Issue 39 - June 2024

Marie Curie Alumni Association

Newsletter

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Special Issue

Integrating sustainability into research and innovation

Guest edited by Alexandra Dubini, Mariana Rosca and Polat Goktas

ISSN 2663-9483

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Message from the Board

Dear MCAA Members,

We hope you are all doing well. Time really flies, and we are already jumping into the second half of the year! It has been a productive year so far for our Association, with a brand new Board actively working towards the growth and improvement of the MCAA.

This special issue of the MCAA Newsletter is dedicated to **advancing sustainable practices in academia**, aiming to explore the integration of environmental responsibilities into research and innovation. This topic is particularly important within the Marie Skłodowska-Curie Actions (MSCA) programme, which emphasizes sustainability as a key component of its framework.

The MCAA is deeply interested in fostering an inclusive and sustainable research environment that enables knowledge to benefit society. We are, therefore, excited to announce the launch of a new **General Interest Group (GIG) on Sustainability**, aiming to foster sustainable initiatives, actions, and measures within and outside of the MCAA community. The group´s mission is to collect, develop, integrate, and apply sustainable practices in research and education, and training activities linked to both science and individual behavior, in particular, to reduce human impact/harm on the environment. The GIG is led by former Board members Alexandra Dubini, Donata Iandolo, and Mariana Rosca and currently comprises 59 members. One of the group's primary objectives is to help the European community with the implementation of the MSCA Green Charter, which constitutes a code of good practice for all recipients of MSCA funding – individuals as well as institutions – aiming to promote the mainstreaming of environmental considerations in all aspects of project implementation. Through the new GIG, the MCAA wishes to actively promote sustainable thinking in research management, aligning with the MSCA Green Charter's aims.

Sustainability, in research and innovation, entails a collective effort to balance current societal needs with future environmental and economic challenges. It requires researchers to develop solutions that not only advance scientific knowledge but also enhance the quality of life, promote social equity, and stimulate economic growth through sustainable practices.

Within the newly established GIG, the MCAA is planning to gather information on the sustainability strategies across all areas, from research to infrastructure, implemented by our members' workplaces. The goal is to compile a detailed summary highlighting what is working well and identifying areas for improvement. Earlier this month, the GIG, in collaboration with the MCAA Research Funding Working Group (RFWG), hosted an online invited lecture on "Education and Career Opportunities in Climate Change, Development and Sustainability" by Lakshmi Kumar T V (Jawaharlal Nehru University, India).

By fostering a culture of sustainability within our community, we promote responsible research conduct contributing to a resilient and sustainable future.

Among recent relevant activities, the MCAA Africa Chapter was invited by Eurodoc to collaborate in drafting a proposal for the "Global Call for Science Missions for Sustainability Project", launched by the International Science Council, working on innovative solutions for complex

Image by Midjourney, prompt by Fabrizio Martina

sustainability challenges. Furthermore, several MCAA members took part in the evaluation process of proposals linked to the sustainability theme for the Ukraine EURIZON Fellowship call. Additionally, at the Euroscience Open Forum (ESOF) Satellite Event organized by the MSCA Unit in Katowice (Poland) on 10-11 June, MCAA member Polat Goktas delivered a talk within the "Greening Research Practices: Policy and On-the-Ground Initiatives" breakout session.

This edition of the MCAA Newsletter provides valuable insights into how sustainability can be effectively embedded in research and innovation practices, offering readers a comprehensive understanding of the current landscape and future directions.

Moving on to **updates from the Board**, we are pleased to report that, in the first three months of its mandate, the current Board has been very active, especially in representation activities.

Board Member, Virginia H. Albarracín, was our delegate at the "ICS Global Knowledge Dialogue: Latin America and the Caribbean" organized by the International Science Council in Santiago de Chile, 9-11 April. Together with the Chairs of our Latin American MCAA Chapters, she participated in the Early- and Mid-Career Researchers Forum and in open discussions about the new strategic roadmap required for the region to effectively progress global commitments such as the 2030 Agenda and its 17 Sustainable Development Goals. As a global Alumni association, the MCAA is also interested in participating in events and networks that can identify regional scientific priorities, opportunities, and challenges, thus contributing to improving the conditions for life and work of our members in the LATAM region.

On 16 May 2024, Vice-Chair Joaquin Capablo spoke at the concluding session of the ReMO conference in Budapest (Hungary). On 21-22 May 2024, Executive Director Mostafa

Moonir Shawrav spoke at the InterAcademy Partnership - International Science Council - Global Young Academy meeting on research evaluation, in Paris (France). On 24-25 May 2024, we were invited to attend the General Assembly and Conference of the Erasmus Mundus Association in Istanbul (Turkey). As mentioned above, the MSCA Unit organized a Satellite Event of ESOF on 10-11 June, preceding the main ESOF event, which this year took place from 12 to 15 June in Katowice, Poland. **Thirty MCAA members and the entire Board were invited to attend the two-day Satellite Event**, and many of them, alongside other members of the Association, were actively involved in a number of sessions: Treasurer Pavlo Bazilinskyy contributed to the session on "A PhD beyond campus: integrating the non-academic sector in doctoral program"; Board members Irene Castellano Pellicena and Ornela Bardhi spoke at the "Careers at the intersection of science & policy," while UK Chapter Chair Quentin Loisel led a hands-on workshop on generative AI for research. Moreover, making the most of the in-person attendance at these two events, **the Board held an informal meeting on 8-9 June in Katowice**. It was the opportunity to discuss numerous topics related to the future of the Association and to have a meeting with some members of the operational team.

Following the successful Satellite Event, several Board members extended their stay to participate in ESOF 2024. Board member Irene Castellano Pellicena spoke at the session on "Rethinking research excellence," while Vice-Chair Joaquin Capablo took part in a panel discussion about the impact of the ISE's Manifesto for early-career researchers. On 26 June 2024, Secretary Maria Magdalena Razalan, alongside UK Chapter Chair Quentin Loisel, presented the Association at the Joint European Commission-UKRI-UUKi MSCA event in London (UK), whereas on 26-28 June, Board member Irene Castellano Pellicena contributed views on "Rethinking research assessment at the European University Association - Council for Doctoral Education annual meeting in Barcelona (Spain).

We are also proud to let you know that we have **submitted the application for the new Coordination and Support Action (CSA)**, the main funding source for the daily subsistence of the MCAA. An important deadline was met, and the results should be out in September, with a tentative start in October 2024. With the support of the current CSA, our operational team is growing, and we are pleased to welcome Gledson Emidio as our new Community Officer, whereas the hiring process is ongoing for further positions.

Finally, **on 19 July 2024, the Board will hold its first official meeting**. The invitation to Chapters and WG Chairs will be sent out shortly. It will be a great opportunity for exchanging ideas and networking.

The Board looks forward to meeting you all soon! Wishing you a pleasant reading.

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Editorial

Towards a sustainable future: integrating environmental responsibility into research and innovation

Dear fellow MCAA members,

As we navigate the rapidly evolving academic landscape, the June 2024 Special Issue of the MCAA Newsletter focuses on a theme of paramount importance: **integrating sustainability into research and innovation**. This issue aims to illuminate the critical intersection between environmental responsibilities and academic endeavors.

A time for change

The urgency for sustainable practices within academia has never been more pressing. Our current era, marked by swift technological advancements and increasing global challenges, demands that we rethink our approach to research and innovation. The dual imperatives identified by Martinuzzi et al. (2018)—**the need for rapid innovation and the imperative to maintain public trust through socially valuable contributions**—highlight the critical balance we must achieve.

These challenges resonate across academia, where the integration of Responsible Research and Innovation (RRI) practices can serve as a critical pathway to achieving a more sustainable and responsible academic culture. RRI encourages institutions to adopt a framework that balances innovative efforts with considerations for societal and environmental impacts, promoting a culture that values sustainability alongside scientific advancement. This approach aligns with the growing recognition of the environmental responsibilities that come with academic research and the broader impact of these activities.

Aligning with global goals

Integrating these insights, the European Green Deal, with its ambitious targets such as achieving climate neutrality by 2050 and reducing greenhouse gas emissions by 55% by 2030, serves as a guiding initiative for our efforts (European Commission, The European Green Deal). The MSCA Green Charter further underlines the commitment required from all sectors, including academia, to contribute meaningfully to these goals (European Commission, MSCA Green Charter). Research infrastructures are also uniquely positioned to lead by example, integrating sustainable practices into both their research outputs and operational processes (European University Association, 2022).

A recent study by the European Commission on the MSCA Green Charter, based on a

2023 survey of projects from the 2021 calls, revealed insightful trends (European Commission, 2024). While awareness of the Green Charter and the European Green Deal was less than half among respondents, over 60% indicated their institutions already promote sustainable research. Common practices included using teleconferencing to minimize travel, promoting greener travel options, raising sustainability awareness, and reducing energy and water consumption. Respondents also highlighted the need for more guidance and financial support from the Commission to further adopt sustainable practices.

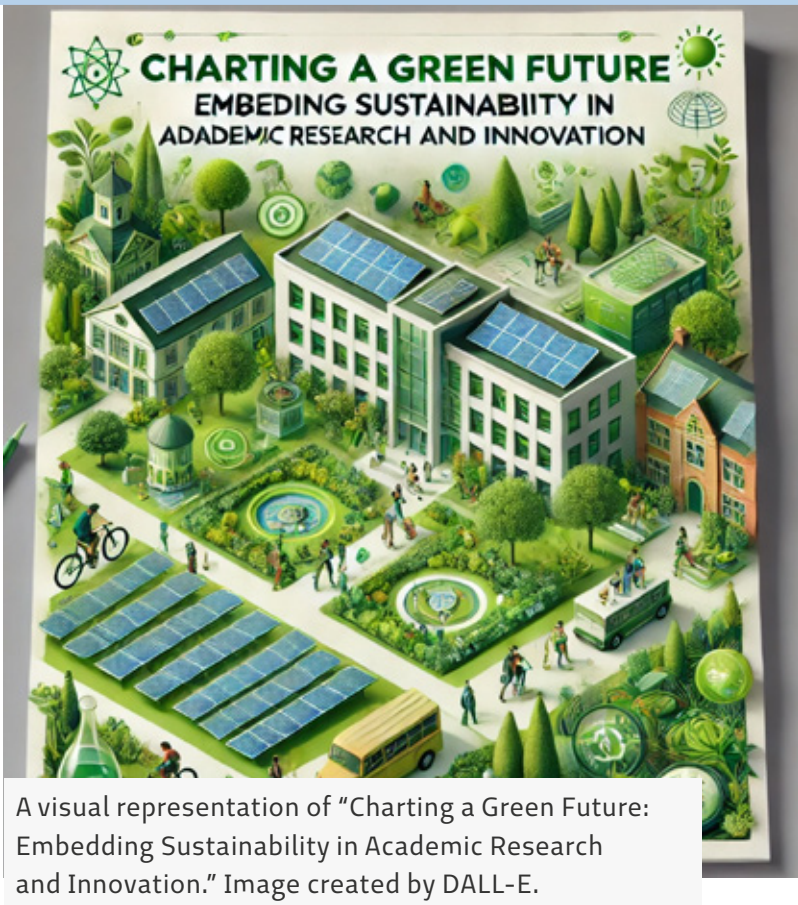
Institutional transformation

Transforming our institutions to support sustainability requires a strategic and systematic approach. Beringer and Adomßent (2008) and Lüdeke-Freund (2020) emphasize the need for holistic changes that encompass academic pursuits and campus operations. This transformation is not merely about reducing environmental footprints but about embedding sustainability into the very fabric of our academic culture.

