

BUILDING SUSTAINABILITY

MANAGEMENT METHODS FOR ENERGY EFFICIENCY MBA



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THIS PUBLICATION REFLECTS THE STATE OF PLANNING AT THE TIME OF PRINTING.
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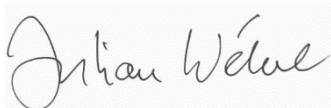
Dear students,

The concept of the German “Energiewende” – literally, energy transition – has gained international attention. It includes a variety of measures that aim at making Europe’s largest economy free of fossil fuels and nuclear energy. In order to attain this, all areas of energy production and consumption will have to go through a transition process. Beside mobility and production, buildings are therefore one of the key factors for a successful Energiewende. In the building sector, this means redirecting from a mainly fossil-fueled energy supply towards renewable energies and a much more energy-efficient use of energy in buildings and urban, as well as, regional areas. This is one of the largest and most urgent challenges of current urban development and other social disciplines.

Finding solutions to such a complex challenge means that a multitude of actors, from business, civil society, to public administration take part in the process and influence it with their differing and often conflicting interests. Resulting from this is the need for skilled workers who, based on a highly professional qualification, both understand all stakeholders and are able to work in a leading position with them.

The MBA program in Building Sustainability – Management Methods for Energy Efficiency will teach you exactly this: skills, methods, and concepts to consider different approaches, to understand them, and to align them for reaching sustainable solutions. Such proficiencies are not only important in the context of the Energiewende, but are indispensable in every building, construction and real estate project that takes energy efficiency and the other sustainability criteria like economical, ecological, social, and cultural balances into account.

In this regard, you will learn a lot from our experts, coming from research labs and science institutions as well as from the practical areas of planning and implementation. You will also learn from your classmates and hopefully enjoy the international, interdisciplinary teamwork as well as Berlin’s urban and cosmopolitan atmosphere.

A handwritten signature in dark ink, reading "Julian Wékel". The signature is written in a cursive, flowing style. The first name "Julian" is written in a larger, more prominent script, and the last name "Wékel" follows in a similar but slightly smaller script. The signature is set against a light gray rectangular background.

Prof. Julian Wékel
Academic Director

Overview	5
The Building Sustainability Team	6
Studying Management Methods for Energy Efficiency with The Experts	7
Second Semester	9
Module 05 Energy-Efficient Societies.....	10
Module 06 Real Estate Economics.....	12
Module 07 Interdisciplinary Project.....	14
Module 09A Smart Buildings	17
Module 9B - Technology and Innovation Management - Part I	22
Faculty	26
Lecturers & Tutors	27

Overview

The Building Sustainability Team

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Studying Management Methods for Energy Efficiency with The Experts

According to the German Advisory Council on Global Change, by 2050, the urban population alone will be larger than the current total world population. This will lead to considerable challenges for the planning and the construction sector, since roughly the same amount of infrastructure will be added in the next three decades as has been built since the beginning of industrialization. In addition, most of the existing infrastructure will have to be renewed in the same period. “For example, if the expansion of infrastructure has a CO₂ footprint that is similar to that of the current infrastructure of cement, steel and aluminum in industrialized countries, the construction of new infrastructures in developing countries and emerging economies alone could lead to around a third of the total available CO₂ budget if the temperature increase is to be limited to 1.5°C.”¹

In addition to the technical aspects regarding CO₂ saving solutions, strategic concepts for communication and cooperation are crucial for success in large-scale and structural important projects. Whereas building a house has become a manageable task, things become much more complicated when considering the urban environment and wider interests such as energy efficiency and other relevant factors of climate protection. The master program Building Sustainability focusses therefore not only on technical and economic perspectives but also aims at imparting basic knowledge in other relevant disciplines. This means that the scope of the program is both broad and specific at the same time. The combination of technology, management, and sustainability-related topics is therefore, a unique opportunity for young professionals to extend their skills and prepare for important planning and construction related team functions in this huge challenge of the 21st century.

