



**Sustainable  
Development** at  
MONTANUNIVERSITÄT  
LEOBEN  
**REPORT 2022**



ADVANCED MATERIALS SCIENCE AND ENGINEERING APPLIED GEOSCIENCES CIRCULAR ENGINEERING  
 SUSTAINABLE MINERAL AND METAL PROCESSING ENGINEERING ENERGY TECHNOLOGY ENVIRONMENTAL  
 TECHNOLOGY GEOENERGY ENGINEERING INDUSTRIAL DATA SCIENCE INDUSTRIAL LOGISTICS INDU  
 ADMINISTRATION INTERNATIONAL MASTER IN SUSTAINABLE MATERIALS INTERNATIONAL MASTER  
 AND CERAMICS INTERNATIONAL MSC IN ADVANCED MINERAL RESOURCES DEVELOPMENT INT  
 PLORATION GEOPHYSICS INTERNATIONAL STUDY PROGRAM IN RESERVOIR ENGINEERING JOINT  
 IN RESERVOIR ENGINEERING MATERIALS SCIENCE MECHANICAL ENGINEERING METALLURGY  
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WHERE RESEARCH SHAPES THE FUTURE

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# MESSAGE FROM THE CHAIRMAN

**Holger Ott,  
Head of Reservoir Engineering  
& Chairman of the Sustainable  
Development Panel**

The term „sustainability“ has been on everyone’s lips for some years now, even though its first use dates back to 1713.

At that time, Hans Carl von Carlowitz coined the term in the sense of a long-term responsible approach to forestry. Today, teaching and research at the Montanuniversität Leoben are increasingly based on the principles of sustainability and form an integral part of the university’s sustainability strategy.

This approach is as follows: The possibility of living a satisfying life today and in the future depends very much on not only advancing economic and social progress, but also on not breaking the ecological limits of planet Earth. Implementing this sustainability approach will remain one of the most significant global challenges.

The United Nations 2030 Agenda also prioritizes the field of sustainability and defines 17 global goals of sustainable development. These are pursued at the Montanuniversität in many departments.

Montanuniversität has always been committed to sustainable development. Already 30



years ago, a focus was set with the introduction of the study field Industrial Environmental Protection, and numerous research projects, such as in the field of hydrogen metallurgy, were initiated and carried out. Today, the research and study program covers the material and energy flow from extraction to recycling.

With this cycle, Montanuniversität is unique and can make valuable contributions to the efficient and environmentally friendly use of resources. Activities are currently being expanded in research areas such as the sustainable provision and use of hydrogen and the avoidance of CO<sub>2</sub> emissions from industrial processes. In teaching, the new study fields Circular Engineering and Responsible Consumption and Production are being established, which are run within the framework of the European University on Responsible Consumption and Production - EURECA-PRO, with partner universities from all over Europe.

The studies at Montanuniversität are undergoing major changes: not only are they being redesigned in terms of content and elements of sustainability are given more space, but new didactic accents are also set!

# OUR VALUES

At Montanuniversität Leoben, sustainability is our motivation to excel in research and teaching.

The university's new development plan is focused on five core values: Energy Efficiency, Climate Neutrality, Sustainability, Zero Waste and Circular Design.