Shrivastava et al. (2020) and Ruiz-Mallén and Heras (2020) advocate for a transdisciplinary approach to sustainability science, one that bridges the gap between natural sciences, social sciences, and humanities. This comprehensive approach is crucial for addressing the complex challenges of our time and for aligning academic institutions with the global Agenda 2030 of Sustainable Development Goals.

A call to action

As we move forward, it is imperative that we reassess and realign our research methodologies and institutional policies to reflect the principles of RRI. This alignment will not only enhance the sustainability of our research processes but also foster a culture



A visual representation of "Charting a Green Future: Embedding Sustainability in Academic Research and Innovation." Image created by DALL-E.

of sustainable behavior, responsibility and responsiveness within academia.

The journey towards sustainability is both challenging and rewarding. By embracing innovative methods, fostering community engagement, and promoting education on sustainable practices, we can make significant strides in creating a more sustainable academic environment. Our collective efforts will ensure that our research not only advances scientific knowledge but also contributes positively to society and the environment.

Takeaways

The integration of sustainability into academic research and innovation is not merely an option but a necessity. As we align with global goals such as those set by the European Green Deal and the MSCA Green Charter, we must recognize our unique position to lead and influence sustainable practices. Through strategic green transformations and

a committed approach to RRI, we can ensure that our academic activities not only push the boundaries of knowledge but also safeguard the environment and society.

Let us embrace this challenge and opportunity to create a lasting impact. By working together and supporting one another in our sustainability efforts, we can achieve a future where academic excellence and environmental stewardship go hand in hand.

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News from the MCAA

Careers after PhD thesis in STEM

Do you have many questions about your career development after finishing your thesis? How to spend the invaluable scientific and transferable skills you have acquired? Do you want to work in a different domain than your doctoral field? Don't panic: many members of our chapter have asked themselves the same questions before this panel discussion.

To answer all of these questions, the MCAA France Chapter, with the collaboration of Maison de l'Ile-de-France of Paris, has organized the conference "Careers after PhD thesis in STEM." It was an excellent opportunity to discuss with ex-MSCA fellows about their career developments and the applications of their skills to the job world.

The conference took place on 31 January at the Cité Internationale Universitaire de Paris. This campus, located in the south of Paris, hosts Erasmus students, PhD and postdoctoral fellows every year. It is a good environment for international students and researchers who want to move to Paris.

In this environment, five speakers were invited to the stage to talk about their experiences after their scientific thesis.

Bionote

Giulia Rizzo specializes in energy solutions for medical implantable devices. She is currently a postdoctoral researcher at INSERM, where she works on biomedical ultrasounds to wirelessly charge medical implants. Giulia was an MSCA PhD researcher in an ITN project. She developed her thesis in Paris, France, between the French company Valotec and at the laboratory C2N.

Alberto Gregori embarked on his career in the European Union's research landscape immediately after graduating. Throughout his career, he has contributed to numerous MSCA projects, taking on roles such as PhD researcher, post-doctoral fellow, project manager, and partner leader. His work has focused on specialty polymers and optoelectronic devices for applications in energy, healthcare, and electronics. Currently, he works as a consultant, specializing in EU grants proposal writing and management. In his personal life, Alberto enjoys traveling, cooking, and embracing new experiences.

Beatrice Adelizzi is currently the project leader at DNA Script, a growing French start-up. She previously lived in the Netherlands, where she completed her PhD in functional supramolecular materials. She then moved to Paris for her postdoc, supported by an MSCA individual fellowship. After completing her postdoc, she joined DNA Script's Advanced Research group as a surface chemist. Since June 2022, she has been leading the inkjet synthesis team.

Throughout her career, Adelizzi has actively studied the job market and refined her skills based on market needs and her career objectives. Her advice to the audience is to explore job opportunities during their thesis and postdoc periods, rather than waiting until the end. Building the right expertise requires time and strategic planning, which is essential for pursuing a career in the R&D industrial environment.

Camila Betterelli Giuliano transitioned from working at a large international company, IBM, to a French small-medium enterprise (SME), the Microfluidics Innovation Center.





Speakers at the event “Careers after PhD thesis in STEM.”

Her career has consistently focused on industrial applications. She completed her PhD at the French company Elvesys, supported by an MSCA fellowship. Currently, her role involves bridging the gap between the market and engineers, ensuring researchers have the right instruments for cutting-edge science. Her advice to the audience is to learn how to effectively "sell" their career path by presenting their skills and experiences in the best possible light.

Alberto Gregori has a background in material science and polymer chemistry. He completed his MSCA PhD thesis in France and subsequently conducted his postdoctoral project at Siemens Healthcare as part of a MSCA Innovative Training Network (ITN). He honed his R&D management skills at research centers such as the Italian Institute of Technology (IIT). Recently, he joined FI Group to support researchers and companies in writing grant proposals and managing large EU projects. His advice to the audience is to always be themselves and to be kind and friendly to others. A successful career is built on both expertise and, more importantly, human connections.

Dureen Samandar Eweis decided to embrace a career in science policy. After an MSCA doctoral thesis in biology at the French Curie Institute,

she did the European bluebook training in Brussels. After this experience, she converted her passion for science policy into her job, becoming a Science Officer at the International Science Council (ISC). Nowadays, she is part of the Centre for Science Futures, a new think tank of the ISC. In her case, she found an inspiring mentor and she had the opportunity to join his team.

Piera Smeriglio has lived between Italy, France, and the USA. She specialized in myology during her PhD. Then she moved to Stanford University for her post-doctorate to learn more about epigenetics. She won an MSCA individual fellowship in Paris, and, after 2 years of MSCA postdoc, she was appointed team leader in the Center of Research in Myology in Paris and landed a permanent INSERM position as a confirmed researcher. She advised the audience to focus on the scientific connections during the thesis. The best occasion for networking could be the laboratory or at conferences.

These examples of ex-MSCA fellows demonstrate the versatility and breadth of options available to post-PhD researchers, whether in academia, industry R&D, management, or science policy. The key takeaway from their experiences is the importance of adaptability, continuous learning, and seizing networking opportunities. A MSCA fellowship not only provides a strong scientific knowledge, but also opens doors to valuable networking and mentoring within the European research community. As attendees reflect on these insights, the path after a PhD is diverse and full of possibilities. The MCAA France Chapter, in collaboration with Maison de l'Ile-de-France of Paris, hopes that this conference has inspired and provided practical advice for those navigating their careers after completing their PhDs. Through such events and the support of organizations like MCAA, researchers can find their unique paths to success in the dynamic landscape of STEM careers.

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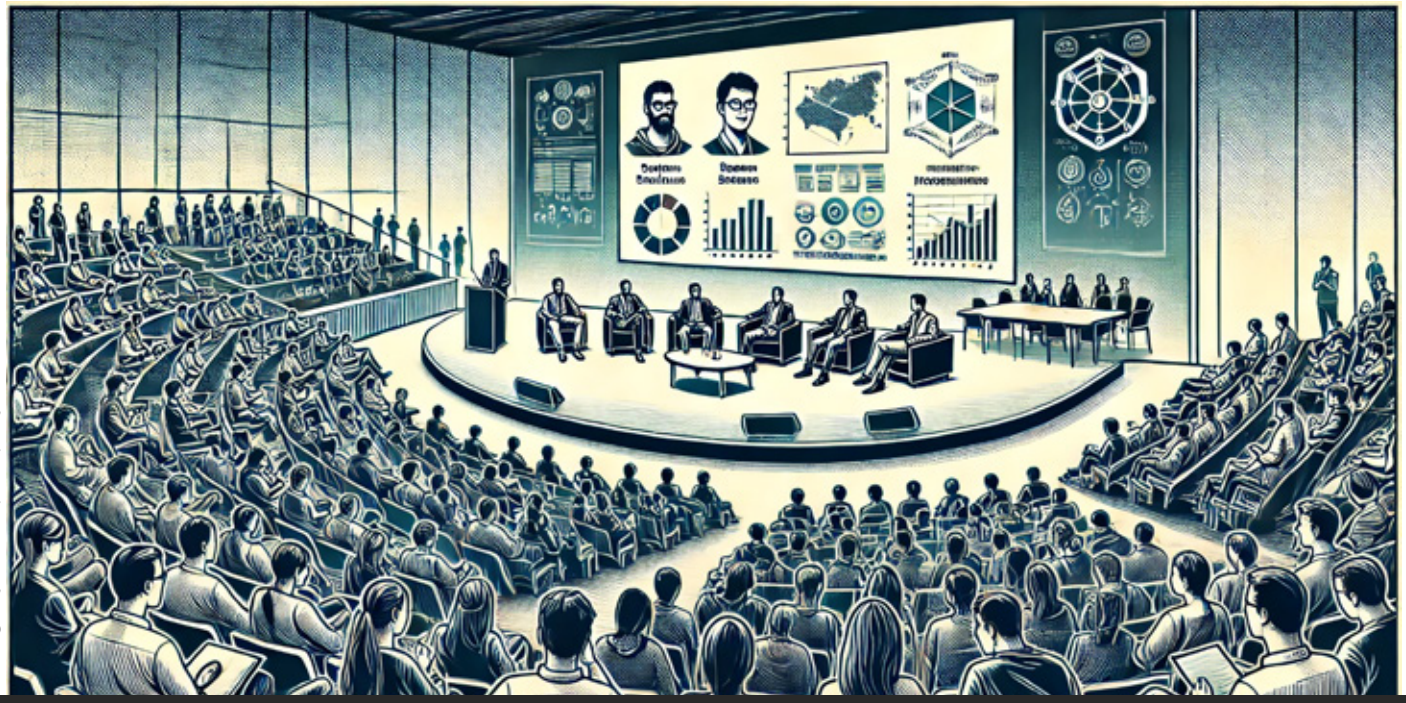

Image by Dall-e, prompt by Fabrizio Martina

News from the MCAA

Open science in research culture: reflect and act for change

How can open science practices be valued and rewarded in the evaluation of research and researchers? How do we use open science practices in research assessment? Which initiatives are available and where to find examples of good practice? Those were the questions answered by Brian Cahill, Lisanna Paladin, Sam Hall and Gareth O'Neill during the MCAA Annual Conference 2024.

The evolution of the current research assessment

Since the topic of the Annual Conference was 10 years of MCAA, Brian Cahill started with a short overview of the policy changes in research assessment within the last decade. The endeavors of a joint effort of MCAA and EuroDoc resulted in May 2019 in the Declaration on Sustainable Researcher Careers headed by Gábor Kismihók (Kismihók et al., 2019).

How can we provide sustainable careers for researchers, how to deploy career management services at organizations, how to put focus on transferable skills training and recognition in PhD, postdoc, and research assessment, or how to provide networking opportunities within and outside of academia. Those were the questions encountered in the following project - NewHoRRIzon in December 2019 (Cohen et al., 2019).

A result of the NewHoRRIzon project was a policy brief describing the uptake of responsible research and innovation practices in MSCA grants within Horizon 2020. The MCAA helped to establish new evaluation criteria for the MSCA call in order to enlarge and modernize the notion of excellence and evaluators and training for MSCA grantees within the multiple dimensions of research. Also, MSCA grants from then on have been supporting knowledge exchange and communities of practice through diverse and inclusive forms of excellence.

The Open and Universal Science project - OPUS

All this joint effort resulted in the start of the OPUS project in September 2022, where the MCAA also played an important part. OPUS develops coordination and support measures to reform the assessment of research and researchers – towards a system that incentivises and rewards researchers to adopt open science practices with a focus on indicators/metrics as well as interventions to support open science.

