

Principles for Responsible Management Education

SHARING INFORMATION ON PROGRESS

Report 2019-20

／CONTENTS

Letter from the Dean	3
Letter from the Sustainability Manager: Reflections on PRME at TUM School of Management	4
Technical University of Munich: The Entrepreneurial University	6
TUM School of Management	11
PRME Office	14
SDGs	15
Principle 1: Purpose	16
Principle 2: Values	19
Principle 3: Method	22
Principle 4: Research	47
Principle 5: Partnership	68
Principle 6: Dialogue	72
Key Feature: Gender Equality	77
Key Feature: COVID-19 Success Stories	78
Achievements & Commitments	83
Appendix: Complete List of Courses Related to Sustainability and Sustainable Development	85

LETTER FROM THE DEAN

Prof. Dr. Gunther Friedl



TUM School of Management is committed to delivering responsible management education based on high-level research. In our unique position as a management school operating within a technical university, we have the opportunity to transcend the borders between disciplines. Together with our colleagues we are able to contribute to solutions to the grand societal challenges, such as climate change, digitization, infrastructure, urbanization and food security. We believe that we can benefit society with our research and the education of individuals who will become tomorrow's leaders.

Thanks to our internationally renowned entrepreneurship group, we are able to gather ideas and put them into practice by creating new companies. Many of the individuals founding these startups combine their knowledge of management and technology with ideas for a more sustainable future.

Since we started reporting to PRME, we have been able to expand our commitment to working on the Sustainable Development Goals. We have launched new research initiatives, such as the SEED Center. We have also created new specializations within our degree programs, such as Renewable Resources or Medicine, to broaden our interdisciplinary approach.

This report presents details of our commitment to society, responsible management education and outreach. We are proud of how much we have achieved so far. In the coming years, we will develop an overarching sustainability strategy and further deepen our commitment to the core values of the UN-PRME initiative.

LETTER FROM THE SUSTAINABILITY MANAGER: REFLECTIONS ON PRME AT TUM SCHOOL OF MANAGEMENT

Prof. Dr. Frank-Martin Belz



In 2003 I was appointed Full Professor at the newly established TUM School of Management. Research and teaching at the intersection of technology and management has been part of the DNA of TUM School of Management since its inception. While I belong to TUM School of Management, my Chair is not at the main campus in Munich: It is located at the green campus in Weihenstephan, TUM School of Life Sciences. As an interdisciplinary researcher in the field of sustainability management, I have always felt at home there. While my colleagues at TUM School of Management talk about markets, management and money, my colleagues at TUM School of Life Sciences focus more on nature, nutrition and neurons.

In the first couple of years after my appointment, I was considered "Mr. Sustainability" by TUM School of Management. Sustainability was to a certain extent compartmentalized. Whenever there was an inquiry relating to re-

sponsibility and sustainability, my colleagues at TUM School of Management would pass it on to me. I was happy to fulfill this role. I remember a situation at one of our early retreats for faculty members. Over a beer, one of my colleagues from the Finance department said to me – half-jokingly, half-seriously – "You know, Frank, you teach the students ethics, responsibility and sustainability, while I teach them to get a job, pursue a career and make money." This two-worlds view was shattered during the financial and economic crises of 2008. Many of my colleagues started realizing that the market system, driven by economic growth, was not sustainable in the long run. In 2013 TUM School of Management signed the PRME. Looking back, membership of the UN-backed initiative was an essential trigger for integrating sustainability into research and teaching at TUM School of Management. Since the release of the first status report, much has happened at the School.

Our respected Dean started emphasizing the importance of sustainability and the Sustainable Development Goals at our regular faculty meetings – something that took even me by surprise. Thanks to his support and that of many other colleagues, sustainability moved to the core of TUM School of Management, following a strategy of institutionalization rather than compartmentalization. Great efforts began to incorporate responsibility and sustainability on all levels of TUM School of Management, including the normative level (for example, mission statements highlighting the management education of "responsible talents"), the strategic level (Strategy 2021 highlighting a strong research agenda with impact on the grand societal challenges) and the operational level (the introduction of a new Bachelor's program in Management and Technology, with a focus on renewable resources).

One of most important and strategic decisions we make is the hiring of new faculty members. Gender, diversity and sustainability play a key role in these key decisions. Take, for example, the new TUM Campus Straubing, which focuses on the bioeconomy and leads the way towards a post-fossil era. I was honored to head a search and evaluation commission for five new professorships in this field. We suggested a number of excellent candidates who were appointed by the TUM President in 2019. All of them conduct research and teaching at the intersection of management and technology, with a special focus

on renewable energies and the bioeconomy. Similarly, we hired two new colleagues at the TUM Campus in Heilbronn who founded the Global Center for Family Enterprise in 2020. They focus on the interplay of family and enterprise, emphasizing value-creation across generations, which shares many similarities with the concept of sustainable development.

This third PRME report shows just how far we have come, from sustainability as a "one-man-show" to sustainability as an integral part of research and teaching across the whole faculty. While we have already achieved much, PRME is rather like an Ironman Triathlon: a 3.8 km swim, a 180 km bicycle ride and a 42.2 km run all in one, calling for great stamina and determination. And as John Collins, the founder of the legendary Ironman Hawaii, once said: "Ironman has always been about finishing what you started. About being able to do what you set out to do. Maybe not as fast as the person in front of you, but certainly faster than the person who never started."

We at the TUM School of Management are committed to PRME. We have already started our Ironman and we are determined to finish it, with the help from our team and supporters.



TECHNICAL UNIVERSITY OF MUNICH: THE ENTREPRENEURIAL UNIVERSITY

ONE OF THE LEADING TECHNICAL UNIVERSITIES IN THE WORLD – WITH AN ENTREPRENEURIAL SPIRIT

Technical University of Munich (TUM) is one of Europe's top universities. It is committed to excellence in research and teaching, interdisciplinary education and the active promotion of promising young scientists. The university also forges strong links with companies and scientific institutions across the world. The Technical University of Munich (TUM) ranks among Europe's most outstanding universities in research and innovation – an achievement powered by its distinctive character as

the Entrepreneurial University. TUM's unparalleled range of disciplines covers engineering and natural sciences, life sciences and medicine, management and social sciences. This inspires modern fields of research extending from bioengineering to machine intelligence. At the same time, TUM links technological change more closely with social, political and ethical issues than other technical universities. Its outstanding degree programs are strongly oriented towards research and, at the same time, tightly coupled to practical experience. TUM offers amazing opportunities at every level of study and research – starting with the first semester right through to professorship.

It invests in the professional development of individual talent and produces many startup founders each year, thanks to its unique support infrastructure. TUM is also very international in nature: it builds long-term research partnerships with the most innovative global players and has a high proportion of foreign students, researchers as well as more than 150 partner universities around the globe. TUM has offices in Brussels, Mumbai, Beijing, San Francisco, and São Paulo. With the founding of TUM Asia in 2012 in Singapore, it became the first German university to establish an overseas campus.

TUM was awarded the title of University of Excellence in 2006, 2012 and 2019 in recognition of its innovative, dynamic culture.

SUSTAINABILITY AS A KEY PRIORITY

In 2019/2020, under its new president Prof. Dr. Hoffmann, TUM has been integrating sustainability in all areas of teaching, research and operations. Together, we are identifying the building blocks required to create a holistic strategy that will act as a roadmap for our sustainability journey – an action plan fitting of a university of international standing with the power to influence society, industry and policymakers. We are in the process of creating the necessary governance structures, building on the commitment and support of the entire university community. Communication and knowledge transfer are key success factors in this process. Our objective is to unleash the full sustainability potential of TUM across our key action areas: research, teaching, entrepreneurship, campus and operations. To achieve this we have established a Sustainability Office, which brings together all existing initiatives and ideas under an overarching strategic framework, supports their implementation and generates new ideas and projects through cooperation. Moreover, our Sustainability Taskforce published a comprehensive report in spring 2020 to underpin TUM's sustainability strategy.

TUM IN RANKINGS

The Technical University of Munich (TUM) ranks among Europe's most outstanding universities in research and innovation – an achievement powered by its distinctive character as an Entrepreneurial University.



Global University Employability Ranking
(Times Higher Education) **Rank 6**



Europe's Most Innovative Universities
(Reuters) **Rank 7**



QS World University Ranking
(best German university) **Rank 55**



THE World University Ranking
(Times Higher Education) **Rank 43**



Academic Ranking of World Universities
(Shanghai Ranking) **Rank 57**



German Startup Monitor **Rank 1**

FACTS & FIGURES

Staff

≈

600	Professors
7000	Research and teaching staff
3500	Other staff

Studies

≈

170	Programs
83000	Members of TUM's Alumni Network

Research & Innovation

≈

8,442	Scientific publications 2019
12	European Research Council Grants 2019
4	Clusters of Excellence (German Excellence Strategy)
50	Patents first filed in 2019
75	Spin-off companies 2019

TUM SUSTAINABILITY HOTSPOT: NEW TUM SEED CENTER

TUM SEED is a Center of Excellence in Research and Teaching, selected and supported by DAAD, with funds from the Federal Ministry for Economic Cooperation and Development. SEED stands for "Sustainable Energies, Entrepreneurship and Development in the Global South". It is a long-term initiative that aims at making contributions to one of the grand societal challenges of our time: the fact that one billion people lack access to electricity.

The TUM SEED Center was founded at the beginning of 2020. It offers higher education and conducts interdisciplinary research at the intersection of sustainable energy and entrepreneurship, aimed at tackling Sustainable Development Goal 7 – clean and affordable energy for all by 2030. The core team includes Prof. Dr. Frank-Martin Belz (Director), Johannes Winklmaier (Project Coordinator), Prof. Dr. Walter de Vries (Director of PhD Program), Dr. Daniela Gimenez (Coordinator of PhD Program) and Sofia Abid (Communications). The TUM SEED Center collaborates closely with the following organizations:

Bahir Dar University
Ethiopia



Bandung Institute of Technology
Indonesia



Indian Institute of Technology
Bombay, India



Jomo Kenyatta University of Technology
Agriculture and Technology, Kenya



Kwame Nkrumah University of Science
and Technology, Ghana



Makerere University
Uganda



Namibia University of Science
and Technology, Namibia



Pontificia Universidad
Católica del Perú, Peru



The partner universities in the Global South will co-create "Living Labs" to conduct research and teaching with impact. The Living Labs provide electricity for people in the rural areas of the Global South in the form of sustainable energy systems, and enable experimental learning for students, international exchange and research beyond borders.





／TUM SCHOOL OF MANAGEMENT

TUM School of Management conducts cutting-edge research and teaching at the interface of management and technology. Founded in 2002, it consistently leads the ranking of business schools in Germany.

Since 2017, TUM School of Management has been a member of a select international group of business schools that are accredited as "Triple Crown" by the AACSB (Association to Advance Collegiate Schools of Business), the AMBA (Association of MBAs) and the EQUIS (European Foundation for Management Development). The Triple Crown certification is internationally recognized as a seal of quality for students and academics.

TUM School of Management attracts students and researchers from all over the world. Its mission is to turn enthusiasm for innovation and technology into real products by teaching the necessary management skills. We believe that entrepreneurship and social responsibility go hand in hand. These are the values we pass on to our students.

On the basis of our interdisciplinary teaching approach, we train future managers who feel equally at home talking to management experts, engineers and scientists. Thanks to the entrepreneurial environment at TUM, a considerable number of our graduates start up their own businesses in technology-based industries.

In the coming years, we want to address the most important far-reaching developments in the course of digitalization, the UN goals for sustainable development and globalization. We will use our research expertise to contribute to solving social challenges. We will train our students to meet the challenges arising from the digital transformation and raise awareness of issues related to sustainable development. We will use the opportunities offered by digitization for our research, teaching and learning.

FACTS & FIGURES



5

Academic
Departments



50

Professors
and 400
research staff



5

Programs



5000

Students
from 40 different
countries

RANKINGS

WirtschaftsWoche

no. 1 "WirtschaftsWoche Ranking 2019": TUM School of Management is the top university among German-speaking universities and the second from top overall for business research. In addition to that Prof. Helmut Krcmar was awarded as best business researcher.



5 out of 5 In the 2020 CHE Ranking, TUM School of Management was honored to be the only university in Germany that received top ratings in all five categories concerning research and the school's scientific approach in lectures.



KOREA UNIVERSITY
Business School

no. 1 In 2019, for the second year in a row, TUM School of Management was recognized as the best German business school in the Worldwide Business Research Rankings published by Korea University Business School.



20 of 135 QS World University Rankings:
In 2019 TUM School of Management placed
20th out of 135 universities in the worldwide
Master in Management Rankings.

Frankfurter Allgemeine

no. 3 & 7 Our professors are among the most influential economists and management scholars in Germany and German speaking countries according to "Frankfurter Allgemeine Zeitung" and "Handelsblatt".



no. 6 FT Master in Management Ranking: In 2019 TUM School of Management achieved a top ten ranking for Master in Management in the subject Industry/Manufacturing (6th place).

Handelsblatt

no. 3 In 2014 TUM School of Management was listed third among all Germanspeaking universities in the ranking by "Handelsblatt", Germany's leading financial newspaper.

TUM SOM SUSTAINABILITY HOTSPOT: CENTER FOR ENERGY MARKETS

Energy markets lie at the heart of one of the greatest societal challenges of our time: achieving sustainable, reliable and affordable energy provision. The Center for Energy Markets is located at the intersection of management and technology, and brings together economics, finance and engineering-based approaches. It offers applied research contributions to topical, real-world questions in the energy sector. At the roots of the Center lies the vision of a global energy transition supported by research and education. The Center aims to contribute to this goal by advancing the understanding of future energy industries and markets, and by tackling real-world energy challenges.

The core areas of the Center for Energy Markets are energy finance, energy price modeling and operative planning in energy markets, market design, regulation, and consumer and producer behavior in energy markets.

The core activities of the Center include offering a broad array of energy-related courses and seminars, from introductory lectures on the structure and peculiarities of energy markets and energy trading to specialized lectures on topics such as energy finance, renewable energy and energy economics. A number of lectures are organized in co-

operation with Stadtwerke München and conducted by industry experts. The Center also supports collaboration between students and industry both in terms of research projects and career opportunities.

In the area of research, the Center for Energy Markets explores how we can provide modern societies with sustainable, reliable and affordable energy. Bringing together economics, finance and engineering-based approaches, the faculty carry out applied research in real-world questions facing the energy sector. Examples of ERS-relevant projects in this area include: Professor Friedl's project GeoFlex, which aims to analyze the flexibility potential of thermal power plants used for deep geothermal projects; Professor Roosen's project EEBatt, which explores the use of distributed stationary batteries in the German energy transition; and the work of David Matthäus, Professor Schwenen and Professor Wozabal on the design of renewable energy auctions.

The Center for Energy Markets is supported by Stadtwerke München and operates within a unique environment at the Technical University of Munich, collaborating with various engineering research centers, such as the Institute of Renewable and Sustainable Energy Systems.