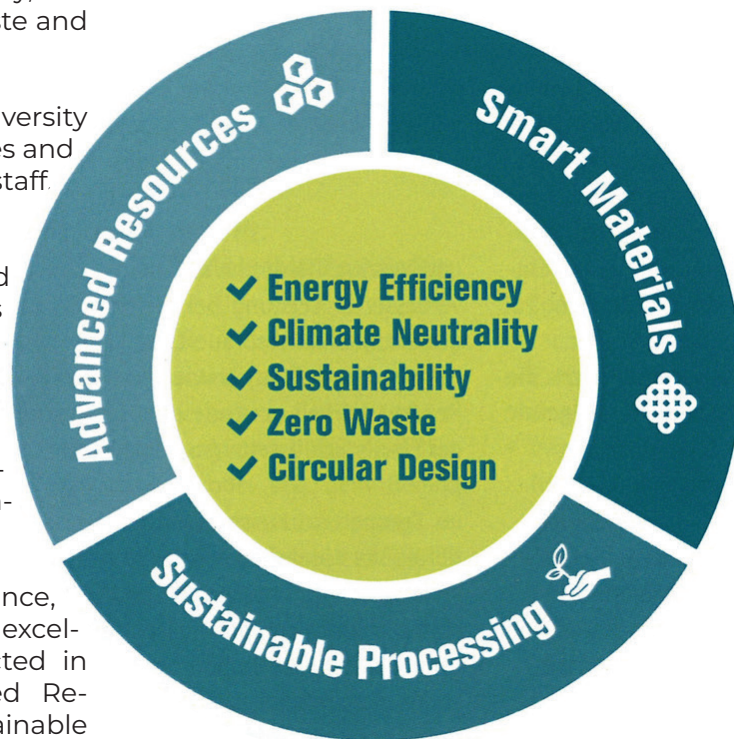
A Sustainable Development Panel of university staff collects and ideates new approaches and pathways to act and live sustainably as staff, researchers, teachers and university.

Our scientists develop technical and scientific methods to solve today's challenges.

In our teaching, we provide our students with environmental challenges and the tools to deal with these issues, and prepare them for their future key role in improving our environment.

Our university stands for excellent science, outstanding education and absolute excellence in research and teaching, reflected in three areas of competence: Advanced Resources, Smart Materials and Sustainable Processing.

Montanuniversität Leoben's sustainable values and ethics at a glance



3 700 students	25% female students	92 sports courses offered	founded in 1840
73 nationalities	8:1 ratio students:teachers	10 charging stations for EVs + 49 for e-Bikes	

# OUR HISTORY IS BASIS FOR THE

Since the foundation of our university, its competences have been continuously deepened and developed in order to actively connect them to current, socially relevant issues. This has led to a broadening of the research spectrum with clear specialisation and positioning at the same time. Development is not standing still now, on the contrary, it is progressing at an ever-increasing speed.

Since the first decades of the 19th century, rapid developments in engineering and transport required a drastic increase in output from the suppliers of mineral resources and building materials, and in particular from the mining and metallurgy production in the alpine region. It was only possible to achieve this rate of growth with more academically trained engineers.

As a consequence, a Chair of Metallurgy was established in Vordernberg in 1814. The Styrian Mining School was officially opened in 1840. Peter Tunner clearly stated his intentions of teaching at academic level and developing his institution into a centre of teaching and exchange for experts in mining and metallurgy from the entire alpine region.

In the revolutionary year of 1848 the university was taken over by the state and moved to the



nearby district town of Leoben in 1849. In 1861 it was promoted to a Mining Academy. 1874 the Mining Academy received a new statute which was to guarantee a sound and stable development, and the status of the teachers was ranked equal to professors at technical universities and was later renamed to Montanuniversität Leoben. With the right to grant doctoral degrees, the institution was at last set equal to the technical universities.

In recent years the great challenges of our time in the areas of resources, climate, energy and the environment required a new orientation of the university. Montanuniversität Leoben is therefore now increasingly researching and teaching for a better tomorrow, so that innovative ideas become sustainable reality.

The university has received distinction and recognition from the professional world, the state, industry and economy in the past for its excellence and outstanding work and dedication in research and teaching. Today, Montanuniversität Leoben aims to contribute to a more sustainable future and to continue its successful path.



# SUSTAINABILITY VISION AT MONTANUNIVERSITÄT LEOBEN

The great social challenges of our time in the areas of resources, climate, energy and the environment demand the adaptation of our behaviour, as well as a reorientation of our university. In recent years, the implementation of sustainability has become increasingly important in all areas of global societal development. With strategies and frameworks such as the UN Sustainable Development Goals and the EU Green Deal it has become clear in which direction research and education will go in the future. Interdisciplinary and excellence-based approaches are needed to address today's societal challenges for a better future.

