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

PRESIDENT'S NOTE

Luís Picado Santos

It was recently confirmed the classification of "Excellent" assigned to CERIS by FCT, inducing a new year full of opportunities that arise from the obtained financial support. All of us should be attentive to the necessary tasks to pave the way to the final objective defined in the candidacy of having a robust Centre to enhance all the IR&D activities.

During the last year, despite the small amount of resources, the activity of CERIS could be recognized as important for all the collaborators and members, namely through: i) the inspiring, once more, "Open Day"; ii) a set of very participated "3 Rocking (Pre) Conceptions" sessions (at lunch); iii) the support to the laboratory activities joining the DECivil in, for instance, contracting a new technician; iv) contributing to the licenses for general software; and v) planning of an automatic framework to receive the survey of the information to produce reports for RADIST, FCT and FCT[1]s periodically evaluation of the Centre.

So, we are in the game and we are here to win not just to play! Let´s do our part, all of us, to continue to be a National reference and to get close to be an International spotted IR&D Centre.

I wish you all the greatest 2020 year that you could wish.

SPOTLIGHT ON

Professor Eduardo Júlio

Eduardo Júlio started his career in 1990 at the University of Coimbra. He is Full Professor of Structural Concrete at Instituto Superior Técnico since 2011. He is the President of GPBE, the National group of fib, The International Federation for Structural Concrete. He has been the President of ICIST (2013-2014), and one of the promoters and founders of CERIS (2014), which resulted from the merge of the latter with two other research centers affiliated to DECivil IST.

He was one of the promoters and founders of the collaborative laboratory (Co-Lab) Cement Sustainable Technologies (2018), gathering five research centers from IST and the Portuguese cement industry, namely Cimpor and Secil. He has played an active role as consultant in structural engineering, having delivered more than 100 specialized studies on bridges, buildings and monuments, for several private and public institutions, in Portugal and abroad, e.g. Itaipu Dam (Brazil). He is (was) the leader (or member) of more than 30 research projects. He authored more than 500 publications. Currently he is the CEO of Fundiestamo, SGOIC S.A., a public company that runs FNRE, the National Fund for the Rehabilitation of the Built Environment.

Professor Alexandre Gonçalves

Alexandre Gonçalves is an Assistant Professor at the Department of Civil Engineering, Architecture and Georesources of Instituto Superior Técnico (IST), University of Lisbon, where he teaches courses related with Geographical Information Systems (GIS), and a member of the CERIS Systems and Management research group. He holds a 5-year degree in Applied Mathematics and Computer Science (1995), a MSc in GIS (1998) and a PhD in Territorial Engineering (2007). In his research at CERIS and IST he has multiple collaborations with other researchers in projects involving spatial data acquisition, geographical modelling, mapping and spatial analysis.

The areas where he collaborates in research range from heritage documentation and GIS-based historical analysis, to territorial management and urban planning, spatial data for sustainable transportation studies and assessment of risk related to natural and built environment hazards. He has participated in various pedagogical international projects funded by the EU in the areas of Remote Sensing, GIS and Spatial Data Infrastructures, mainly in content development and training of trainers, in collaboration with several European and Middle East universities.

SPOTLIGHT ON

Doctor António P. C. Duarte

António P. C. Duarte is a post-doctoral researcher at CERIS, having completed his Ph.D. in Civil Engineering in 2018 with the thesis entitled 'Strength and ductility of short rubberized concrete filled steel tubes for seismic areas'. He is currently working within the Composites Research Group (CORE Group) in the project 'Fire Behavior of GFRP Composite Panels for Rehabilitation of Building Floors', funded by the National Portuguese Funding Agency for Science, Research and Technology (FCT). He was asked about his goals for the future:

I am highly motivated to carry on with my research on structural and computational mechanics. Besides continuing the investigation on the topics studied in my Ph.D. thesis, I am also facing new challenges on the numerical modeling of fiber reinforced polymer (FRP) composite structures.

Overcoming these challenges will help me developing the research plan I submitted in the scope of the Scientific Employment Stimulus, approved for funding by FCT. Last but not least, teaching is also a goal I have for my professional life.

