

RD20 International Summer School

4th Edition — 2026

UM6P / LIMSET — Ben Guerir, Morocco

May 17 – 23, 2026

“Driving the Energy Transition: Global Perspectives and African Opportunities”

Theme: Decarbonizing the Fertilizer Value Chain — Pathways from Innovation to Industrial Transformation



Under the patronage of the RD20 initiative, which brings together the leading R&D institutes of the G20 countries in the field of decarbonization of society, this year the University Mohammed VI Polytechnic (UM6P) in Benguerir proudly hosted the 4th edition of the International RD20 Summer School in Morocco — a leading hub for clean energy research and innovation on the African continent. Being the first edition on African soil, it intends to bridge the gap between global innovation and regional reality. By building local capabilities, strengthening research ecosystems and developing skilled human resources across the continent, UM6P can play a role as a strategic regional platform that connects Africa with its international partners.

Focusing on this year's central theme - *Decarbonizing the Fertilizer Value Chain: Pathways from Innovation to Industrial Transformation* – and in cooperation with the Laboratory of Inorganic Materials for Sustainable Energy Technologies (LIMSET) at the university campus, it brought together early-career researchers & senior scientists from 15 countries to join lectures, speeches and podium discussions from world-class keynote

speakers and industry leaders and to elaborate on three realistic hands-on case studies on decarbonization pathways for the fertilizer industry.

In his capacity as Chief of Staff Officer – President’s Office of the hosting University Mohammed VI Polytechnic (UM6P), Mr. Khalid Baddou welcomed the participants at the opening of the event. In their welcome addresses, Dr. Noriko Yoshizawa from the National Institute of Advanced Industrial Science and Technology (AIST) in Japan, Prof. Abdessamad Faik from University Mohammed VI Polytechnic (UM6P) in Morocco and Prof. Abdelilah Slaoui from Centre National de la Recherche Scientifique (CNRS) in France highlighted the importance of global collaboration in the field of research and development for clean energy technologies and sustainable development. It was followed by a high-level panel discussion with distinguished leaders from international industry and academia.



The RD20 Summer School is more than a learning experience - it creates a platform for knowledge exchange and future scientific collaboration, scientific excellence, and research partnerships that will continue in the future to contribute to clean energy transition. The event encouraged direct interaction between almost 100 participants across the whole academic spectrum – from bright young minds in the early stages of their research careers up to renowned energy specialists working at the forefront of today’s global energy challenges. Besides exposure to cutting-edge innovation in clean energy technologies, it also fosters interdisciplinary learning by providing social and economic perspectives and cross-cultural understanding of global implementation issues.



With its world-class laboratory facilities at its iconic campus next to pilot plants and industrial partners in the UM6P Green Energy Park, it offers cross-disciplinary teams to work on integrated problems, spanning from materials science, process engineering, AI/ML, economics and policy work. Furthermore, Morocco offers a uniquely rigorous testbed for clean-energy innovation—grid-scale solar and wind operating in desert and coastal climates, growing green-hydrogen value chains. During field visits RD20 Summer School participants received insights into research currently conducted at the university: carbon management, grid flexibility, hydrogen and ammonia, and circular-water processes for industry.



The dense program dealt with several of the most pressing industrial challenges of our time:

- Transforming ammonia & fertilizer production through green hydrogen;
- Scaling Power-to-X technologies from lab to industry;
- Reducing the carbon footprint of material extraction & supply chains;
- Building the next generation of international clean energy leaders.

In their group work researchers could immerse themselves on high-impact decarbonization challenges, evaluating solutions for low-carbon ammonia, electrified and heat-integrated processes, lifecycle and techno-economic analyses at industrial scale, and supply-chain resilience for critical minerals. Through first-hand experience of an R&D environment where experiments are informed by real operating constraints, participants could reimagine the future of the decarbonized fertilizer value chain – right here, right now.

Global cooperation is based on trust and understanding. The RD20 Summer School curriculum places equal importance on connecting people with diverse cultural and social backgrounds. During the side programs of the event delegates had ample opportunities in a less formal environment to exchange their ideas and immerse themselves into the rich cultural heritage of Morocco and experience its warm sense of hospitality.