PRME OFFICE TASKFORCE

TUM School of Management conducts research and teaching at the intersection of management and technology, with an emphasis on ethics, responsibility and sustainability.

We have been a PRME signatory since 2015. Over the last five years, we have reported on our PRME-related activities with great pride and promoted PRME throughout the institution. Since 2015 we have been tracking qualitatively our activities and efforts towards achieving an ethical, responsible and sustainable education of the leaders of tomorrow. In 2020 we realized that we needed to start assessing the impact and effectiveness of our sustainable activities in a more systematic and quantitative manner. We also wanted to define a clear strategy for increasing the sustainable impact of our institution. For this reason we set up a PRME Office, which in 2021 will start collecting systematic data related to PRME, with the aim of recording our core sustainability-related activities and defining core strategies for enhancing the sustainable impact of our institution.

The PRME Office plays a key role in measuring the current sustainability orientation of the School. It does this by means of an in-depth analysis of our teaching and research activities. It also monitors the dialogue with both internal and external stakeholders. Furthermore, it analyses and shapes our sustainability strategy, whose aim is to tackle the grand societal challenges, and transmits our core values and purpose to our students – the sustainable leaders of tomorrow.



Prof. Dr. Gunther Friedl
PRME Office Director
& Dean of the TUM
School of Management



Prof. Dr. Frank-Martin Belz
PRME Sustainability Manager
& Holder of the Chair of
Corporate Sustainability



Esther Salvi
PRME Sustainability Assistant
& PhD student at the Chair of
Corporate Sustainability



Claudia Ferring
PRME Communication



Dr. Christina Green
PRME Quality Management



Dr. Mattia Marchesini
PRME Quality Assistant

SDGS

TUM School of Management deals with the opportunities and challenges of a rapidly changing world and conducts research and teaching with an impact on the grand societal challenges and sustainable development.

Research that contributes to finding solutions to the grand societal challenges is a key aspect of our mission and vision. To this end, we increasingly engage in interdisciplinary research projects involving different departments within the School and/or departments from other TUM schools, and tackling the 17 UN Sustainable Development Goals.

With the adoption on September 25, 2015, of the 2030 Agenda for Sustainable Development at the UN Summit in New York, UN member nations entered a pact affecting the future of the world. The 17 UN Sustainable Development Goals in the Agenda link the principle of sustainability with economic, ecological and social development. The SDGs apply to all countries in the international community and are also the leading objective for our academic institution.

SUSTAINABLE DEVELOPMENT GOALS



PRINCIPLE 1: PURPOSE

At TUM School of Management, we strive to apply our research competencies to contribute to the grand societal challenges and to tackle the UN Sustainable Development Goals. As reflected in our mission, we put the emphasis on raising the level of awareness regarding responsible management, ethics and sustainability among our students and faculty.



VISION

Being one of the leading management schools at the interface with technology, engineering and the sciences, contributing to solutions for the grand societal transformations.

MISSION

Grounded in our technological and entrepreneurial ecosystem, we educate responsible talents and pursue relevant research to advance innovation-based businesses and societies in Germany, Europe and the world.

To achieve our mission, we operate at the interface between management and technology educating our students and teaching them how to contribute responsibly to environmental and societal challenges. Our close relationship with TUM's technical and engineering subjects provides natural and fruitful connections, which are reflected in most of our programs. For example, the establishment of the TUM campus in Straubing for Biotechnology and Sustainability led to the introduction of a new technology specialization in "Renewable Resources" for our Bachelor's program and a new outreach program for topics in the area of sustainability.

Building on the school's areas of excellence we aim to become one of Europe's leading management schools at the interface to engineering and science, contributing to solutions for the grand societal challenges.

We want to educate our students to meet the challenges and threats posed by digital transformation and make them more sensitive to issues related to sustainable development. We aim to exploit, on a massive scale, the possibilities that digitization offers for research, teaching, and learning. Consistent with these ambitions, we will continue, and even increase, our internationalization efforts. We therefore strive to achieve the following strategic objectives:

- I) A strong research agenda with impact on the grand societal challenges;
- II) An attractive and distinct portfolio of programs that addresses the interface of management and technology;
- III) Careful, high-quality preparation of students for the future demands of societies and organizations;
- IV) Further internationalization of TUM School of Management with respect to students, research, and outreach;
- V) A strong profile for TUM School of Management in the international community.

These strategic objectives entail sustainability, both as a "transversal" dimension and a key driver. The decision to become a PRME signatory in 2015 was a strategic one for TUM School of Management: It created the foundations for achieving higher levels of sustainability in our institution. Through PRME, we have raised the level of awareness about responsible management, ethics and sustainability amongst our students and faculty over the last five years. The School has built an institutional framework and formulated an overarching strategy encompassing all aspects of responsible management. In 2020, to complement and expand the activities of the Sustainability Officer elected by the faculty in 2015, we established a PRME Office. This Office has now started assessing the impact and effectiveness of our sustainable activities in a more systematic and quantitative manner. It is also defining a clear strategy for increasing the sustainable impact of our institution in the future.

ASSURANCE OF LEARNING RESULTS

Assurance of Learning (AoL) is a method for checking whether and to what extent our learning goals and objectives, which are anchored in our mission, are achieved by our students. In other words, it indicates whether the School is accomplishing its mission. We evaluate the results of the AoL at

regular intervals and use them to improve our curriculum and develop our methods of instruction. This includes looking at goals related to the ethics, responsibility and sustainability of our teaching activities.



PRINCIPLE 2: VALUES

At TUM School of Management we pursue our mission and follow our vision of becoming one of Europe's leading management schools at the interface of management with engineering and science. We contribute to solutions to the grand societal challenges, following specific values that are embedded in our organizations at all levels. Those values are as follows:

RESPONSIBILITY AND INTEGRITY



We conduct research in line with the highest scientific and ethical standards and are committed to progress and innovation for improving people's lives. We teach general management skills with an emphasis on technology, and in doing so advocate the United Nations' sustainability values of freedom, equality, solidarity, tolerance, respect for nature and shared responsibility.

PASSION FOR EXCELLENCE



We strive for excellence in our areas of research and publish our findings in order to create impact. We provide our students at all levels with a sound scientific education, not only to facilitate their starts in careers in business or in science but also to improve their critical thinking, so that they act responsibly in relation to society.

ENTREPRENEURIAL ATTITUDE



We research entrepreneurship and innovation and integrate the results into the education of our students at all levels, enabling our students to think and act entrepreneurially. We encourage our colleagues, students and doctoral candidates at TUM to found growth-oriented startups, and we facilitate their successful development.

CURIOSITY AND OPENNESS



We encourage research beyond disciplinary, institutional and national borders, opening up new perspectives and generating novel research findings and approaches to management practices. We develop talented individuals irrespective of their gender, nationality, religion or belief, disability, age and sexual orientation. We are determined to learn from our students' cultures, experiences, and opinions.

COLLEGIALITY AND GEMÜTLICHKEIT



We foster a climate of mutual interaction, help and collaboration among students, faculty and administrative staff. We cultivate an attitude of Gemütlichkeit – the Bavarian way of life – and a warm and friendly atmosphere within the school.

TUM SCHOOL OF MANAGEMENT CODE OF CONDUCT

In accordance with its mission, vision and strategy, TUM School of Management is committed to ensuring the highest ethical standards of personal and collective behavior. This covers areas such as honesty, fairness, trust, respect, integrity, diversity and equality.

HONESTY

Being truthful and sincere in communication and action. At TUM this value of honesty should be reflected in your conduct and your compliance with TUM's legislation and regulations.

TRUST

Believe that people are good and honest and mean you no harm. Trust that you can rely on information given to you. Reflect this value in your own behavior by being honest and respectful. Give people a reason to trust you.

DIVERSITY

Respecting everyone regardless of their ethnicity, gender, physical abilities, cultural background, religion or belief, socio-economic status, sexual orientation, life-style, age, interests and experiences. At TUM we see diversity as an opportunity and an enrichment of our community.

SUSTAINABILITY

Maintaining environmental sources at a level that does not exhaust natural resources or produce unnecessary waste.

MEET NEW PEOPLE IN A FAIR AND UNPREJUDICED WAY!

These standards guide and challenge the community in its principles of thinking and acting in accordance with TUM's strategic core values: responsibility, ethics, research orientation, relevance, engagement, excellence and innovation. They should also act as the foundation for our commitment to diversity and equality. Positive and empathetic interaction with one another builds bridges to trust, respect and understanding across cultures.

RESPONSIBILITY

Understanding our educational mission as a responsibility towards society. Scientific advancement strives for the improvement of human life and coexistence.

FAIRNESS

Making decisions impartially and objectively. Conduct is free from competing self-interest, prejudice, nepotism and favoritism. Be open when meeting people in a fair and unprejudiced way.

EQUALITY

Recognize that each individual is unique and has unique preconditions, abilities or disabilities. Everyone deserves an equal chance regardless of where they have come from. Appreciate that there are those who require particular care and attention in order to establish a general state of equality of opportunity.

SCIENCE

Applying a scientific approach, evaluating our own unconscious biases, challenging dogmas, and doubting that which has not been proven.



Picture: The TUM Thiersch Tower glows orange on International Day against Violence against Women

／ COMMITTING TO VALUES

All members of TUM School of Management are individually accountable for their own actions and, as a community, we are collectively responsible for sustaining the School's ethical standards and acting in compliance with the principles and commitments of the Code of Conduct.

SUSTAINABLE BEHAVIOR

Use consumable resources (electricity, water, plastics, paper etc.) responsibly.

Seek to reduce, separate and recycle waste.

Even if not explicitly requested, consider sustainability in all aspects of university life.

IN-CLASS BEHAVIOR

Give everyone in class the chance to speak their mind and contribute.

Use inclusive language, free of violence and discrimination.

Do not cheat, lie, fabricate or invent information. Be honest in your academic life.

STUDENT BEHAVIOR

Only sign up for courses you really intend to attend, especially when using the seminar-place-ment-tool. This avoids blocking course seats and removing the opportunity for other students to attend.

Do not sign up for more exams than you intend to take. Be sure to consider the time you must invest in each course, and manage your time realistically.

If you are pursuing a degree, please only accept a placement from our international office, if you really intend to go. Once a place is accepted, we are unable to redistribute it to another student - even if you voluntarily reject the place.

BEHAVIOR IN RESEARCH

Be aware of your responsibility for people, society and the environment of your research.

Avoid plagiarism, ensure that all sources are cited and check their reliability.

LECTURER BEHAVIOR

Be aware of your social responsibility wheteaching.

Understand that your teaching is a service for our students.

Treat students with respect and treat them equally and fairly.

SOCIAL MEDIA BEHAVIOR

Adhere to the same standards of behavior online as you would in respectful face-to-face interactions with others.

When using digital and social media, be mindful that materials posted online can be copied freely and can continue to exist even if the original item is removed.

Do not copy or share personal information (pictures, grades or lecture notes) of others without their express permission.

Be a model of civil coexistence in a diverse and digital society.

Be rational: Analyze online sources with particular care and be thorough in your proofing of information you find online.

／ PRINCIPLE 3: METHOD

In line with our purpose and our commitment to our values, at TUM School of Management we conduct teaching activities at the intersection of management and technology, with a focus on sustainability. The strength of this focus varies: Some of our teaching modules have sustainability at their core, referring to the SDGs explicitly and tackling the grand societal challenges. Other courses refer to sustainability and integrate it to a greater or lesser degree.

Below, we present the key modules demonstrating our orientation towards sustainability. We describe each module, referring to the specific SDGs that they tackle. First, we introduce modules related to new sustainable ventures, followed by modules related to sustainability management, and finally mo-

dules related to sustainable innovation, society and public policies. For reasons of space we are not able to describe all our courses related to sustainability and sustainable development here. For a complete list of all such modules, please refer to the Appendix.

In 2020/21 we started evaluating how our teaching modules relate to sustainability and sustainable development in a qualitative way. One of our main objectives for 2021/22 is to assess sustainability-related content in all our teaching modules both qualitatively and quantitatively, and to develop specific strategies to increase the focus on sustainability in all our modules.

KEY MODULES WITH A FOCUS ON NEW SUSTAINABLE VENTURES



Foundations of Entrepreneurial and Ethical Business

Bachelor in Management & Technology

Prof. Dr. Holger Patzelt

Chair of Entrepreneurship

Prof. Dr. Christoph Lütge

Chair of Business Ethics

Acting both entrepreneurially and ethically is important for new and established businesses, not only to successfully compete in dynamic environments but to transform the global economy toward sustainable development. Topics include the following: Entrepreneurship and economic growth, entrepreneurial motivation and psychology, creativity, opportunity recognition and evaluation, opportunity assessment and business planning, entrepreneurial human and social capital, financing sources for young ventures, and social and sustainable entrepreneurship. In addition, the modu-

le introduces basic problems, arguments and theoretical approaches to business ethics. It investigates the chances of realizing moral norms at the interface of entrepreneurship/economics and ethics. Underlying this is the analysis of ethical decision processes in corporations and the detailed investigation of situations and alternative courses of action. Topics include reputation, trust and social capital, as well as corruption, environmental protection, and global ethical concepts.



Picture: Prof. Dr. Holger Patzelt (first from the right)

KEY MODULES WITH A FOCUS ON NEW SUSTAINABLE VENTURES



Foundations of Entrepreneurial Business

Bachelor in Management & Technology
(TUM Campus Straubing)

Prof. Dr. Claudia Doblinger

Professorship of Innovation and
Technology Management

This course introduces students to the foundations of entrepreneurship and the entrepreneurial process. While entrepreneurial thinking and acting is generally important for achieving the Sustainable Development Goals 2030, this course includes a specific focus on environmental entrepreneurship, where students obtain a profound knowledge of the multifaceted relations between the environment and entrepreneurship. Furthermore, they learn about the origins of sustainability, its definition and the-

ories such as the triple-bottom-line approach. They also learn how market failure can lead to new entrepreneurial opportunities related to the environment. In the practical workshops, students identify and evaluate a business idea in the context of environmental entrepreneurship.



Picture: Students of TUM School of Management

KEY MODULES WITH A FOCUS ON NEW SUSTAINABLE VENTURES



Sustainable Entrepreneurship – Getting Started

Master in Consumer Affairs
Master in Consumer Science
Master in Management
Master in Management & Technology
Master Sustainable Resource Management

Prof. Dr. Frank-Martin Belz

Esther Salvi

Chair of Corporate Sustainability

In this seminar we invite Master's students to make a difference and tackle the grand societal challenges, such as clean and affordable energy for all by 2030. We present the UN Sustainable Development Goals by 2030 and have the students work in teams. Each team has to identify a grand societal challenge and to turn it into a business opportunity through sustainable entrepreneurship. We explain the sustainable business model canvas as tool

for the teams to explore their own ideas and work through a stepwise approach. To inspire students, founders and cofounders of sustainable ventures present their sustainable business models in guest lectures. At the end of the seminar, each student team presents the sustainable business model that they have developed and submits a written seminar paper. Notable sustainable business models developed by our students in 2019/20 include: Cnergy – a crowdfunding platform for sustainable energy in the Global South; The Locals – an innovative platform promoting sustainable online purchases; and Out of The Box – providing sustainable solutions for the take-out market in Germany.