Details about OPUS were described by the next panelist, Gareth O'Neill: "Research assessment should focus on activities and outputs of researchers. Main principles for the assessment lay in redefinition and new sets of indicators, priorities or the coverage of a full spectrum of activities, which applies across countries, disciplines and organizations." There are several key initiatives at the EU level and also worldwide, the big current leader of change being the Coalition for Advancing Research Assessment (CoARA).

Image by Midjourney, prompt by Fabrizio Martina.

In OPUS, we understand the term 'Open Science' referring to practices providing open access to research outputs, early and open sharing of research, participation in open peer review, measures to ensure reproducibility of results, and involving all stakeholders in co-creation.

Open research Europe and reforming research assessment

Sam Hall, Associate Publisher for Open Research Europe, shared his insights into open research projects and their influence on research assessment. He highlighted the main open science aspects as recommended by CoARA: Promoting qualitative judgment with peer reviews supported by quantitative indicators, following the highest standards of ethics and integrity or reproducibility, focusing on diversity of research outputs, transparent processes and methods, valuing teamwork, and supporting diverse profiles and career paths.

"How can we all specifically support research assessment? By transparency in all processes, reproducibility, and novelty, which altogether brings back recognition and citable reports. Also, anyone can maximize research outputs through a variety of article types," suggested Sam (European Commission, Directorate-General for Research and Innovation,

2021). One useful tool that can be applied is Contributor Roles Taxonomy (CRediT) to capture every author's contribution.

Good practice at EMBL

In the last part of the session, Lisanna Paladin shared a good practice used at the European Molecular Biology Laboratory (EMBL). This working place is very international and dynamic, with a high turnover of employees, but at the same time, it offers a very collaborative environment.

Lisanna is responsible for the EMBL Bio-IT project, which is a cumulative initiative and can serve as a model for any research topic or area. Bio-IT is based on the several core principles: flexible and on-demand training, evolving alongside community needs; infrastructure maintenance through collaborative platforms, coding platforms, and any kind of support for collaboration and interaction; comprehensive yet guided information dissemination;targeted to community development, based on volunteer contributions. This initiative is also seen as an opportunity to give back knowledge and skills to society. Bio-IT is all based on do-ocracy, a system where responsibilities are attached to people who do the work.

All of this is also open science – sharing the experience with concurrent check-ups, both top-down and bottom-up. Key message: Open Science is allowing, supporting, and valuing people to share. Importantly, open science is creating alternative career opportunities in science.

Why open science?

"Why is open science important for research assessment in Europe?" asked Brian to the audience.

"It is fair. The typical way of assessing science is very unfair since it is focused only on successful outputs, such as publications in Nature. And that is not always the case. Therefore, it should not be our only ambition. The impact on society is way wider. We should seek alternative ways that are more intuitive. Unfortunately, the system got focused on this one side of the full story," with these words Lisanna concluded the session.

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Special Issue
Integrating sustainability into research and innovation

Developing sustainability training through research on sustainability

Effective training on sustainability principles and applications requires deep engagement with scholarly work from the Humanities and Social Sciences on sustainability and development. Thus, the historical legacies of sustainability research, combined with the European integration process, are essential to rediscover due to their blend of contention and hope.

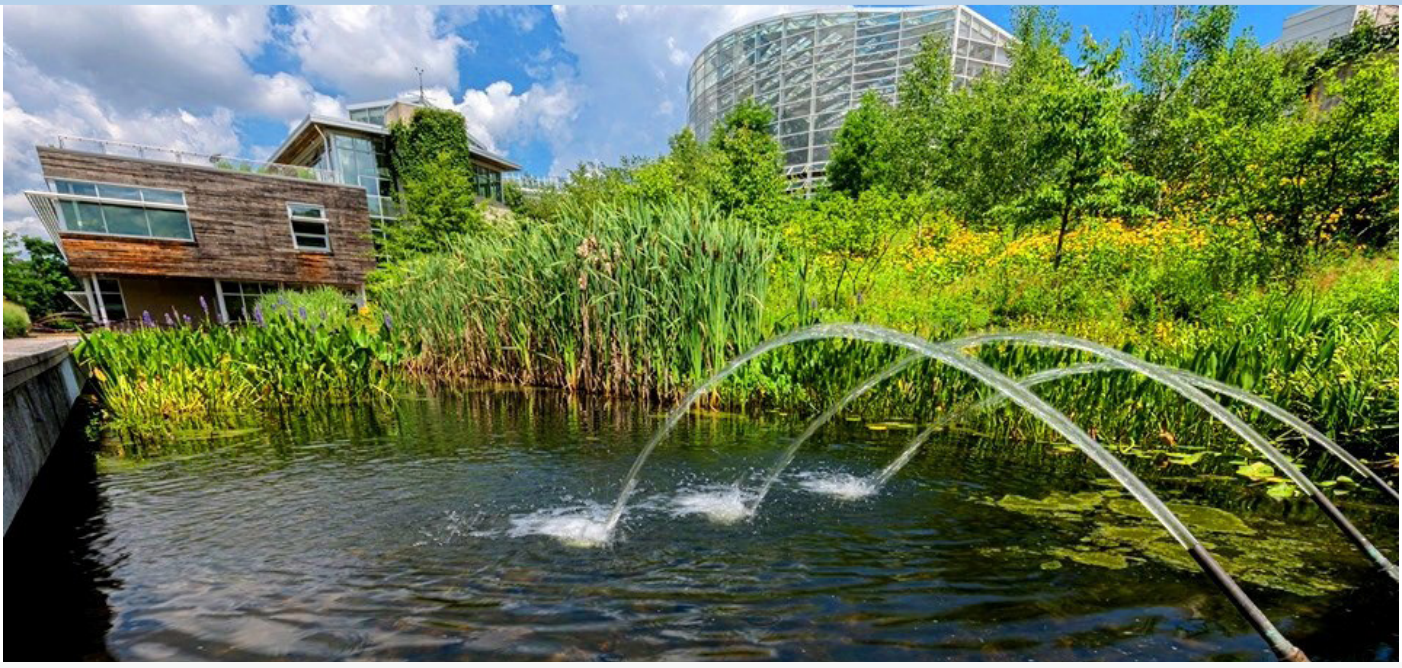
Bionote

Cristina Blanco Sío-López is a Senior Distinguished Researcher at the University of La Coruña (UDC), Spain, and PI of the 'FUNDEU' and 'FREEMOVEU' projects. In 2024-2025, she will be a Visiting Fellow at the University of Cambridge, UK. She was the PI of the EU Horizon 2020 'NAVSCHEN' project and a MSCA Senior Global Fellow at the University of Pittsburgh, USA, and Ca' Foscari University of Venice, Italy. She also served as an Assistant Professor at the University of Groningen, the Netherlands, and a 'Santander' Senior Fellow at the University of Oxford, UK, where she remains a Senior Member.

Uncovering the european integration-sustainability entanglement

When designing sustainability training, it is often applied without context, missing the importance of setting contexts, clarifying causal links, and establishing either continuity or creative disruption as we move forward. In my case, critical historical analysis has provided me with not just structures but a solid corpus of sources and content, serving as a gateway for future sustainability research explorations.

To achieve this, I developed a practice of uncovering historical developments that



The Center for Sustainable Landscapes in Pittsburgh, site of the author's MSCA Global Fellowship and one of 'the greenest buildings on Earth'. Photo by Cristina Blanco Sío-López.

inform existing and potential sustainability choices. This involved valuing the Humanities' contributions to crafting and diffusing path-breaking concepts in sustainability. The result was dedicated academic training on the historical evolution of the main conceptual premises in the European Community's (EC) development cooperation and sustainability dimensions as part of the European integration process.

Post-colonialism and learning from asymmetries

This training firstly addressed the post-WWII decolonization context, examining how development concepts were markedly framed by the weight of past imbalances and asymmetries (Brundtland, 1987) in the early European integration process. These asymmetries were later accentuated by the EC Member States (MS) neglecting the fact that European integration implied not only individual MS socioeconomic cohesion responsibilities, but also equally shared international cooperation and sustainability responsibilities (Hildebrand, 1992), positioning the EC/EU also a global player.

Contextual factors and sustainability paradigms

The training also examined the shifting paradigms of the diversity of instrumental meanings given to 'sustainable development' in EU policy-making in the post-Cold War. This included: the EU agenda-setting focus on the compatibility between environmental protection (Carter, 2013) and economic growth (Burns and Tobin, 2016); the 'democracy clause' for EU development cooperation and its conditionality implications; the shifts to the 'Ecological Modernization' paradigm and the inner hindrances to the EU 'sustainability governance' self-assumed principle. By relating changing contexts to changing paradigms, the offered training helped participants understand which array of contextual factors support socially and environmentally enriching new paradigms.

The citizens' engagement angle

In addition, the training focused on the innovative capacity of global and EU civil society and activist movements to mainstream impactful social concepts. This included

Author's photo of the Oruro Carnival in Bolivia in 1996, honoring the indigenous communities' heritage. Photo by Cristina Blanco Sío-López.

influencing the collective imagination and agenda-setting in European representative politics (Delreux and Happaerts, 2016).

Key sources for this training were used to promote citizen engagement through participative democracy experiences. These sources were drawn from the EU Historical Archives in Florence and Oral History interviews with key EC/EU players, including an interview with the Development Cooperation Commissioner, who proposed and secured an international agreement on the EU development cooperation 'democracy clause'.

Takeaways – alternative meanings of 'growth'

Training on the Sustainability-European integration entanglement led to learning about alternative pathways to growth, relying on innovative governance processes and implementation of new technologies aligned with 'Ecological Modernization' self-defining narratives. These outcomes suggest incorporating fragile populations as part of our collective 'we', rather than a perpetual 'they'. They also invite reflection on the paradox of multilevel quality degradation (environmental, political, socioeconomic, etc.), spreading without benefiting the a priori degraders.

And yet, a fundamental tension persists: the short-term economic priorities versus the necessary long-term consolidation of sustainable development within a global community of values mindset. Our hope might lie in training to evolve from a Community of interests to a Community of values.

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Special Issue
Integrating sustainability into research and innovation

Performing excellent research sustainably: about the MSCA green charter

Insights from exchanges with the MSCA community on sustainable research practices. Photo by European Union, 2024. Fotografnaevent.pl

Excellent science can be performed sustainably. The MSCA Green Charter guides researchers to integrate environmental sustainability into their practices, addressing the climate emergency while maintaining research excellence.

Whenever I discuss the environmental sustainability of research practices with members of our community, I tend to encounter two contrasting positions.

The first is the "climate emergency" position. Based on numerous reports from bodies like the Intergovernmental Panel on Climate Change or the European Commission, this position holds that fast and ambitious action is needed to cut carbon emissions, address biodiversity loss and eliminate pollution. Accordingly, the research and innovation sector should join other sectors in the green

Bionote

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Image by Midjourney, prompt by Fabrizio Martina.

transition, not only by offering scientific and technological solutions to the climate crisis but also by adopting more sustainable research practices.

The second is the "science first" position. It stresses that Research & Innovation (R&I) programmes funded by the European Union, such as the MSCA, should focus primarily on fostering excellent science and achieving impact. The sustainability of research practices should remain a secondary objective; it should not compromise the primary aim.

While there appears to be tension between these positions, three observations can help us reconcile them.

A tension between scientific and sustainability objectives?

First, this tension is not unique to the R&I sector. At the EU, national, or local level, various objectives are set for public action – powering homes and industries, securing food supply in quantity as well as quality, or indeed stimulating research and innovation. However, these goals must be balanced with each other, as well as with other principles considered to be important by the public and its representative institutions. Striking the right balance between environmental considerations and other key objectives has been central to the European Green Deal from its inception, which addresses all sectors of our European economies and societies.

