and Structures (Elsevier), (vi) was ASCE-EMI Stability Committee Chair and APMTAC Vice-President, (vii) is CMM Co-Founding Member, SSRC Executive Committee Member and ECCS Technical Committee Member (Stability and Cold-Formed Structures), (viii) co-authored award-winning papers published in Structures and International Journal of Structural Stability and Dynamics, (ix) received the Ferry Borges (2008, 2010, 2013), ASCE Shortridge Hardesty (2010), UL/Santander Totta (2012, 2018) and SSRC Lynn Beedle (2018) Awards, and (x) is a Member of the

Portuguese Academy on Engineering and Distinguished Member of the Structural Stability Research Council (USA).



### **Professor Luís Evangelista**

Luís Evangelista is an Assistant Professor at the Department of Civil Engineering of Lisbon's Polytechnic Institute (ISEL-IPL) where he lectures structural engineering related courses. From 2015 to 2019 he held a position as Associate Professor at the University of Stavanger, in Norway. He is a member of CERIS since 2004 in the Research Group 5 - Studies on Construction. He holds a 5-year degree in Civil Engineering (Structural Design specialization) from IST (1997), a MSc. in Construction from IST (2007), and a PhD in Civil Engineering from IST (2014). He has been involved in numerous collaborative research programs and has supervised several MSc. and PhD. students on subjects related to sustainability in construction, and construction and demolition waste management and recycling. Currently, he is the PI of a research project related to CO<sub>2</sub> capturing using mortars and concrete.



### **Doctor João Crucho**

João Crucho is a post-doctoral researcher at CERIS, having completed his PhD in Transportation Systems at IST under the MIT Portugal Program in 2018 with the thesis entitled "Development of an Accelerated Asphalt Concrete Aging Method and Utilization of Nano-Modifiers to Improve Durability of Asphalt Concrete". During his PhD (spring 2016), he was a Visiting Scholar at the University of Illinois at Urbana-Champaign where he conducted research on the rheology of nano-modified asphalt binders.

His interest by the mechanical performance of paving materials started during his MSc in Civil Engineering, also by IST. Since then, at the LVCT – Laboratório de Vias de Comunicação e Transportes (Laboratory of Transport Infrastructures), he has been working in the fields of asphalt mixture aging, asphalt binder modification and use of alternative aggregates. His major research interests are materials, pavement engineering and infrastructure management.

Always with the goal of improving the performance and

durability of our transport infrastructures, he is currently working in a research project – development of techniques to adding value on recycled materials to promote the circular economy in transport infrastructures – funded by the National Portuguese Funding Agency for Science, Research and Technology (FCT).



## **PhD student Alban Kuriqi**

Alban Kuriqi is a PhD student at CERIS, having recently delivered his PhD thesis in sustainable development of small-scale hydropower plants, funded by the National Portuguese Funding Agency for Science, Research and Technology (FCT). He was asked about his research impact:

“Development of renewable energy is showing growing interest worldwide. Small-scale hydropower represents an essential renewable energy resource, particularly for electrification of remote areas. However, similar to other renewable resources, the development of small-scale hydropower has its challenges and drawbacks related to environmental impacts. In my PhD research, I emphasise the importance of harmonising hydropower production with riverine ecosystem conservation. I proposed some new practical approaches and recommendations concerning the implementation of the environmental flows that might be useful for sustainable planning and operation of small-scale hydropower plants.

In my future research, I would like to focus on exploring the potential of complementary solutions such as hybridisation of two or more renewable energy resources with small-scale hydropower to reduce further the ecological impacts induced by the later one. Last but not least, combining industry with research and transferring the new knowledge to the next generation through teaching are some of my professional life goals.”