Picture: Esther Salvi (fourth from the right) in class during group work

KEY MODULES WITH A FOCUS ON NEW SUSTAINABLE VENTURES



Sustainable Entrepreneurship – Theoretical Foundations

Master in Management & Technology
Master in Management

Prof. Dr. Frank-Martin Belz
Dr. Daniela Gimenez

Chair of Corporate Sustainability



Entrepreneurship has the potential to play a key role in achieving sustainable development and the Sustainable Development Goals 2030. There is an emerging stream of research at the junction of sustainable development and entrepreneurship. In this seminar, students gain a profound knowledge of sustainable entrepreneurship research, including theories and empirical studies. Going beyond simplistic win-win rhetoric, we discuss the difficulties of balancing the triple bottom line, the gap between sustainable entrepreneurial intentions

and action, and the role of culture, gender and diversity. Students read and discuss articles published in leading journals about the antecedents, process and outcomes of sustainable entrepreneurship. Ultimately, they develop their own research proposal to join the academic conversation in the field of sustainable entrepreneurship.



Picture: Professor Belz in classroom discussion

KEY MODULES WITH A FOCUS ON NEW SUSTAINABLE VENTURES



International Summer School "Sustainable Entrepreneurship: Theory and Practice"

Prof. Dr. Frank-Martin Belz

Esther Salvi

Chair of Corporate Sustainability

The International Summer School "Sustainable Entrepreneurship: Theory and Practice" is a unique experience for students and young professionals from all over the world, and an opportunity for them to become change-makers. Leading scholars introduce the participants to the grand challenges of sustainable development and the UN SDGs, presenting the theoretical foundations of sustainable entrepreneurship. In addition, the founders of companies in the field of renewable energies, fashion and food, active in both the Global North and Global South, introduce

their business models and the stories behind them, from venture conception to funding and market expansion. Participants have the opportunity to interact with the founders of the sustainable enterprises directly and take inspiration from them. Working in teams with other students from all over the world, they develop their own sustainable business models and pitch them to a jury. At the end of the International Summer School, they receive a certificate from TUM School of Management.

In 2019, 16 students from 12 different countries participated in the International Summer School. They developed four sustainable business models: Avoyogi, Bee.Different, Valterri, and The Eco-Watch.



Picture: Professor Belz teaching at the International Summer School 2019

KEY MODULES WITH A FOCUS ON NEW SUSTAINABLE VENTURES



Advanced Topics in Innovation & Entrepreneurship: Social Entrepreneurship Lab

Prof. Dr. Oliver Alexy
Dr. Alexandra Mittermaier

Social entrepreneurship leads to the creation of social enterprises by identifying a social problem, recognizing an opportunity for its solution, and creating an enterprise for implementing that solution and effecting transformative change. Ever since Bill Drayton coined the term "social entrepreneurship" in the 1970s, ventures focused on solving societal challenges have grown in number and been increasingly successful. From Muhammad Yunus' Grameen Bank to Munich-based Polarstern Energie and Recup, social enterprises have successfully created both economic and social value, helping alleviate environmental destruction, inequality and injustice.

The Social Entrepreneurship Lab provides interested Master's students with an opportunity to learn about social entrepreneurship. It achieves this goal by enabling active engagement with existing social enterprises from Munich and around the globe that are seeking to scale their operations and have a national and international impact. These so-

cial enterprises bring real-life problems to the classroom, and groups of students are then trained to work on them. The students receive further coaching and are helped to produce solutions that can be put into practice.

The problems dealt with by students are often cross-disciplinary. For this reason, we involve students across different disciplines and across Munich's universities – the Technical University of Munich (TUM), Ludwig-Maximilians-Universität (LMU) Munich and the Munich University of Applied Sciences ("Hochschule München", HM). The various students participate in the practice-based, interactive seminar, which is co-facilitated by the Social Entrepreneurship Akademie (SEA). In this way they learn hands-on the meaning and workings of social entrepreneurship. They also enjoy a "deep dive" into entrepreneurial practice and become skilled at working across cultural and disciplinary boundaries to solve the grand challenges of today.

KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Foundations of Ethical Business

Bachelor in Management & Technology
(TUM Campus Straubing)

Prof. Dr. Claudia Doblinger

Professorship for Innovation and
Technology Management

The field of "business ethics" deals with the norms by which conditions and decisions can be justified and put into practice. This module gives students a profound knowledge of normative ethical theories. It makes them aware of the norms in business-related decisions that go beyond a purely economic rationale. Discussions about stakeholders – as opposed to shareholders – are facilitated. The concept of corporate social responsibility is also introduced, stressing organizations' engagement in (and reporting on) ethically-oriented practices. In addition to learning about theory, students discuss two case studies, where they applying their theoretical knowledge to current problems (for example, ethics in the digital age, ethical considerations regarding bio-hacking).



Picture:
Prof. Dr.
Claudia Doblinger



KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Corporate Sustainability

Bachelor Seminar

Dr. Daniela Gimenez

Dr. Roxana Codita

Chair of Corporate Sustainability

This seminar aims to highlight key issues in corporate sustainability from the dual perspective of, on the one hand, established companies and, on the other, new ventures. Established companies are called upon to tackle the challenges of our rapidly changing world, such as climate change, peak oil, peak food and pollution – challenges to which they themselves make a significant contribution. Therefore, in the first part of the seminar, we look at how such companies can integrate sustainability into their business practice, pointing

to emerging challenges and also new opportunities arising from corporate sustainability. In the second part of the seminar, we switch our perspective and focus on new sustainable ventures, describing the main concepts relating to sustainable entrepreneurship.



Picture: Dr. Daniela Gimenez (second from the left)
in class room discussions

KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Sustainability Management in Corporations

Master in Management
Master in Management and Technology
Master in Sustainable Resource Management

Prof. Dr. Alwine Mohnen
Christoph Ratay & Theresa Kaiser
Chair of Corporate Management

This advanced seminar for Master's students leverages leading contributions to the academic literature and insights into common business practices to introduce participants to key concepts of sustainability management in corporations. Key discussion topics include sustainability performance measurement and reporting, incentives to promote sustainability and the impacts of cultural differences on sustainability management. Based on an interactive kick-off session that familiarizes students with key corporate sustainability topics, par-

ticipants choose their own research focus in groups of two and explore their chosen field as part of a seminar paper. Throughout the research and writing process, research groups participate in individual coaching sessions led by teaching staff with practical and academic experience in the field of corporate sustainability. In this way students actively engage with the latest research on sustainability management in corporations and work on their own research ideas, contributing to the field.



KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Sustainable Supply Chain Management

Open to students of all programs

Dr. Patricia Rogetzer

Chair of Logistics and Supply
Chain Management (Prof. Minner)

This course deals with the topic of sustainability in supply chains. The three pillars of sustainability (economic, social, environmental) are seen as a cornerstone for today's businesses. Students learn about some important concepts in sustainability, such as "closing the loop" or the circular economy, as well as "systems thinking" and life cycle analysis. The course starts with an introduction to the basics and the fundamental concepts of sustainability in operations and supply chain management. We discuss how these concepts can be transferred to certain key performance indi-

cators. The reporting standards of the Global Reporting Initiative are then used to discuss the contents of sustainability reports. During the course, we also look at how to incorporate sustainability concepts into decision models in the context of supply chain management, especially location decisions and routing decisions. In addition, students discuss current issues (such as humanitarian supply chain topics and corporate social responsibility issues) in sustainable supply chain management, based on recent journal papers.



Picture: Sustainable Supply Chain Management, Class 2019/20

KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Basics of Material Flow Analysis and Life Cycle Assessment

Bachelor in Bioeconomy

Prof. Dr. Magnus Fröhling

Professorship for Circular Economy

Sustainable production and consumption methods are of great importance for the safeguarding of planetary boundaries and the conservation of our environment for future generations. This requires a knowledge of efficient and sustainable resource management for the design of products and services. This course provides today's students – who are tomorrow's decision-makers – with tools and methods for analyzing material and energy flows and investigating the potential environmental impacts of products and services. Material Flow Analysis (MFA) and Life Cycle Assessment (LCA) are suitable, frequently used instruments for making sustainability measurable from a system perspective. The course provides students with the knowledge, tools and methods necessary for this purpose and thus empowers them to operationalize sustainability in various contexts.



Picture:
Prof. Dr.
Magnus Fröhling



KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Lean Six Sigma Yellow and Green Belt Certifications

TUM Massive Open Online Program (edX Platform)

<https://www.edx.org/professional-certificate/tumx-lean-six-sigma-green-belt-certification>

Prof. Dr. Martin Grunow

Chair of Production
and Supply Chain Management

Prof. Dr. Holly Ott

Dr. Reiner Hutwelker

Lean and Six Sigma are management systems for business processes. Their purpose is to directly increase the quality and availability of products and services, reduce the consumption of resources and eliminate waste, thus reducing costs and increasing customer satisfaction. These systems arrange theory, methods, tools and statistics into a guideline for improvement initiatives and projects. Individuals who master them can gain Yellow and then Green Belt certification, which gives them greater earning power in companies and other organizations around the world. This makes Six Sigma relevant for all employees and even students.

The Six Sigma & Lean Production Yellow and Green Belt programs offered by TUM School of Management as massive open online courses

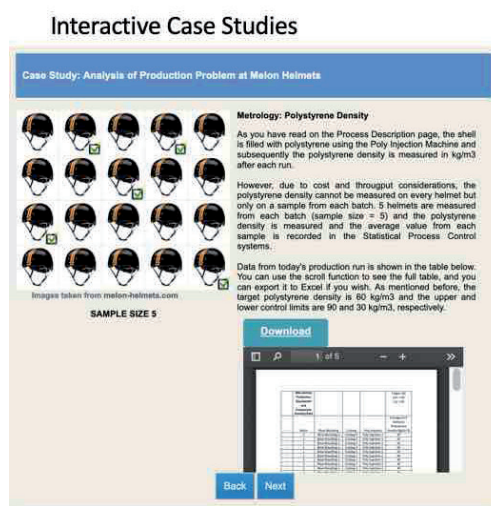
via the platform edX make it possible for learners anywhere in the world to learn Six Sigma and Lean and receive certification from TUM. Response has been tremendous, with over 300,000 participants so far. The courses have received top rankings for online education.

The Green Belt program guides learners through a full "standard" Six Sigma project on reducing litter. Learners receive individual coaching online and can run their project from anywhere in the world. As Six Sigma and Lean are data-driven methodologies, the certifications help women drive improvement projects in companies: The step-by-step process-improvement cycle in Six Sigma relies on data collection and actions are driven by the statistical analysis rather than personal opinion.

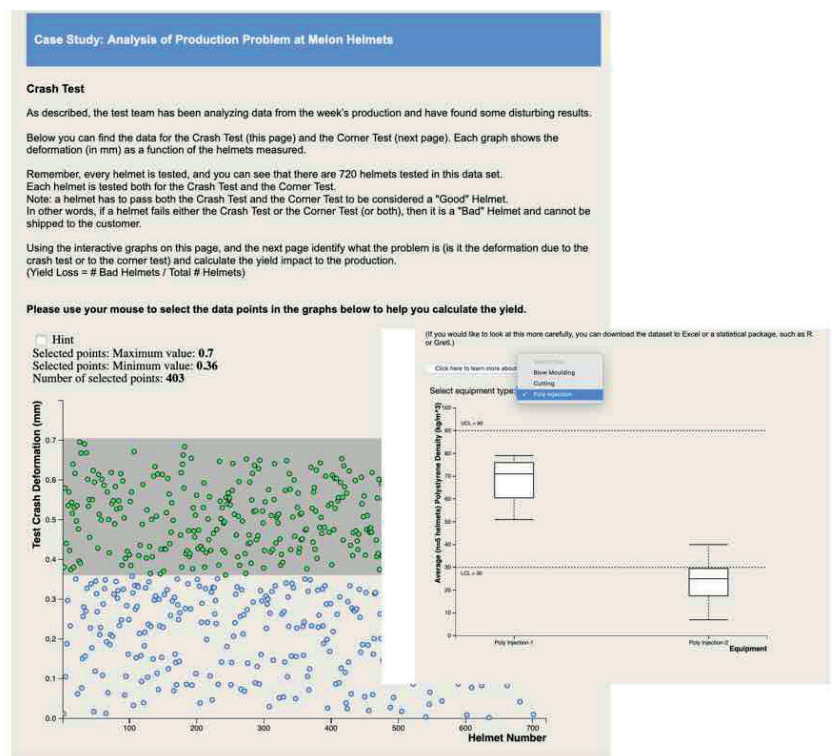
What learners say:

"This was the best course I have done. First of all, because it is normally really difficult to attend a course like this: The price in Brazil is expensive, I live in the countryside and it is hard to get a good education. So, an opportunity like this – the chance to take an incredible course taught by amazing professionals – is really worthwhile. I'm trying to improve myself living in a poor region and I know I can do it through a good education and get a new job. Thank you."

"My name is Irene de Sera. I currently work as a Project Engineer on the development of a large renewable energy project. I decided to enroll for this course because I want to be able to bring Lean methodologies to Jamaica and empower production workers to continuously improve. I'm really grateful and excited that I can actually follow a course from TUM from my home so far away!"



Picture: Interactive Statistic Exercises: Lean Six Sigma Yellow and Green Belt Certifications



KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Circular Economy/ Sustainability Management: Circular Cities

Master in Management
Master in Management and Technology
Master in Sustainable Resource Management

Prof. Dr. Magnus Fröhling
Rosina Lohmeyer, M.Sc.
Professorship for Circular Economy

This seminar is dedicated to the implementation of a circular economy in cities. Students explore the challenges, potential and enablers of a circular economy in urban areas. We focus on current trends, future projections and initiatives for tackling the challenges of cities as they strive to achieve more sustainable development.

By 2050, two-thirds of the world's population will live in urban areas. Cities account for 75 percent of the Earth's resource consumption, produce half of all global waste and are responsible for the majority of greenhouse gas emissions. Today's cities follow a linear take-make-waste economy. The concept of a circular economy rethinks our current production and consumption patterns. Circular cities aim to create new business opportunities, close resource loops and manage resource and waste flows more efficiently. The vision of circular cities that we investigate in

the seminar involves ways of contributing to sustainable urban development and making cities and other human settlements inclusive, safe, resilient and sustainable.



Picture: Circular Cities

KEY MODULES WITH A FOCUS ON SUSTAINABILITY MANAGEMENT



Food Economics

Master in Consumer Sciences

Prof. Dr. Jutta Roosen

Chair of Marketing and Consumer Research

Prof. Luisa Menapace, PhD

Chair of Governance in International Agribusiness

Food plays a central role in our everyday lives. It is also intrinsically tied to the Sustainable Development Goals, as the means to end hunger, improve nutrition and ensure healthy lives. In this module, students are introduced to the economic theories that help them understand consumer and corporate behavior in food markets and improve their knowledge of global trends and important phenomena related to food production, distribution and consumption.