Finally, the RD20 Summer School concluded with a closing ceremony celebrating the achievements, dedication, and collaborative spirit that characterized the entire program. Participants presented the results of the case studies, demonstrating the knowledge gained and innovative solutions developed throughout the Summer School. To recognize excellence, the organizing committee held an awards ceremony during which the **three best case study presentations** were honored with medals and trophies, while **the three best posters**, selected during the poster sessions, received trophies for their outstanding scientific quality and presentation. A special recognition trophy was awarded to Dr. Noriko Yoshizawa from AIST in Japan for her remarkable commitment, engagement, and valuable contribution to the success of the event. Certificates of appreciation were presented to the organizing team in recognition of their efforts in planning and delivering the Summer School, while certificates were also distributed to all experts, speakers, and participants for their contributions and active participation. By bringing together participants, experts, speakers, organizers and guests, the 4th RD20 Summer School again succeeded in fostering new connections, shared experiences and establishing new pathways for intensified international collaboration.



Message from the organizers



Mr Abdessamad Faik

Professor at Mohammed VI Polytechnic University, Director of Laboratory of Inorganic Materials for Sustainable Energy Technologies (LIMSET)

Our university covers the whole value chain from research and development to all kind of technologies related to energy, renewable energy, and the emerging field of power to X or the production of green hydrogen and green molecules in general. In the last seven years, we were having very severe weather conditions with less rain in Morocco, which impacts the drinking water installations of the country. And because Morocco has no own fossil fuels, we must rely on the import of our energy from abroad. And this sometimes can be challenging for the economy of the country.

These are the reasons why we must develop renewable energies and drive the energy transition. The initiative of RD20 is very important because it can help us to accelerate a win-win collaboration with the members of RD20. With Morocco being a leader of the energy transition on the continent, it is our aim to show to other African countries that it is possible to move toward the energy transition by adopting the use of renewable energies.

For us, it was an opportunity to show to the RD20 members the facilities that we have at the university, which makes it attractive for scientists and PhD students to come and to work in our laboratories, aiming to show them real case studies of Africa and Morocco, and how we can create a real impact. Our main focus this year is the decarbonization of the fertilizer industry. We are looking for ways to transform this industry with the adoption of new technologies that are more sustainable and help to cut CO₂ emissions.



Here at UM6P we are working on different projects that contribute to the promotion of energy transition and renewable energy systems, and in research and development we are focusing on the development of different materials in the catalyst field, as well as in system integration. The RD20 summer school was a great opportunity to meet experts working in different fields, but focusing on the same goal, which is energy transition and renewable energy integration. I was pleased that the main theme was the decarbonization of the fertilizer

Ms Hanane Ait Ousaleh

Assistant Professor at Mohammed VI Polytechnic University, LIMSET, Morocco

value chain, which is the same topic we are working on at the Mohammed VI Polytechnic University. It was a great pleasure to exchange with different experts, professors and researchers sharing the same goal to achieve net zero carbon emissions. And for me, it was a good opportunity to contribute and share my knowledge in the project that we are working on.

**Mr Abdechafik El Harrak**

Education and research fellow at LIMSET, Mohammed VI Polytechnic University, Morocco

At the Laboratory of Inorganic Material for Sustainable Energy Technologies (LIMSET), we develop materials for different applications. I worked mainly on two fields, first materials for thermal energy storage and in parallel on solid-state hydrogen storage. At LIMSET we are working on materials for batteries, for hydrogen storage and on thermal energy storage. In order to reduce CO₂ emissions, we will be electrifying most of the systems here in Benguerir. The city is also an important production location for fertilizers, which are directly linked to food production, because they are used mainly in agriculture. The exchange between experts and all the other participants help us to find better solutions and also to collaborate in different topics.

Phosphogypsum is a by-product of the phosphate industry, which is produced in huge quantities. In the case study during the workshop of the RD20 summer school, different approaches were presented in the valorization of this by-product. RD20 here at UM6P in Morocco provided a lot of activities that encourage participants to be active and get insights about the different challenges we face for a more sustainable world and for the reduction of all the emissions that affect our life. Using the network that we have at the UM6P hub with different countries in Africa as well as in America and Europe, thereby supporting the RD20 initiative has become one of my missions. What I liked most was the active participation during the case studies, we had lively discussions between the experts and the whole audience. There is not much I can suggest for future events, maybe only to add more activities and excursions to the program.

Message from the lecturers



Mr Tata Sutardi

Director of National Research and Innovation Agency of Indonesia (BRIN)

As director of the Research Center for Energy Conversion Technology in the National Research and Innovation Agency in Indonesia, I would like to challenge our researchers with the world's leading energy conversion technologies. Within my 14 research groups, I always stimulate the researchers to be innovative in their field of study, with the aim to bring ideas into reality through their own research. Our organization should be at the frontline of technological progress that can be implemented in Indonesia, and to qualify us as a preferred partner for collaboration with the industry.

