Sustainable Water Management & Resource Adaptation: Security and Energy Nexus 1st Edition

A Book of Abstracts

IEREK
RESEARCH & KNOWLEDGE ENRICHMENT

Université Paris Cité

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Sustainable Water Management and Resource Adaptation: Security and Energy Nexus - 1st Edition

A Book of Abstracts submitted to the 1st edition of the international conference on **Sustainable Water Management and Resource Adaptation: Security and Energy Nexus (SWMRA)** 12 - 13 November 2024

Acknowledgements

IEREK would like to express its appreciation to all members of the staff and scientific committee for their tremendous efforts and contribution to the growth of this institution and for making the the International Conference on Sustainable Water Management and Resource Adaptation: Security and Energy Nexus. IEREK would like to thank the conference chairperson, Professor Mohamed M. Chehimi and the co-chairs prof. Silvia Serranti, prof. Eric D. van Hullebusch, prof. Anas Y. Al-Hayawia and prof. Khalid Hashim. Mohamed M. Chehimi had a hand in making the 1st Edition of this conference what it is today by providing scientific and logistical support throughout its organization. IEREK takes pride in being an institution that amasses a highly qualified and competent team who restlessly worked for months to make this conference what it is today in hopes of creating a well-rounded society. Last but not least, we cannot neglect the prominent role undertaken by our Editors and Reviewers, Session Moderators and keynote speakers who made it their duty to help this institution in spreading knowledge to the masses.

Foreword

« *L’eau c’est la vie* » is a common French saying meaning « *water is life* ». More than that, French novelist Jules Verne (1928-1905) wrote back in 1873 « *Oui, mes amis, je crois que l'eau sera un jour employée comme combustible* » (« *Yes, my friends, I believe that water will one day be used as fuel* »).

Water means a lot to scientists and mobilizes them for scientific, technological, and management purposes. Indeed, water lies at the heart of adaptation to climate change and serves as a crucial link between climate systems, human society, and the environment. It is a finite and irreplaceable resource that is fundamental to human well-being. Various necessary adaptation measures that deal with climate change have the potential to create resilience to climate change and enhance water security. Sustainable governance of available surface and groundwater resources is key to solving water problems.

For this first edition of Sustainable Water Management & Resource Adaptation (SWMRA) conference held in Paris, France, IEREK and Université Paris Cité, in association with Sapienza University of Rome and Institut de Physique du Globe de Paris (IPGP), have gathered experts from diverse disciplines and countries/regions to share knowledge and discuss the latest developments in the field of water science, technology, and management. Four invited, prestigious keynote speakers have agreed to give lectures on water recovery, treatment, and monitoring; water as solar fuel, and integrated approaches to reduce environmental and human health risks.

Five sessions are organized to discuss specific topics: Day 1 focuses on water pollution control and remediation, and energy-related aspects of water e.g. to address water scarcity. Day 2 concerns water management, security, and resilience, as well as circular bioeconomy, water resource modeling, and sustainable management of agricultural land and urban green spaces.

This SWMRA 2024 event is a unique opportunity to gather materials chemists and physicists, environmental scientists, and climate and urbanization experts. It is thus a unique multidisciplinary event focussed on water. De facto, there is room for the participants to engage in discussions after the sessions to develop new collaborations and networks.

We are confident this Abstract book will be valuable for academics, technologists, policymakers, students, and newcomers in the field, who have a holistic view of water adaptation, monitoring, treatment, and management. We thank all participants in the event and all contributors to the abstract book. With their input, we trust to contribute to advancing water science and to address numerous UNs' sustainable development goals, namely SDG3, SDG6, SDG7, SDG8, SDG9, SDGs11-15.

We anticipate that the SWMRA 2024 event and its Abstract book will inspire our readers for the right reason “Water is worth it” to paraphrase the slogan of a famous French multinational personal care corporation.

Word from the Chairman of the Board of IEREK

It is my honor to be launching this conference on Sustainable Water Management and Resource Adaptation: Security and Energy Nexus, a truly successful and rich event. Organizing an event in this topic, year after year, we hope, continues to bring substantial benefits to the research community and the related disciplines. This conference brings together experts, scholars, and practitioners from all backgrounds to share ideas, insights, and solutions for the urgent challenges in sustainable water management and resource adaptation. By bridging the worlds of academia and practical experience, it offers a rare opportunity to tackle the real issues impacting water security and energy needs. Through collaborative discussions, participants can track trends, assess the impact of interventions, and improve strategies for lasting resilience. The event also sparks interdisciplinary cooperation because water and resource management require more than one field's expertise. Here, environmental scientists, engineers, economists, and social scientists join forces to build a more connected, comprehensive approach to sustainability, making real progress toward securing water resources for future generations. IEREK-International Experts for Research Enrichment and Knowledge Exchange - is an institution that began pursuing its goal of reaching excellence in disseminating research and knowledge across countries in 2013, and since then has been connecting the world's scholars and providing them with a platform that would advance all their endeavors. Building international relationships with prestigious universities and institutes worldwide is one of IEREK's main goals, spreading knowledge and enhancing research around the world, along the way, through collaborating with trustworthy partners who share its same vision. With that said, IEREK hopes to present the world with a conference that positively contributes to its relative field and makes way for scholars to combine their ideas for the greater goal of discovering new and innovative solutions to the issue at hand, with the aid of our scientific committee comprised of distinguished professors and researchers from a variety of international, established universities. Finally, I hope that the conference succeeds in delivering its message to the world of professionals in the various concerned disciplines in order for their work to be put into motion. I would like to extend a warm welcome to individuals spanning from undergraduate to postgraduate levels, as well as anyone poised to gain the most from this event. I eagerly anticipate the opportunity to meet and engage with all of you during this fruitful experience.