## 03 TRIBUTE



### Tribute to Luís T. Ribeiro – March 2020

*We would like to express our deepest regret at the loss of our member of CERIS, Professor Luís Ribeiro, from Instituto Superior Técnico. With an international career and academic, artistic and literary projects in various areas, he was a member of CERIS with unique transversal activities. We say goodbye with sadness and in deep appreciation to his many achievements in water resources, hydrogeology, and cultural impact of water resources and water works, among other areas. At the present time, he was particularly interested in nature-based solutions for groundwater management, studying ancient solutions from Andean and Mesoamerican civilizations. He had a profound understanding of the reciprocal influences between technical and cultural aspects in the making of human societies, recognizing groundwater value as a cultural heritage. He illustrated his scientific work with this citation "The essential is invisible to the eyes" (Antoine de Saint-Exupéry).*

*We express our condolences to the Professor's family and friends, and we promise to cherish and tend his legacy.*

## 04 AWARDS

### BEST PRACTICE RECOGNITION

The 3<sup>rd</sup> edition of CERIS Open Day occurred on October 9<sup>th</sup> and 10<sup>th</sup>, 2019, at Foz do Arelho. Our annual event, was again recognized as a Best Practice 2020, under the category of Research, Development and Innovation, by the 5<sup>th</sup> edition of the Best Practices Observatory (ObservIST) of Técnico-Lisboa. This award allowed us to continuously disseminate the CERIS dynamism and to promote part of our value within Técnico community.

CERIS really appreciates this initiative and acknowledges the commitment of the Organizing Committee of this third edition composed by the following researchers, coordinated by Prof. Inês Flores-Colen with the support of Ana Soares: André Castelo, Laura Khammash, Luis Vieira, Maria Ana Benoliel, Mariana Simão, Maria João Costa, Marta Cabral, Sofia Real and Vera Durão.

The Organizing Committee would like thank to all participants (86 researchers with 12 nationalities) of this event, that made this event possible. All the six CERIS research groups were represented in this edition.



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**Best Practice  
Recognized  
Research,  
Development  
and Innovation  
2020****IABSE's Honorary Membership 2020**

Professor Fernando Branco was awarded the IABSE's HONORARY MEMBERSHIP 2020 'in high appreciation of his outstanding and dedicated services to the Association'.

This exceptional award is an expression of IABSE's high appreciation of a member's dedicated service rendered to IABSE (International Association for Bridge and Structural Engineering) over several years, and the great contributions the member has made to the Association.

[Link](#)

**Best Student Award - 2019 September**

PhD student Cláudia Reis was recognized with best student award with the paper title 'Pile-Supported Quay Submitted to Successive Earthquake and Tsunami Actions', presented at the PORTS2019 Conference, held in Pittsburgh, Pennsylvania on September 15-18, 2019. This conference was organized by the American Society of Civil Engineering (ASCE), sub-committee of Coasts, Oceans, Ports and Rivers Institute (COPRI).

[Link](#)



### Best poster award – September 2019

PhD student Luis Espinosa was recognized with the best poster award entitled ‘Seasonal rainfall trends and a North Atlantic Oscillation Index teleconnection over a small island’, presented at the MIT Portugal Program annual conference. This meeting was held on September 30, 2019, at the University of the Azores.

[Link](#)



### Best paper award – May 2019

CERIS researcher and PhD student at FCT Nova, Nuno Peres received the ‘Sarada M. and Raju A. Vinnakota’ Prize, awarded by the Structural Stability Research Council, USA, with the work: ‘A geometrically exact curved thin-walled beam finite element accounting for cross-section deformation’, supervised and co-authored by CERIS members Professors Rodrigo Gonçalves and Dinar Camotim.

[Link](#)



## 2<sup>nd</sup> Innovation Young Engineer Award 2019

CERIS researcher and PhD student at IST Madalena Ponte won second place in the Innovation Young Engineer Award 2019 by Ordem dos Engenheiros. The award-winning work was entitled 'Definition of a methodology for the seismic assessment of complex masonry monuments' and was supervised by CERIS member Professor Rita Bento. This work was developed within the study 'Assessment of the seismic security of the National Palace of Sintra: identification of structural anomalies and vulnerability factors' (2017-2019), promoted by Parques de Sintra Monte da Lua and developed at IST.

[Link](#)



## Award of Excellence - 2020

CERIS researcher Luís Evangelista, Professor at ISEL, received the award of excellence in the area Technologies and Engineering. This award was given by Instituto Politécnico de Lisboa (IPL) and Caixa Geral de Depósitos (CGD) and aims to encourage, value and recognize the work and scientific merit of professors, researchers and non-teaching staff.