Whereas the Building Sustainability program is new, there is already plentiful experience in conducting practice-orientated master programs on the EUREF campus. The first program started in October 2012, was taught in German, and focused on energy-efficient construction and operation of buildings. As a Master of Science, it was an interdisciplinary program with a very specific focus. It turned out, however, that this subject matter needs a broader scope. Two other Master programs – European and International Energy Law (Master of Business Law) and Energy Management (MBA) – also showed high international demand in the field of energy and sustainability. Therefore, current, and former students, teachers, and professionals re-designed the program and created Building Sustainability (MBA) with a schedule that focusses not only on engineers and architects but also on urban planners, economists, and project managers.

The idea is that sustainable project results can only be achieved in extensive cooperation of all stakeholders, considering economic, ecological, social, and cultural aspects. Managing and moderating such a cooperation is one of the major challenges of implementing sustainability in planning and building projects of all scales. The program aims therefore on enabling students to understand the complexity of sustainable planning and management processes and to develop solutions

¹ WBGU – German Advisory Council on Global Change (2016): Humanity on the move: Unlocking the transformative power of cities. Summary. Berlin: WBGU

accordingly. This will happen in modules with different approaches: some will teach facts and numbers, others will facilitate connections between different fields and the soft skills of mediating between them, and some are designed to apply these competences to practical projects.

Graduates will be able to moderate and manage complex projects in the construction, real estate, and planning sector. The program provides the knowledge and skills for assessing projects from technical, ecological, and economic perspectives and for creatively finding solutions to consider the varying stakeholders' interest, in teams or independently. Graduates will either be able to enter the labor market in both the private and public sectors or continue with postgraduate studies.



Second Semester

Module 05 Energy-Efficient Societies

Dr. Ing. Carolin Schröder

Technische Universität Berlin

Zentrum Technik und Gesellschaft

www.tu-berlin.de/ztg/menue/startseite_ztg/



Aims and Scope Students will learn about different ways of conceiving energy efficiency in a global context, societal consequences of energy efficiency, the different roles and job profiles for students of this program, analyze good and bad practices of project management, including their own project work, acquire skills for dealing with complex and diverse audiences (i.e. Peer experts, contractors, users in different project contexts), acquire skills for conflict management (communication, participation and cooperation) and Competences gained: Professional 30 %, Methods 30 %, Systems 15 %, Social 25 %.

Schedule

- | | |
|----------------------|---|
| Tue. 16/04/19 | Introduction: Framing the German 'Energiewende'
Dr. Ing. Carolin Schröder |
| Tue. 23/04/19 | The Individual, the Building & Sustainability
Dr. Ing. Carolin Schröder |
| Tue. 07/05/19 | The Digital & the Smart: Energy in the Neighbourhood
Dr. Ing. Carolin Schröder |
| Tue. 14/05/19 | Sustainability & Local Societies
Dr. Ing. Carolin Schröder |
| Tue. 21/05/19 | Energy in the City: Best Practices
Dr. Ing. Carolin Schröder |

Tue. 04/06/19	The German/ Non-German City: Politics, Governance & Participation Dr. Ing. Carolin Schröder
Tue. 11/06/19	Energy of the Future: The National & European Level Dr. Ing. Carolin Schröder
Tue. 18/06/19	Global Challenges for the Energy Sector: Climate change, energy poverty & Resilience Dr. Ing. Carolin Schröder
Tue. 25/06/19	Consultation Dr. Ing. Carolin Schröder
Tue. 25/06/19	Final presentation Dr. Ing. Carolin Schröder

Literature

- [1] Bridge, G., Bouzarovski, S., Bradshaw, M., & Eyre, N. (2013). Geographies of energy transition: Space, place and the low-carbon economy. *Energy Policy*, 53, 331-340.
- [2] Sovacool, B. K. (2012). The political economy of energy poverty: A review of key challenges. *Energy for Sustainable Development*, 16(3), 272-282.
- [3] Strunz, S. (2014). The German energy transition as a regime shift. *Ecological Economics*, 100, 150-158.
- [4] Rydin, Y. (2011). *The purpose of planning: Creating sustainable towns and cities*. Policy Press.
- [5] <http://www.nachhaltigesbauen.de/> they provide a (small) English section
<https://www.umweltbundesamt.de/>