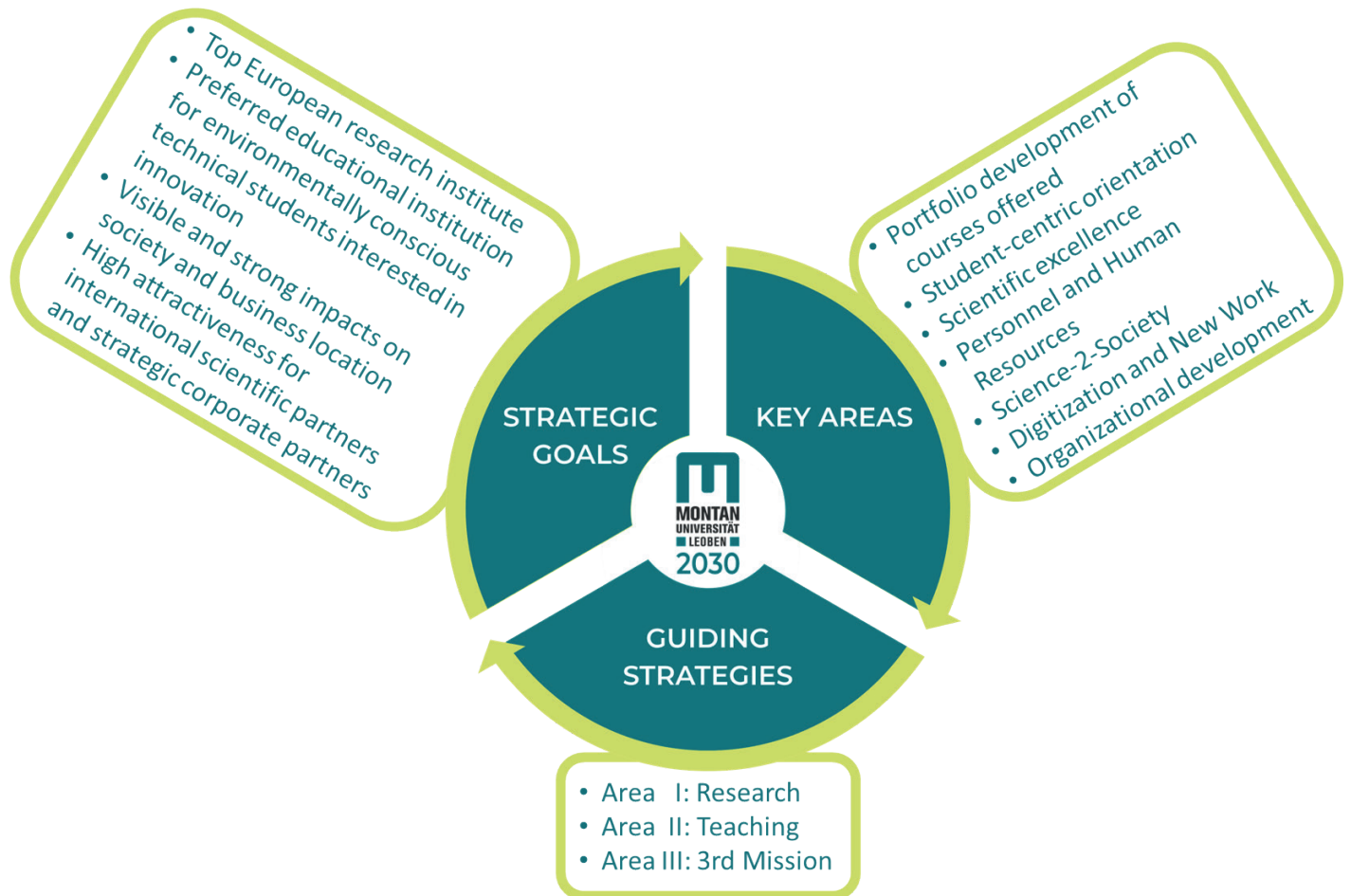
Already in its 2017 development plan, the university defines „safe, clean and efficient energy, climate protection, environment, resource efficiency and raw materials, inclusive, innovative and reflexive societies [and] safe societies“ as relevant topics in connection with European research.