Mourad S. Amer, PhD
IEREK CEO & Founder
COEUS CEO & Founder
Series Editor, ASTI /SUCI /SLNR by Springer

WORD BY THE CONFERENCE CHAIRPERSON

Dear SWMRA 2024 Participants, welcome to Paris, France. On behalf of Université Paris Cité, IPGP, and Sapienza – University of Rome, I am delighted and honored to welcome prestigious Keynote speakers, and international experts from various fields but all committed to addressing today's challenges of water resource adaptation, recovery, management, and treatment, as well as bio-circular economy.

I would like to thank you very much for joining us in Paris, France, to share your results related to water for a better life on Earth and for making this first SWMRA event successful. I do hope SWMRA will trigger further national and international networking in this multidisciplinary domain of water and that this magic liquid will continue to inspire you in your everyday research.

Prof. Mohamed M. Chehimi

Conference Chair & Research Director Université Paris Cité & CNRS (UMR 7086), ITODYS Lab.

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Experimental Assessment of the Domestic Ovens Performance Operated on Hydrogen-Natural Gas Blends

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Abstract:

The need to reduce the emission of greenhouse gases (GHG) while still providing energy for a growing world population is a major current challenge, in which decarbonizing the domestic cooking plays an important role. Blending hydrogen derived from renewable energy sources into the natural gas network is being promoted alongside electrification. Nevertheless, switching to hydrogen–natural gas blends can affect combustion processes in residential and commercial appliances, both in terms of performance and safety, since methane and hydrogen differ in their physical and chemical properties. While mixtures with low hydrogen content have safety measures and risks comparable to those of natural gas, the consequences become more pronounced with higher levels of hydrogen. Furthermore, different combustion technologies perform differently when supplied with hydrogen-natural gas blends. The present study focuses on investigating the influence of hydrogen-natural gas blends up to 20% of hydrogen on domestic ovens, with and without thermostatic control. The heat input and maintenance consumption measurements, based on EN 30 standards 1,2, demonstrated that the addition of hydrogen results in a slight reduction of the heat input, despite the small increase in flow rate due to the lower hydrogen–natural gas blend Wobbe Index (WI). In the experiments, a negligible impact on safety issues and a reduction in CO exhaust emissions was also verified. Additional tests, based on SASO 167 3, showed an insignificant influence of the hydrogen-natural gas blends on temperature distribution in the oven chamber. The results confirm the safety and fitness for purpose of the tested oven models when hydrogen–natural gas blends up to 20% of hydrogen were used. It is considered that the obtained results will encourage the use of this blends, thus contributing to the decarbonization of domestic cooking.

Keywords:
Hydrogen, Greenhouse, Hydrogen-natural gas blends, Domestic heating process, Decarbonization.

References:

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3. SASO 167:2012 "Methods of Test for Domestic Cookers for Use with Liquiefied Petroleum Gases"

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A Book of Abstracts

Dear Reader, this Abstract book abstract is a collection of conference papers presented at the first edition of Sustainable Water Management & Resource Adaptation, held in Paris, France, on 12-13 November 2024 (SWMRA 2024). This event is co-organized by Université Paris Cité, Institut de Physique du Globe de Paris (IPGP), and Sapienza University of Rome, in association with IEREK. The organizers of this first SWMRA event have a holistic approach to water science, technology, management, and adaptation management. Towards this end, they gathered scientists from diverse disciplines and regions to discuss water pollution control and remediation, energy-related aspects of water, management, security, and resilience, as well as circular bioeconomy, water resource modeling, and sustainable management of agricultural land and urban green spaces. Université Paris Cité, IPGP, and Sapienza University of Rome are engaged the three establishments are committed to the ecological transition through cutting-edge research to address the 17 UNs' sustainable development goals (SDGs), particularly those relevant to water.

The organizers anticipate SWMRA 2024 abstract book to be a source of inspiration for our readers, whether they are experts, engineers, students, policymakers, or newcomers in the broad domain of water.

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