In the same vein, the European Parliament and Council of the European Union, co-legislators at EU level, have recently approved a reform of the rules applying to all EU funding programmes. The reform notably aims to ensure that European spending does not cause (significant) environmental harm – while paying attention to the specificities of each spending programme and ensuring their objectives are still achieved.

Second, and turning to the R&I sector in particular, many of the changes needed for greater sustainability in everyday research and project management concern activities that must happen anyway. Decisions on waste management, how to use energy, what to buy and how to travel: these are practical questions that researchers and institutions must grapple with routinely. While different choices may have different practical implications, incorporating sustainability concerns into these decisions does not create an entirely new set of activities which would be unrelated to the pure act of scientific pursuit – in a similar way that hiring is a routine task for a team or institution, but which should also be performed in light of gender balance principles.

What matters is ensuring that researchers and institutions incorporate sustainability

principles when planning and managing research activities. Since 2021, the MSCA Green Charter has supported this shift in practices and mindsets by setting out clear principles for individuals, institutions, and consortia and helping them identify where action would be needed to increase the environmental sustainability of their projects. While the principles of the Charter are not mandatory, the MSCA programme encourages our community to act by requiring reflection on the sustainability of projects at the proposal stage as well as at the final reporting stage. In situations of ex-aequo proposals, where selection panels evaluate proposals as equally excellent and impactful but there isn't enough budget to fund them, other criteria are used to decide between them – environmental sustainability can now serve as a deciding selection criterion.

Third, and most importantly, the discussion on environmental sustainability in research is not imposed on our sector, but stems from it. Surveys, public stances from different parts of the sector (for instance, from the European University Association or from Science Europe), and as well as direct exchanges with our community – including the very active MCAA and its Sustainability General Interest Group – show that many people in our sector want to take action to make research projects more sustainable. Many already do, as demonstrated in this timely and important special issue.

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Special Issue
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Enhancing sustainability in academia through Artificial Intelligence (AI) and Internet of Things (IoT)

Artificial Intelligence (AI) and Internet of Things (IoT) offer unique opportunities to make academic environments more sustainable by streamlining operations and promoting a greener future. This article explores how AI and IoT can improve sustainability in academic settings through specific examples, addressing challenges, and evaluating their impact.

Artificial Intelligence (AI) and Internet of Things (IoT) present unique opportunities to enhance sustainability in academic environments by optimizing operations and fostering a greener future. This article examines how AI and IoT can boost sustainability in educational settings through specific examples, discusses the challenges involved, and assesses their overall impact.

Bionote

Temiloluwa Emmanuel Amoo is a researcher at Polymat and a PhD candidate at the University of the Basque Country, Spain. He holds both a Bachelor's and Master's degree in Chemical Engineering from Covenant University, Nigeria. Amoo is currently exploring the intersection of material science (polymers) and machine learning. His goal is to leverage these emerging technologies to accelerate the discovery of specialized materials crucial for sustainable development. He is a recipient of the prestigious MSCA grant for his PhD. In addition to his research, Amoo is deeply interested in personal development.

Data is intelligence

Institutions generate vast amounts of data daily, which can be transformed into valuable insights when utilized effectively. By implementing IoT devices to gather this data and leveraging AI models for analysis, resource management can be significantly improved, resulting in more efficient and sustainable operations.

Real-world applications

A notable example is the Smart Campus project at the University of Bologna's Cesena campus in Italy (Ceccarini et al., 2021). They installed air quality sensors and cameras to count people in classrooms and labs. By visualizing the data, they were able to manage resources like classrooms and optimize timetables for significant energy savings.

At the University of Extremadura in Spain, IoT devices such as cameras and sensors were combined with AI algorithms to create an intelligent system of monitoring water usage patterns and detecting anomalies such as leakages (Barroso et al., 2023). An alarm is triggered if an anomaly is detected which helps in managing water usage more effectively.

Another example from the Technical University of Greece used IoT devices to understand past energy consumption trends (Marinakis & Doukas, 2018). By using predictive techniques, they achieved a 10% decrease in energy consumption related to heating and cooling and an 11% reduction in operational costs, with savings paying for the installation cost within two years.

Impact analysis

AI and IoT in academia can significantly reduce energy consumption and operational costs. For example, effective timetabling based on IoT data can save up to 5% on energy during heating and cooling seasons, reducing carbon footprint over time (Song et al., 2017). Financially, these savings allow universities to invest more in academic programs and scholarships, showing a positive return on investment. Furthermore, the data collected supports ongoing sustainability research, offering both practical and academic benefits.

Challenges and solutions

One challenge of integrating AI and IoT into academic infrastructure is data fragmentation, where data is scattered across different systems and not integrated. Universities need robust systems to bring all these data together. Connecting IoT devices to the internet would play a huge role in addressing this issue (Wang et al., 2021)

Another challenge is funding for IT infrastructure and training. Universities need to prioritize funding to harness these technologies' potential for sustainability. Additionally, more connected systems are more vulnerable to cyberattacks. Investing in strong cybersecurity measures is crucial to protect data and maintain system integrity (Nishant et al., 2020).

Broader context and industry comparisons

IoT in manufacturing has revolutionized supply chain management, minimizing waste and improving energy efficiency. A comprehensive example of AI and IoT applications can be seen with big data solution companies like Palantir Technologies. They help industries meet their economic and sustainability goals by integrating their data into a software platform that provides visualization and decision-making suggestions (Gordon, 2021). This platform creates a digital twin of operations, synchronizing diverse data into a unified view, and helping stakeholders make informed decisions.

This industry example validates the benefits seen in academia and provides a roadmap for further integration. By studying these strategies, academic institutions can anticipate challenges and streamline their adaptation processes, thus accelerating sustainable improvements.

Takeaways

Integrating AI and IoT in academia holds significant promise for enhancing sustainability. As demonstrated by institutions like the University of Bologna and the University of Extremadura, these technologies offer tangible benefits in reducing environmental impact and optimizing resource usage. While challenges exist, they can be effectively managed through strategic planning and collaboration with technology partners. Ultimately, the continued adoption and improvement of AI and IoT in academia would be crucial in developing sustainable practices that can be applied across various sectors.

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Compostor: The composting station features compartments representing the three stages of compost development (from left to right). The sieving process is shown here, utilizing a cylindrical sieve is used to separate finer materials from coarser ones in the final product. Photo by David Avelar.

From waste to wealth: CIÊNCIAS' journey to sustainable organic recycling

Launched in 2009 to raise awareness of permaculture, HortaFCUL is now a resilient community at the Faculty of Sciences in Lisbon, promoting nature-based solutions. Since 2016, the composting station has produced 47.95 tons of compost, serving as a successful neighborhood-scale composting project in Portugal.

HortaFCUL is a community-based permaculture project at Lisbon University's Faculty of Sciences campus (FCUL) (Chaves and Vieira, 2020). Launched in 2009 by a group of students, its goal was to raise public awareness about innovative permaculture practices to address global challenges such as ecosystem degradation and climate change.

This bottom-up project has become a catalyst for practical and technical knowledge based on experimentation and scientific evidence. HortaFCUL is a resilient and inclusive community, educating the general public about nature-based solutions.

Some of these nature-based solutions include on-ground projects, such as three tiny forests, one edible garden, two agroforests, one vertical garden, and two composting stations.

Closing the waste loop

In 2016, the first composting station was installed in Permalab to process the organic waste from the campus' gardens. The station consists of three compartments, each with a volume of 8m3.

Each compost pile is formed with alternate layers of "greens" (sources of nitrogen) and "browns" (sources of carbon), and it is transferred from one compartment to the next twice during the whole process to prevent excessive compaction, lack of oxygenation and increase feedstock homogenization (Horta, 2021). The period between the first piling and the compost sieving is, on average, 4 to 6 months.

A second station, installed in 2019, uses a vermicomposting approach. HortaFCUL utilizes eight 1.5m3 containers to process

organic leftovers from the campus' cafeterias and bars. Vermicomposting relies mostly on worm activity to catalyze organic matter transformation.

Worms aerate the substrate and enhance the availability of certain minerals. In HortaFCUL's vermicomposting station, these macroinvertebrates should be added 21 days after the last input of organic matter, allowing the temperature to decrease to tolerable values for worms - around 25 °C (Verhoeven, 2019). To ensure worm survival, containers are kept shaded. The liquid resulting from worm activity, also called worm slurry, is collected in buckets at the bottom of the containers and applied during crop growth.

Turning challenges into solutions

No community-led zero-budget project is free of structural challenges. However, permaculture teaches us how to turn a problem into a solution. Here are four challenges and their respective solutions:

Vermicomposting

Challenge #1: Major relative proportion of highly compactable and acidic residuals (coffee grounds and orange peels).

Bionote

António Vaz Pato holds a Biology degree and an MSc in Conservation Biology from the University of Lisbon. His research focuses on restoration ecology and plant community responses in secondary succession, collaborating with CIBIO at the University of Porto. He also explores urban ecology and ecosystem services at HortaFCUL, University of Lisbon. Earlier this year, he authored a report on the 15-year impact of the HortaFCUL project, contributing to the research presented in this article.

Florian Ulm, originally from Germany, has lived in Portugal for nearly 14 years. He earned his Bachelor's in Biology from the University of Kaiserslautern in 2010 and a Master's in 2013, focusing on Acacia longifolia invasion in Portuguese dune systems. He completed a PhD in Biodiversity, Genetics, and Evolution from the University of Lisbon in 2019, researching practical solutions like using invasive species compost in agriculture. Florian has worked on projects such as R3forest and FightDesert, and currently works as a data scientist for 2adapt, focusing on climate change adaptation. He also promotes sustainability in higher education through the PermaLABs project.

Madalena Aires Horta holds a Bachelor's degree in Environmental Biology from the University of Lisbon, Portugal, and a Master's degree in Management and Conservation of Natural Resources from the University of Évora, Portugal. Her field of research is decentralized organic waste management systems in urban environments, and on this topic she has worked on a case study of a community-scale composting system in Lisbon. She has also worked professionally in this area, in Composta, a start-up focusing on composting systems in Cascais, Portugal.

Silvana Munzi, a biologist with a PhD in Environmental Science, has been a dedicated lichenologist since the 20th century. She participated in several projects on the impact of nitrogen on lichens and received an MSCA Marie Curie fellowship in 2012 to investigate nitrogen tolerance in lichens at the University of Lisbon. For five years, she was an Assistant Researcher there, studying symbiotic systems' molecular and physiological responses to environmental stresses. She also worked on biomonitoring pollution, climate change, and nitrogen stress in urban environments. Currently, she manages the ERC project "RUTTER: Making the Earth Global," focusing on nautical rutters.

Solution: Alternating thinner layers of cafeteria's residuals with thicker layers (3x thickness) of dry leaves. This prevents excessive compaction and subsequent fermentation, promoting feedstock oxygenation to boost microorganisms' aerobic metabolism.

Challenge #2: Attraction of undesirable macroinvertebrates, e.g. cockroaches.

Solution: These macroinvertebrates become food for insectivorous birds, attracting native bird fauna.

Regular Composting

Challenge #3: High amount of coarse plant residuals (thick branches, vine plants).

Solution: Coarser residuals are deposited in swale ditches in Horta's agroforests for faster biomass incorporation into the soil.

Challenge #4: Pile turning process relies solely on manpower.

Solution: Working days at Horta attract volunteers to assist with this demanding activity, promoting social bonding within the community.