## How do we contribute to sustainability?

In the course of this evolutionary development, the university is self reflectively placing its core competencies along the value-added cycle in relation to societal and ecological developments. Thus, it has meaningfully developed further by adapting a range of topics connected to resource use, energy and sustainable development. Today, the cycle of resources and materials is fully mapped at MUL and its definition is the center of the institutional philosophy, reflected in teaching and research.



# SUSTAINABILITY STRATEGY



The university's development plan for the years 2022-2027 defines the core values of sustainability as the "DNA" of the university. These values are: Energy Efficiency, Climate Neutrality, Sustainability, Zero Waste, Circular Design.

Of particular importance is the fact that they encompass all levels of the university and are reflected in the document as strategic key areas.

In all these areas of activity, our university staff is part of the implementation. Each person needs to be aware of the potential which they can bring to this process for transforming towards sustainability.

The new development plan of the university is an instrument to ensure that we are all on the same page, but it also requires us to acknowledge our personal responsibility and implement the changes outlined. Its essence is to tell staff and students that we are all part of the solution and that each of us can make a difference through our actions.



# CONTRIBUTING TO THE SUSTAINABLE DEVELOPMENT GOALS

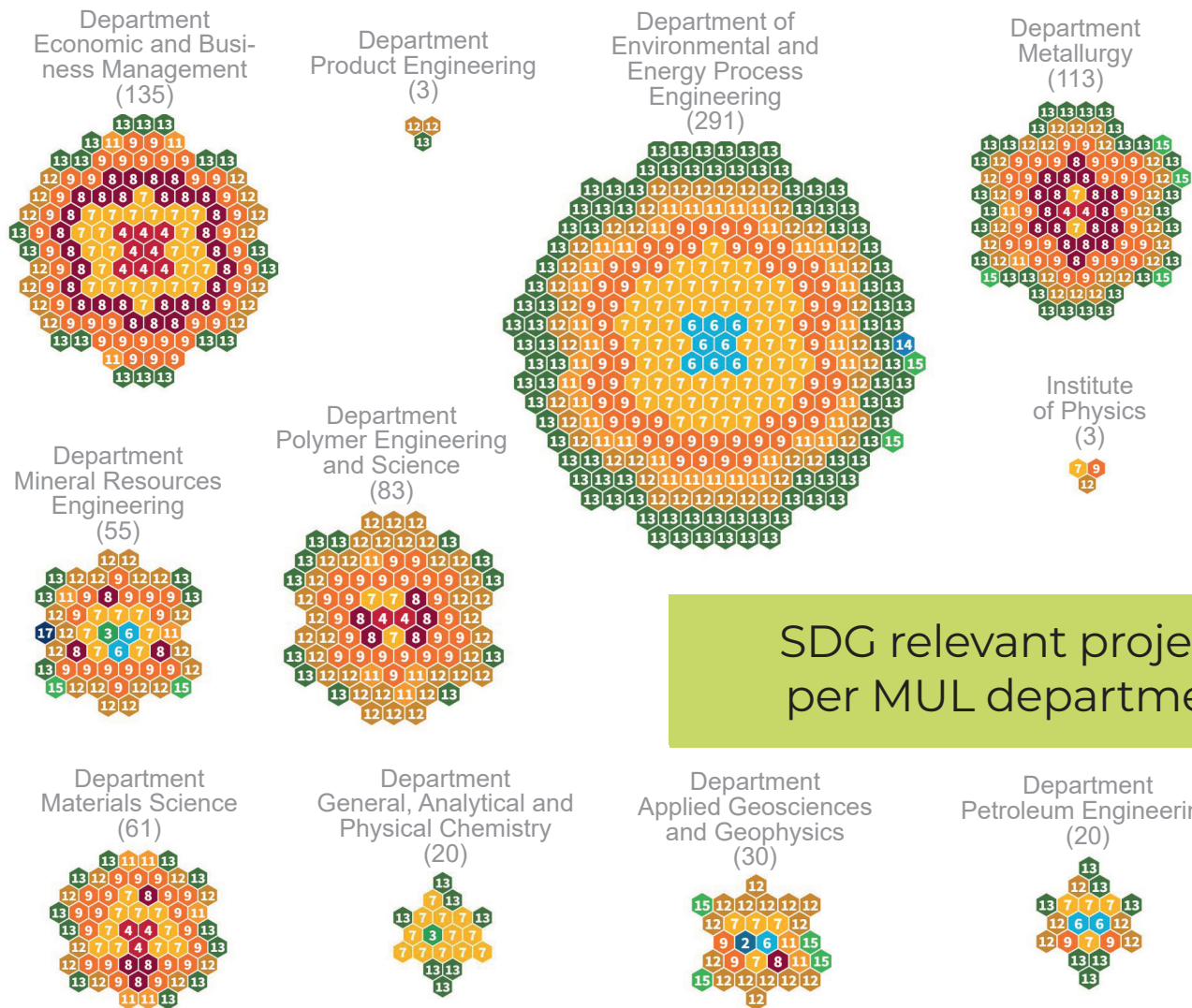
Montanuniversität Leoben is working on a variety of projects to achieve the SDGs. Raw materials and their processing and the related energy consumption contribute considerably to development, economy and modern society. Therefore, the raw material life cycle expertise of Montanuniversität Leoben is important in relation to sustainable development, as a recent survey shows: The illustration shows how the different departments contribute to which SDG.