By attending the RD20 summer school, we can see how each country develops new technologies and how they apply the benefits to their people. Through interaction with all members, we can see what kind of technology might be suitable for adoption in my country. The RD20 event in Morocco gave me the opportunity to come for the first time to the African continent. Here I met many people and could experience a new culture. I look forward to the next event where I hope to have the opportunity to experience future technologies in commercial operation. I expect that thanks to this meeting, the collaboration will continue growing and can be of benefit to us.

Message from the young researchers



Ms Mandi Anyangwe

My field of research focuses on integrating renewable energy into agricultural systems, because I come from a part of the world which in some places even doesn't have access to electricity, which is still the reality in sub-Saharan Africa, and in my home country Cameroon. Now I live in the UK, which also faces the challenges of energy security and high energy bills. So being here at the RD20 Summer School, I have been benefiting from the fact that I could meet researchers from all over the world and very experienced experts in the sphere of renewable energy technologies and innovation. This enabled me to receive the most up-to-date information that cannot yet be found in literature, which is very important for me, and I consider the RD20 research

PhD researcher at Keele University,
United Kingdom

initiative a good place to be with. And I can also contribute my expertise within this initiative because there are a lot of advantages to integrate renewable energy in real agricultural systems. Also the issues addressed during the panel discussions have triggered me to think way beyond what I am doing now. Through RD20 we are able to meet other researchers who are working on similar topics, which enables us to cooperate and exchange knowledge.



Ms Arini Nuran Zulkifili

Technical Specialist at National
Institute of Advanced Industrial
Science and Technology (AIST), LCA
database, Japan

I am Malaysian, and I am currently working as a technical specialist in the IDEA lab in AIST in Japan. The IDEA lab is focusing on developing and researching an environmental database for a life cycle inventory. Through collaboration with other countries like in Southeast Asia, we collect all data input which can give us a clear view towards decision-making in environmental related issues. I think the RD20 summer school is a very good initiative because it enables people coming from different backgrounds in the environmental-related field to have discussions on our research not only during the technical program, but also in a less formal manner during lunch or dinner. The panel discussion towards net zero emissions was an eye-opening session, very good insights were given from the UK and Saudi Arabia, how each of the countries tackle the problems. As a recommendation an icebreaking session for the participants at the beginning of the program could be beneficial in the future.



Mr Luis Martin Mejia Mendoza

In our center through basic research we are trying to develop technologies with low Technology Readiness Level and to scale them up even to commercialization. My work is mainly focused on applying machine learning models to do this in material discovery, in the synthesis of novel materials. Here in RD20 I was made aware of the challenges people are facing in terms of adaptability of new technologies, the scaling-up, and implementation. Also how to mitigate risks in the value chain like critical materials, deployment process, and development. The RD20 summer school is very important because it connects people from all parts of the world to share our specific geographical problems that we might face because of different policies, impact of climate

Machine learning scientist,
National Research Council, Clean
Energy and Innovation Center,
Canada

change, different regional or geographical issues, the risk of disruptions in supply chains, and how to mitigate them. The country I was originally born and the country I am working now are on the same continent, so we share similar problems in the mitigation of global warming. Initiatives like RD20 and of the G20 countries are important for the implementation of global decarbonization measures. From a personal perspective I wish that my research could support the RD20 effort through the discovery of new materials to improve energy conversion and energy storage.



Ms Marta Santini

PhD student at Centre for Energy
Policy at the University of
Strathclyde, Scotland

I was expecting from the RD20 summer school to be able to connect with people from other fields and other communities, other countries, in order to get a fresh perspective and to be able to build new connections. It is the main strength of the RD20 initiative in research and development in the sphere of energy to put people together in the same room, to be able to talk, to share experiences. In particular it is helpful for people from Italy, which is my home country, and for the UK, where I live now and work, where we share mainly a Eurocentric perspective. Being in contact with people from Indonesia, US, Japan, it helps building new connections, but also adopting a different point of view. Something that I really liked was being able to build relationships. Here, meeting with experts from fields different from mine and from countries that I never visited and with people with whom I have never been able to talk to. For future summer schools I wish to build a better bridge between technicians and social scientists and economists, because these are two different kind of worlds that rarely share the same room. Helping them to understand each other points of view and needs, it would really make a difference for both worlds.

**Ms Haouas Hayat**

Post-doc researcher at LIMSET,
Mohammed VI Polytechnic
University, Morocco

My laboratory is working on clean energy by promoting, discovering, and enhancing inorganic materials for batteries, hydrogen production, hydrogen storage, or ammonia production, and also for thermal and chemical energy storage, using different tools like AI, atomic simulations, synthesis, and ultimately building a prototype reactor for each application. As a participant and also member of the organization committee of RD20, I gained good insights, because this summer school gathers experts from around the world from different fields, and they can show us solutions for our problems, owing to their expertise of many years.