Module 06 Real Estate Economics

Prof. Dr.-Ing. Nicole Riediger

Construction and Real Estate Management –
International Project and Facility Management

Hochschule für Technik und Wirtschaft Berlin (HTW)

www.htw-berlin.de/campus/



Aims and Scope The learning aim is the understanding and implementation of the essential concepts of real estate financing and investment relevant to business problems and management decisions. The students know the basics of financial mathematics and they are able to calculate simple real estate development projects as a part of feasibility studies.

Schedule

Tue. 16/04/19	Overview of Real Estate Finance and Investment Prof. Dr.-Ing. Nicole Riediger
Tue. 23/04/19	Time Value of Money Prof. Dr.-Ing. Nicole Riediger
Fri. 26/04/19	Microeconomics Sarah Elsheikh, M.Sc.
Mon. 29/04/19	Tutorial - Basic calculations Sarah Elsheikh, M.Sc.
Tue. 30/04/19	Macroeconomics Sarah Elsheikh, M.Sc.
Tue. 07/05/19	Investment Analysis I Prof. Dr.-Ing. Nicole Riediger

Tue. 14/05/19 Investment Analysis II
Prof. Dr.-Ing. Nicole Riediger

Tue. 21/05/19 Financial Leverage
Prof. Dr.-Ing. Nicole Riediger

Mon. 27/05/19 Tutorial - Basic calculations
Sarah Elsheikh, M.Sc.

Wed. 29/05/19 EXAM

Literature

[1] Real Estate Finance and Investments (14th Edition) by William Brueggeman-Jeffrey Fisher

Module 07 Interdisciplinary Project

Prof. Dr. Tetyana Morozyuk

Technische Universität Berlin

www.campus-elgouna.tu-berlin.de



Aims and Scope After this module, the students will have an experience to follow the concepts of sustainability for the buildings, be able to evaluate the energy-related parameters for different types of the ready-planned and already existing building, implement new and innovative concepts to the improvement and optimization strategies of sustainability-related and have the experience to apply the knowledge from the project management module (work in a small project group with little assistance) and scientific writing module (presentations and reports).

Schedule

- | | |
|----------------------|--|
| Mon. 08/04/19 | Introduction- What we mean by Smart Energy Buildings and how it matters.

Smart Energy Building from a technical perspective – components and functionality.

Dipl.-Ing. Daniel Freund |
| Fri. 12/04/19 | Introduction to the project. Project management and team work. Thermodynamic principles applied to HVAC systems of different building types. Thermophysical principles applied to HVAC systems of different building types

Prof. Dr. Tetyana Morozyuk |
| Mon. 15/04/19 | The market environment for Smart Energy Buildings – who is involved and what do they do?

Dipl.-Ing. Daniel Freund |
| Fri. 03/05/19 | Interdisciplinary Project (Project Work) |

Fri. 10/05/19	The first presentation. Defining the object and location, evaluation of cooling and heating load Prof. Dr. Tetyana Morozyuk
Fri. 17/05/19	Implementation of the periphery HVAC equipment to the building architecture. Prof. Dr. Tetyana Morozyuk
Mon. 20/05/19	The market environment for Smart Energy Buildings – who is involved and what do they do? Dipl.-Ing. Daniel Freund
Fri. 07/06/19	Interdisciplinary Project (Project Work)
Fri. 14/06/19	Nearly Zero Energy Buildings. Concept of exergy applied to buildings; Low-Ex buildings. Recycling: Materials, water and heat of ventilation Prof. Dr. Tetyana Morozyuk
Fri. 21/06/19	Interdisciplinary Project (Project Work)
Fri. 28/06/19	Electricity Generation: Actual Status and Perspectives. Project questions. Prof. Dr. Tetyana Morozyuk
Fri. 05/07/19	Consultation Prof. Dr. Tetyana Morozyuk
Fri. 12/07/19	Interdisciplinary Project (Final Presentation) Prof. Dr. Tetyana Morozyuk

Literature

[1] Moran M.J., Shapiro H.N., Fundamentals of engineering thermodynamics, John Wiley, New York, 1992 or later.