Since often several SDGs can be assigned to a single project, the visualization is based on

SDG impact points. In this sense, a project can have multiple impact points. In total, the survey came up with 814 SDG impact points.

Montanuniversität Leoben contributes to SDGs in its scientific output, with special focus on:

- » SDG7: Affordable and Clean Energy
- » SDG9: Industry, Innovation and Infrastructure
- » SDG12: Responsible Consumption and Production
- » SDG13: Climate Action



# THE EUROPEAN UNIVERSITY ON RESPONSIBLE CONSUMPTION AND PRODUCTION (EURECA-PRO)

## „CONTRIBUTING TO THE SUSTAINABLE DEVELOPMENT GOALS“

European University alliances are a flagship initiative of the European strategy for universities. They are intended to represent a new form of cooperation between higher education institutions in Europe with the long-term goal of strengthening the excellence the European Higher Education Area.

The European University on Responsible Consumption and Production (EURECA-PRO) unites nine universities including technical and comprehensive, research-led universities: Montanuniversität Leoben (Austria), Technische Universität Bergakademie Freiberg (Germany), Technical University of Crete (Greece), Universidad de León (Spain), Silesian University of Technology (Poland), University of Petroșani (Romania), Mittweida University of Applied Sciences (Germany), Hasselt University (Belgium) and Université de Lorraine (France). All share a long-standing history of cooperation and together cover a wide array of interdisciplinary topics.

The alliance, which is led by Montanuniversität Leoben, enables students and staff to study, teach and research in the field of responsible consumption and production with the long-term goal of a joined virtual and integrated European campus until 2040.

As of today, EURECA-PRO comprises a total of 120.000 students, 18.000 researchers and administrative staff and is organized in 110 departments.

## Sustainable Development Goal 12

The systematic implementation of **United Nations Sustainable Development Goal 12 (Responsible Consumption and Production)** in society is at the core of EURECA-PRO's mission and vision. Its interdisciplinary composition and international expertise are an ideal breeding ground for innovation covering technological, ecological, policy, economic and societal aspects and their transfer into society and industry. EURECA-PRO's ambition is to provide education that teaches the complexity of systems and fosters cooperation across expertise fields and borders that can generate solution-based approaches to reducing CO2 emissions and the targets of the EU Green Deal.