Composting works

In permaculture, environmental, social and economic impacts are translated to three main ethics: Earth Care (environmental), People Care (social) and Fair Share (economic). Here are some compiled numbers (Vaz Pato et al., 2024):

Earth Care

- 47.95 tons of compost produced (2016 – 2023)
- 2.5 ha of green spaces as residuals' regular source
- 8.1 tons of vermicompost produced (2021 - 2023)

Vermicomposter: The vermicomposting station comprises eight upcycled garbage containers previously used by the municipality's waste management department. Each container has a small tube and a jerry can at the bottom to collect the worm slurry run-off. Photo by David Avelar.

- 3.04 tons of food leftovers recycled by vermicomposting per semester (2021 - 2024)

People Care

Compost production relies on community's efforts; working days (450 at least since the project's inception) at HortaFCUL are essential for promoting social bonding and integration near the members of this community.

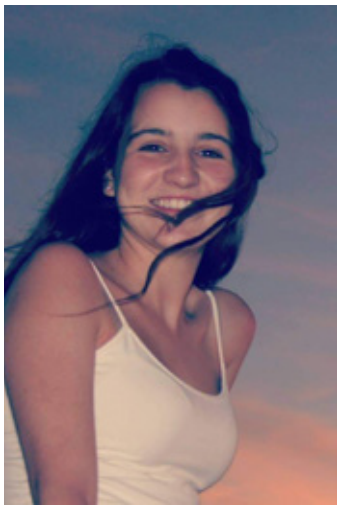
Fair Share

Composting connects with the community through the Gift Table, where excess compost and plants are provided in exchange for a donation, following a Gift Economy approach. This method represents budget cuts by producing valuable goods with low financial input and avoiding residual transportation to landfills.

Fertilizing the ground

While university-led initiatives have been launched in the country over the past four years, they often lack production indicators






and detailed descriptions. The HortaFCUL project, grounded in scientific knowledge and with a strong social component, provides a replicable example for other universities and institutions.

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Reducing the expense of life science research through resource-conscious methods

Maintaining sterile conditions and long-term preservation of samples are crucial in biological research. Traditionally, this requirement has led to the extensive use of single-use plastic consumables and maintenance of ambient temperature, resulting in significant financial and environmental costs. By adopting resource-conscious methods, researchers can substantially reduce these expenses while maintaining the integrity of their work.

Regulating energy consumption

Laboratories consume massive amounts of electricity and require a high running cost. Since this expense is usually borne by the institute's funding, researchers rarely see the numbers. Generally, most people are told to turn off the equipment when not in use. However, this rule cannot be applied to some of the equipment, such as ultra-low freezers.

Gradually switching to energy-efficient models is a possible solution. For the existing freezers, switching to -70 °C instead of -80° can result in a considerable energy reduction without affecting the storage of biological samples. Amina Zankel, Head of Environment, Health and Safety at the Research Institutes

Bionote

Pallavi was born and raised in Pithoragarh, Uttarakhand, India. She moved to the University of Delhi for her Bachelor's and then to the University of Hyderabad for her Master's and PhD. Since January 2023, she has been a postdoctoral researcher at the Max Perutz Labs, Vienna, Austria. Apart from biochemistry and microscopy, she is enthusiastic about the importance of sustainability and mindfulness in the research ecosystem. She is also a member of the Climate Group at her institute.

of Molecular Pathology situated at the Vienna BioCenter, shares an example of this: "We saved up to 42% energy during the first year of switching 18 old devices and 3 new devices to -70°C."

Reusing single-use plastics

Single-use plastics are prevalent in research laboratories due to their convenience in preventing cross-contamination between samples. Items like pipette tip boxes, 15/50ml tubes, and petri dishes are commonly used and discarded after a single use. However, reusing single-use plastic consumables multiple times before disposal is possible. During my PhD in India, I reused 50ml tubes several times by washing and autoclaving. Since not all single-use plastic can withstand the heat and pressure of an autoclave, we checked the material specifications and invested in a good quality material before purchasing. In the long run, the benefits of washing and reusing labware outweigh the cost (Farley and Nicolet, 2022).

Due to the lack of a timely supply of cover glass-bottom dishes for imaging cells during the COVID-19 lockdown, I had to find a way to reuse the existing dishes multiple times without compromising data quality or risking contamination. We quickly adopted a method where we washed the 35mm cover glass bottom dishes immediately after use and sterilized them with alcohol and UV light. This technique was reliable and effective (Deolal and Mishra, 2022). Similarly, 8-well imaging chambers with cover glass bottoms can also be reused. By simply replacing the old cover glass with a new one while retaining the plastic chamber body, we can extend the life of our supplies (Bodner et al., 2023). Plasma cleaning can be used to sterilize the surface of delicate material such as cover glass. Clara Bodner, a researcher and former staff member at an imaging facility, suggests that with a little planning, several labs can share the cost, making expensive equipment like a plasma cleaner more affordable per head.

Challenges and considerations

Despite the success of these and similar approaches, researchers often overlook resource-conscious practices. This mindset disparity is notable between researchers at institutes with abundant funding and those with limited resources. Even if any resource-conscious approach is practiced in the course of a study, it often does not make it to a final published version of a research article. This is something that authors and editors of scientific journals can consider promoting.

Recognizing individual efforts through small rewards as well as providing dedicated time and resources for proactive, self-driven grassroot groups can make a significant difference (Dobbelaere, et al., 2022). Nikola Winter, Technical Management staff and member of the Climate Group at the Max Perutz Labs, emphasizes the importance of institutional support. "Self-motivation can only get you so far. To set an example, the institute's framework and leaders'

participation make the execution effective," she says.

My thoughts also resonate with Nikola, Clara and Amina that discussing effective resource utilization in monthly or annual meetings is essential and ensures transparency and accountability among stakeholders. A well-funded ecosystem can indeed enable institutes and labs to invest in more energy-efficient and cost-effective resources. Institutionalizing some of the practices and encouraging innovation will eventually benefit both the scientific community and the planet.

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A simple procedure to reuse imaging chambers by replacing the cover glass at the bottom

1. After use, soak the imaging chamber in a class jar containing 70% ethanol for a few hours.
2. Scrape away the cover glass from the bottom using a scalpel or fine knife.
3. Wipe the excess glue and glass from the base.
4. Prepare a small amount of silicon glue such a Twinsil, a non-toxic two component glue that hardens in a few minutes and can be removed with ease for next usage.
5. Apply the glue to the walls of the chamber using a toothpick or a thin applicator and place the cover slip on top of it. Avoid trapping any air bubbles and apply gentle pressure to make sure the sits well.
6. As a precaution, the efficacy of seal can be tested before seeding cells by filling the wells with water.

This figure briefly outlines the steps involved in cleaning and preparing an imaging chamber for re-use by replacing the cover-glass at the bottom. Written and made by Pallavi Deolal with inputs from Clara Bodner.

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UEF CECE case study report

The University of Eastern Finland (UEF) hosts the UEF Research Center for Sustainable Circular Economy (UEF CECE), continuing the legacy of the CICAT2025 project. Led by Professor Hanna Lehtimäki, UEF CECE promotes sustainability through interdisciplinary research and collaboration.

The University of Eastern Finland (UEF) is home to the UEF Research Center for Sustainable Circular Economy (UEF CECE). Established to continue the legacy of the major circular economy project "Circular Economy Catalysts: From Innovation to Business Ecosystems" (CICAT2025), which operated from 2019 – 2023, UEF CECE aims to catalyze positive change towards a sustainable future.

Directed by Hanna Lehtimäki, the center brings together researchers from various disciplines in and outside of UEF aimed at researching, catalyzing, and promoting a change towards a more sustainable future. Officially launched in March 2023, UEF CECE began with an interdisciplinary, collaborative, and appreciative strategy workshop to set a clear vision and guidance on the road ahead.

Research focus

UEF CECE is part of the UEF Business School and linked to the RESOURCE Research Community, which stands for "Sustainable Resource Society: Circular Economy, Energy and Raw Materials." The center aligns its core research with the UEF and RESOURCE RC's strategic vision to accelerate societal innovations for sustainability transitions in the nexus of energy, critical raw materials, and the circular economy. Thus, research focuses on three key areas:

1) Sustainable circular economy through micro- and macro-level analysis, including catalysts for circular economy,

2) Business ecosystems of critical materials and metals to support the greenification and electrification of traffic and logistics, and to explore circular ventures and their role in novel solutions,

3) Sustainable business and new business models, such as the platform economy, customer engagement, collaboration, and data-driven AI analysis to create new business opportunities.



Research projects

UEF CECE has several ongoing research projects:

GOVERMAT – "Multi-level governance of critical materials for future electric mobility" focuses on the innovation and circular ecosystems perspective of EV battery materials and magnets.

CESMI – "Circular Economy Solutions for Microplastics: Indo-Finnish Scientific Collaboration for Innovation" addresses microplastics.

MILESTONE – "Making Circular Economy Socially Inclusive through Entrepreneurship" emphasizes sustainable social inclusion, innovation, and entrepreneurship.

LEADSUS – "Leading Regenerative Circular Economy" develops leadership practices for transitioning to a sustainable and circular economy.

JTF – "Circular economy skill development for working life", supported by the EU Just Transition Fund (JTF) and partnered with local SMEs and agencies to increase local circular economy knowledge and expertise in the Northern Savo and Northern Karelia areas of Finland, offering micro-credentials in sustainability and the circular economy.

Achievements

In its first year, UEF CECE has focused on increasing visibility, collaboration, and knowledge dissemination. A website was launched, and LinkedIn is actively used for sharing information. The center hosts weekly Morning Coffee sessions featuring national and international speakers from universities, research institutes, and businesses discussing sustainability and the circular economy, with growing attendance.

Despite initial funding challenges, UEF CECE has secured research funding through initiatives such as the "Doctoral School Pilot," adding two positions, and the LEADSUS and JTF projects, with several applications pending. Additionally, a new International Master's degree program in Sustainability Leadership to the UEF curriculum, will commence in autumn 2024, with an inaugural class of 15 international students.

UEF CECE has participated in international joint workshops and conferences (e.g. UK, India, Finland, and USA), and organized its own international conferences. Research collaborations span Finland and global networks, expanding through new researchers and inviting members to international networks such as the EU COST Action (European Cooperation in Science and Technology) and the Nordic Circular Hotspot.

Academic exchanges and visits include partnerships with institutions such as U. Exeter, WCEF, and UNEP. Hanna Lehtimäki serves as Finland's COST Action Leader.

Two edited books with international contributors with the support of UEF CECE researchers have been published:

- "Routledge Handbook on Catalyzing Sustainable Circular Economy" with over 100 multidisciplinary contributors, essential for circular economy enthusiasts. (Open Access)
- "Art and Sustainability Transitions in Business and Society" features 11 chapters from 25 international authors, providing inspirational cases and insights on the role of the arts in sustainability agencies.

In essence, UEF CECE researchers have co-authored a variety of journal publications and book chapters with international and industry colleagues and have been invited to speak at events with internal and external partners from business, society, and education.