In an interactive setting, we discuss the effectiveness of food policy instruments and food labeling, and reflect on the significance of nutrition. We draw on recent scientific advances in the field of food economics to critically analyze globalized food value chains, considering all major actors and the relevance of the sustainable agricultural practices that build the basis of viable food markets. Through presentations, short papers and subsequent in-class discussions, students consolidate their newly-acquired knowledge of economic concepts, trends and phenomena related to food markets and learn how to use findings from scientific publications in a critical and responsible manner.

KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



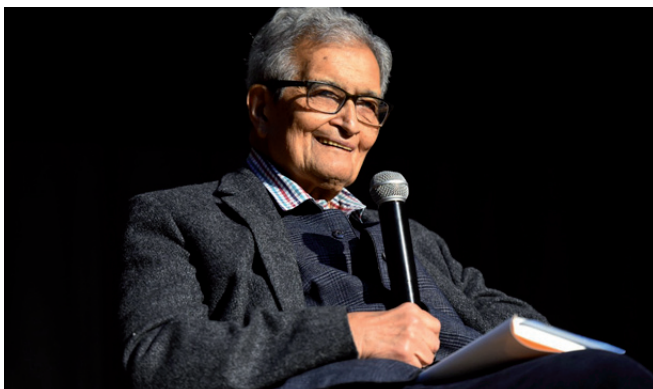
Business Ethics: Great Economists – A Panorama of Important Business Thinkers and Their Ideas

Master Seminar

Alexander Kriebitz
Prof. Dr. Christoph Lütge
Chair of Business Ethics

This seminar discusses the concepts and ideas about the economy formulated and elaborated by the leading economists of the nineteenth and twentieth century. The economists discussed include Adam Smith, Karl Marx, F.A. von Hayek, John Maynard Keynes and Amartya Sen, all of whom theorized about how to develop fair institutions and realize aims in policy goals such as reducing poverty

and hunger in the context of the North-South divide. The explicit focus of the seminar is on the implications of these concepts for contemporary questions, such as climate change and global inequality, and for individual and collective action.



Picture: Amartya Sen at the launch of his book
"A Quantum Leap in the Wrong Direction"

KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



Business Ethics: The Ethics of Artificial Intelligence

Master's Seminar

Franziska Poszler

Prof. Dr. Christoph Lütge

Chair of Business Ethics

The increasing presence of artificial intelligence (AI) in a variety of fields – healthcare, public safety and mobility, for example – is associated with moral and ethical questions and problems that are only just beginning to be explored. This seminar deals with the moral and social arguments for and against the use of AI. The questions that we address relate closely to the SDSs, for example: How will AI influence society's health and wellbeing, as well as the labor market and economic growth? How

can AI help reduce inequalities? What are the requirements for the responsible development and consumption of AI? What partnerships are necessary or already exist to achieve the SDGs? In answering these questions, we critically discuss the applicability of traditional ethical theories and more recently established ethics guidelines for AI. Using the contents of the seminar, students develop their own solutions to existing problems related to AI.

KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



Challenges in Energy Markets

Master in Management & Technology

Dr. Leonhard Birnbaum
Burkhard von Kienitz
Center for Energy Markets

In the course of this module, students gain a profound knowledge of the key aspects of global energy markets and their most important developments today and in the future. The course covers topics such as power generation technologies, power plant projects and the strategies of the major players in this field. Students gain insights into the execution of energy projects, challenges, project risks and financing models. The course also sheds light on the supply chain aspects of energy projects. In addition, we discuss the energy

mix up to 2030, climate goals and possible technological and political measures to attain these. Students learn about the carbon tax, the emission trading system and other measures fostering decarbonization. The course also deals with local energy markets, the role of hydrogen in the future and its role in the future of mobility. Lastly, students learn about different solutions for decarbonizing the mobility sector. To keep up to date with ongoing developments, students read and discuss the latest articles published on these topics.



KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



Economics of Energy and Technology

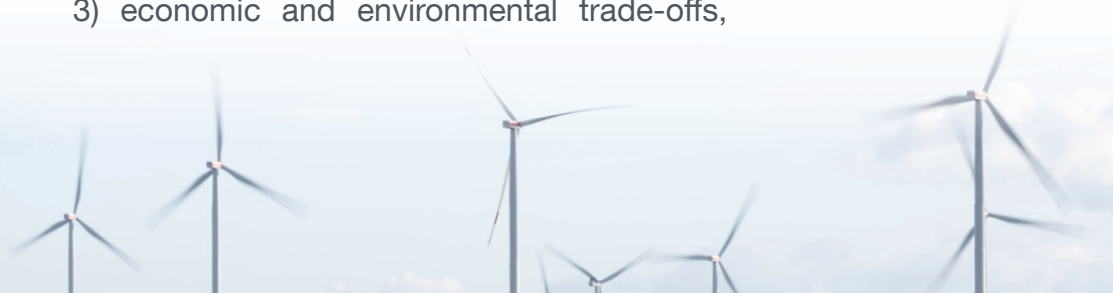
Master in Management & Technology

Prof. Dr. Svetlana Ikonnikova

Chair of Resource Economics

In the modern world, all the sectors of the global economy depend on energy to grow and prosper. In its turn, energy production and consumption affects the climate and how it changes, both directly and indirectly through its use of other environmental resources. Understanding the connection between energy, environment and economics and how that connection is evolving with the introduction and adoption of new technologies is of outmost importance for global economic prosperity and environmental sustainability. The goal of this advanced seminar is to educate students about: 1) current economic and environmental challenges in the production and use of energy and environmental resources; 2) new technological and economic solutions supporting the energy transition; and 3) economic and environmental trade-offs,

the answer to which may affect future sustainability. Students learn how to evaluate new technologies and energy uses in terms of economic, energy and environmental efficiency. The models and experiences presented teach them to embrace the complexity of multi-objective solutions and strategies. When reviewing existing business models and engineering systems, students are encouraged to agree or offer different strategies or techno-economic solutions that fit the energy transition agenda. Students work in groups on research projects, producing written reports and presenting new or reconsidered solutions in class for review. In so doing they learn how to defend their views while staying open to alternative opinions, new data and information – something that is critical in the field of energy.



KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



Energy Trading

Master in Management & Technology

Dr. Stephan Illerhaus

Sofia Berdysheva

Center for Energy Markets

Energy markets play a key role in protecting the environment. For this reason it is important to understand the functioning of energy markets and the central role of energy trading. This course gives students a profound knowledge of organizational concepts and key supporting processes in energy trading. They deepen their knowledge of how to program the financial operations of an order book, whether in the setting of an auction or in continuous trading, and calculate key financial indicators such as mark-to-market valuation. They also learn to build and interpret a price forwards curve and

calculate and interpret key risk measures such as value-at-risk and conditional-value-at-risk. As part of their learning, they calculate the marginal cost of electricity generation and its impact on the economics of CO₂ emissions trading. Additionally, they learn how to set up and solve a mathematical optimization problem to decide the best generation mix.



KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



What is the Future of Mobility? Engaging Technologies, Politics, Economic Scenarios and Practices

Master in Management & Technology
Master in Consumer Science

Dr. Alexander Wentland
Prof. Dr. Sebastian Pfotenhauer
Chair of Innovation Research

Questions of mobility lie at the heart of many of the Sustainable Development Goals, including Sustainable Cities and Communities, Climate Action, and Good Health and Wellbeing. At the same time, past technological and political choices about mobility underlie many of today's societal challenges, including traffic jams, land consumption, urban sprawl, pollution, climate change, technological path dependencies and social injustices, to name but a few.



Picture: Prof. Dr. Sebastian Pfotenhauer in class

This course introduces participants to the key questions and issues facing managers, policymakers, engineers and society at large when trying to understand, anticipate and organize the future of mobility. To help them comprehend current developments and visions around mobility, students engage with the history of transportation, as well as past and present predictions about the future. Changes in infrastructural arrangements and mobility practices have often influenced economic and cultural development. Since the Industrial Revolution, we cannot imagine modern social relations and everyday life without a highly sophisticated system of roads, highways, railroads, sea-lanes and air traffic. Over the course of the semester, students tackle a host of mobility-related phenomena not as isolated cases but as a constitutive part of modern technologized societies and their visions of the future.

KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



Working in the Digital Age: Games and Morality in Business, Education and Training

Master in Management & Technology

Dr. Maxim Egorov
David Plecher
Jakub Cichor

Research shows that video game consumption is increasing across the globe. At the same time, video games are seen as a potential cause of unethical or irresponsible behavior. There is an increasing need to educate individuals about responsible engagement with video games, while taking the medium's effects on ethics and morality into account. In this seminar, students discover how learning occurs in media, based on established theories, both through general learning models and through violent or pro-social content.

We discuss moral development and how content pertaining to morality in video games can be analyzed in the context of social intuitions and moral foundations. Students engage with the literature on learning, ethics and morality, and use their acquired knowledge to analyze a video game of their choosing based on the concepts taught and relevant moral questions. Through their analysis, they develop a deep understanding of how video games can affect individuals and how those effects can be leveraged for responsible education.



Picture: VR

KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



Policy and Innovation

Bachelor in Bioeconomy
(TUM Campus Straubing) and
Bachelor in Management & Technology
(TUM Campus Straubing)

Prof. Dr. Claudia Doblinger

Professorship of Innovation
and Technology Management

This module introduces students to the basic principles of politics and innovation from a global and international perspective. Students acquire a basic knowledge of the definitions of innovation, politics and the evaluation of political measures, especially in connection with climate change and renewable raw materials. Key learning goals include assessing the effects and implications of political measures on

the innovation activities of companies, identifying and evaluating business opportunities, and creating business models in the field of renewable resources/climate change. Students experience the process of developing business ideas through group work and case-study discussions, with a special focus on the relationship to sustainability, networks, ecosystems and social innovations.



Picture: TUM Campus Straubing

KEY MODULES WITH A FOCUS ON SUSTAINABLE INNOVATION, SOCIETY AND PUBLIC POLICIES



Innovation, Society, Public Policy
(formerly Responsible Governance of
Science, Technology, and Innovation)
Master in Management & Technology
Master in Consumer Science

Prof. Dr. Sebastian Pfotenhauer
Dr. Stefania Sardo
Chair of Innovation Research

As a popular saying has it: "With great power comes great responsibility." Science, technology and innovation are arguably among the most powerful drivers of change in contemporary societies. Yet, their development and governance has traditionally not included people who have to live with their consequences. Rather, it has been the prerogative of a small group of experts – scientists in the lab, companies developing a product or service, or regulators in government agencies.



Picture: Prof. Dr. Sebastian Pfotenhauer in class

This course provides a graduate-level introduction to the questions and issues facing policymakers, companies and society at large when trying to understand, design, govern and live with innovation. Students explore how innovation is shaped by social, economic and policy processes, and vice versa. They also learn how emerging technologies and scientific progress pose controversial questions that require public attention. And they discover how institutions successfully – or unsuccessfully – govern innovation responsibly. Among the questions asked by the course are: What is "good" innovation? What is, and what should be, the role in innovation of science, businesses, government and other members of society? Can and should the innovation process be steered – and, if so, how and by whom? How do innovations shape societies? Who benefits from innovation, and who loses? How does innovation differ across national systems and diverse cultures? Over the course of the semester, students identify fundamental patterns and recurring tensions at the interface of innovation, society and public policy, and learn how to address them with confidence in their own research.

PRINCIPLE 4: RESEARCH

At TUM School of Management we conduct research with impact. Sustainability and sustainable development are central aspects and lie at the core of many research centers, scientific publications and research projects. All our doctoral students and researchers have to follow our code of conduct as well as good scientific practices and are invited to include sustainability to various extents in their research. Moreover, scholarships and fellowships offered by the School promote internationalization, gender equality and diversity as well as entrepreneurial and social initiatives. In addition, the School offers a grant to ensure flexibility and better life balance for doctoral students with families.

TUM-GS Internationalization Support

TUM School of Management supports international and intercultural cooperation in research and efforts to build global networks. Doctoral students can apply for a variety of funds set aside to support internationalization.

Initiative Grant

Employers are often looking for initiative, interdisciplinary cooperation and social skills among job applicants. TUM Graduate School promotes these skills through its new Initiative Grant, which provides financial support for organizing interdisciplinary workshops and similar events for doctoral students, as well as for initiatives and social projects organized by doctoral students.

The amount of support is geared toward the type of event, up to a maximum of EUR 2,000 per activity.

TUM-GS Diversity Supplement Travel Grant

The Diversity Supplement Travel Grant supports subject-specific stays abroad by doctoral students with family obligations or special health or other needs. It covers part of the travel expenses incurred by the family members (for example, children) of doctoral students who need to travel with them due to special circumstances. Doctoral students who face significant additional costs when traveling due to physical disabilities, special needs or other special circumstances can also apply.

Key Research Projects with an Emphasis on Sustainability and Sustainable Development

TUM School of Management incorporates sustainability in its key research projects to a varying extent. In this section we present key projects running in 2019/2020 which focus on sustainability and sustainable development. We describe the projects in the following order: first, projects related to sustainable ventures considering the organizational level, then projects related to sustainability management, and finally projects related to sustainable innovation, society and public policies.

RESEARCH PROJECT: DOES THE PLACE MAKE THE PEOPLE? THE ROLE OF LEADERSHIP AND WORK CLIMATE FOR MORAL AND PRO-SOCIAL SOCIALIZATION IN THE WORKPLACE



Funded by the German Research Foundation

Prof. Dr. Claudia Peus

(Grant recipient)

Dr. habil. Armin Pircher Verdorfer

(now: University of Amsterdam, formerly:
TUM; Grant recipient)

Dr. Martin Fladerer

Clarissa Zwarg, M.Sc.

Chair of Research and Science Management

Human moral and pro-social development does not end with adulthood. People constantly learn and adapt to their environment. One place where many people spend a significant share of their day is the organization for which they work. In this research project we investigate the role of the organizational context (for example, the leadership and work climate) in the moral and pro-social develop-

ment of its employees. Our research adopts a longitudinal cohort approach in which we follow organizational newcomers and veterans over a period of three years. We combine quantitative and qualitative research methods to obtain a comprehensive picture of developmental trajectories.



Picture: Prof. Dr. Claudia Peus at the opening event of the
TUM Institute for LifeLong Learning

INDUSTRY RESEARCH COOPERATION PROJECT: BUSINESS LEADERS SURVEY



In cooperation with Wertekommission Initiative Werte
Bewusste Führung e.V., funded by PricewaterhouseCoopers

Prof. Dr. Claudia Peus
Dr. Martin Fladerer
Dr. Ulf Steinberg
Chair of Research and Science Management

A detailed understanding of what values managers hold and how those values develop over time is a great starting point for responsible management education. To gather this data, we conduct an annual survey among German business leaders. This consists of an assessment of important values and in-depth analyses of contemporary topics related to ethical leadership. The discussion of this research project with our students in different modules highlights the value-based nature

of leadership and allows our students to understand that responsibility, sustainability and environmental concerns lie at the heart of the management discipline. Ultimately this project increases awareness among both our young students and our seasoned MBA-students that managerial degrees of freedom come with a responsibility to work towards sustainable development as outlined in the Sustainable Development Goals.