Doctor Rosa Félix

Rosa Félix is an urban cycling mobility researcher. With a MSc in Territory and Urban Planning Engineering by IST, Rosa is a newly graduated PhD in Transportation Systems by the MIT Portugal program – with a thesis in barriers and motivators to bicycle and behavior change – and was a Visiting Scholar in Portland State University in 2017/18. She is currently working in a research project with the Municipality of Lisbon and IST, as a CERIS collaborator, and is member of U-Shift lab. Since 2012 she has been working in cycling mobility and collaborated in the elaboration of the Bicycle Mobility Plan of the Municipality of Loulé and in the team for the integration of the EuroVelo Network in Portugal. Being a cycling activist in Lisbon, since 2011 she is member and project coordinator of Cicloficina dos Anjos, a community bicycle shop. In 2015, Rosa organized the first Mobility Week of Instituto Superior Técnico.

AWARDS

Professor Eduardo de Arantes e Oliveira Award

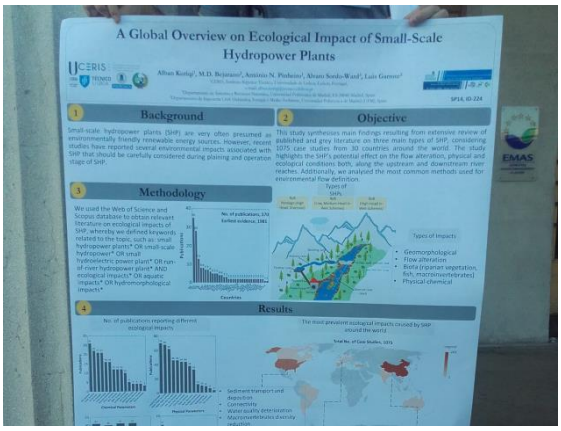
XII Conference on Steel and Composite Construction, held in Convento de São Francisco, Coimbra, on November 2019

(+) Sérgio Nascimento, José Oliveira Pedro and André Biscaya:
Paper title: Flange-induced Buckling of High Strength Steel Girders. (+)

Best Poster Award

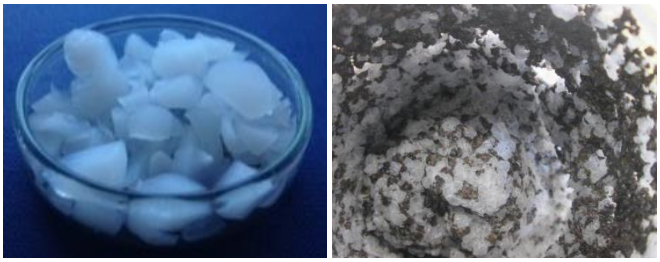
Alban Kuriqi, co-authored by M.D Bejarano, António Pinheiro, Alvaro Sordo-Ward and Luís Garrote:
6th Biennial Symposium of the International Society for River Science, held at University of Natural Resources and Life Sciences, Vienna, Austria, on September 2019 (+)

Poster title: A Global Overview on Ecological Impact of Small-Scale Hydropower Plant. (+)



National Patent

The national patent PT108864 B was granted by INPI on 17th of July 2019 to the CERIS researchers: Inês Flores-Colen, António Soares and Jorge de Brito, with also de collaboration of CQFM (now iBB) researchers from IST. This invention has the title: Thermal mortars with subcritical silica aerogel and natural lightweight aggregates.