[Link](#)



## Best paper in a journal – May 2019

Professors Cristina Matos Silva and Patrícia Ferreira Dinis, PhD Student Inês Teotónio and MSc student Joana Serro received the Grant Award, given annually by the Engineering Economy Division of the American Society for Engineering Education to the authors of the best paper in The Engineering Economist with the paper: 'The Socioeconomic Feasibility of Greening Rail Stations: A Case Study in Lisbon', The Engineering Economist, volume 64, 2019, issue 2, pp. 167-190. The papers are judged on originality, importance of the problem, logic and clarity, and adequacy of proposed solution. The award certificate will be presented in Annual Awards in conjunction with the ASEE Conference in Montreal Canada, which was postpone due to Covid-19.

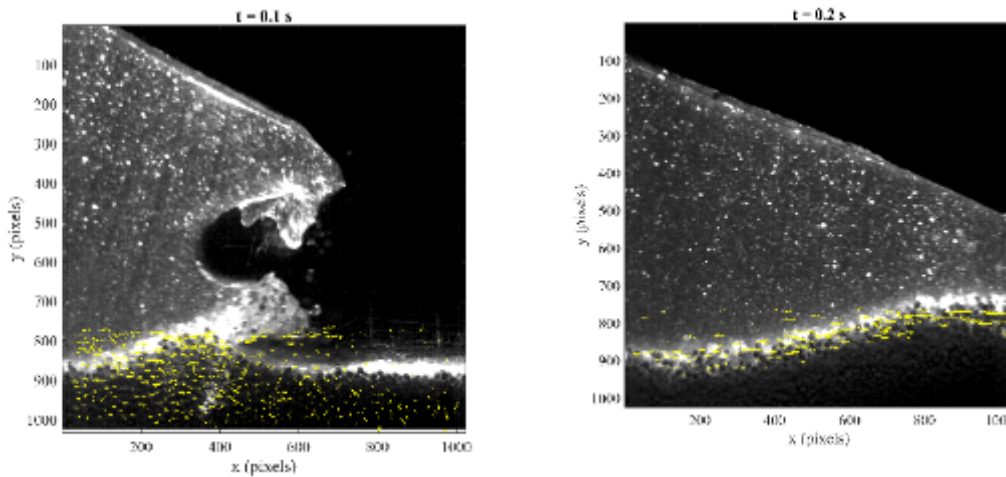


## **05 R&D PROJECTS (concluded in the period)**

**PTDC/ECM-HID/6387/2014-POCI-01-0145-FEDER-016825**  
**Morpheus. River bed MORPHology and Erosion studies**  
**Funding: FCT. Period: 2016-2020.**  
**Rui Ferreira - RG 1**

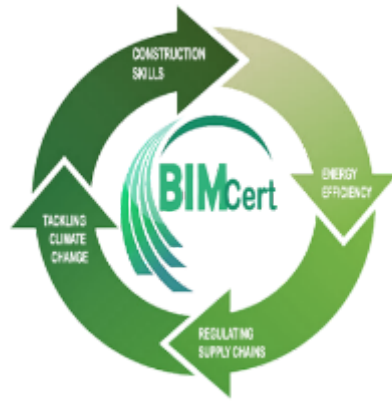
Sediment statistical mechanics can be seen as a way to obtain a physically sound description of rather complex processes (e.g. localized erosions due to bridge piers). Furthermore, sediment mechanics plays an important role in many other processes found in different areas of Science and Engineering, including flood management, river restoration, dam breach studies, avalanches and landslides or the study of granular fluids in mining, food, and pharmaceutical industry. Almost 70 years after Meyer-Peter and Muller proposed their expression we proposed a deeper and fresh analysis of the problem based on physical reasoning and experimental work. We chose discrete sediment analysis (Lagrangian) instead of a continuous description (Eulerian). A direct implication of the Lagrangian approach is the need for the statistical analysis of sediment motion. For that purpose, we conducted experiments using state-of-the-art instrumentation and thus overcoming the limitation of short acquisition times. We developed and proposed a patent on a solid discharge flowmeter used to measure the solid flowrate by an independent method to confront the different existing definitions.