In 2022, EURECA-PRO was presented with the Sustainability Award in the field of "International Cooperation" by the Austrian Ministry of Education, Science and Research as well as the Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology, acknowledging EURECA-PRO's contribution to the ecological, cultural, political aspects of sustainability and efforts to reach SDG 12.

## EURECA-PRO's unique study opportunities

EURECA-PRO combines teaching, research and innovation with flexible study programmes across universities, focusing on sustainability, academic excellence and the strengthening of European values. The alliance offers unique BSc, MSc, Joint Master, and PhD programmes on Responsible Consumption and Production.

MONTANUNIVERSITÄT LEOBEN  
 UNIVERSIDAD DE LEÓN  
 TECHNISCHE UNIVERSITÄT BERGAKADEMIE FREIBERG  
 POLYTECHNEIO KRITIS  
 UNIVERSITATEA DIN PETROȘANI  
 HOCHSCHULE MITTWEIDA  
 POLITECHNIKA ŚLĄSKA  
 UNIVERSITEIT HASSELT  
 UNIVERSITÉ DE LORRAINE



The European University  
 on Responsible Consumption  
 and Production



Co-funded by  
 the European Union

By joining EURECA-PRO, students can profit from a unique degree programme in Europe with access to exceptional, interdisciplinary, and global education and research as well as innovative teaching methods. Our graduates will be equipped to tackle the biggest societal challenges with engrained sustainable, interdisciplinary, intercultural and systemic thinking. Furthermore, students will get the opportunity to form an impressive European network and to take part in a great variety of events such as conferences, colloquia and summer schools.

Graduates are the future experts on the United Nations, Sustainable Development Goal 12 – Responsible Consumption and Production and will be highly sought-after experts in the fields of environmental-, sustainability, project- and strategic management, in environmental product- and process design, in institutions dealing with environmental protection, in the energy sector or in business consulting.

More information: <https://www.eurecapro.eu/>



# FLAGSHIP PROJECTS

## SUMA

The EIT-Labelled Sustainable Materials Master Programme (referred to as SUMA) educates high-level European and international engineering and science students in the field of materials science and engineering. SUMA covers all aspects of the materials life cycle addressing materials development and substitution, materials selection, materials production and transformation, materials degradation, materials recycling across the material families both for structural and functional materials.

4 QUALITY EDUCATION



8 DECENT WORK AND ECONOMIC GROWTH



The Erasmus Mundus Joint Master in Sustainable Mineral and Metal Processing Engineering was created because the demand for mineral raw materials, metals and materials is steadily increasing with the transition to renewable energy, electromobility, digital communication and other clean energy technologies. The PROMISE consortium of four leading universities in the field of mineral processing and mining is supported by 30 industry partners.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



To foster more, but sustainable mineral production in the EU, SUMEX establishes a sustainability framework for the extractive industry in Europe, and suggests one common standard to describe what responsible extraction should mean in the EU. In addition, the SUMEX Sustainability Framework also includes evaluation and decision-making criteria in order to assess a policy's, project's or operation's sustainability.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



## Hydrogen and Carbon

Natural gas is the fossil fuel containing the least impurities with an estimated global resource of around 800 trillion m<sup>3</sup>. Although the composition of natural gas can vary to some extent, its primary component is methane. By pyrolysis, methane can be split into its components carbon and hydrogen, where especially hydrogen is of interest as a future alternative for various industrial applications. Additionally, there is a high potential for large-scale applications of carbon, especially in construction and agriculture.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



RE-SOURCING will establish an international platform to address EU's responsible sourcing agenda that facilitates the development of a globally accepted definition of RS, develops concrete and focused ideas for incentives and supervision, enables information exchange and solution-oriented discourse between experts and stakeholders, and supports the European Innovation Partnership on Raw Materials and the EU industrial policy.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



# EDUCATION FOR SUSTAINABLE DEVELOPMENT

Transitioning to sustainable development calls for a motivated body of students eager to tackle the challenges of our times. To address the needs and the gaps when it comes to implementing education for sustainable development, Montanuniversität Leoben is rethinking its study offer.