R&D PROJECTS (concluded in 2019)

Environment and water resources

	CERIS PI
PIEZAGRO (PTDC/AAG-REC/7046/2014). Vulnerability risk assessment for the agroforestry sector in South Portugal under climate change: Impact of the evolution of the piezometric level. Funding: FCT. Period: 2016-2019	João Nascimento
SOIL TAKE CARE. Funding: FEDER through the Interreg Sudoe initiative (SOE1/ P4 / F0023). Period: 2016-2019	Teresa Melo

PIEZAGRO aimed to develop an innovative approach based on GIS, remote sensing data and dendrochronology measurements to assess the vulnerability of groundwater dependent ecosystems to climate change with respect to the evolution of the piezometric level. The project studied the semi-arid region of Alentejo in the south of Portugal particularly threatened by desertification. This region is mainly covered by agroforestry species of high economical interest and with a predominance of phreatophytes woody species such as Cork oak, Holm oak, Eucalyptus, and Stone and Maritime pines. The project is aligned with the Portuguese strategy for adapting water sources for agriculture and forests to climate change challenges. The scientific outcomes provided a powerful decision tool for the elaboration of mitigation plans to reduce climate change impact on groundwater resources and presented solutions to promote groundwater recharge in the most endangered areas identified.

SOIL TAKE CARE aimed to improve the management and rehabilitation of contaminated soils in SW Europe and included partners from Spain, Portugal and southern France. Soils play an essential role in our societies and are associated with different economic, ecological and cultural aspects. However, they are often the target of negative actions that contribute for their long term or irreversible degradation. In SW Europe there are many areas affected by soil contamination by metals, hydrocarbons or other hazardous compounds. These contaminations affect not only soils and their functions, but also surface and groundwater, the atmosphere and human health. Public authorities responsible for the environmental management currently face significant and costly technical challenges for the inventorying of these contaminated sites and their remediation to minimize the associated risks. The SOIL TAKE CARE developed low cost and simple methodologies for the rapid diagnosis of contaminated sites to improve the information available for their environmental, social and political management.

Interreg Sudoe
European Regional Development Fund

R&D PROJECTS (concluded in 2019)

Studies on Construction

CERIS PI

SLPforBMS (PTDC/ECM-COM/5772/2014). Service Life Prediction for a risk-based Building Management System. Funding: FCT. Period: 2016-2019 — Jorge de Brito

SLPforBMS developed a building management system of building envelope's elements (flat and pitched roofs, walls - ceramic, renderings, painted surfaces, natural stone, ETICS and architectural concrete), in current buildings, including inspection and diagnosis, service life prediction procedures and support decision-making processes in the maintenance/rehabilitation area. This project developed an inspection and diagnosis system based on the normalized classification of defects, leading to correlation matrices between the defects and their causes. These systems were validated through extensive fieldwork, using visual inspection, evaluating the degradation condition of the buildings elements. Moreover, different service life prediction models were developed, from simple deterministic formulations through stochastic models and factorial (with deterministic or stochastic approaches) to computational models based on artificial intelligence (artificial neural networks and fuzzy logic), based on the information collected using the inspection and diagnosis system created. A software based on the information systematized on the project was created, which can be used as decision support tool for manufacturers, designers, contractors, developers and insurance companies, as it allows considering stochastically the risk associated with failure of the envelope's elements.

R&D PROJECTS (concluded in 2019)

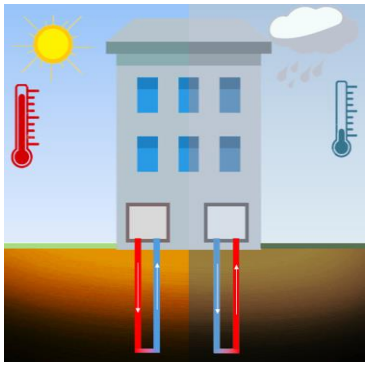
Structures and geotechnics

CERIS PI

SUCCESS (PTDC/ECM-GEO/0728/2014). Sustainability of shallow geothermal systems. Applied studies for climates of southern Europe. Funding: FCT. Period: 2016-2019 — Rafaela Cardoso

The aim of this Project was to carry on an integrated analysis of the main processes involved in heating and/or cooling of buildings with thermoactive geostructures systems (see figure) from the stage of soil thermal characterization to the building's energy efficiency long term evaluation. The behaviour of a specific building in UAveiro campus was simulated based on data collected from the building and from its foundation soil, and its sustainability was accessed. The case study building has a Energy Management System that collects data from several sensors, with years of historic data from the building and geothermal system. The weather records of a local station (in the University) were also available. With the data of the overall system in operation its behaviour was numerically reproduced in an integrated manner to evaluate sustainability and energy efficiency. Experimental data from soil samples collected on the site was used for model calibration and in order to understand better temperature exchanges between the soil and the system.
This project presented as innovative aspects the detailed and integrated analyses of the sustainability of the global geothermal system, for the specific conditions of the Portuguese territory, it has also the purpose of collecting data and most of all to attaining knowledge or abilities in areas where information is either limited or totally lacking in Portugal.