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Bionote

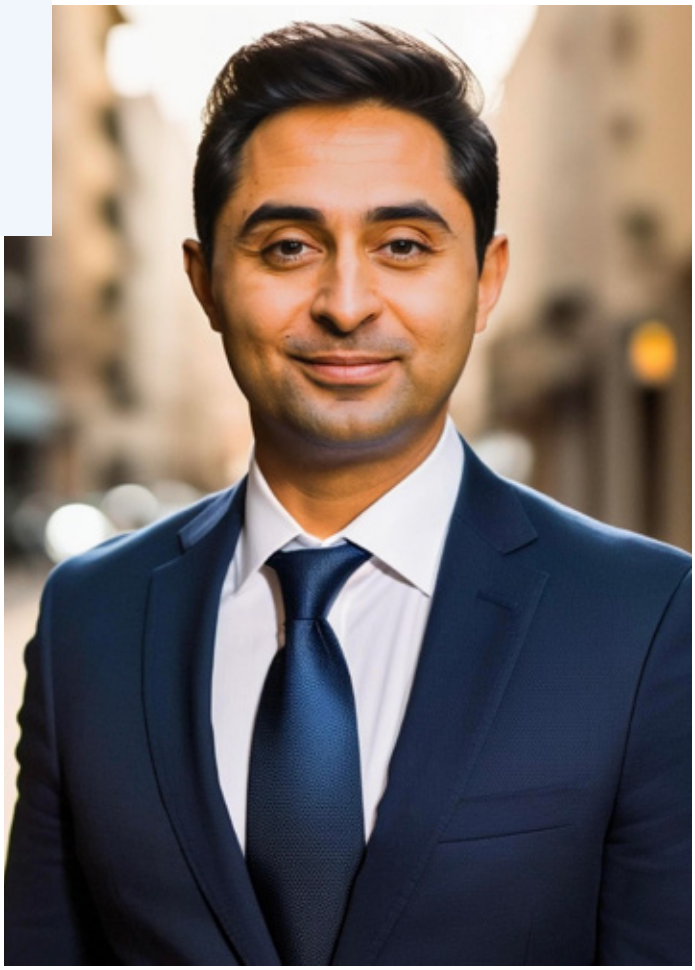
Nuppu Mielonen is a doctoral researcher in the Business School at the University of Eastern Finland, Kuopio, Finland. She is a Project Manager at the UEF Research Center for Sustainable Circular Economy and a University Researcher in "Multi-level governance of critical materials for future electric mobility" (GOVERMAT), a multidisciplinary research project funded by the Academy of Finland. Her research focuses on the circular economy and the ecosystems of green transition metals. Specifically, the emergence, organizing and value creation of circular economy ecosystems are of interest.

Kristina Leppälä is a researcher and lecturer at the University of Eastern Finland Business School's Research Center for Sustainable Circular Economy (UEF CECE). Her research examines organizational and relational social practices that take place within and across organizational boundaries. Currently, she is engaged in two research programs examining sustainability leadership and the just transition for peat entrepreneurs. Due to her expertise in biomedical technology, she is a co-lead for the Special Interest Group 'Health and Innovation' within the International Society of Professional Innovation Management (ISPIM).

Hanna Lehtimäki is a Professor of Innovation Management and Director of the Research Center for Sustainable Circular Economy at the University of Eastern Finland. Her research focuses on circular economy through innovation management, strategic management, organization theory, leadership, and entrepreneurship. As Vice Director of UEF's Sustainable Resource Society, she promotes multidisciplinary social sciences research for sustainability. Her work has been published internationally, and she has recently co-edited books on art and sustainability and catalyzing sustainable circular economy.

Special Issue
Integrating sustainability into research and innovation

Innovative and sustainable research practices: a panelist's perspective



Thrilled to share my experience as a panelist at the Marie Skłodowska-Curie Actions Satellite Event in Katowice, Poland! Discussing sustainable research practices, I highlighted case studies on air quality analysis and AI-powered cellular studies, demonstrating how scientific innovation can align with environmental principles to foster a sustainable future in research.

Bionote

Polat Goktas is a Senior AI Researcher at University College Dublin, focusing on AI models for healthcare, life sciences, and sustainability. He actively contributes to the MCAA, promoting a sustainable research culture as an Editorial Board Member and Secretary of MCAA Ireland Chapter. Additionally, he is involved in the MCAA Sustainability General Interest Group and IEEE Young Professionals Climate and Sustainability Task Force, integrating sustainability into scientific inquiry.

Greening research practices: policy and on-the-ground initiatives

The Marie Skłodowska-Curie Actions (MSCA) Satellite event is a fantastic platform that fosters exchanges between researchers, MSCA alumni, and other professionals. It precedes the EuroScience Open Forum (ESOF)'s biannual conference and exhibition, enriching professional and intellectual dialogues.

Participating as a panelist at the MSCA Satellite Event, organized by the European Commission on June 10-11, 2024, in Katowice, Poland, was an immense honor. I had the privilege of speaking alongside esteemed colleagues Gokce Kor Bicakci from Marmara University and Anastasia Moschovi from Monolithos Catalysts & Recycling Ltd. The session, "**Greening Research Practices: Policy and On-the-Ground Initiatives**," was moderated by Robin Gadbled, Policy Officer, European Commission.

Presenting at the MSCA Satellite Event on "Greening Research Practices: Policy and On-the-Ground Initiatives" held on June 10-11, 2024, in Katowice.

Session highlights

The session began with an introduction by Robin Gadbled, who set the policy scene on sustainability in MSCA, especially under the MSCA Green Charter. His insights provided a comprehensive overview of the policies driving sustainability initiatives within the MSCA framework.

Anastasia Moschovi from Monolithos Catalysts & Recycling Ltd., Greece, highlighted practical applications of sustainability in the field of recycling and catalyst development. Her work demonstrated the feasibility and benefits of incorporating green practices into industrial processes.

Gokce Kor Bicakci from Marmara University, Turkey, emphasized the importance of integrating sustainable practices into research methodologies. Her presentation showcased innovative approaches to reducing environmental impact in academic research.

Innovative and sustainable research practices: real-world case studies

During my talk, titled "I**nnovative and Sustainable Research Practices: Case Studies in Data-Driven Air Quality Analysis and AI-Powered Cellular Studies**," I presented two significant projects that I developed as part of my MSCA Career-FIT PLUS fellowship.

Air quality study in Ho Chi Minh City, Vietnam

This project utilizes an explainable data-driven approach to understand the impact of various air pollutants. By prioritizing digital tools and methodologies, we minimize physical resource use (Goktas et al., 2024). Employing high-performance computing facilities further reduces the need for physical infrastructure, decreasing the direct & indirect carbon footprint.

DeepStain: revolutionizing cellular analysis with AI

DeepStain integrates AI with bright-field imaging, eliminating the need for chemical staining in cellular analysis (Goktas & Carbajo, 2023; 2024). This significantly reduces hazardous waste and enhances the efficiency of stem cell production, reducing both energy consumption and resource waste. AI-powered non-invasive imaging techniques reduce the ecological footprint by eliminating the need for chemical dyes.

These case studies underline the potential of integrating innovative technologies with sustainable practices, providing tangible examples of how scientific research can advance without compromising environmental integrity.

Workshop and collaborative efforts

After the presentations, we engaged in a workshop divided into four groups, each tackling different aspects of greening research practices. I led Group 2, which focused on the knowledge and tools needed to evaluate our environmental footprint. We discussed tools like life cycle assessment indicators and transparent policy information. These discussions highlighted the necessity for accessible data and practical tools to enhance sustainability in research.

Engaging discussions and future directions

The interactive workshop provided participants with the opportunity to explore specific areas of interest. Group discussions focused on identifying key players in promoting sustainability, evaluating environmental footprints, securing financial resources for sustainable projects, and navigating existing laws and regulations.

As leader of Group 2, I facilitated a discussion on the tools needed to evaluate environmental footprints. We explored various environmental measurement tools, life cycle assessment indicators from the United Nations and European Commission, and the importance of transparency in policy and regulation. The group emphasized the need for accessible decision-making data and user-friendly tools to accurately assess carbon footprints.

Concluding thoughts

The MSCA Satellite Event was an enriching experience that underscored the importance of sustainable practices in research. The exchange of ideas and collaborative spirit among participants highlighted the collective commitment to advancing sustainability in academia and beyond.

By integrating innovative and sustainable practices, researchers can significantly reduce their environmental impact while continuing to push the boundaries of scientific discovery. The discussions and insights gained from this event will undoubtedly contribute to ongoing efforts to promote environmental stewardship in research practices.

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Special Issue
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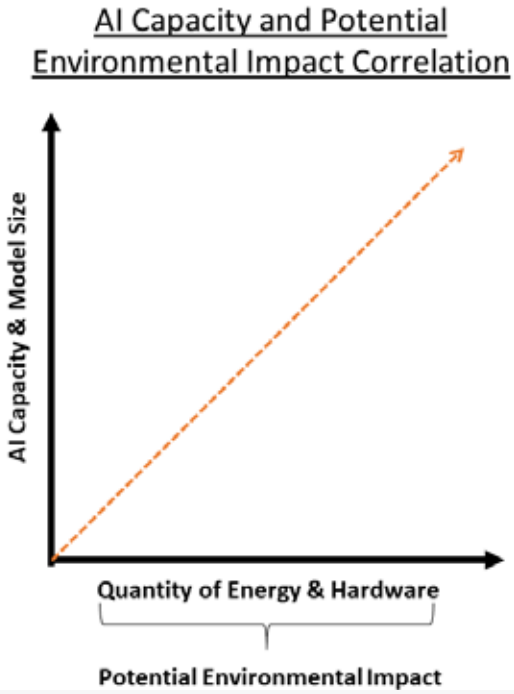
The hidden costs of AI in science: environmental impacts and solutions

The rise of Artificial Intelligence (AI) is revolutionizing scientific research, offering new capabilities in data analysis and predictive modeling. However, this technological marvel comes with significant environmental costs due to its heavy reliance on energy and specialized hardware. As AI becomes integral to research, balancing its benefits with sustainability practices is crucial to minimizing its ecological footprint.

Bionote

Quentin Loisel is a current MSCA PhD researcher at Glasgow Caledonian University, UK, and the MCAA UK Chapter Chair. He is part of the Health CASCADE project, which aims to make co-creation trustworthy. He is developing technologies for this complex collective intelligence, democratic, and evidence-based process. His work bridges technology and the fundamental human dimension within the values of the co-creation process. With the recent rise of generative AI, he actively explores its potential for cognition, collaboration, and science. With technology's growing influence in our society, Quentin aims to enable collaboration between society's actors to make the most of future technology.

Artificial Intelligence (AI) is transforming the landscape of scientific research, offering unprecedented capabilities in data analysis, predictive modeling, augmentation, and automation. Over the past decade, it has become integral to some scientific methodologies, leading to groundbreaking discoveries. For instance, AI has enabled researchers to predict protein structures with remarkable precision (Schauperl & Denny, 2022) and to model complex climate scenarios that were previously infeasible (Jones et al.,



Figures representing the "AI Life Cycle Development and AI Capacity and Potential Environmental Impact Correlation." Designed by Quentin Loisel.

2023). Generative AI technologies' opening and fast development have passed a new milestone. Characterized by their accessibility and versatility, specialized AI models can relevantly interact with the language and support all the steps of the research workflow across any field. Their adoption could increase productivity while improving the quality and accessibility of science. These qualities push to an ever-increasing use and potential general adoption. However, a significant environmental toll lies beneath these technological marvels.

The environmental costs of AI

The AI life cycle implies five stages: 1) planning and data collection, 2) model development, 3) mode validation, 4) deployment, and finally, 5) monitoring and maintenance. This cycle requires two primary resources: hardware and energy. Indeed, AI technologies rely heavily on specialized hardware, such as graphics processing units (GPUs) and data centers, which require rare and precious materials. The extraction of these materials often involves environmentally damaging mining practices.

Moreover, training AI models can be an energy-intensive process; one study estimated that training some AI models can generate as much carbon dioxide as five cars over their lifetimes (Luo et al., 2023). This high energy consumption contributes to carbon emissions and strains our energy resources.