[2] Kakac S., Shah R.K., Aung W., Handbook of single-phase convective heat transfer. Wiley, New York, 1987

[3] Refrigeration. ASHRAE Handbook, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 2002

[4] Shan K. Wang, HANDBOOK OF AIR CONDITIONING AND REFRIGERATION, McGraw-Hill, 2000 or later

Module 09A Smart Buildings

Dipl.-Ing. Daniel Freund

Distributed Artificial Intelligence Labor

Technische Universität Berlin

www.dai-labor.de

Aims and Scope: This module will provide insight into the planning, implementation and operation of technologies (software, communication and hardware) in building monitoring, control and automation, with special emphasis on energy efficiency and energy management. Currently available solutions will be regarded as well as current development and future expectations for so-called smart buildings.

Participants will gain a basic understanding of software-based and intelligent energy management of modern building environments. In view of a holistic energy balance, students develop detailed knowledge of the internal factors such as building configuration, users/usage, monitoring, control/automation and distributed generation. On the other hand, they will understand from a smart building perspective the relation of building energy management with external factors such as energy procurement, (regenerative) energy supply, regulations and energy markets.

Graduates will have the ability to determine and evaluate the effects of smart building design and implementation alternatives with respect to energy efficiency and compare them to other measures (e.g. intelligent automation of heating compared to modifications of building envelope).

In this respect, students will develop academic research skills in the area of software and IoT in smart homes and gain hands-on experience in realization and management of energy-efficient systems in the networked building.

Schedule

Mon. 08/04/19	Introduction- What we mean by Smart Energy Buildings and how it matters. Smart Energy Building from a technical perspective – components and functionality. On-site team work – small project assignment. Smart Building networks- protocols and standards for building automation I Case study on Smart Energy Buildings
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Dipl.-Ing. Daniel Freund

Mon. 15/04/19 Smart Building networks- protocols and standards for building automation II

The market environment for Smart Energy Buildings – who is involved and what do they do?

Preparing for the Smart Building seminar thesis – proper research and proper writing

Team work – case study assignment

Dipl.-Ing. Daniel Freund

Mon. 06/05/19

Dipl.-Ing. Daniel Freund

Mon. 13/05/19 Smart HVAC systems - State of the art and future development

Building-integrated local and distributed energy generation – PV, CHP, etc.

Smart districts and neighborhoods – efficiency gains through aggregation

EXCURSION: Guided tour at Rooftop

Dipl.-Ing. Daniel Freund

Mon. 20/05/19 Integration of Smart Homes into Smart Grids – The outbound interface

Integrated energy storage for smart buildings – Lead, lithium, water and the specifics of electric vehicle integration

EXCURSION: Guided tour at Efficiency House Plus

Dipl.-Ing. Daniel Freund

Mon. 03/06/19 Planning software and Smart Building projects

A security perspective on Smart Homes and Smart Grid technologies – Botnets, worms and viruses

Team presentation of case study assignment II

Bleeding edge digitization development in Smart Buildings –
what's hyped and what helps?

Guided tour at IOLITE Smart Home living lab

Dipl.-Ing. Daniel Freund

Mon. 17/06/19

Dipl.-Ing. Daniel Freund

Mon. 24/06/19 Presentation of seminar results

Personal consultations on the lecture content

Dipl.-Ing. Daniel Freund

Literature

D. Abbott, "Keeping the Energy Debate Clean: How Do We Supply the World's Energy Needs?," in Proceedings of the IEEE, vol. 98, no. 1, pp. 42-66, Jan. 2010.

Biljana L. Risteska Stojkoska, Kire V. Trivodaliev, A review of Internet of Things for smart home: Challenges and solutions, Journal of Cleaner Production, Volume 140, Part 3, 2017, Pages 1454-1464,

De Craemer, Klaas & Deconinck, Geert. (2019). Analysis of State-of-the-art Smart Metering Communication Standards.