Picture: Prof. Dr. Claudia Peus at the opening event of the TUM Institute for LifeLong Learning

**WERTE
KOMMISSION**
INITIATIVE
WERTE BEWUSSTE
FÜHRUNG

FREEWALK: DEVELOPMENT OF ECONOMICALLY VIABLE AND SOCIALLY ACCEPTED FREE WALK CATTLE HOUSING SYSTEMS



Funding: European Commission's European Research Area NETwork on Sustainable Animal Production (ERA-NET SusAn) organization

Funding period: June 2017 – June 2020
Contact person: **Megan Waldrop, Ph.D.**
Further Information available at:
<http://www.freewalk.eu>

The FreeWalk project aims to develop and evaluate free walk cattle housing systems, which improve animal welfare, animal health, re-use waste products, ameliorate soil structure and have positive consumer acceptance. The project is a collaboration between eight universities and research institutes throughout Europe. The free walk systems that are assessed are the compost bedded pack barn and the artificial floor, using tie-stall and cubicle housing systems as points of comparison.



The project takes an integrative approach to assess case farms, taking into account the entire farm: bedding, artificial floor, animal welfare, animal health, manure quality, soil structure, CPN-balances and product quality. Societal acceptance of the housing systems is assessed at the national level. In order to integrate the results from each project component, systems analysis and economic evaluation is performed at farm, national and European levels.



WOMEN IN AGRICULTURE – LIVING AND WORKING SITUATION, SOCIAL SECURITY AND THE ROLE OF WOMEN IN AGRICULTURE



Funding: Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

Funding Period: April 2019 – December 2020
Contact person: **Andrea Dehoff, M.Sc.**

This project examines the living and working situation of women in agriculture, their social security position and the role of women in agriculture. Changing rural demography, ongoing agricultural restructuring combined with changes in the understanding of gender roles affects the lives of farm women. Based on a survey, the social and economic situation of women in agriculture in Bavaria are examined and compared across time using results from previous studies.



EVALUATION OF THE EU SCHOOL PROGRAM



Funding: Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

Funding period: April 2018 – July 2023

Contact person: **Dr. Rebekka Topp**

Further information:

https://ec.europa.eu/commission/news/eu-school-scheme-2018-sep-03_en



Applicable since August 2017, the EU school fruit, vegetables and milk scheme combines two previous schemes (the school fruit and vegetables scheme and the school milk scheme) under a single legal framework for more efficiency and an enhanced focus on health and education. The scheme supports the distribution of the aforementioned products to children from nursery (preschool) to secondary school, and is accompanied by educational and information measures. In Bavaria the accompanying measures are subsumed under the program "Voll in Form".

The aim of the school scheme is to increase awareness about the diversity of fruit, vegetables and milk products, to increase appreciation of them and to promote healthy eating habits among children. Our research project evaluates the implementation and sustainable effects of the EU school program and the effectiveness of the accompanying educational measures.



IMPLICATIONS OF ESG RISKS IN FINANCIAL REGULATION AND THEIR INFLUENCE ON FINANCIAL MARKET PRACTITIONERS



In collaboration with and funded by: FIRM e.V.
(Frankfurter Institut für Risikomanagement und Regulierung),
Frankfurt, Germany

Alexander Schult
Prof. Dr. Gunther Friedl
Prof. Dr. Sebastian Mueller (CFA)

Increasing environmental awareness and the possible effects of ESG risks have led to a variety of initiatives and measures on a national and supranational level, for example, various UN climate agreements and the EU's European Green Deal. The increasing importance of ESG risks in the future is also reflected by initiatives by various banking-regulation entities. Thus, the European Banking Authority (EBA) examines the risk weighting of sustainable/green assets, the German BaFin and the Bank of England publish statements on the (future) handling of sustainability risks, and the ECB works with national regulators on initiatives to take sustainability into account in banking supervision and stress tests. As a next step, new regulation on sustainability and ESG risks can reasonably be expected.

This joint research project with FIRM e.V. first identifies possible options for anchoring ESG risks as a risk driver instead of a new type of risk in the existing capital requirement regulation (CRR), and provides an overview of the current research on the empirical relationship between sustainability (ESG-compliance) and corporate financial performance (CFP). Second, we suggest how the long-term effects of climate-related, transitory risks could be integrated into the short to medium-term planning horizons of banks, by using a combination of stress tests and scenario analyses for selected use cases. One of those use cases could be, for example, estimating the increased risk for the automotive or aviation sector due to the introduction of a CO2 price and its impact on profitability, probability of default and credit rating.

SCALINGS – SCALING UP CO-CREATION: AVENUES AND LIMITS FOR INTEGRATING SOCIETY IN SCIENCE AND INNOVATION (EU HORIZON 2020)

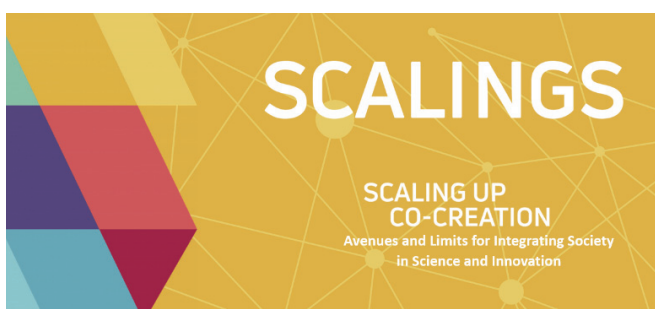


Funded by the European Union Horizon 2020 program
Prof. Dr. Sebastian Pfotenhauer

The EU Horizon 2020 project SCALINGS ("Scaling up Co-creation: Avenues and Limits for Integrating Society in Science and Innovation") is a EUR 4 million flagship initiative coordinated by Prof. Dr. Sebastian Pfotenhauer investigating the use of new collaborative innovation formats such as living labs and pre-commercial procurement in robotics, autonomous driving and urban energy systems across ten countries.

Through its multi-sited, embedded and comparative experimental research design, SCALINGS studies the unique implementations

and outcomes of three co-creation instruments: innovation procurement, living labs and co-creation facilities. The consortium focuses on two technology domains (robotics and urban energy systems) across ten partner countries. SCALINGS aims to strengthen opportunities for best-practice transfer and a socially robust upscaling of co-creation, while improving our understanding of how co-creation practices relate to the social, cultural, economic and institutional environments in which they are implemented. It is an interdisciplinary project that brings together social scientists, engineers, policymakers and industry partners from all over Europe.

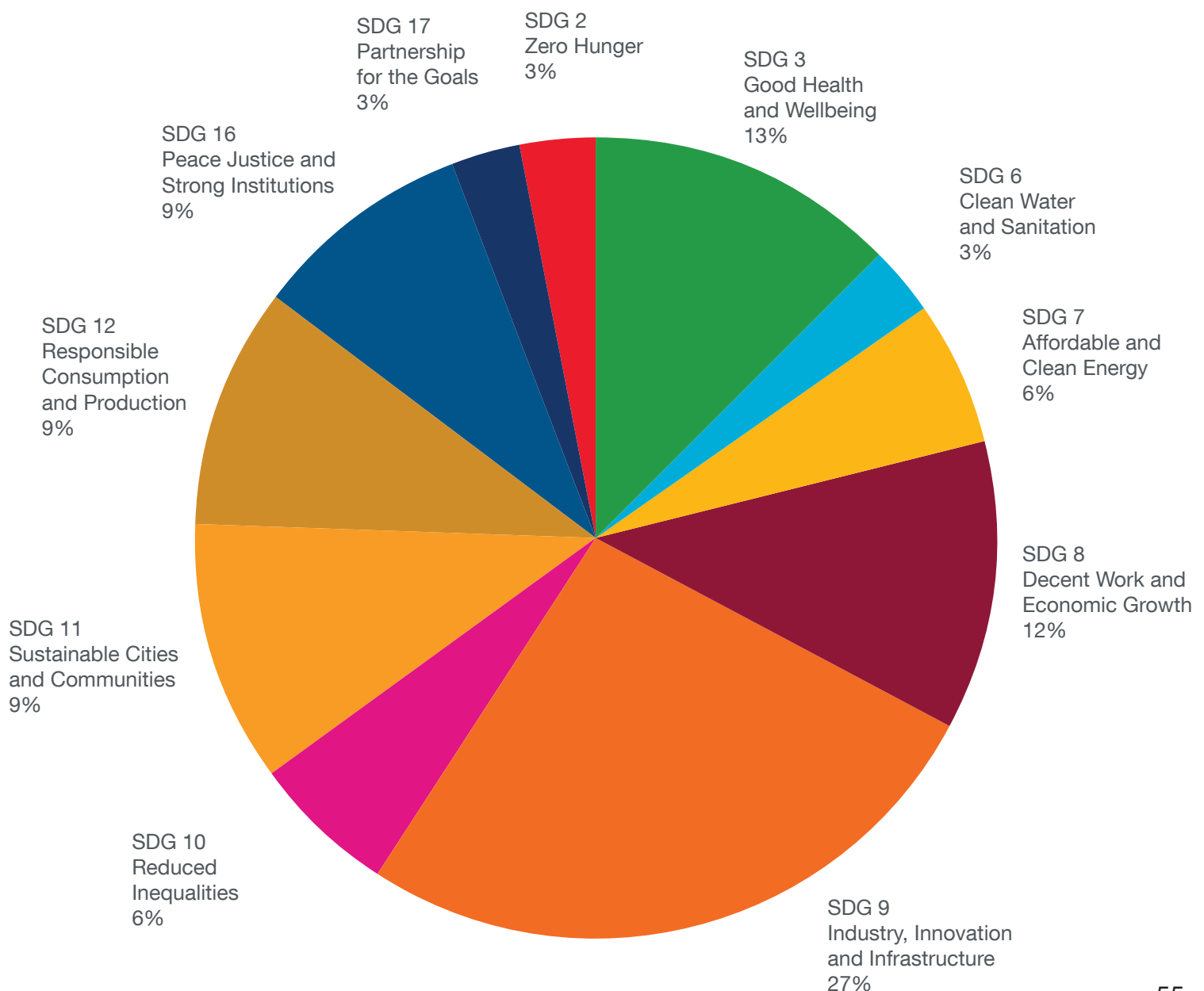


Picture: EU Horizon 2020 Project SCALINGS

SCALINGS is funded by the European Union's Horizon 2020 research and innovation program, within the "Science with and for Society" program. This specific program aims to build effective cooperation between science and society, to recruit new talent for science, and to pair scientific excellence with social awareness and responsibility.

KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

The graphic below illustrates the publication profile on SDG topics of TUM School of Management. The pie chart indicates the percentage of peer-reviewed articles related to each SDG published during 2019/2020. Below the chart, we give some key examples of publications focused on sustainability and sustainable development. First, we describe peer-reviewed articles related to sustainable business founders and ventures at the individual and organizational level. Next, we present key articles related to sustainability management. And finally, we describe key articles related to sustainable innovation, society and public policies.



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



Women entrepreneurs' progress in the venturing process: The impact of risk aversion and culture

Dr. Daniela Gimenez Jimenez
Prof. Dr. Linda F. Edelman
Prof. Dr. Alexandra Dawson
Prof. Dr. Andrea Calabro

Small Business Economics, 2020
DOI: <https://doi.org/10.1007/s11187-020-00435-8>

Researchers have observed that entrepreneurship is a gendered phenomenon and that cultural norms and practices play a role in creating those differences. However, few studies have explored the relationship between risk aversion and country-level culture using a gendered lens. Using an institutional lens, the authors investigate whether the relationship between risk aversion, national culture and progress in the venturing process differs between young female and male nascent entrepreneurs. To answer this question, the authors combined data from the 2004 Global Leadership and Organizational Behavior Effectiveness (GLOBE) survey with data from the 2013/2014 Global University Entrepreneurial Student Spirit Study (GUESSS), leading to a sample of 1,552 nascent student entrepreneurs from 11 countries. The findings indicate that there is a gender difference in the relationship between risk aversion and progress in the venturing process, even though the researchers did not hypothesize any gender differences. In addition, the findings show that socially supportive cultures would decrease the negative relationship between risk aversion

and progress in the venturing process for female nascent entrepreneurs, while they did not find a significant moderating relationship of performance-based culture between risk and progress in the venturing process for both female and male entrepreneurs. Overall, these findings provide a base for designing public policies for empowering and supporting young women entrepreneurs by designing public policies specific to their culture, helping reduce gender inequalities (SDG 5). For example, public policymakers in performance-based cultures (such as Germany and Switzerland), programs and incentives that provide female nascent entrepreneurs with help accessing resources may help moderate the risk of engaging in the new venture startup process. For public policymakers in socially supportive cultures (such as Italy and Spain), it is important to continue policies that support women's networking: Our findings make it clear that women's risk aversion is less in cultures that are rich in social capital. Our article also has implications for SDG 8 (decent work and economic growth) because it provides suggestions for supporting young female nascent entrepreneurs through their entrepreneurial journey. It suggests that young female nascent entrepreneurs in performance-based cultures seek out critical relationships to help offset the lack of a supportive environment. By contrast, for young female nascent entrepreneurs in socially supportive cultures, the support received from greater access to social capital and other resources can help to mitigate risk aversion, leading to greater progress in the venturing process.

KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



Shedding Light on Leaders' Self-interest: Theory and Measurement of Exploitative Leadership

Prof. Dr. Ellen Schmid
Prof. Dr. Armin Pircher Verdorfer
Prof. Dr. Claudia Peus

Journal of Management (2019), 45(4), 1401-1433
DOI: <https://doi.org/10.1177/0149206317707810>

The research project reported in this publication defines leader behaviors aimed at advancing the leader's self-interests as a separate class of unethical leader behaviors. Exploitative leader behaviors, such as passing an employee's work off as one's own, are not inherently harmful to employees but rather impede their development in the long run.

As such, they can be differentiated from leader behaviors that are harmful or abusive. The present research publication finally allows leadership researchers to do so in a meaningful way. Formerly, they only differentiated between leader behaviors that are either harmful to employees or the organization, without taking the negative consequences of exploitative behaviors for ethical work climates and sustainable personnel development into account.



Picture: Students of TUM School of Management

KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



Taming the emotional dog: Moral intuition and ethically-oriented leader development

Dr. Maxim Egorov
Prof. Dr. Armin Pircher Verdorfer
Prof. Dr. Claudia Peus

Journal of Business Ethics (2019), 160(3), 817-834
DOI: <https://doi.org/10.1007/s10551-018-3876-4>

The research reported in this publication provides a novel perspective on the question of what aspects leader development initiatives need to focus on to make leaders realize the moral dimension of leadership. As opposed to traditional views of moral judgment as an entirely rational endeavor, novel perspectives in research on morality highlight the influence of moral intuitions. In plain English, novel approaches to human morality focus on the first second after observing a moral transgression, where many observers report a flash of

emotion that may influence one's judgment of the situation. The present research applies this line of thinking to leader development and proposes a framework that highlights the importance of an awareness of one's own moral intuitions that may be fostered through instruction and targeted reflection exercises. Developing leaders in this regard, such as we do in our executive education programs, is an essential foundation of fostering ethical work cultures and sustainable behaviors by leaders and companies.