Compared to other technological advancements, AI's environmental impact is particularly stark. For instance, traditional computing systems, while energy-consuming, do not match the intensity of AI's resource demands. However, not all AI models have the same environmental impact. A small model could be trained on your computer in a few hours, using your existing hardware and consuming only a few watts. However, until now, the model size has been a central factor of AI progression capacity. This can be seen in the name of the promising "Large Language Models" (e.g., ChatGPT), where "Large" marks the distinction from the previous smaller "Language Models." The larger a model is, the more data, computing power, and energy you need. In short, AI capacity,

model size, necessary infrastructure, energy, and environmental impact are positively correlated. Generative AI models confirm this tendency, with bigger models showing more versatile capacity. Couple this correlation with a potential generalization of AI in science, and you will understand how all science could exponentially carbonate.

Toward sustainable AI in science

The AI industry works to develop and optimize energy needs and hardware efficiency to save costs during the development cycle. In this situation, we can speak about research for AI sustainability. However, waiting for technological advances to solve environmental impact is not a good strategy. Instead, it is about engaging the research ecosystem in sustainable practices. As the scientific community embraces AI, research actors must consider a new range of questions, from ethical usages to deploying and securing infrastructures. This is a timely opportunity to imply sustainability in these questions and ensure the evolution is made accordingly. Another good point is that we do not start from scratch; we already have the material to consider sustainable technology deployment (Mohamed Hashim et al., 2022) and research practices (Ligozat et al., 2020).

However, what does not consider these resources is the potential general adoption of

generative AI models. For research institutions, this means making AI technologies available to their communities and making decisions toward efficient data management, green data centers, recycling electronic devices, energy-saving hardware, virtualization, cloud computing, sustainable deployment practices, and continuous system optimization. These are crucial for reducing the environmental impact of AI technologies. Specifically, using open-source models and developing narrow tools based on smaller but specialized models would avoid training unnecessary additional models. Hardware lifecycle management and organizational commitment to sustainability policies would further enhance this effort.

Best practices for AI needed

Indeed, like most other digital technologies, the environmental impact of using these AI tools is hidden, and their accessibility calls users for trivial usage. For example, the current working guidelines on using generative AI for research (European Commission, 2024) don't include an environmental dimension. A potential reason is that these guidelines still struggle to establish the appropriate use of these technologies. However, this would be necessary to evaluate the ecological impact of generative AI in science. This is a new field for metascience, and answering this question would allow the development of best practices for optimal usage in science and its environmental impact.

This question becomes urgent since the adoption and the environmental impact of research with it are growing. As we continue to harness AI's power, we must ensure its ecological footprint does not overshadow its scientific benefits as it evolves.

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Special Issue
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Promoting geothermal energy applications in Europe's existing buildings

Bionote

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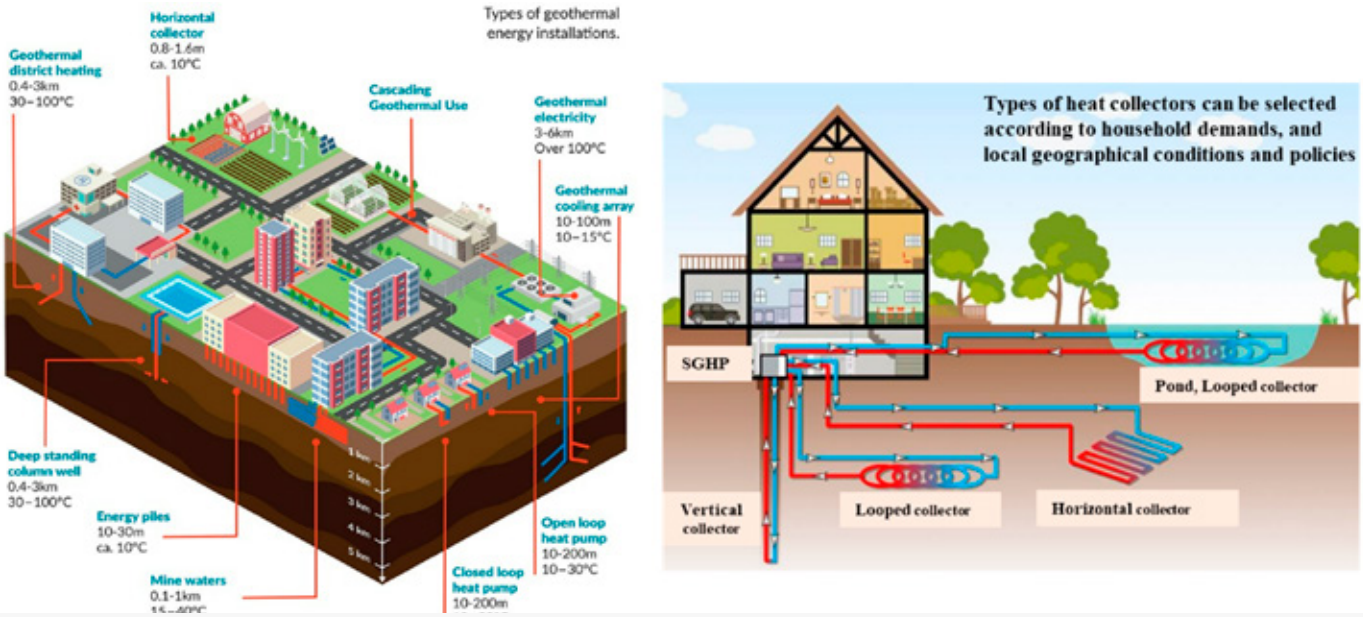
Fan Mo is a postdoctoral researcher at the University of Cambridge, UK and the University of Nottingham, UK, as well as a guest lecturer at the Royal Institute of Technology in Sweden and Tongji University. Fan Mo is Vice Chair of the MCAA China Chapter. Previously, he served as the Deputy Minister of the Academic Department of the Oxford Chinese Students & Scholars Association.

Integrating shallow geothermal energy into Europe's existing buildings offers a sustainable solution for heating and cooling, significantly contributing to environmental sustainability and carbon neutrality. This article explores the financial, technical, and regulatory barriers to adopting geothermal technology and highlights innovative solutions to overcome these challenges in Europe's housing sector.

Geothermal energy, as one of the most recommended renewable energy technologies, has been widely explored for building heating/cooling and carbon-neutrality transitions (European Union, 2020). It offers a consistent and sustainable solution for heating and cooling buildings, distinct from intermittent renewable sources like solar and wind energy. Geothermal energy is not only available round the clock but can also be harnessed anywhere with adequate subsurface conditions, making it a versatile solution for the EU's diverse climatic regions. Geothermal energy for heating and cooling is categorized by the depth of the heat source:



Common utilization of geothermal energy for building heating/cooling. Author's modification based on web images: https://www.gsi.ie/en-ie/geoscience-topics/energy/Pages/Geothermal-Energy.aspx and https://www.mechanicalsolutions.gr/en/products/geothermia-107

- Shallow Geothermal Heat Pumps (SGHPs): These systems operate at depths less than 5400 meters. They are simple, cost-effective, and among the most efficient energy solutions in the EU (European Commission, 2021). They use the ground's stable temperature for heating in winter and cooling in summer.
- Medium-Deep Geothermal Systems: Functioning at depths between 400 and 5000 meters, these systems are suitable for district heating and cooling. They provide substantial energy for larger buildings or groups of buildings.

Integrating geothermal energy into existing buildings can significantly contribute to the EU's carbon-neutrality targets. Large-scale application is essential for reducing CO2 emissions across Europe (Ramos-Escudero et al., 2021). The latest European Geothermal Market Report (EGMR) 2022 shows a decade of growth for geothermal utilization (EGEC, 2023). However, practical applications face small-scale and low utilization rates, especially for existing buildings.

Barriers to geothermal energy adoption

Financial barriers

1. High Upfront Costs: Installation costs, driven by expenses for drilling and setting up the underground loop system, are significant. Installing a ground source heat pump system can range from €8,500 to €20,000 (Settle Down Support, NA), while conventional gas boiler systems cost €1,000 to €3,000.

2. Economic Viability of Retrofits:
Older buildings often require extensive modifications to accommodate geothermal systems, increasing overall project costs. Furthermore, the complexity involved in integrating geothermal systems into existing infrastructure can escalate the cost and technical challenges, thereby reducing the feasibility of adopting geothermal energy in existing buildings.

Technical barriers

1. Installation Complexity: Installation is technically complex and requires significant expertise and resources. This complexity is

heightened in urban areas and older buildings with limited space.

2. Integration with Existing Systems: Many buildings have outdated heating systems not readily compatible with modern geothermal technologies, requiring substantial modifications and upgrades.

Regulatory barriers

1. Complex Processes for obtaining permissions: Installation involves drilling, posing risks to underground infrastructure. Obtaining permits requires navigating complex local, regional, and national regulations.

2. Inconsistent Policy Support: Policy support varies across EU member states, creating an uneven playing field and hindering investments.

Social barriers

1. Lack of Public Awareness and Engagement: Many homeowners and building managers are unfamiliar with geothermal technology and its benefits, leading to hesitation and resistance.

2. Cultural and Behavioral Resistance: People are accustomed to traditional heating systems and may be reluctant to switch to new technologies.

Future solutions, directions, and recommendations

Financial solutions and incentives

1. Subsidies and Grants: Financial support in the form of subsidies and grants from governments can lower the initial investment for geothermal systems.

2. Innovative Financing Models: Models like Energy Performance Contracting (EPC) and Property Assessed Clean Energy (PACE) financing can promote adoption by reducing upfront costs.

Technological innovations

1. Advanced Drilling Techniques: Investing in advanced drilling technologies can reduce

Image by Midjourney, prompt by Fabrizio Martina.

installation costs and complexities, facilitating adoption in densely populated areas.

2. Integration with Building Automation Systems (BAS): BAS can optimize energy usage and enhance efficiency by managing geothermal systems in real time.

Simplified regulatory frameworks

1. Streamlining Permitting Processes: Simplifying regulatory frameworks can reduce administrative burdens and accelerate geothermal system deployment.

2. Unified Policy Support: Establishing a unified policy framework across the EU can encourage investment and facilitate the integration of renewable energy into building renovations.

Social engagement and public awareness

1. Public Education Campaigns: Education campaigns can raise awareness and understanding of geothermal systems and highlight their benefits.

2. Community Involvement and Participation: Engaging communities in planning and implementing projects can build trust and support, serving as best-practice examples.

Takeaways

Shallow geothermal energy offers a compelling solution for reducing the carbon footprint of Europe's existing buildings. Addressing financial, technical, regulatory, and social barriers requires comprehensive efforts. Implementing financial incentives, investing in technical advancements, simplifying regulatory frameworks, and increasing public awareness and engagement can make geothermal energy integration practical and sustainable. These efforts will contribute to achieving carbon neutrality while also laying the foundation for a greener and more resilient future for the European Union.

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Special Issue
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Bottom-up approach for integrating sustainability in academia

Explore how embedding sustainability at the foundational level of academia prepares students for global challenges while making them adept at advocating for change.

Sustainability in academia involves a comprehensive integration of environmental stewardship, social equity, and economic viability into educational policies, curricula, and institutional operations. This approach is crucial for nurturing an academic culture that supports the holistic development of students as global citizens who are environmentally conscious and socially responsible. Specifically, it encompasses efforts to reduce environmental impacts, promote social justice, and ensure economic efficiency within and beyond the educational setting.