We organised the project in 5 tasks: Task 1 to gather the existing information found in the literature review. The mathematical models were implemented in already existing codes. Task 2 was devoted to the development of a solid discharge flowmeter. Task 3 provided the simple test case where the Lagrangian dynamics of sediments was analyzed together with the Eulerian database. Task 4 proposed to fuse together two independent and already existing algorithms of PIV and PTV. Task 5 enlarged the scope of the experiments by considering granular fluidization.



**H2020-EE-2017-11-14 - BIMCert. Construction skills, Energy efficiency, Regulating supply chain and Tackling climate change**  
**Funding: H2020. Period: 2018-2020.**  
**António Aguiar Costa - RG 3**

BIMCERT is the development of a series of training interventions using digital technology and improved blended learning techniques to support, enhance and maximise the impact of energy efficient skills at all operational levels within the modern construction industry. BIMCERT provides an easily accessible portal for training the vast middle tier of construction industry supply chain workers. The framework and materials supporting the portal will improve workers BIM skills, thus leading to better collaborative working that guarantees energy efficient, sustainable buildings and increased quality throughout the entire construction supply chain. BIMCERT thus ensures that this construction industry tier has access to an innovative skills training platform that enables them to exceed their current non-integrated 2D and 3D functionality to an optimised skill level enabling the sector to achieve energy efficiencies and carbon reduction. In addition to the middle tier construction workforce, the solutions provided by BIMCERT are also targeted for use by a wide range of end-users and workers in the construction and building industry, as well as other associated industries. The development, testing, demonstration and validation activities that support BIMCERT tools and methodologies will focus on the multidisciplinary approaches and concepts (especially in relation to the social and human considerations of collaboration) required for successful uptake in operational environments. Validation will be achieved through active participation of relevant industry and academic stakeholders at all stages of the tool development. BIMCERT will also consider relevant policies in all jurisdictions, and will engage and support decision-makers to facilitate implementation.



**PTDC/ECM-EST/6465/2014 - FRP – QUAKE. Seismic Behaviour  
and Ductility of Structures Built with Glass Fibre Reinforced  
Polymers – Funding: FCT Period: 2016-2020.  
Fernando Branco - RG 5**

This project addresses the seismic behaviour of glass fibre reinforced polymer (GFRP) pultruded structures, aiming at developing structural solutions with adequate seismic performance. GFRP pultruded profiles are promising structural materials owing to their high strength, lightweight and corrosion resistance. However, their brittle failure has raised well founded concerns about their seismic performance. In this context, this project focuses on the development of GFRP structural systems with adequate seismic performance. Improved, material adapted, connection systems for GFRP frame structures were developed and tested at full-scale, allowing to determine their strength, ductility and ability to dissipate energy. Full-scale 2D frame tests were also conducted, allowing to evaluate the performance of those connection systems at the frame level as well as to test additional energy dissipation systems. Finally, ongoing 3D full-scale frame tests in a shaking table will allow to assess the behaviour of the systems developed under seismic actions. The combination and analyses of these results will lead to the proposal of a manual for the seismic design of GFRP pultruded frame structures.

CERIS members: Fernando Branco, João R. Correia, José Gonilha



## 06 SEED PROJECT

### **Bi-THEM (PI: Giovanni Borsoi)** **Studies on Construction + Structural Design and Geotechnics +** **Environment and Water Resources**

Bi-THEM aims at defying an innovative bio-hydrothermal model for External Thermal Insulation Composite Systems (ETICS). The biological susceptibility of ETICS can be foreseen by knowing their composition and monitoring the environmental temperature and humidity. Several ETICS specimens, exposed to weathering, will be studied, using also experimental hygrothermal sensors developed at INESC-ID. The project intends, ultimately, to further explore the biological habitat of ETICS façades and to minimize the development of biological colonization on these external building systems.



## 07 TECHNICAL AND SCIENTIFIC COLLABORATIONS (concluded)

### **Fundiestamo**

The FNRE Guide (Guia FNRE), from the National Fund for Building Rehabilitation (FNRE), will be published until September. This book will support the development of refurbishment projects of buildings in the scope of FNRE, which is managed by the Real Estate Investment Funds Management Society (Fundiestamo). CERIS researchers coordinated and co-authored the following Chapters as an expert consultancy service (through Fundec): João Azevedo, Jorge Proença, Luís Guerreiro and Mário Lopes (Seismic Safety); José Dinis Silvestre, Jorge de Brito, Manuel Duarte Pinheiro and Vera Durão (Sustainability); António Aguiar Costa and Juliana Mizumoto (BIM: Building



Information Modelling). CERIS researcher Eduardo Santos Júlio (Fundiestamo President) is the Editor of this book.