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



It Takes a Village to Sustain a Village: A Social Identity Perspective on Successful Community-Based Enterprise Creation

Dr. Christina Julia Hertel
Prof. Dr. Sophie Bacq
Prof. Dr. Frank-Martin Belz

Academy of Management Discoveries (2019), 5(4): 438-464
DOI: <https://journals.aom.org/doi/10.5465/amd.2018.0153>

Community-based enterprises (CBEs) have the potential to lead the way toward sustainable development – in line with the general principle of "thinking global and acting local". CBEs are collectively established, owned and controlled by the members of a local community, for which they aim to generate economic, social and/or ecological benefits. They address a broad range of problems facing many rural communities around the globe. To understand how and why CBEs successfully come into existence, we conducted an exploratory case

study of two community-based pubs founded in rural Bavaria, Germany, in the 2010s. Using abductive data analysis, we uncover several collective identity mechanisms that spur community mobilization and entrepreneurial action. Specifically, we find that, whereas an incumbent collective village identity lays the ground for successful CBE creation, an emergent enterprising community identity is critical to go beyond venture inception. Through identification with the entrepreneurial project, supporters develop a lasting commitment to it – reinforced over time through artifacts, rituals and celebrations – which further feeds and sustains its implementation. Our study paves the way for future research on entrepreneurship, collective action and identity in local communities.



Discoveries



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



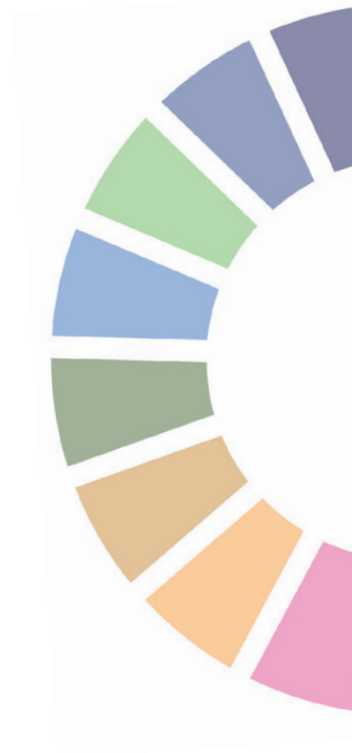
An organizational view on transport transitions involving new mobility concepts and changing customer behavior

Dr. Laura Lang
Prof. Dr. Alwine Mohnen

Environmental Innovation and Societal Transitions (2019), 31, 54-63
DOI: <https://doi.org/10.1016/j.eist.2019.01.005>

The integration of electric, shared and autonomous vehicles is one of the greatest societal challenges of our century. It can be assumed that, in the next few years, electric mobility will become an inherent part of a sustainable mobility sector and people's everyday life in urban societies, not only due to climate change and stricter regulations in cities but due to further technological advance and widespread awareness. Innovative concepts of future transportation will shape new forms of mobility and ultimately the future of the entire automotive industry. This study addresses the ongoing shift in values and individual customer demand that has to be met by the introduction of innovative concepts for the future of transportation. Its qualitative approach is based on the

use of semi-structured interviews with representatives from a traditional car manufacturer. By investigating the expectations and actions from an organizational perspective, it finds important predictions concerning the inevitable changes in customer behavior and organizational strategy. The integration of electric and shared vehicles with autonomous driving functions may be the ultimate and financial profitable solution for not only counteracting the increasing problems of urban transportation but also satisfying more sophisticated customer requirements in future mobility.



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



**Governments as partners:
The role of alliances in U.S. cleantech startup innovation**

Prof. Dr. Claudia Doblinger
Prof. Dr. Kavita Surana
Prof. Dr. Laura Diaz Anadon

Research Policy (2019), 48(6), 1458–1475
DOI: <https://doi.org/10.1016/j.respol.2019.02.006>

This study emphasizes the importance of direct startup/government interactions for accelerating innovation in clean energy technologies – a policy priority for governments around the world aiming to mitigate climate change and provide affordable energy. Empirical evidence from 657 US climate-tech startups suggests that direct technology and licensing collaborations between startups and government partners, such as the US National Renewable Energy Laboratory (NREL), enhanced startup patenting and follow-on financing more than comparable collaborations with private firms or universities.



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



ARPA-E Encourages Innovation in Clean Energy Startups but Funding Gap May Remain

Dr. Anna Goldstein
Prof. Dr. Claudia Doblinger
Prof. Dr. Erin Baker
Prof. Dr. Laura Diaz Anadon

Nature Energy (2020), 5(10), 803–810
DOI: <https://doi.org/10.1038/s41560-020-00683-8>

Although the potential benefits of public spending in clean energy technologies are high, the most effective ways for governments to stimulate innovation and improve the cost and performance of clean technologies remain uncertain. This study explores the impact of the US Advanced Research Projects Agency – Energy (ARPA-E), which operates a high-risk, high-reward funding style that has been associated elsewhere with well-known successes in defense. Findings from comparisons of 25 climate-tech startups funded by ARPA-E in 2010 with rejected ARPA-E applicants, startups funded by a related government program and

other comparable climate-tech startups show that ARPA-E awardees filed patents at twice the rate of similar firms. However, while ARPA-E awardees performed better than rejected applicants in terms of post-award business success, there were no significant differences compared to other cleantech startups. Hence, the high-risk, high-reward funding model has succeeded in advancing energy technology, but more is needed to help these innovative firms "cross the valley of death" and bring new cleantech products to market.



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



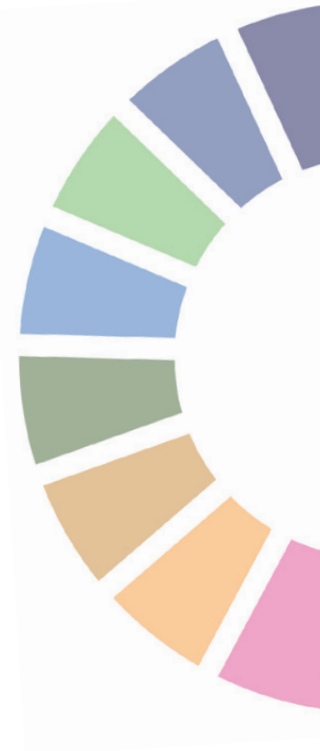
Technology Complexity Affects the Emergence and Evolution of Wind Industry Manufacturing Locations along Global Value Chains

Prof. Dr. Kavita Surana
Prof. Dr. Claudia Doblinger
Prof. Dr. Laura Diaz Anadon
Prof. Dr. Nathan Hultman

Nature Energy (2020), 5(10), 811–821
DOI: <https://doi.org/10.1038/s41560-020-00685-6>

Wind energy can contribute to national climate, energy and economic goals by expanding clean energy and supporting economies through new manufacturing industries. However, the mechanisms for achieving these interlinked goals are not well understood. This study examines the relationship between characteristics of wind turbine technology and the manufacturing location for various components of the turbine – from high-complexity components, such as blades and gearboxes, to low-complexity components, such as towers and generators. Empirical evidence from

389 global component supplier firms (2006–16) that work with 13 original equipment manufacturers suggests that what gets manufactured and where it gets manufactured depends largely on the complexity of the turbine component and the knowledge required to manufacture that component. These findings show the importance of understanding technologies along with firms and countries within global value chains for achieving national climate, energy and economic goals.



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



Renewable Auctions: Bidding for Real Options

David Matthäus
Prof. Dr. Sebastian Schwenen
Prof. Dr. David Wozabal

European Journal of Operational Research (2020), in press.
DOI: <http://dx.doi.org/10.2139/ssrn.3441339>

Procurement auctions for renewable energy support have become a standard policy instrument to stimulate investment in clean energy. It is essential for bidders in these auctions to value the different options they have with a winning bid. One way is to simply calculate the assumed net present value of a project: the present value of the cash-flow that comes with your winning bid, that is, the awarded subsidy level, net of construction costs for the renewable plant. Another option is to recognize the value of defaulting on the awarded project and hence not building the promised plant. In this article we combine auction theory and real options theory to model bidders who view the right to build subsidized renewable capacity as a real option. Using asymptotic theory for multi-unit auctions, we derive optimal bidding strategies and analyze how auction design and bidder characteristics impact

equilibrium bids, award prices and realization rates. In particular, we show that bidders who value the flexibility of non-realization higher bid more aggressively and exhibit lower realization rates. We analyze the determinants of these effects and illustrate how auction design can trade-off procurement cost and realization rates by adjusting pre-qualification payments and the grace period for construction. Finally, we test our results on data from two real-world auctions in the UK and Germany and show that our model explains auction outcomes and observed realization rates. Our results show that regulators need to take bidders' real options into account when designing auctions for renewable energy support, as otherwise policy-makers will not be able to effectively achieve climate goals.

KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



The Xinjiang Case and Its Implications from a Business Ethics Perspective

Alexander Kriebitz
Raphael Max

Human Rights Review (2020), 21, 243–265
DOI: <https://doi.org/10.1007/s12142-020-00591-0>

The discourse on economic integration with authoritarian regimes has evolved as a key topic across the various disciplines of social sciences. Are sanctions and boycotts effective methods for incentivizing human rights improvements? Our study focuses on the situation in China's Xinjiang province from 2010 to 2019. We discuss the relevance of human rights as an ethical norm within business ethics and international law. Scrutinizing the

interests of key players in the region, including the Central Government of the People's Republic of China, Xinjiang's local government and enterprises involved in the region, we discuss the economic and political measures by the Western community needed to improve the human rights situation in Xinjiang.



Picture: Xinjiang

KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



Artificial Intelligence and Human Rights: A Business Ethical Assessment

Alexander Kriebitz
Prof. Dr. Christoph Lütge

Business and Human Rights Journal (2020), 5(1), 84-104
DOI: <https://doi.org/10.1017/bhj.2019.28>

Artificial intelligence (AI) has evolved as a disruptive technology, impacting a wide range of human rights-related issues ranging from discrimination to supply chain due diligence. Given the increasing human rights obligations of companies and the intensifying discourse on AI and human rights, we shed light on the responsibilities of corporate actors in terms of human rights standards in the context of developing and using AI. What implications do

human rights obligations have for companies developing and using AI? In our article we discuss first whether AI inherently conflicts with human rights and human autonomy. Next, we discuss how AI might be linked to the beneficence criterion of AI ethics and how AI might be applied in human rights-related areas. Finally, we elaborate on individual aspects of what it means to conform to human rights, addressing AI-specific problem areas.



KEY SCIENTIFIC PUBLICATIONS WITH AN EMPHASIS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT



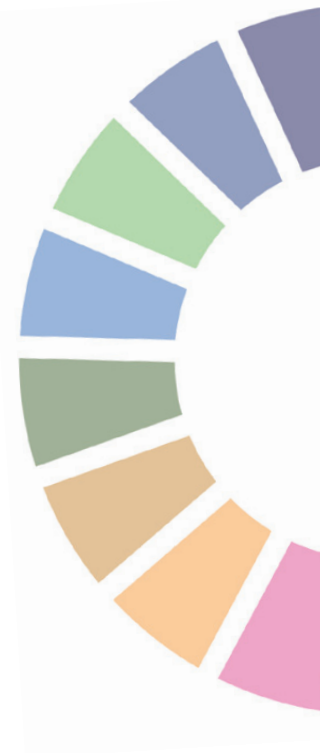
**Programming away human rights and responsibilities?
The Moral Machine Experiment and the need for a more
"humane" future for AVs**

Prof. Dr. Mrinalini Kochupillai
Prof. Dr. Christoph Lütge
Franziska Poszler

Nanoethics, (2020), 14, 285–299
DOI: <https://doi.org/10.1007/s11569-020-00374-4>

Dilemmas involving the choice of which human life to save in the case of unavoidable accidents are expected to arise only rarely in the context of autonomous vehicles (AVs). Nonetheless, the scientific community has devoted significant attention to finding appropriate and (socially) acceptable automated decisions in the event that AVs or drivers of AVs do indeed face such situations. Awad and colleagues (2018), in their now famous paper "The Moral Machine Experiment", used a "multilingual online 'serious game' for collecting large-scale data on how citizens would want AVs to solve moral dilemmas in the context of unavoidable accidents." Awad and colleagues undoubtedly collected an impressive and philosophically useful dataset of armchair intuitions.

However, their expectation and intent that the findings based on an analysis of this dataset can "contribute to developing global, socially acceptable principles for machine learning" if implemented or accepted by policymakers would violate basic tenets of human rights law and fundamental principles of human dignity (for example, disregard of equal right to life, discrimination). To make its arguments, our paper cites principles of tort law, relevant case law, provisions from the Universal Declaration of Human Rights and rules from the German Ethics Code for Autonomous and Connected Driving. In this way, we aim to demonstrate important ethical and legal concerns that need to be considered when striving to develop AVs responsibly.



PRINCIPLE 5: PARTNERSHIP

To achieve the Sustainable Development Goals, TUM School of Management actively engages with stakeholders and builds partnerships with communities, businesses and governments. These institutional networks allow the School to join forces with different stakeholders in achieving a more sustainable future. Thanks to our internationally renowned entrepreneurship group, we are able to gather ideas and put them into practice by creating new companies. Many of the individuals founding these startups combine their knowledge of management and technology with ideas for a more sustainable future.

Below, we present two examples of sustainable startups with roots in our network.



AQON PURE

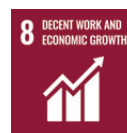


Division: Water and Sanitation

Founder: Maximilian Wilk (TUM SoM)
& Konstantin Wilk

Number of employees: 2-10 employees

AQON Pure reduces lime deposits on surfaces in contact with water thanks to its innovative limescale protection technology. AQON Pure can be installed at the domestic water connection of a building with minimal effort. In particular, this protects components of the drinking water installation as well as downstream products from premature ageing due to limescale. The special feature: The valuable minerals calcium and magnesium are retained in the water. Regular refilling of salt or renewal of limescale protection granules or filter cartridges are not necessary with AQON Pure.



SOCIAL-BEE



Division: Integration Service

Founder: Zarah Bruhn (TUM SoM)

Number of employees: Appraox. 17

Social-Bee is Germany's first integration service provider. It aims to integrate refugees and migrants into the labor market and society in general. As a non-profit limited company, it reinvents the model of temporary employment in a social way. Social-Bee employs disadvantaged people itself then passes them on to companies. All income generated is used for the support and further training of disadvantaged people and to take them over after 1.5 years at the most. At Social-Bee, every life matters. With every job, the service creates perspectives and promotes a colorful society.

