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Luís Miguel Pires Neves · Ricardo de Jesus Gomes ·
Sandra de Jesus Martins Mourato ·
Vânia Sofia Santos Ribeiro *Editors*

Proceedings of the 1st International Conference on Water Energy Food and Sustainability (ICoWEFS 2021)

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Preface

The **International Conference on Water Energy Food and Sustainability – ICoWEFS 2021**, taking place in Leiria/Portugal (May 10–12), Portugal, aims to be a major forum to foster innovation and exchange knowledge in the water-energy-food nexus, embracing the sustainable development goals (SDGs) of the United Nations, bringing together leading academics, researchers and industrial experts.

A climate-neutral continent by 2050 will drive technological, economic and societal transformations towards circular economies using more green and clean technologies and the decarbonisation of energy-intensive industries.

Innovation regarding water, energy, agri-food, bioeconomy, natural resources and the environment will speed up the transition towards sustainability, promoting water and food security in the world.

The forest and wood pine tree from the Leiria region welcomed us, and this material was the basis in the manufacture of the ships used in the Portuguese Navigations in the fifteenth and sixteenth centuries. Now in the twenty-first century, this region has several wind and biogas power plants supported by a solid industrial cluster.

The conference will be a networking and collaboration among participants to advance the knowledge and identify major trends in the fields mentioned above, even in an online format according to the health rules.

We are grateful to the authors from 33 countries with their contribution of 98 papers accepted to be presented at ICoWEFS 2021 and published by Springer Nature, to the directors and staff of the School of Technology and Management of the Leiria and Portalegre Polytechnics for their support, to the research centres and sponsoring companies, to the members of the scientific committee and external reviewers, keynote speakers, and, finally, to the members of the organisation, who

with redoubled efforts during a pandemic time managed to carry out this conference.

We hope that we can meet again at the next ICoWEFS.

João Galvão
Paulo Brito
Conference Chairs

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Keynote Speakers

Smart Bioeconomy to Enable Sustainability

Annukka Pakarinen

HAMK – Häme University of Applied Sciences, Finland

Dr Annukka Pakarinen holds a PhD degree in Environmental Solutions in Agriculture and a Master's degree in Chemical Engineering. She is a director of HAMK Bio Research Unit. She has expertise in utilising and treating (physical, chemical, enzymatic, etc.) plant or waste-based raw materials in biofuel production. As a research unit director, she closely follows the field of bioeconomy throughout the chain from primary production to value-added refining and smart solutions. She has also been a founder of a start-up company.

The Conditional Framework of Regional Biobased Innovations; Insights and Experiences from Regional Hubs in H2020 Bloom Project

Remco Kranendonk

Wageningen University and Research, The Netherlands

Remco Kranendonk is a senior researcher at Wageningen Environmental Research, working on regional development and bioeconomy regional clusters. Advices and facilitates regional innovation processes and has a broad experience in connecting science and regional networks of practitioners. He participated in the FP7 project BERST as WP leader in setting up a community of practice. He is the program leader of the Climate Smart Agriculture Program in the Netherlands within Climate KICs. He was the organiser of the TCI 2016 Global Cluster Conference and responsible for WUR Strategy on Regional Partnerships. He is active in the H2020 Bloom project, focussing on raising awareness of biobased perspectives within the civil society; he is responsible for extending the regional triple helix networks to a quadruple helix interplay.

Ecodesign and Sustainable Packaging: Challenges, Trends and Perspectives

Ana L. Pires

MARE/FCT NOVA University of Lisbon, Portugal

Ana Pires received a PhD in Environmental Engineering from the Faculty of Science and Technology of the NOVA University of Lisbon (FCT NOVA). She is a researcher and invited professor at FCT NOVA in solid waste management and circular economy and a author of several articles and communications, with a book awarded by the International Solid Waste Association. Her research areas focus on developing sustainable eco-design methodologies, reuse-based circular economic models and sustainability metrics for hierarchical waste management. She is a co-founder of the waste@NOVA network of researchers dedicated to innovation in waste treatment and management technologies.

All life on Earth depends upon healthy Oceans—Choose your lifeline

Howard Dryden

GOES Foundation, University of Edinburgh, Scotland UK

Howard is an internationally acclaimed marine biologist, now takes the helm as Chief Scientific Officer of GOES Foundation (Global Oceanic Environmental Survey). As an academic and successful businessman, Howard's 30+ year career has been focussed on one vision—to make the aquatic environment safer and cleaner for humans and all the other organisms on which our life depends. Along with his team of marine biologists and an experienced globally connected group of policy-makers, communication experts and management consultants are the driving force behind GOES. Being aware that all life on Earth depends on a healthy oceanic ecosystem and that climate change is all about carbon dioxide (but that most of the effort by Governments has gone into reducing emissions) and that it is known that elimination of aquatic environmental pollution from toxic-for-ever chemicals such as PCBs and oxybenzone is primordial to avoid ocean acidification and a complete collapse of the entire marine environment, Howards' focus is about restoring oceanic ecosystems to sequester carbon dioxide.