## 08 APPLICATIONS TO THE SOCIETY / COMMUNICATION

### Collaborations in actions – COVID-19

The CERIS researcher Filipa Ferreira participates in the “Study of the presence of the COVID-19 virus in wastewater”. Águas do Tejo Atlântico, in collaboration with Instituto Superior Técnico and Instituto Ricardo Jorge, initiated a study for the detection of genetic material of the virus responsible for COVID-19 in the wastewater of three Water Plants in Greater Lisbon. In the short term, it is intended to extend this work to a national level. The objective of this initiative is the development of a decision support tool, using wastewater as an indicator of virus circulation in the population, contributing both to the prior detection of possible outbreaks (before they are clinically significant) and to the measurement of decay. This work will also allow to evaluate the efficiency of the current treatment systems in the removal of other relevant viruses in the context of wastewater.





CERIS PhD students João Figueira and Luís Vieira with other members of the IST community in cooperation with the NDA (Núcleo de Desenvolvimento Académico) developed online sessions that address mental health issues at this exceptional time. The project BrainStorms had already been founded before the quarantine period and was adapted to respond to the most varied needs related to mental health within the IST community. At the moment all the sessions took place via zoom and live for youtube.

[Link](#)

## Science in Communication



CERIS integrates in IST Research Units 'group of Science Communication, coordinated by Joana Lobo Antunes from IST. The initiative "Explain it like I'm 5" started on May 2020 and five sessions have already occurred. The next online session will be on 5<sup>th</sup> of September (Prof. Arlindo Oliveira)

[Link](#)

## 90 Seconds of Science (Antena 1)

M90 Seconds of Science (Antena 1) is a project from University of Lisbon and Antena-1, with the support of Novartis and Santander Universities. Portuguese researchers briefly present their research in 90 seconds (in Portuguese).

Participation of researchers from CERIS:

Ep. 829: Investigação quer conhecer o perfil dos ciclistas na cidade de Lisboa – Rosa Félix, 9 de abril de 2020

<https://www.90segundosdeciencia.pt/episodes/ep-829-rosa-felix/>

EP. 686: Projeto IAAPE quer tornar as cidades mais amigas de quem quer e pode andar a pé – Filipe Moura, 23 de setembro de 2019

<https://www.90segundosdeciencia.pt/episodes/ep-686-filipe-moura/>

Link

## 09 CERIS NETWORKS

### **CERIS in the CIB Student Chapter of the Department of Civil Engineering, Architecture and Georesources, IST**

The CIB Student Chapter of IST is a CIB-endorsed group that promotes networking and knowledge dissemination. The members of CIB-SC are postgraduate, graduate and research students at the DECivil and CERIS. Their work is related to the sustainability of the construction sector and is divided in two groups: i) service life in construction; ii) sustainable construction.

The objectives of the CIB Student Chapter are:

- To encourage the development of research interests among its members and to create awareness of the significance of research on buildings' construction;
- To provide a forum for dissemination of knowledge and exchange of research skills with CIB Students Chapters and the global research community;
- To improve the contact and benefits with other CIB Student Chapters, to disseminate relevant events, and new information (e.g. knowledge from conferences and workshops);
- To foster contact with task groups and commissions of CIB.

The CIB-SC includes several CERIS collaborators of the Studies in Construction Research Group, amongst them João Pacheco (President), André Castelo (coordinator of Group 1: Service Life in Construction) and Beatriz Marques (coordinator of Group 2: Sustainable construction), as well as members from other organizations, especially LNEC.

Readers are invited to visit the website and to join the CIB-SC of IST.