PROJECT STUDY IMPROVES THE HUMANITARIAN SUPPLY CHAIN OF "SHADES OF LOVE"

Prof. Dr. Rainer Kolisch

Chair of Operations Management

In collaboration with Shades of Love,

<https://www.shadesoflove.org/project>



The three Technology and Management students Anne-Sophie Häusler, Marie Kurschewitz and Alexander Schörken completed their Project Studies module at Shades of Love.

Shades of Love is the world's leading non-profit organization for eyesight protection. It collects new and used sunglasses and distributes them in remote high-mountain regions

such as the Himalayas and Andes, helping the people in these regions avoid the eye diseases caused by ultraviolet radiation. The three students analyzed and reorganized the supply chain so that sunglasses could be delivered in a timely manner and at minimum cost. Their work made a valuable contribution to the inhabitants of high mountain regions.

PROJECT STUDY: CO2 REDUCTION FOR B2C CLIENTS – OLIVER WYMAN

Prof. Dr. Gunther Friedl

Chair of Management Accounting

In collaboration with Oliver Wyman



Oliver Wyman is one of the world's leading management consulting firms. With offices in more than 50 cities across 26 countries, the company combines deep industry knowledge with expertise in strategy, operations, risk management and organizational transformation.

Within the scope of this project, students have the chance to expand their knowledge and expertise on clean energy, assessing different customer groups with regards to CO2 neutrality. The focus is on criteria such as age, education, living situation and attitude towards CO2. Based on the data they gather, the students involved in the project then develop approaches for presenting relevant energy suppliers to customers.

PROJECT STUDY: HOW DO TECHNOLOGY COSTS IN THE FIELD OF RENEWABLE GENERATION DEVELOP OVER TIME?



Center of Energy Markets

Technologies enabling renewable energy development such as PV, wind turbines, electricity storage and power-to-gas have seen a rapid cost depression over the last decade. In terms of policymaking, enabling rapid cost depression is an important measure fostering the transition towards a completely renewable energy sector.

To support this transition with concrete measures, the Center of Energy Markets launched a project in 2020 aimed at investigating how various support mechanisms for renewable energy influence the costs of such technologies, and in particular their development over time. Answering this question involves the following steps:

- Analyze the cost depression of different technologies and areas
- Relate these to each other
- Perform a quantitative analysis of the "spillover effects" (for example, how do the costs in Region A influence the costs in Region B, or how do the costs for Technology A influence the costs for Technology B)
- Carry out a qualitative analysis of support mechanisms for renewable energy and how they are connected to costs



PROJECT STUDY: SUSTAINABLE BUSINESS MODELS OF MINI GRID DEVELOPERS IN SSA



Prof. Dr. Frank-Martin Belz
Chair of Corporate Sustainability
In collaboration with **Africa GreenTec**



Affordable, clean electricity for all by 2030 is one of the main Sustainable Development Goals formulated by the United Nations (SDG 7). Today, one billion people still live without access to electricity, about 60 per cent of them in Sub-Saharan Africa (SSA). Latest-generation mini grids (PV, batteries and smart metering) provide a sustainable, profitable and scalable solution to reach the tar-

get of universal electrification in rural areas. The World Bank (2019) estimates the annual profit potential for the mini grid market to be around USD 3.3 billion within the next ten years. Consequently, there are a number of mini grid developers in SSA with different approaches aiming to realize this great potential. The main task of this project is to identify five key mini grid developers in SSA and analyze their sustainable business models.



PRINCIPLE 6: DIALOGUE

At TUM School of Management we foster dialogue on PRME-related topics across departments and disciplines, as well as externally. We inform the public about our latest research in the areas of sustainability and sustainable development. We also partner with sustainable ventures through conferences and lecture series, such as the "Munich Lecture on Business Ethics", and online workshops, such as "Sustainable Company: Sustainability and Supply Chain" and "Home Stay Event: Corona Success Stories". We support initiatives tackling the grand societal challenges, for example, through the Global Outreach (GO) Green Belt, the Social Impact Award, and the Heureka Student Award. We encourage student organizations such as 180 DC Munich and Enactus Munich. Below, we provide a brief description of each of these initiatives.

Lecture Series & Online Workshops

Sustainable Company: Sustainability and Supply Chain Infineon. Make life easier, safer and greener

Online workshop : <https://www.infineon.com/>

Infineon's mission is to make life easier, safer and greener. But how is Infineon bringing this mission to life?

In this workshop, the key speakers from the sustainable company Infineon analyzed how Infineon is integrating sustainability into its supply chain and how this gives rise to competitive advantages. They also discussed how they learn from their competitors, while managing the balance between people, planet and profit.

The Munich Lecture in Business Ethics

The Munich Lecture in Business Ethics is an annual lecture series jointly held by the Chair of Business Ethics and the Chair of Economics, Finance and Industrial Economics. The lecture series features discussions about current topics relating to business ethics and attracts a broad audience from TUM and beyond. Professor Christian List of the London School of Economics participated in the annual lecture in 2019.

Home Stay Event: Corona Success Stories

Online workshop

The theme of the online workshop – a relaxed, evening event – was corona success stories. Five sustainable startups participated. The virtual format guaranteed security and flexible access for everyone involved.



The sustainable startups involved were:

AQON Pure (Maximilian Wilk)
Hello Better (Hannes Klöpfer & Dr. Hanne Horvath)
KINEXON (Dr. Alexander Hüttenbrink)
Streavent (Lysander Homm)
TeleClinic (Katharina Jünger)

INITIATIVE FOR SUSTAINABILITY

Global Outreach Green Belt (GOGB)

The goal of the Global Outreach Green Belt (GOGB) program is to allow motivated learners to become qualified Lean Six Sigma practitioners through a fully coached project free of charge, ultimately benefiting the community and the environment. The program was launched in 2019. In 2019/2020, the GOGB Award was won by Mr. Tony Raju from Kerala State in India for his project at a government-funded rural hospital, where improvement areas ranged from reducing patient waiting times to improving availability of key medicines. The application pool for the 2020/2021 GOGB Award was very diverse, with projects from Africa, the Middle East, the Americas and Europe, covering such diverse topics as community waste disposal, health-care, vehicle emissions, public transportation, energy management systems and education. The TUM GO-GB Selection Committee chose four finalists whose projects met the mission of the TUM GO-GB Award:

- David Olamide Awe (Nigeria), in the area of waste management, to reduce the environmental impact of residential solid wastes in Nigeria
- Jemma Hale (Netherlands), in the area of education, to improve the coaching of corona coachees supporting affected people in their careers
- Gabriella Nxumalo (South Africa), in the area of education, to improve training programs run by mining companies for local host communities in South Africa
- Ayushi Sharma (India), in the area of public health and waste management, to improve the disposal system for harmful and unhygienic waste for a hospital in India

The ultimate winner of the GOGB *2020/2021 Award* was David Olamide Awe for his project in Nigeria.



SOCIAL IMPACT AWARD

The Social Impact award was created in 2017 to honor and highlight innovative projects in the area of social business and social entrepreneurship. All students and graduates of TUM School of Management can apply, submitting a project or their Master's or Bachelor's thesis addressing a social problem and offering an innovative solution. To demonstrate the social impact of their proposal, they should describe its value for their target group and

society in general. The winning team receives a cash award of EUR 2,000, sponsored by the School's alumni organization. To ensure maximal visibility, the award ceremony takes place during the faculty graduation ceremony. The winning project in 2019 was Curafa (2019), a project with Merck KGaA to build affordable healthcare units in disadvantaged regions in the world.



Pictures : Social impact award / Curafa

HEUREKA STUDENT AWARD 2019

The Heureka Foundation recognizes outstanding Master's theses dealing with mobility combined with environmental aspects and optimization methods. The Heureka Student Award 2019 was won by Pia Ammann, a PhD student working under the Chair of Operations Management.


In her thesis, Pia developed an efficient and competitive adaptive large neighborhood search for a highly constrained vehicle routing and scheduling problem arising in the charter bus industry. (<http://stiftung-heureka.de/2020/02/12/die-preistraeger-des-heureka-student-awards-2019-stehen-fest/>)

STUDENTS ORGANIZATIONS WITH A FOCUS ON SUSTAINABILITY

180DC Munich

180DC brings together the skills of students and the needs of non-profit organizations and social entrepreneurs. The Munich branch (www.180dcmunich.org) was founded in 2015 and now has over 180 members. In 2019 it was named the World's Most Innovative Branch, reflecting its strong development over recent years.

As the first student initiative of the city, 180DC Munich offers students the opportunity to become socially involved, apply their university knowledge in practice and gain an initial insight into possible future professional fields. The initiative thus represents an important complement to university teaching and offers organizations an opportunity to achieve the UN Sustainable Development Goals.



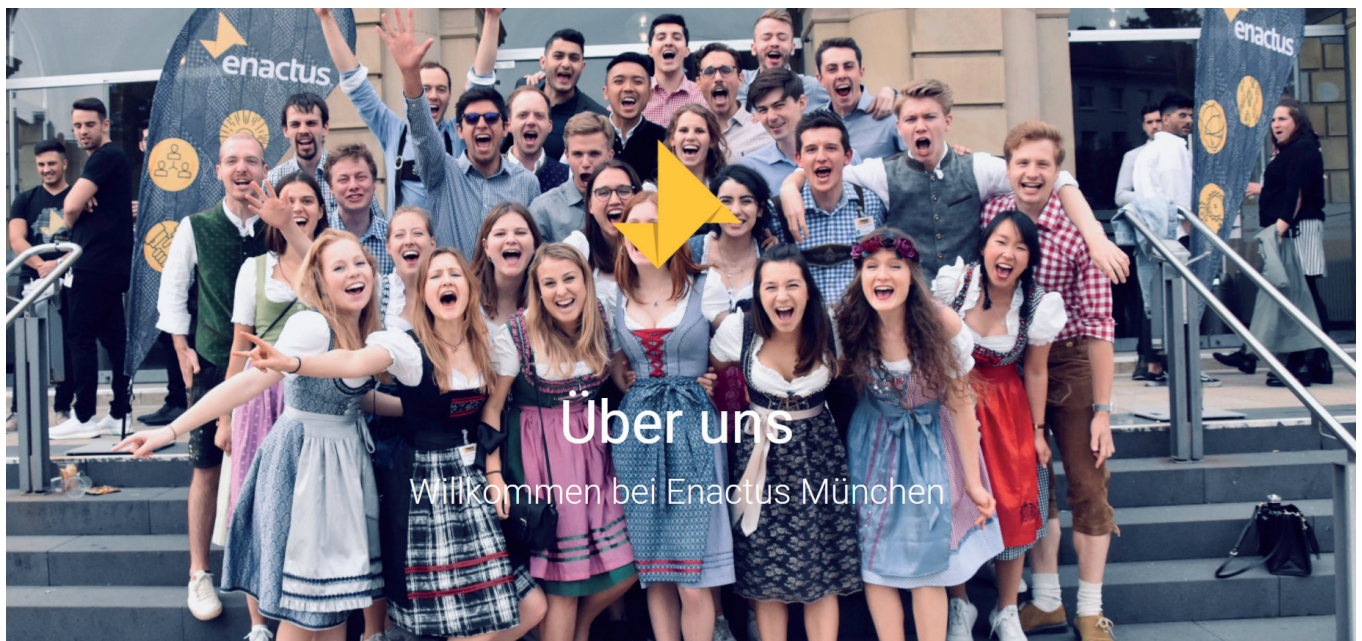
Are you open-minded,
ambitious and original?

JOIN 180DC!

ENACTUS MUNICH

Students at TUM School of Management actively participate in Enactus, a global entrepreneurship initiative and student organization that aims to improve the living conditions of people worldwide through entrepreneurial projects. Enactus is made up of a worldwide network of universities, companies and students where students can take responsibility, apply their university knowledge in practice

and really make a difference. TUM School of Management welcomes and supports Enactus Munich, in particular through the engagement of the Entrepreneurship Research Institute and Prof. Dr. Patzelt, who sits on the local board of Enactus.



Picture: Enactus

KEY FEATURE: GENDER EQUALITY



TUM School of Management has taken a number of steps aimed at achieving gender equality. First, the School's Equal Opportunity Commission involved two committees that target faculty members and female junior academics at the doctorate and postdoctoral/Habilitation levels.

The Equal Opportunity, Women and Diversity Committee of TUM School of Management is headed by Prof. Dr. Nicola Breugst and has 11 further members. Its aim is to implement the **TUM Diversity Code of Conduct**.

Specifically, its role is:

- 1) To participate and vote in School Council meetings
- 2) To sit on the Appointments Committee
- 3) To be the point of contact for female students and academics, where this role is not performed by the Women's Office of the Technical University of Munich
- 4) To write an annual report on the position of women at the School
- 5) To help draw up a diversity agreement and goals

KEY FEATURE: COVID-19 SUCCESS STORIES



TUM School of Management also collaborated with various startups who developed solutions for tackling the challenges posed by COVID-19. One example was TeleClinic, a startup offering the possibility of digital doctor's appointments, online prescription ordering and sick leave via an app. Another was CleverAckern, a platform supporting the livelihood of farmers, who faced a shortage of harvest workers during the Corona crisis. Yet another example was Bring&Rings, who helped develop a practical solution for providing neighborhood help during the pandemic.

In 2020, like other business schools, TUM School of Management faced a new situation of great uncertainty and severe consequences for us all: COVID-19. We saw COVID-19 as a challenge. Nevertheless, we tried hard to turn it into an opportunity for digitization, internationalization and inclusion, according to the tenets of the sustainable development. For example, our international summer school "Sustainable Entrepreneurship", which usually takes place at the School's main campus in Munich, was moved online rather than canceled, and we provided ten scholarships for students from the Global South. Ultimately, 25 students from 15 different countries participated in the interactive seminar, meeting sustainable company founders and working together to develop sustainable business models.

Below, we highlight these and other COVID-19 "success stories", beginning with the International Summer School and then moving on to some examples of collaborations between the School and startups.



INTERNATIONAL SUMMER SCHOOL 2020

"SUSTAINABLE ENTREPRENEURSHIP: THEORY AND PRACTICE" – INTERACTIVE ONLINE SEMINAR



Prof. Dr. Frank-Martin Belz
Esther Salvi

Chair of Corporate Sustainability

The International Summer School 2020 "Sustainable Entrepreneurship: Theory and Practice" is a great example of how TUM School of Management turned the problem of reduced mobility during the corona pandemic into an entrepreneurial opportunity, successfully adapting face-to-face classes to an online learning environment. Some 25 students from 15 different countries, from both the Global North and South, took part into the online program. They studied the principles of sustainable entrepreneurship, with its combination of economic, social and environmental dimensions. Through interaction with the founders of sustainable companies working in the fields of energy, food and health, combined with lectures from outstanding academics and interac-

tion with like-minded students from all over the world, participants learned how to tackle the grand societal challenges and become change-makers. In teams, they developed five sustainable businesses, which they then pitched at a final online presentation: GrownHealthya, Firefly, Fish and Ship, Soap Drop, and The Essential Venture.