We feel very honored and pleased that we are hosting the RD20 event at UM6P, the first time in Africa and the first time in Morocco. Through the solutions of the other participants we can see that Africa has a role to play in the development of clean energy. What I appreciated about RD20 in Morocco was to understand that we undertake really meaningful research activities. For future RD20 summer schools I would like to suggest to extend it about one week to 15 days, to enable more collaboration and contact between participants, to allow us also to present our work in more detail and what we have achieved in every field.

4th RD20 Summer School Achievements

The table below presents the synthetic quantitative indicators reflecting the scale and impact of the 4th RD20 International Summer School.

Indicator	Value
Total Participants	90
Expert Speakers and Mentors	29
Number of lectures (plus high-level panel discussions)	16 (4)
Distinct Institutions (including 14 RD20 member institutions)	36
Participants' Countries Represented	15
Continents Represented	4
Speaker-to-Participant Ratio	29.6%
Internal Organizing Team (UM6P)	8 Members

With a speaker-to-participant ratio of nearly 30%, the event achieved a high-touch mentorship environment rarely seen at summer schools of this scale. This density of expertise created unique conditions for knowledge transfer, mentorship, and scientific collaboration across generations of researchers.

Five Strategic Scientific Pillars

01

Renewable Energy & Storage

Advanced focus on Battery Technology and Thermal Energy Storage (TES) for industrial decarbonization, including grid-scale applications and Power-to-X pathways.

02

Green Molecules

Exploration of Green Hydrogen and Ammonia as essential vectors for a carbon-free fertilizer chain, including production pathways and value chain analysis.

03

CCUS — Carbon Capture, Utilization & Storage

Identification of industrial solutions for hard-to-abate emission sectors, with focus on scalable capture technologies applicable to fertilizer and chemical industries.

04

Digital Innovation & AI in Materials Science

AI-driven acceleration of materials discovery and process optimization, including machine learning applications for material extraction and lifecycle analysis.

05

Systems Thinking & Just Energy Transition

Analysis of critical material supply chains, financing mechanisms, and policy frameworks to ensure equitable and sustainable energy transitions globally.

Industrial Case Studies

Researchers and participants worked collaboratively in 9 teams on three structured industrial case studies in a total of 9 scenarios, applying theoretical knowledge to real-world decarbonization challenges:

Case	Title	Focus Area
Case 1	Grid Integration & Power-to-X Pathways	Renewable Energy & Storage
Case 2	Hydrogen & Ammonia in the Value Chain: Calculating the True Climate Cost	Green Molecules
Case 3	Reducing the Carbon Footprint of Material Extraction	AI, CCUS & Systems Thinking

Expert Speakers & Institutional Hubs

The scientific program featured 29 expert speakers, representing a speaker-to-participant ratio of 29.6% — a deliberately curated density designed to maximize mentorship and direct knowledge exchange. Expert speakers originated from the following institutional hubs:

Institution	Country	Expertise Domain
UM6P / LIMSET	Morocco	Host & coordination — energy materials, process engineering

AIST	Japan	PV, grid modeling, energy systems
CNRS	France	Materials science, RD20 coordination
CEA	France	Thermal storage, green hydrogen
NLR	United States	Systems thinking, battery technology
KACARE	Saudi Arabia	Wind energy, industrial scaling
KAPSARC	Saudi Arabia	Policy, energy economics
Univ. of Strathclyde / Birmingham	United Kingdom	Engineering, sustainable energy
JRC (European Commission)	EU	Policy frameworks, CCUS
Fraunhofer ISE	Germany	Solar energy, materials
ENEA	Italy	Energy & environment research

Academic & Professional Profile of Participants

The participant cohort was meticulously curated to foster multi-generational knowledge transfer, balancing emerging researchers with established academic and industrial experts:

- ☐ **PhD & Master's Students — Dominant cohort, forming the next generation of energy leadership**
Primary audience for the school's mentorship and training objectives
- ☐ **Postdoctoral Researchers — Highly represented, forming a critical bridge between training and expertise**
- ☐ **Professors — Strong presence, primarily from France, the United Kingdom, and UM6P**
- ☐ **Scientists — Permanent staff from national laboratories (CNRS, CEA, AIST, NLR)**
- ☐ **Industrial Participants — Strategic integration of JESA Group and KACARE**
- ☐ **Government & Policy Representatives — Saudi Ministry of Energy, KAPSARC**

This multi-tiered structure empowered a sophisticated Science-Industry link, enabling participants to engage directly with both frontier research outputs and real-world industrial constraints.