SUCCESS
Sustentabilidade de sistemas geotérmicos superficiais
Estudos aplicados a climas do sul da Europa



Architecture, urbanism and territory

CERIS PI

ASAP-EHC - Atlas of School Architecture in Portugal – Education, Heritage and Challenges. Funding FCT. Period: 2016-2019. — Alexandra Alegre

PSSS - Public Space's Service System. An integrated assessment methodology. Funding FCT. Period: 2016-2019. — Pedro Brandão

SEED PROJECTS

Research Projects supported by CERIS in the 2019th edition (concluded)

ENSURE (PI: Laura Monteiro)

Hydraulics + Environment and Water Resources + Systems and Management + Studies on Construction

The ENSURE project focused on the multidimensional feasibility analysis of wastewater reuse projects in urban areas. Alternative scenarios of water reuse in a Portuguese municipality were established and studied regarding costs, water savings and environmental and health risks. Results will be presented at IAHR Europe Congress. The water company Águas do Tejo Atlântico demonstrated interest in the project and cooperated with the team by providing water quality records and treated wastewater samples. The latter were analysed for unconventional microbiological parameters by LAIST, with whom a partnership was also established.

The ENSURE project also paved the way for an Msc thesis on the non-monetary benefits of reclaimed water use.

A review paper on the use of reclaimed water for irrigation of urban green areas, regarding observed impacts is being prepared. In addition, the team is also working on a FCT project proposal on the reuse topic.

SMARTCAM (PI: Moisés de Brito)

Hydraulics + Studies on Construction + Structures and Geotechnics

The aim of this project is to develop a portable intelligent imaging system for phenomena involved in natural and built environment risks. This system includes an innovative image processing hardware and software to support Particle Image Velocimetry (PIV) and Digital Image Correlation (DICT) applications, including real-time PIV. The solution will empower researchers at CERIS with modern tools that can be used both in the field as well as in the laboratory. Despite still being a work in progress, some milestones have already been achieved and the results are being shared through journal submissions. The articles evaluate the performance of the developed PIV software and detail the synthetic PIV image generator tool created for the study. A PIV LED lighting unit was also built and partially tested and will be continued by PhD student Luís Mendes.

TECHNICAL AND SCIENTIFIC COLLABORATIONS (concluded)

Parques de Sintra - Monte da Lua

Evaluation of the Seismic Vulnerability of the National Palace of Sintra: identification of structural anomalies and vulnerability factors

CERIS PI: Rita Bento

Duration: 21 months (start: September 2017)

A study was carried out to analyse the seismic performance and the vulnerability of the National Palace of Sintra. An interdisciplinary approach was called upon that contemplated the following steps: 1. Research, compilation and analysis of historical data relevant to the general characterization of the construction; 2. Field survey of the structure; 3. Definition of the experimental campaign and development of different in-situ experimental tests; 4. Numerical modelling and calibration of the models; 5. Seismic assessment. Step 3 includes dynamic characterization tests presented in the video **(+)**, which are crucial for the calibration of numerical models.

Municipality of Lisbon

Seismic Risk Assessment Program for Municipal Building Property

CERIS research team: Carlos Sousa Oliveira, Francisco Mota de Sá, Mário Lopes, Mónica Amaral Ferreira

Duration: 91 months (start: January 2012)

The Lisbon City Council owns more than 3,000 buildings (20,000 apartments), many of them with expected poor seismic performance (built before the 1st Portuguese earthquake design regulation in 1958).
An expeditious procedure of assessing the seismic risk of individual buildings was developed by CERIS/IST in order to support decisions on rehabilitation and strengthening of buildings, and raise public awareness towards preventive attitudes and policies.