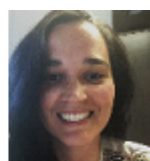
Link



President



Coordinator – G1



Coordinator – G2

## 10 EVENTS / SEMINARS

### CERIS SESSIONS: Rocking (Pre)Conceptions

The fourth edition CERIS WEB Session took place on 22<sup>th</sup> and was attended by 26 CERIS researchers. The title was: “Smart Cities: Opportunities and threats”. The special guest was Anat Tchetchik from the Department of Geography and Environment of Bar-Ilan University, Israel.

**TÉCNICO LISBOA** **CERIS** Civil Engineering Research and Innovation for Sustainability

**4TH CERIS SESSION: ROCKING (PRE) CONCEPTIONS**

**WEB SESSION**

**Smart Cities: Opportunities and threats**

Many cities around the world are investing resources and arm themselves with thousands of sensors to become "smart". Prestigious competitions like the one in Barcelona, granting the World Smart City Awards, take place each year with hundreds of cities contending. It has been estimated that by 2023, the total revenue of the Smart Cities market will reach about \$ 720 trillion. The idea of the smart city is based on the desire to significantly improve the well-being of its residents, but at the same time many concerns about technology's takeover of our lives and other threats posed by the smart city are at stake. The session will address the emergence of the smart cities concept and the global trends that led to its popularity, as well as the challenges and risks inherent in implementing this vision.

Anat Tchetchik, the Department of Geography and Environment of Bar-Ilan University, Israel

Apr 22, 2020 12:00 PM to 13:00 PM Lisbon  
Join from PC, Mac, Linux, IOS or Android:  
<https://videoconf-colibri.zoom.us/j/91120795372>

**FCT** Fundação para a Ciência e a Tecnologia

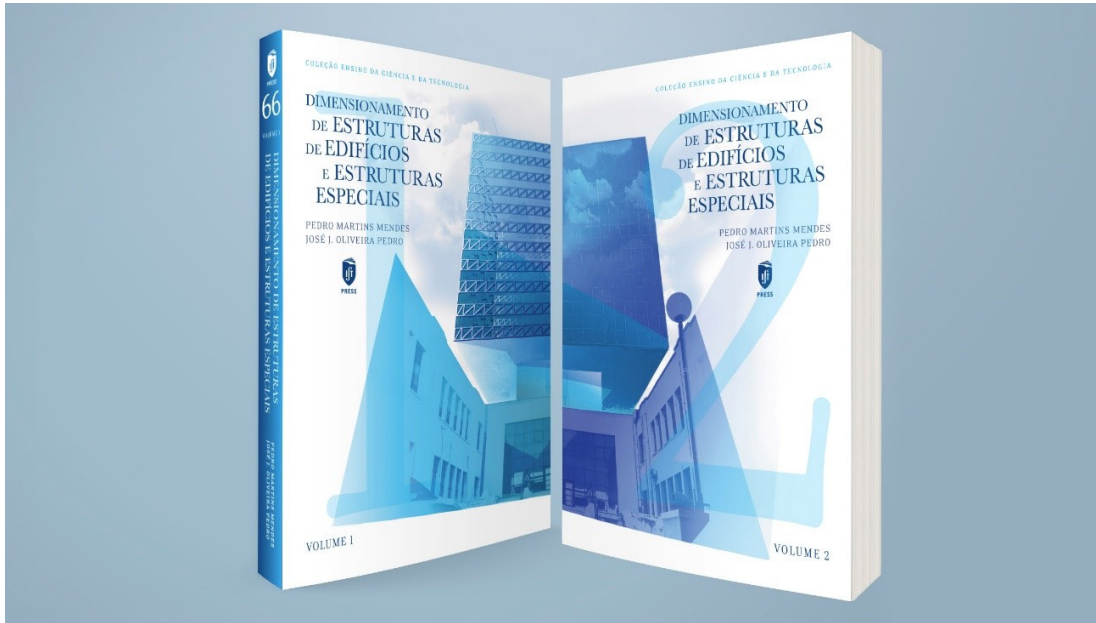
### Seminar of the SLPforBMS Project

On 5<sup>th</sup> of March a seminar to present the main results of the project SLPforBMS - Service Life Prediction for a risk-based Building Management System was held at IST. It promoted a round table to discuss new opportunities on the subjects of building inspection and service life prediction and included the presentation of a new software tool. About 20 people attended this event.