The continuous introduction of new fields of study since the early 1990s is a good illustration of this development and commitment for sustainability: Industrial Environmental Protection and Process Engineering (winter semester 1992/92), Industrial Energy Engineering (WS 2009/10), Recycling Technology (WS 2014/15) are unique courses in Austria in that they complement the vision of the Circular Economy at university level with topics such as disposal and collection logistics, processing techniques for secondary raw materials and the recycling of secondary materials.

New studies such as Responsible Consumption and Production, and Circular Engineering (both WS 2022/23) as well as the renaming and redeveloping Industrial Environmental Protection and Process Engineering to Environment and Climate Protection Technology (WS 2022/23) show our continuous commitment to education for sustainable development.

Foto © Mats Hillblom, BOLIDEN, MUL

# EDUCATION AT MONTANUNIVERSITÄT

## New degree course in environmental and climate protection technology.

In the winter semester 2022/23 a new regular degree program Environmental and Climate Protection Technology started and replaced Industrial Environmental Protection and Process Engineering the previous degree program. This reform is intended to improve studyability, reduce drop-out rates, increase the attractiveness and visibility of the studies and facilitate the vertical as well as horizontal change of fields of study through modularization.

The new program consists of redesigned courses according to current issues and include the process technology of renewable raw materials and bio-based energy sources. The new curriculum teaches knowledge about industrial processes and their associated decarbonization technologies. The capture, storage and use of the climate-damaging gas CO<sub>2</sub> as a raw material is taught in an interdisciplinary approach.

## AMRD – International Master of Science in Advanced Mineral Resources Development

AMRD is a Joint Master Degree Program between different mining universities around the globe:

- » Montanuniversität Leoben;
- » TU Bergakademie Freiberg;
- » Dnipro University of Technology;
- » China University of Mining and Technology Beijing;
- » Amirkabir University of Technology Tehran;
- » Instituto Superior Técnico of the Universidade de Lisboa;
- » Universidad Politécnica de Madrid;
- » St. Petersburg Mining University.

The aim of the AMRD Master is the provision of knowledge and competence in developing sustainability and environmentally friendly methods in mining and mine remediation under economic considerations.



## PROMISE – Joint Master on Sustainable Mineral and Metal Processing Engineering

Together with an international consortium, the Montanuniversität Leoben has succeeded in launching a new Erasmus Mundus Joint Master. In autumn 2022, the first students of the new Erasmus Mundus Joint Master Sustainable Mineral and Metal Processing Engineering, PROMISE for short, started their studies, enjoying a first-class education in the field of sustainable raw material processing. The Chair of Processing and Refining at Leoben is pleased to have created a complementary branch of education and is confident that the courses offered will prepare future graduates in the best possible way for the challenges of the future.

## MiReBooks

MiReBooks initiates a series of Virtual & Augmented Reality based (=Mixed Reality) interactive mining handbooks as a new digital standard for higher education across Europe. MiReBooks is a new digital learning experience. By taking traditional paper-based education material and enriching it with virtual and augmented reality-based experiences, teachers can convey and students can experience phenomena that are usually not easily accessible in the classroom reality. Complex issues of mining are no longer a challenging barrier for learning progress and students complete their studies with a more thorough comprehension of their discipline. The new method meets the learning habits of present and future generations of students which will enter the job market as digital natives and highly influence the way mining skills are applied.



# THE NEW SUSTAINABILITY

## University Development

Montanuniversität's new development plan sets a clear key task for the university: the consistent further development of the university profile, especially in the „path already taken towards climate, environment, energy & resources“. There is general agreement on the fact that our scientists all excel in these areas. The strategic goals formulated in the new plan are: Firstly to become a top European research institute in core topics. Secondly, to become the preferred educational institution for environmentally conscious technology students. Thirdly, to be highly attractive for international scientific partners and strategic corporate partners and last but not least to have visible and strong impacts on society and business location.