In order to adequately respond to architects, engineers, contractors and building owners, a guidance tool "Guia de Boas Práticas – Reforço Sísmico" (Guide of Good Practice on Seismic Strengthening) was developed to identify and describe generally accepted rehabilitation techniques (structural and non-structural). It is available since February 2020 on the Câmara Municipal de Lisboa website. **(+)**

APPLICATIONS TO THE SOCIETY/ COMMUNICATION

Education and seismic risk communication

CERIS Research Team: Mónica Amaral Ferreira, Carlos Sousa Oliveira

The Treme-Treme serious game was designed to increase student knowledge about earthquake science and preparedness in a fun way, appropriate for elementary school. It was developed in 2014 and updated in 2019. It is expected to be launched soon on Google Play.

Departamento de Engenharia Informática: Rui Prada, Pedro A. Santos, Pedro Barreto, Duarte Botelho, Inês Carvalho Batina

Graphic Designer: Hugo O'Neill

Website: treme-treme.pt **(+)**

CERIS in the Executive Committee of The European Association for Earthquake Engineering

The new Executive Committee (EC) of the European Association For Earthquake Engineering (EAEE) was elected in June 2018. The five members are Alain Pecker (France), Rita Bento (CERIS, Portugal), Christoph Butenweg (Germany), Mauro Dolce (Italy) and Katrin Beyer (Switzerland).
According to its statues, the objectives of the EAEE are (i) to promote regional cooperation among scientists and engineers, and to advance the research front in the field of earthquake engineering, (ii) to contribute, support and play an active role in organising all research and educational activities in Europe in the field of earthquake engineering and (iii) to play an active role in all aspects of mitigation of the effects of earthquakes in Europe and to set a model for other national, regional and international organisations to follow in advancing earthquake risk mitigation.
The main task of the EC is to develop a set of activities conducing to the practical implementation of the EAEE objectives. **(+)**

EVENTS

CERIS OPEN DAY

On October 9th and 10th, CERIS has promoted the 2019 CERIS Open Day which took place outside IST (specifically, at the Inatel Foz do Arelho Hotel), in an informal environment, in order to contribute to the conviviality within the CERIS community and thus strengthen their identity. **(+)**

The program of the initiative was diverse, including motivational lectures on challenging topics, oral presentations and playful actions, fundamentally team building. See the film. **(+)**

TÉCNICO LISBOA

Best Practice Recognized
Research, Development and Innovation 2019

EVENTS

CERIS SESSIONS: ROCKING (PRE)CONCEPTIONS

The **second edition** of CERIS lunch events took place on the 16th July, at Civil Engineering Museum, with Prof. Manuel Francisco Costa Pereira (CERENA). The title was **"A trip to Mars before going on vacation!".** The presentation with multimedia resources, discussed the importance and implications of space exploration in the most diverse scientific areas, addressing: **(+)**

- How were robotized missions prepared;
- What kind of information was collected so far, and what are the implications for engineering developments.

There were 35 attendants.

The third edition of CERIS lunch events took place on the 12th November, at Alfredo Bensaúde Museum, with Drª. Joana Lobo Antunes (IST, FCSH). The title was "**Science communication in a digital world",** addressing:

- How to communicate science research in the best way;
- How to use social media to communicate science;
- What are the relevant issues in science communication.

There were 33 attendants.

SEMINARS

The Engineer of the Future in the Water Sector

During the XVI Ibero-American Seminar on Supply and Drainage Systems, which took place on 15-17th July of 2019 at Instituto Superior Técnico, a seminar was held to discuss and share past experiences and to address today's main challenges in the water sector. This initiative was organized by IAHR Portugal Young Professionals Network and was attended by 44 participants.

The University of Queensland's Sustainable Minerals Industry

Researcher Carlos Miraldo presented the research conducted at the University of Queensland's Sustainable Minerals Industry (SMI) and discussed future research collaborations between SMI and Instituto Superior Técnico in hydrology, groundwater management and mining in a session held on the 14th November 2019 at Instituto Superior Técnico.