## 11 DISSEMINATION

### Books

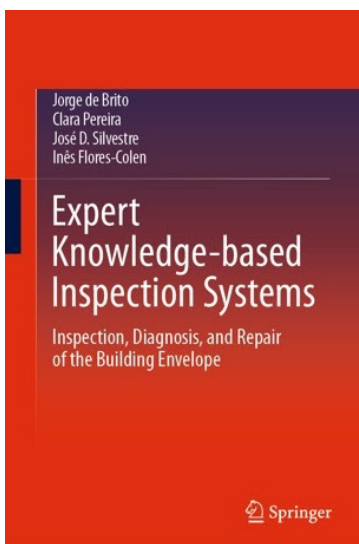


#### Structural design of Buildings and Special Structures

CERIS member José Oliveira Pedro has published the manual on the topic “Structural design of Buildings and Special Structures”, published by IST press, 2 volumes, nº 66 of “Collection of Teaching Science and Technology”.

This book provides the basic aspects of structural design of concrete and steel structures. This is a didactic book but intend also to be useful not only for students but also for professionals in the field.

[Link](#)



#### Expert Knowledge-based Inspection Systems

CERIS members Jorge de Brito, Clara Pereira, José Dinis Silvestre and Inês Flores-Colen have published the manual on the topic “Expert Knowledge-based Inspection Systems”, published by Springer International, 469p, ISBN 978-3-030-42446-6, DOI 10.1007/978-3-030-42446-6.

This book provides a novel approach to building pathology in current buildings. The book addresses natural stone claddings, adhesive ceramic tiling, renders, painted surfaces, External Thermal Insulation Composite Systems (ETICS), architectural concrete

surfaces, windows and doors framing, and claddings for pitched and flat roofs. Given its scope, the book offers a valuable guide, particularly for researchers, building inspectors, civil engineers, architects and maintenance planners.

[Link](#)

## 12 UPCOMING EVENTS



### **IsCTSC 2020 - Oct 2020, Vimeiro**

The 12<sup>th</sup> International Conference on Transport Survey Methods, “Travel Survey and Big Data: how to make the best of both worlds” will be held in Porto. CERIS researcher João de Abreu e Silva is the chairman of the local organizing committee. This event will take place on 25-30 October.

[Link](#)



### **ICUR2020 - June 2020 - Lisbon – Postpone to 2021**

The CERU - European Centre on Urban Risks - is organizing the 2nd International Conference on Urban Risks (ICUR2020) which will be held in Lisbon on 23-25 June. CERIS researcher Mónica Amaral Ferreira is in the organizing committee.

[Link](#)

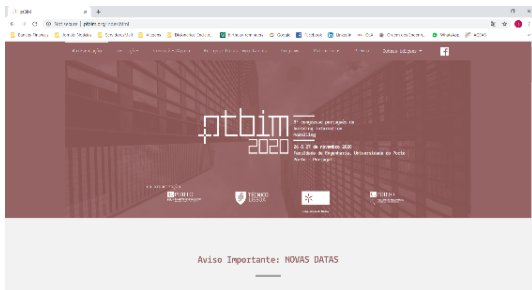


### **9<sup>th</sup> EWICIS – 2020 – Lisbon**

The workshop organized under the sponsorships of Working Group 8 (Seismic Behaviour of Irregular and Complex Structures) of EAAE will take place at IST. CERIS researcher Rita Bento is the chairman of the organizing committee.

[Link](#)





### 3<sup>rd</sup> ptBIM - Nov 2020 – Porto

ptBIM 2020 – 3<sup>rd</sup> National Congress of Building Information Modelling will be held on 26-27 November 2020. CERIS research member António Aguiar Costa is Chair of the Scientific Committee and Member of the Organizing Committee.

[Link](#)

And ...

## CERIS DAY OUT

7<sup>th</sup> October 2020

Sintra/Cascais

Don't miss the opportunity to get along with CERIS community outside workplace!



### CEES 2021 – Oct 2021 - Coimbra

CEES 2021 – 1<sup>st</sup> Conference on Construction, Energy, Environment and Sustainability will be held on 12-15 October 2021. CERIS research member Jorge de Brito is co-Chair of the Organizing Committee.

[Link](#)

NEWSLETTER SUBSCRIPTION



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