A key component of these efforts is aligning with the United Nations Sustainable Development Goals (SDGs), particularly SDG 4, which aims to ensure inclusive, equitable quality education and promote lifelong learning

Bionote

Srishti Goyal is currently pursuing a PhD in Economics at Universitat Rovira i Virgili, Spain, where she focuses on analyzing the distributional impacts of climate change from a general equilibrium perspective. In her previous roles at Young Lives India and UNESCO-MGIEP, she utilized her analytical skills to enhance educational and social initiatives. These experiences have deepened her commitment to evidence-based research that directly informs policy-making. She is dedicated to ensuring that her work positively influences the policy landscape and contributes effectively toward achieving sustainable development goals. Her research connects economic policies with environmental and social outcomes, aiming to create well-being-focused and sustainable policy frameworks.

Promoting sustainability through education. Image designed by Freepik.

opportunities. Specifically, SDG 4.7 focuses on equipping all learners with the knowledge and skills needed to promote sustainable development. Integrating sustainability in academics directly supports SDG 4.7 by broadening students' understanding of sustainability across disciplines and preparing them to address complex global challenges. This approach enhances education quality by embedding critical thinking, problem-solving, and global awareness, which are essential for societal progress.

Despite the critical role of sustainability in shaping the future, academia struggles to fully embed these principles across its core activities, including education, research, operations, and community outreach (Ramos et al., 2015). To address this challenge, this article champions a foundational, bottom-up approach to embed sustainability within the academic curricula. This strategic shift is essential not only for educating individuals and preparing them to address contemporary challenges holistically but also for transforming learning environments to produce future professionals capable of contributing effectively to global sustainability efforts, including the broader goals of education for all.

Challenges in sustainability education

There is often a myopic focus on the environmental dimension amongst the students and teachers (Birdsall, 2014; Silveira et al., 2021). This limited perspective neglects the crucial socio-economic aspects that are essential for a comprehensive understanding of sustainability. Sustainability, to be fully appreciated and effectively implemented, must integrate all these dimensions. Education should not only inform about environmental issues but also address the interconnectedness of societal and economic impacts.

Historical efforts and ongoing challenges

Historical efforts following the Talloires Declaration in 1990 began recognizing the role of educational institutions in promoting environmental sustainability (ULSF, 1990). Forums like the one at Macquarie University emphasized integrating sustainability into curricula (Reid & Petocz, 2006). However, initiatives such as the University of Pennsylvania's Integrating Sustainability Across the Curriculum (ISAC) program have largely focused on specialized sustainability courses rather than integrating them across all disciplines (University of Pennsylvania Environmental Innovations Initiative, 2023). Studies indicate that while some Australian universities have incorporated sustainability in engineering curricula, the integration remains limited (Arefin et al., 2021). Similarly, Spanish universities have introduced sustainability through innovative methods in specific areas (Lafuente-Lechuga et al., 2024). This narrow focus highlights the challenge of achieving seamless integration of sustainability education across disciplines (Usha Iyer-Raniga et al., 2013).

Discrepancies between intent and implementation

The disconnect between initial commitments to sustainability, as outlined in the SDGs, and their comprehensive integration into educational curricula is highlighted by various studies. Observations show that even innovative teaching methods like flipped classrooms for courses such as "Economic Planning" and "Caribbean Social Problems" at the University of the West Indies are exceptions rather than the norm (Griffith & Moore, 2020). Further compounding this issue, the "Rethinking Schooling for the 21st Century" report exposes significant deficiencies in integrating sustainability into school curricula across Asia (Mochizuki & Vickers, 2019). Additionally, a report exposes significant deficiencies in integrating sustainability into school curricula across Asia. Secondary school economics curricula and textbooks were analyzed, revealing that textbooks often omit fundamental sustainability concepts like externality, green growth, limits to growth and planetary boundaries. Moreover, it was found that Indian textbooks inadvertently perpetuate gender norms. Interestingly, Bhutanese curricula that do incorporate sustainability principles still rely on Indian textbooks, which lack these essential teachings. This discrepancy highlights the gap between curricular intent, inspired by the SDGs, and actual educational delivery, emphasizing the need for textbooks that align closely with the curricula to ensure that the intended sustainability concepts are effectively taught.

Takeaways

Moving forward, it is crucial for the academic community to deeply embed sustainability principles from the ground up. By transforming our approach to education, we ensure that students not only learn about sustainability but are also fully prepared to apply these principles across various professional and personal contexts. This not only equips them

as informed and capable global citizens who can drive sustainable development but also ensures that future professionals are ready to tackle the complex challenges of our times. Comprehensive commitment to these integrative efforts is essential for securing a sustainable future for all, and fostering an environment where innovation and responsiveness to global challenges flourish.

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Special Issue
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Mine water: can it be a potential water resource?

Can mine water be a potential resource for different uses in mining areas?

Coal is a significant source of energy and a pillar for industrial growth in many countries around the globe. On the other hand, mining operations and other related activities are responsible for the deterioration of environmental components, such as water, air and soil. Mining and associated activities, directly/indirectly, can impact both the quality and quantity of water resources in and around the mining areas. For example, acid mine drainage (AMD) can affect the aquatic ecosystem.

The water crisis is a critical issue in the mining environment worldwide. During mining operations, a huge volume of water is released into the surrounding environment as a by-product, carrying suspended and dissolved elements. These suspended and dissolved loads may contain both toxic and hazardous elements, which, upon being exposed to other environmental entities, can deteriorate the ecosystem of living and non-living things. Furthermore, the leachate from the mine

Bionote

Ashwani Kumar Tiwari is an Assistant Professor in the School of Environmental Sciences at Jawaharlal Nehru University, New Delhi. His research focuses on water resources management, GIS, hydro-geochemistry, pollution, and aquifer vulnerability. He received the INC-IAH Young Scientist Award 2022 for his contributions to groundwater investigation and management. He chairs the MCAA Research Funding Working Group and is a member of INYAS. Dr. Tiwari completed his Ph.D. from IIT Dhanbad and was a post-doctoral researcher at Politecnico di Torino, Italy. He has published extensively and reviews for international journals.

Iron-contaminated groundwater in an Indian coal mining area.

Mine water in a quarry of an Indian coalfield.

overburden dump is also responsible for contaminating the mining areas' surface water and groundwater resources. Moreover, mining operations can damage the area's aquifer and reduce the available groundwater supplies. These operations also present social issues, such as putting the population of mining areas under stress due to the water crisis.

Commonly, coal mine water is contaminated with some specific dissolved elements/ parameters (i.e. sulphate, iron, manganese, total dissolved solids, total hardness, aluminum, nickel, and others), (see Picture 1). These contaminants are the most concerning for mining authorities and policymakers. Mining areas have a huge quantity of mine water resources (see Picture 2) which could potentially be used as water supply for society after appropriate treatments.

The mining industries and policymakers can contribute to a suitable environment. The mining sector plays a key role in maintaining energy supplies, the economy, and the livelihood of communities, and it can be integrated into a plan where every product at each step is utilized to minimize waste. Identifying how these metals, ions, and minerals are employed in different industries can open new possibilities for environmental sustainability in some industry segments. As well as being used in industrial sectors, mine water can also be used for domestic and irrigation purposes after the appropriate treatment. It can also help minimize the contamination level of surface and groundwater resources and reduce stress by having more water supply in the area.

Scientific and systematic approaches aimed at benefiting society are necessary for a more sustainable future through better use of mined water.

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Unlocking sustainable success: science driven management consulting

In today's fast-paced and always changing business landscape, sustainability is no longer just a buzzword—it's a necessity. At d-fine, we understand that integrating sustainability into research, innovation and industry practices requires more than just good intentions: It requires a profound understanding of the underlying science and people with a strong analytical background. These skill sets are essential to critically assess complex environmental data frameworks, identify patterns and trends, and make informed decisions.

Transforming industries with science driven sustainability

Our approach combines the strength of scientific expertise with practical management strategies. This fusion enables us to deliver sustainability projects that are not only ambitious but also achievable and measurable. Here's how our consultants scientific background makes the difference:

- **Evidence-based**: Our consultants rely on empirical data to identify and define sustainability KPIs and define effective strategies. This ensures that our recommendations are both measurable and replicable.
- **Critical problem-solving**: With their training in scientific methodologies, our consultants have the skills to execute and optimize sustainability initiatives, ensuring continuous improvement and long-term success.
- **Cross-disciplinary**: Our team's diverse scientific expertise allows us to tackle sustainability from multiple angles, integrating insights from various fields to create holistic and science-based solutions.

Meet our experts

Ari Pankiewicz is a former MSCA scholar and did his PhD in physics. As a head of sustainability services at d-fine, he helps companies across all sectors to implement sustainability practices.

Carla Mereu did her PhD in Financial Mathematics and conducted different projects in decarbonization paths and strategies.

Moritz Kompenhans did his PhD with a MSCA scholarship in Aerospace Engineering. He works with industrial and manufacturing clients in projects, where data-driven approaches help to conduct product lifecycle analysis and emission data transparency across company borders and value chains.

About d-fine

d-fine's project teams are characterized by more than 1500 experts with a strong analytical and technological background. They all combine a high level of expertise with in-depth technological understanding.

We implement sustainability-related projects for different clients - from investment and financing to risk, from modeling and validation aspects to reporting. For example, our decarbonization tool for buildings, which has received an award from the German Business Initiative for Energy Efficiency, helps our customers to sustainably reduce greenhouse gas emissions and conserve resources.

We not only help our customers to reduce emissions, but d-fine has also been certified as a climate-neutral company since 2019. With our "net-zero commitment" as part of the Science Based Target initiative, we are providing our measurable contribution to a climate-friendly future.

Science driven sustainability @ d-fine Image by d-fine.

Accessibility Statement

The MCAA believes in a society based on diversity. A society where diversity is the norm, not a deviation. A society where diversity is a strength, not a weakness. Access barriers are created by a society that does not acknowledge the value of diversity. Diversity and access are foundational elements of the flourishing of the research endeavour.

As a community of researchers, the MCAA is committed to increase the accessibility of its products, services, and events. Under the leadership of the Editorial Team of the Communication Working Group, with the support of other Working Groups and the MCAA Board, the MCAA has been promoting a series of actions aimed at increasing the inclusivity of its community and reducing access barriers.

Since the June 2021 issue, the MCAA Newsletter has a new layout. The new design should make the reading experience more accessible by reducing a number of barriers our readers may face.

The new layout complies with many requirements of major print and digital accessibility standards and guidelines. For example, background and foreground colours were selected and paired so as to fulfil the AAA level requirements for colour contrast devised by the Web Content Accessibility Guidelines (WCAG 2.1). Colour selection and pairing also complies with requirements for colour blindness. The text is not justified in order to keep the spacing between words consistent and regular in the entire text. Line spacing and font size were revised and increased too. Each macro-section is identified by a different colour so as to provide the reader with a map of content organisation. The layout adopts TestMe, a font inspired by the Design for All principles. Last but not least, the PDF file now complies with PDF accessibility requirements and can be used by screen readers.

Editorial information

About

The MCAA Newsletter is the main communication channel for and about the MCAA community. It is a publication venue for science communication and public outreach. Its main aim is the dissemination of information about past and current MSCA projects, as well as activities of MCAA Chapters and Working Groups, events, and members' achievements.

The MCAA Newsletter is a registered publication (ISSN 2663-9483) in the Royal Library of Belgium (KBR). It is published by the Marie Curie Alumni Association, Kunstlaan 24, 1000 Brussels, Belgium.

Instructions for submission

Authors interested in submitting an article should read the Editorial Guidelines and the Editorial Rules, and then submit an article **exclusively** through the form available on the MCAA Newsletter website.

Editorial Board

Managing Board

General requests should be sent to: newsletter@mariecuriealumni.eu

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Acknowledgment

Funded by the European Union