The International Summer School 2020 is an example of an international and inclusive program that targeted students not only from the Global North but also from the Global South. We achieved this thanks to our collaboration with the TUM SEED Center (www.seed.tum.de), which awarded ten scholarships to students from Ethiopia, Indonesia, Kenya, Namibia, Peru and Uganda.



"I am glad to have been part of the International Summer School 2020. With lectures from professors and founders of sustainable business enterprises, I have learned how to conceive, develop, and implement business ideas using the Sustainable Business Model Canvas which I highly recommend startup businesses to adopt. I am going to use the knowledge to start up a sustainable enterprise in low-income economies and train people in sustainable living. Thank you so much TUM School of Management for this remarkable experience!"

Bridget Nakangu International Summer School 2020 Student from Uganda

TUM SOM & STARTUPS TOGETHER AGAINST COVID-19



TeleClinic



Area: Healthcare

Founder: Katharina Jünger (CDTM)

Number of employees: 60

TeleClinic offers users the possibility of digital doctor's appointments, online prescription ordering and sick leave via an app operated from home. The costs for doctor's visits are covered by the statutory health insurance from Monday-Saturday 7 a.m. to 7 p.m.; in the case of privately insured persons, invoices are issued.

Development in Corona times:

Massive growth due to the corona crisis. A clear COVID-19 success story and forerunner of the digital transformation.

HelloBetter



Area: Telemedicine /
Online Psychotherapy

Founders: Philip Ihde (TUM SoM),
Hannes Klöpper,
Prof. Dr. David Ebert,
Dr. Hanne Horvath
& Dr. Elena Heber

Number of employees: Approx. 40

Scientifically proven online psychological training and online psychotherapy with the assistance of psychologists and psychotherapists. Help with depression, stress, anxiety, panic and other psychological complaints. Soon also available on prescription, thanks to the Digital Supply Act.

Development in Corona times:

The telemedicine startup profits from the fear of corona. Psychotherapy via video telephony is booming.

Development of corona training, including the possibility of using a corona hotline.

TUM SOM & STARTUPS TOGETHER AGAINST COVID-19



Kinexon



Area: Connectivity, Intelligence and Automation

Founder: Dr Alexander Hüttenbrink (TUM),
Dr Oliver Trinchera (TUM),
Dr Maximilian Schmidt (TUM SoM),
Mehdi Bentanfous,
Nikolai von Loeper

Number of employees: Approx 70

The world's most advanced full-stack solution for real-time connectivity, intelligence and automation.

Industrial sector: A Smart Factory & Industrial 4.0 Real-time Localization System (RTLS) intelligently networks and controls the shop floor. Creates transparency about the optimization and automation potentials of processes
Sports sector: Real-time data collection and analysis of performance and tactics data for team sports. The first intelligent playing field infrastructure.

Development in Corona times:

Growth and development of the KINEXON SafeZone solution for companies to ensure hygiene measures within their premises.

Sustainable protection of work processes in the event of COVID-19 infection.



Hawa Dawa



Area: Air Quality

Founder: Karim Tarraf (TUM SoM)

Number of employees: Approx. 16

Air pollution is combated sustainably by analyzing and evaluating air quality using artificial intelligence.

The aim is to establish environmental data as an important aspect of our decision-making and to provide clean air for cities, businesses and citizens. Hawa Dawa makes the invisible visible. With its data, the company provides the first link in a new digital knowledge network for resistant and climate-neutral cities and future-oriented companies.

(Topics: Smart city, smart health, traffic management.)

Development in Corona times:

Establishment and foundation of the start-up in corona times

Clear Corona winner & opportunity user

TUM SOM & STARTUPS TOGETHER AGAINST COVID-19



Clever Ackern



Clever Ackern

Area: Agriculture

Founders: Fabian Hoehne (TUM SoM)
& Frederic Lapatschek
(TUM SoM)

Number of employees: 3
& many socially committed

Platform to support and sustain the livelihood of farmers who faced a shortage of harvest workers during the Corona crisis. Association of potential harvest workers and farmers.

Development in Corona times:

Much encouragement and positive feedback for the introduction of this platform. Due to strong growth after establishment during the corona crisis, takeover of "Das Land Hilft-Initiative".



Bring&Ring



Bring&Ring

Area: Society

Founder: Zarah Bruhn

Number of employees: Approx. 4

Bring&Ring brings helpers and those seeking help together, especially in times of COVID-19, facilitating communication of shopping lists and securing payments for purchases. Every possibility to reduce personal contact helps us all through the crisis faster. Bring&Ring complements existing networks and enables contactless shopping for risk groups, covering the entire organization and handling of ordering processes. On the one hand, Bring&Ring is a Web app; on the other, it is a community and solidarity campaign, enabling people to be there for each other and safely fight the coronavirus. Bring&Ring calls volunteers ("bringers") who go shopping or visit a pharmacy on behalf of those who currently cannot leave their homes ("ringers").

Development in Corona times:

Development of a practical solution for neighborhood help during corona times.

ACHIEVEMENTS & COMMITMENTS

	Achievements 2019/2020	Commitments 2021/2022
Taskforce	We established the first PRME Office	<ul style="list-style-type: none"> The PRME Office will: Be enlarged, including at least one colleague from each campus and students Qualitatively and quantitatively assess the focus on sustainability & SDGs in our teaching and research activities Define a core strategy and specific objectives for enhancing the sustainable impact of our institution
Principle 1: Purpose	We reinforced our purpose and commitment to society, responsible management education and outreach, and started tracking information on PRME-related activities (e.g. through Assurance of Learning)	We will keep embedding PRME principles into our institutional strategy and improving methods of collecting and tracking information on PRME-related activities
Principle 2: Values	We were able to grow our commitment to sustainability, working on the Sustainable Development Goals. In 2020 we developed a code of conduct as a guideline to ensure a respectful and enjoyable environment at TUM School of Management	In the next two years, we will develop a coherent overarching sustainability strategy and thereby deepen our commitment to the core values of PRME
Principle 3: Method	We increased the focus on sustainability and sustainable development in our teaching modules. We also started assessing how our modules relate to sustainability and the Sustainable Development Goals in a qualitative way. A student team started developing a tool for assessing the sustainability of all teaching modules in the Master and Bachelor Programs in Management and Technology	One of our main objectives for 2021/2022 is to assess sustainability-related content in all our teaching modules, both qualitatively and quantitatively, and to develop specific strategies to enhance the focus on sustainability in all our modules

ACHIEVEMENTS & COMMITMENTS


	Achievements 2019/2020	Commitments 2021/2022
Principle 4: Research	We started assessing how our research relates to sustainability and sustainable development in a qualitative way	In 2021/2022 we plan to assess how our research relates to sustainability and sustainable development in both a qualitative and a quantitative way. Moreover, we will develop a specific strategy to enhance the focus on sustainability in our main research areas
Principle 5: Partnership	We entered new partnerships and collaborations with sustainable startups and universities around the world in order to tackle the grand societal challenges. One example is the new SEED Center, involving eight partner universities from the Global South and aiming at contributing to Sustainable Development Goal 7, i.e. clean and affordable energies for all by 2030	We will continue enlarging our existing networks and build new ones tackling the grand societal challenges and PRME-related topics
Principle 6: Dialogue	We constantly inform the public about our latest research in the areas of sustainability and sustainable development through conferences and lecture series, e.g. the Munich Lecture in Business Ethics	We plan to further foster dialogue on PRME-related topics across the School. For example, by: initiating Project Studies for the assessment of the sustainability of our research activities and teaching modules; opening forums; and enhancing information exchange between different departments and centers

APPENDIX: COMPLETE LIST OF COURSES RELATED TO SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

- AR30295 Project Urban Landscape
- BV550017 Sustainable Real Estate Development
- IN4200 Design Thinking for Business Innovation 1 / IN4891 Design Thinking for Business Innovation 2
- WI000946 Energy Markets 1 / WI001125 Energy Markets 2
- WI001223 Challenges in Energy Markets
- ED0027 History of Consumption Goods
- WI001165 Sustainable Entrepreneurship – Getting Started
- WIB14002 AS Life Sciences & Management: Sustainable Entrepreneurship – Theoretical Foundations
- WI001179 AS Consumers, Technology & Sustainability
- WI000926 International Environmental Governance and Conflict Management
- WIV02001 AS Economics & Policy: Environmental Economics
- POL61404 Analyzing the Coronavirus Pandemic in Real Time
- POL62400 Environment and Climate Transformation
- WI001211 Understanding Regional Innovation Cultures
- WIB04001 AS Finance & Accounting: Globalization and Digitization as a Challenge
- WIB23002 AS Finance & Accounting: Sustainability Management in Corporations
- WI001206 Modeling Future Mobility Systems
- WIB22001 Sustainable Supply Chain Management
- WI001147 Exploring Society through Future Technologies
- WI001171 Food, Science, Culture: The Contested Terrain of Sustenance
- WI001194 Who is responsible for food and health? Social and cultural perspective on food, health, and technology
- WIB14002 Advanced Seminar Life Sciences & Management: Sustainable Entrepreneurship – Theoretical Foundations
- WIB26001 Advanced Topics in Innovation & Entrepreneurship: Social Entrepreneurship Lab



- WIB23002 Advanced Seminar Finance & Accounting: Sustainability Management in Corporations
- WIB04001 Advanced Seminar Finance & Accounting: Globalization and Digitization as a Challenge
- WIV02001 Advanced Seminar Economics & Policy: Environmental Economics
- WIV02003 Advanced Seminar Economics & Policy: Health Economics
- WI001179 Advanced Seminar Consumers, Technology & Sustainability
- WI001146 Responsible Governance in Science, Technology, and Innovation
- WI001194 Who is responsible for food and health? Social and cultural perspective on food, health, and technology
- WIB22001 Sustainable Supply Chain Management
- WI001165 Sustainable Entrepreneurship - Getting Started
- POL62200 Energy Transformation
- POL62400 Environment and Climate Transformation
- WI001155 Environmental Economics and Environmental Management
- WI000202 Environmental Policy
- WI000946 Energy Markets 1 / WI001125 Energy Markets 2
- WI001223 Challenges in Energy Markets
- WI000926 International Environmental Governance and Conflict Management
- WI001206 Modeling Future Mobility Systems
- MW2244 Energy from Biomass and Residuals with Seminar
- MW2149 Introduction to Wind Energy
- MW2428 Solar Engineering
- EI0644 Photovoltaic Stand Alone Systems
- MW1475 Renewable Energy Technology 1
- MW1476 Renewable Energy Technology 2
- EI80004 Sustainable Mobility
- EI7513 Ecomanagement and Life Cycle Analysis

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- POL70045 Master Seminar Business Ethics
 - POL70080 Master Seminar Business Ethics: Ethics of Technology
 - POL70044 Business Ethics
 - ED0354 Practicing Evidence and Evidencing Practice in Science, Medicine, Technology, and Society
 - AR30295 Project Urban Landscape I
 - WI000739 Consumer Behavior
 - WI001175 Consumer Behavior Research Methods
 - WI001255 Lecture Series Renewable Energy Systems in the Global South
 - WI001165 Sustainable Entrepreneurship - Getting Started
 - WI001150 Sustainable Entrepreneurship - Theoretical Foundations
 - WI001211 Science, Technology, and the City
 - WI001194 Who Is Responsible for Environment and Health? Social and Cultural Perspective on Environment, Health, and Technology
 - WI001234 The Social Psychology of Leadership and Management
 - WI001160 Sex und Konflikt am Arbeitsplatz
 - WI000926 International Environmental Governance and Conflict Management
 - WI001179 Advanced Seminar Consumers, Technology & Sustainability
 - WI000286 Environmental and Natural Resource Economics
 - POL70070 Ethics of Technology
 - POL70044 Business Ethics
 - WZ1822 Introduction to Economics and Business Ethics
 - WIB25001_1 Advanced Seminar on Innovation & Entrepreneurship: Psychology of Entrepreneurship
 - WIB271011 Advanced Seminar on Innovation & Entrepreneurship: Venture Growth and Internalization
 - WI201047 International Management & Intercultural Cooperation

 - Certificate Programs:
<https://www.eec.wi.tum.de/certificate-programs/>

PHOTO CREDIT

6	Andreas Heddergott	Internal visuals	TUM Thiersch Tower
11	Andreas Heddergott	Internal visuals	TUM School of Management Building
13	tbk f.	unsplash	Turbine
18	Yaroslav Astakhov	unsplash	Students sitting in lecture hall
20	Joanna Chmielecki	Internal visuals	The TUM Thiersch Tower glows orange on International Day against Violence against Women
23	Bureau Zweisam Fotografie		Prof. Dr. Holger Patzelt (first from the right)
24	Andreas Heddergott	Internal visuals	Students of TUM School of Management
25	Alexandra Robayo	Internal visuals	Esther Salvi (fourth from the right) in class during group work
26	Alexandra Robayo	Internal visuals	Professor Belz in classroom discussion
27	Alexandra Robayo	Internal visuals	Professor Belz teaching at the International Summer School 2019
29	Astrid Eckert/ Ulrich Benz		Prof. Dr. Claudia Doblinger
30	Alexandra Robayo	Internal visuals	Dr. Daniela Gimenez (second from the left) in class room discussions
31	Andreas Heddergott	Internal visuals	Students at the TUM Audimax
32	Unknown	Internal visuals	Sustainable Supply Chain Management, Class 2019/20
33	Astrid Eckert/ Ulrich Benz		Prof. Dr. Magnus Fröhling
35	Prof. Holly Ott	Internal visuals	Interactive Statistic Exercises: Lean Six Sigma Yellow and Green Belt Certifications
36		https://seakademie.org/en/hackathon/	Circular Cities
37	Artem-Beliaikin	unsplash	Woman buying groceries
38	imago images	https://www.capital.de/wirtschaft-politik/amartya-sen-vordenker-globaler-gerechtigkeit	Amartya Sen at the launch of his book "A Quantum Leap in the Wrong Direction"
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44	Maxim Hopman	unsplash	VR
45	Andreas Heddergott	Internal visuals	TUM Campus Straubing
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48	Astrid Eckert/TUM	Internal visuals	Prof. Dr. Claudia Peus at the opening event of the TUM Institute for LifeLong Learning
49	Astrid Eckert/TUM	Internal visuals	Prof. Dr. Claudia Peus at the opening event of the TUM Institute for LifeLong Learning
50	Max Welt	pexels	Chicken
51	Cottonbro	pexels	Women in agriculture
52	Katerina-Holmes	pexels	
57	Andreas Heddergott	Internal visuals	Students of TUM School of Management
61	Lincoln Electric Systems	unsplash	Solar panel
65	Grey Zhang	unsplash	Xinjiang
70	Martin Adams	unsplash	Turbine
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74	Helena Lopes	unsplash	Social impact award
74		https://www.curafa.com/en/home.html	Curafa
76		https://enactus-muenchen.de/	Enactus
78	Jacob Lund Photography	unsplash	Online business meeting from home
79	Unknown	Internal visuals	Bridget Nakangu, International Summer School 2020

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