## Sustainable Development Panel

Complementary to the strategy planning on Montanuniversität Leoben's governance level via its development plan, the Sustainable Development Panel was founded at Montanuniversität Leoben to anchor the idea of sustainability in the areas of research, teaching and in the university organization. The panel is a consortium of dedicated staff members interested in sustainability. It works to centrally organize developments and activities related to sustainability, as well as to stimulate and initiate new initiatives. At its foundation, the vision and goals of the Sustainable Development Panel were set

## TripleN - the sustainability initiative of Montanuniversität Leoben

TripleN was created as a brand by the Sustainable Development Panel and bundles all efforts of the university to promote a sustainable development of the planet. With TripleN, Montanuniversität Leoben shows its commitment to sustainability to the public and has established the following actions:

- » Triple N Talks: In the public lecture series research on current topics is presented.
- » Triple N Magazine: Online and print publication on all issues concerning sustainability at the university
- » Sustainability in research and teaching in various projects at the university
- » Green Office Initiative: An assessment of sustainable work habits



# TRIPLE N

Foto © Max Manavi-Huber



# NETWORKS & PARTNERSHIPS

## Together for more sustainability!

As stated in SDG 17 „Partnerships for the Goals“, partnerships are needed to promote and achieve sustainable development. Therefore, Montanuniversität Leoben is part of a number of networks and initiatives.

Many of these partnerships are managed by the Resources Innovation Center Leoben (RIC). RIC is responsible at international projects in the fields of sustainability, raw materials and education. The vision of the RIC is to support the creation of a sustainable future. Thereby the topics are: Raw materials, climate protection and sustainability at the university. The center works towards making a valuable contribution to the global goal - a sustainable planet earth.

## Alliance of Sustainable Universities

The Alliance of Sustainable Universities in Austria is a national association of 18 Austrian universities which form a unique network with the common goal of sustainable development. In 2018, Montanuniversität Leoben joined and has since been active in various working groups.

## UniNEtZ - Universities and Sustainable Development Goals

In the UniNEtZ project, 18 partner institutions have joined forces to present options on how the UN Sustainable Development Goals can be implemented. In the period 2019-2021, they worked on an options report to support the Austrian government in implementing the SDGs.

The follow-up project UniNEtZ II aims at a strong dialogue with society.

## The climate research network CCCA

The Climate Change Centre Austria was founded in 2011 and since then it is the contact and networking point for climate change research in Austria. It defines itself as a one-stop-shop for research, politics, media and the public in all questions of climate research in Austria and thus promotes a sustainable climate dialogue.

## EIT RawMaterials

The EIT RM strategy is primarily aimed at making the European minerals, metals and materials sector sustainably competitive by promoting and encouraging innovation, and by training innovators along the entire raw materials value chain. EIT RM is characterized by its focus on the following topics: Securing the supply of raw materials, designing material solutions and closing material loops. These three themes are always pursued with the aim of strengthening the regions and developing their potential to support a sustainable and innovative raw materials sector in Europe.

The EIT RawMaterials Regional Center Leoben contributes to the raw materials community in Europe through its vast project portfolio and numerous public events.

# Montanuniversität SUSTAINABLE CAMPUS



## MAP LEGEND

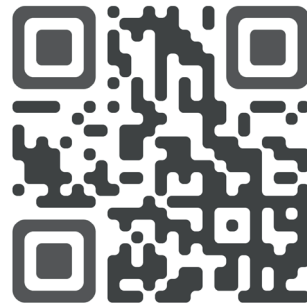
-  Water fountain
-  Battery/phone/printer cartridge recycling
-  Recycling center
-  Recreation park
-  EV charging station
-  E-Bike charging station
-  PV panels



See TripleN - Montanuniversität Leoben's  
sustainability initiative:



Link to Montanuniversität Leoben's website:



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# WHERE RESEARCH SHAPES THE FUTURE

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