X. Fang, S. Misra, G. Xue and D. Yang, "Smart Grid — The New and Improved Power Grid: A Survey," in IEEE Communications Surveys & Tutorials, vol. 14, no. 4, pp. 944-980, Fourth Quarter 2012.

Ford, Rebecca & Pritoni, Marco & Sanguinetti, Angela & Karlin, Beth. (2017). Categories and functionality of smart home technology for energy management. Building and Environment. 123. 10.1016/j.buildenv.2017.07.020.

M. Kezunovic, J. D. McCalley and T. J. Overbye, "Smart Grids and Beyond: Achieving the Full Potential of Electricity Systems," in Proceedings of the IEEE, vol. 100, no. Special Centennial Issue, pp. 1329-1341, May 13 2012.

Mendes, Tiago D. P. et al. "Smart Home Communication Technologies and Applications : Wireless Protocol Assessment for Home Area Network Resources." (2015).

Strategies for Efficiency Houses Plus - Principles and examples of energy-generating buildings. The building standard Effizienzhaus Plus (efficiency house plus) is the basis for sustainable building. BMUB Brochure | No. 6036

Energy and Buildings (Journal) - An international journal devoted to investigations of energy use and efficiency in buildings

Building and Environment (Journal) - The International Journal of Building Science and its Applications

Excursions:

EXCURSION: Guided tour at Rooftop

The concept behind Rooftop is to redesign unused attic space in typical Berlin Wilhelminian-era buildings, making them energy-efficient, modern residential units. These structures benefit from the high-up position and the existing building infrastructure.

Using solar power modules, the new attic apartments produce excess energy which alongside the additional Rooftop unit can also contribute to supplying the building below. Facade elements that can be folded upwards are able to dose the daylight that enters the room. They automatically track the sun, or adapt to personal requirements using a smartphone app. When they are folded closed, the facade elements enclose a layer of air outside the insulating glass, which increases the thermal protection.

www.artconnect.com/projects/team-rooftop



EXCURSION: Guided tour at Efficiency House Plus

With its first state-owned Efficiency House Plus with electric mobility, the Federal Building Ministry has laid the cornerstone for its research programme and the network that has evolved from this. The pilot building designed by Professor Werner Sobek is located at Fasanenstraße 87a in 10723 Berlin-Charlottenburg. The detached house comprises about 130 square meters of living space and is designed for a family of four. The “glass showcase” in front of the house is designed for parking and charging electric vehicles (e-cars and e-bikes). Between the two-storey living space and the “showcase” is what is known as the building’s “energy core”, which houses all the building services and wet rooms.

(www.zebau.de/projekte/kompetenzzentrum)



Tour at IOLLITE living lab

The IOLITE platform offers an open smart home ecosystem with a focus on interoperability. The broadband gateway will be the central hub in the connected home, enabling the easy management of all devices, home automation, the IoT and further applications. The IOLITE ecosystem offers co-operation opportunities and benefits for all participating partners, including users, installers, developers, providers and device manufacturers. (<http://iolite.de/>)



Module 9B - Technology and Innovation Management - Part I

Prof. Dr. Jan Kratzer

Chair of Entrepreneurship and Innovation Management

School of Economics and Management

Centre for Entrepreneurship TU Berlin

www.entrepreneurship.tu-berlin.de



Aims and Scope The module Technology and Innovation Management is an interdisciplinary project. Students learn about innovation and technology management in theory and practice. First, the course provides theoretical input sessions about innovation management, technology management, project management, team building, and more. Second, the students will apply this knowledge to a real project and work together with industrial partners. They will develop a business model and prototype in (interdisciplinary) teams based on a given problem. Finally, the teams hand in a written project report and give an oral presentation on their prototype.