Stating that if we do not eliminate pollution within ten years, then we lose the marine ecosystem and biodiversity in 25 years, along with the food supply for 2 billion people, the GOES Foundation is now the primary focus of Dr. Howard Dryden.

Biochemical Biorefineries for Advanced Biofuels

Francisco Gírio

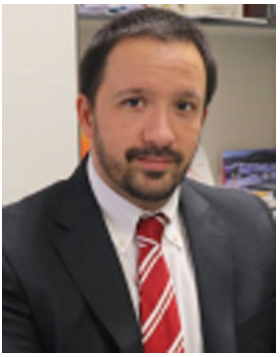
LNEG-National Laboratory of Energy and Geology, Portugal

Francisco Gírio, PhD, is a principal researcher and the head of Bioenergy Department of LNEG-National Laboratory of Energy and Geology, Lisbon, Portugal. In his research career, he participated as a researcher in more than 47 research projects on lignocellulose bioconversion, being the coordinator of 14. He is currently a member of the Management Board of Bioenergy Joint Program of the European Energy Research Alliance (EERA-Bioenergy), member of the Steering Committee of the European Technology and Innovation Platform on Bioenergy (ETIP-Bioenergy), member of the Scientific Council and Board of Trustees of IMDEA Energy (Spain) and President of SIADEB—Iberoamerican Society for the Development of Biorefineries. He did publish over more than 100 peer-review papers and more than 200 papers and lectures at international conferences.

The Future Challenges of Water Management as a Finite Resource

Alberto C. Neto

Be Water (PT) CEO



Since 2017, Alberto Carvalho Neto is the chief executive officer at BEWG (PT), a company working on water, energy, waste sectors and environment projects, improving the circular economy. Leader in a group with more than 400 workers in Portugal, he is also involved in the challenging international development of the group, essentially in Portuguese speaking countries, North Africa and Europe, through the group's water expertisein the last three decades in Portugal. The challenges in the environment for the following years are relevant and strategic for the future of humankind, and companies such as BEWG will have a role to play in the management and preservation of limited natural resources.

Global Electric Power Sector: Engaging with Environment Issues

Saifur Rahman

Joseph Loring Professor and Director Virginia Tech Advanced Research Institute, USA

Professor Saifur Rahman is the founding director of the Advanced Research Institute (https://www.ari.vt.edu) at Virginia Tech, USA, where he is the Joseph R. Loring professor of electrical and computer engineering. He directs the Centre for Energy and the Global Environment (https://www.ceage.vt.edu). He is Life Fellow of the IEEE and IEEE Millennium Medal winner and was the President of the IEEE Power and Energy Society (PES) in 2018 and 2019. He was the vice president for IEEE publications and a member of the IEEE Board of Directors in 2006. He was a member of the IEEE Society's governing board on the Social Implications of Technology (SSIT) from 2016 to 2018. He was the founding editor-in-chief of the IEEE Electrification Magazine and the IEEE Transactions on Sustainable Energy. He served as a chair of the USA National Science Foundation Advisor Committee for International Science and Engineering from 2010 to 2013. He is a member at the large of the IEEE-USA Energy Policy Committee. He is a distinguished lecturer for the IEEE PES and has lectured on smart grid, energy-efficient buildings, renewable energy, demand response, distributed generation and critical infrastructure protection topics in over 30 countries on all six continents. He has published over 140 journal papers and has made over four hundred conferences and invited presentations.

In recognition of his expertise and contributions to energy efficiency research, Dr Rahman was appointed to the State of Virginia Governor's Executive Committee on Energy Efficiency in 2015. He is the only member of the academia of this 12-member committee. He was also a member of the Virginia Energy Efficiency board of governors Council from 2015 to 2018. He received his PhD in electrical engineering from Virginia Tech in 1978. His MS degree is from the Stony Brook University and has BScEE degree from the Bangladesh University of Engineeringand Technology. His industry and government experience includes work with the Tokyo Electric Power Company in Japan, the Brookhaven National Laboratory in New York, Duke Energy in North Carolina and consultancy for the World Bank, the United Nations, US Agency for the International Development and the Asian Development Bank.

Conference Sponsors

The conference co-chairs and organising committee wish to acknowledge the support and sponsorship given in the organisation of the ICoWEFS 2021—International Conference on Water Energy Food and Sustainability, held at the School of Technology and Management of the Polytechnic of Leiria, Portugal:

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