Seminar on optimization problems

Professor José Aguilar Madeira, researcher of IDMEC-IST, gave a seminar on the 19th November 2019, where he provided an overview and addressed the applicability of Directional Direct Search Methods (DDSM) used to solve Derivative-Free Optimization problems (DFO). There were 15 attendants. **(+)**

SimaPro for Environmental Life Cycle Assessment (LCA) - Quick-Start Workshop

Following the acquisition by CERIS of a classroom license of SimaPro software (simapro.com), CERIS researcher José Dinis Silvestre provided a quick-start workshop on the 30th of January 2020, to disseminate to interested CERIS researchers how they can use this software to develop Environmental Life Cycle Assessment (LCA) studies in the scope of their research activities. 23 researchers attended this 2-hours' workshop.

CERIS REPRESENTATIONS

MooB meeting in Lisbon

Between the 8th and the 12th of July the Instituto Superior Técnico, Universidade de Lisboa, received students and professors from Budapest University of Technology and Economics, to participate in the MooB meeting "Multi-objective life cycle optimization of sustainable and innovative construction materials and buildings", a bilateral cooperation FCT project coordinated by CERIS researcher José Silvestre. CERIS was represented in the open session by the vice-president Inês Flores-Colen.

Bilateral relations with Brazil

CERIS was represented by vice-president Rui Ferreira in a formal meeting, on 14th of November, between Instituto Superior Técnico and Universidade Federal do Rio de Janeiro, envisaging a protocol for bilateral relations.

CERIS at Techn@portugal

On 4th of July, Rita Bento, the coordinator of CERIS RG6 (Structures and Geotechnics) was at Techn@portugal, event organized by ANI with the participation of more than 100 I&D institutions. **(+)**

CERIS at DECivil Welcome Tour

CERIS participated in the DECivil Welcome Tour, an event organized by the PhD students of the DECivil on the 3rd October 2019 to mark the beginning of the academic year. Rui Ferreira presented the activities of CERIS and interacted with the new PhD students.

IST's Technology Transfer

CERIS participated in the events of the IST's Technology Transfer. **(+)**

CERIS REPRESENTATIONS

CERIS at FORUM CIVIL event

CERIS participated in the event "Research at DECivil" on 1st of October 2019, organized by Forum Civil, at Civil Engineering Museum. The President of CERIS, Luís Picado Santos, presented the activities of CERIS and interacted with the researchers.

International institutional presentations of CERIS

Institutional presentations of CERIS were performed by the Vice-President Rui Ferreira, at University of Roma (May 2019), University of Bologna (July 2019) and Nanjing Institute of Water Research (December 2019).

UPCOMING EVENTS

UGIIC 2020 - April 2020 - Lisbon

Urban Green Infrastructure International Conference – For a greener future is an interdisciplinary conference on green infrastructures and nature-based solutions for cities. This event is organized by IST (CERIS researchers Cristina Matos Silva and Carlos Oliveira Cruz are in the organizing committee) and ANCV **(+)** and will take place on 2-3 of April. Is also part of Urban Future global conference (UFGC20). **(+)**

ISCTSC 2020 - May/June 2020 - Porto Novo (Vimeiro)

The 12th 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 31 May – 5 June. **(+)**

ICUR2020 - June 2020 - Lisbon

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.

9th EWICS - June 2020 - Lisbon

The workshop organized under the sponsorships of Working Group 8 (Seismic Behaviour of Irregular and Complex Structures) of EAEE will take place at IST on 25-26 June. CERIS researcher Rita Bento is the chairman of the organizing committee. **(+)**

4th CERIS Session: Rocking (pre)conceptions - Smart Cities: Opportunities and threats

The CERIS session will take place on **26th February 2020**, 12:30-14.00, at Civil Engineering Museum. The special guest is Anat Tchetchik from the Department of Geography and Environment of Bar-Ilian University, Israel. **(+)**