After this course students will,

- Understanding the central terms and basics of innovation and technology management
- Understanding the interplay between innovation and technology management
- Raising awareness and motivation for applied innovation research
- Transfer of knowledge and innovation management methods
- Insights into concrete innovation projects in practice
- Application of creativity and presentation techniques for the successful development and presentation of innovation projects
- Strengthening the capacity of interdisciplinary teamwork
- Systematic preparation for the implementation of innovation projects to the development of a first prototype

Schedule

Tue. 09/04/19 Introduction lecture- Air Mobility, Energy & Blockchain
World Café with Industry Partner
Prof. Dr. Jan Kratzer
Dr. Maren Borkert
Julian Alexandrakis

- Wed. 10/04/19** Air Mobility in the City
Quali Research Methods: Intro& Practice
Project Planning
Prof. Dr. Jan Kratzer
Dr. Maren Borkert
Julian Alexandrakis
- Wed. 17/04/19** Quali Research Methods: Development
Quali Research Methods: Practice
Ideation I& II
Prof. Dr. Jan Kratzer
Dr. Maren Borkert
Julian Alexandrakis
- Wed. 08/05/19** Technology and Innovation Management I, II, III & IV
Prof. Dr. Jan Kratzer
Dr. Maren Borkert
Julian Alexandrakis
- Wed. 15/05/19** Quali Research Methods: Analysis I& II
Business Model Development I & II
Prof. Dr. Jan Kratzer
Dr. Maren Borkert
Julian Alexandrakis
- Wed. 05/06/19** Assessment Preparation
Group Work
Assessment: Interim Presentation

Literature

- [1] Donald L. Anderson. Organization Development. The Process of Leading Organizational Change. Sage Publications, 2010.

- [2] Thomas Bieger. Zukünftige Geschäftsmodelle: Konzept und Anwendung in der Netzökonomie; mit 3 Tabellen. Springer, 2002.

- [3] Roman Boutellier and Mareike Heinzen. Growth Through Innovation: Managing the Technology-Driven Enterprise. Springer, 2014.

- [4] Peter F. Drucker. Innovation and Entrepreneurship. HarperBusiness, 2006.

- [5] Jack R. Meredith and Jr. Samuel J. Mantel. Project Management. A Managerial Approach. John Wiley & Sons, 2006.

- [6] Barbara Praetorius, Dierk Bauknecht, Martin Cames, Corinna Fischer, Martin Pehnt, Katja Schumacher, and Jan-Peter Foß. Innovation for Sustainable Electricity Systems. Exploring the Dynamics of Energy Transitions. Physica, 2009.

- [7] V W Ruttan. Technology, Growth, and Development. An induced innovation perspective. Oxford University Press, 2001.

- [8] Melissa A. Schilling. Strategic Management of Technological Innovation. Mcgraw-Hill Education, 2013.

- [9] Joe Tidd and John Bessant. Strategic Innovation Management. Wiley, 2014.

- [10] Paul Trott. Innovation Management

- [11] Michael Crosby et al. Blockchain technology: Beyond bitcoin. Applied Innovation, 2:6–10, 2016.

- [12] Sinclair Davidson et al. Economics of Blockchain. 2016.

- [13] William Mougayar: The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology. John Wiley & Sons, 2016.

[14] Shermin Voshmgir & Valentin Kalinov. Blockchain. A Beginners Guide. Blockchainhub, 2017.

Graduation Ceremony MBA Building Sustainability 2017-19

July 19th 2019

Details to be announced

Faculty

Lecturers & Tutors

Prof. Julian Wékel

Academic Director

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master-in-energy.com

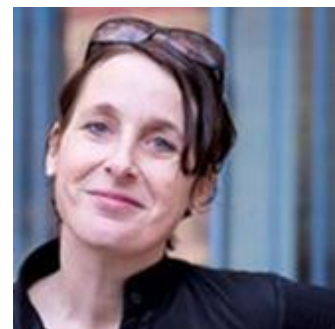


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Dipl.-Ing. Daniel Freund

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Dipl.-Ing. | M.Eng. Christoph Vornhusen

Founder/ owner

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Dr.-Ing. Carolin Schröder

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Sarah Elsheikh, M.Sc.

Field Protection Assistant

Danish Refugee Council / Dansk Flygtningehjælp
American University in Cairo (AUC)

www.drc.ngo/

