Organized by

Zurich-Basel Plant Science Center
World Food System Center
Energy Science Center

September 13–17
Wislikofen, Switzerland

Summer SCHOOL 2021

RESPONSE

Responsible Research, Innovation and Transformation in

Food, Plant and Energy Sciences

This summer school receives funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 847585– RESPONSE.

This year's summer school is organised by the Zurich-Basel Plant Science Center, World Food System Center and Energy Science Center as part of the RESPONSE Doctoral Programme (DP) «RESPONSE - to society and policy needs through plant, food and energy sciences».

CONTACT

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INTRODUCTION

Welcome to Responsible Research, Innovation and Transformation in Food, Plant and Energy Sciences – the 9th summer school of the Zurich-Basel Plant Science Center.

Food and energy are the great challenges for modern societies, both producing enough for the growing world population as well as producing and distributing them environmentally friendly, fair and equitable. Their footprint on land, biodiversity, ecosystems, water, soil and their impact on climate is enormous. Establishing food and energy systems that support the Sustainable Development Goals (SDGs) is of uttermost importance to stay within the planetary boundaries.
Societal transformation through innovation and research are key elements in the discussion how the global community could overcome its complex problems, related to environmental, social and economic constraints in a resource-limited world. Innovation conflicts arise when transformation is mainly technological driven and is not taking up the environmental, ethical, legal and social issues of society. In response scientists are asked to take a role in science-in-society dialogue and especially if their research is related to fulfilling the Sustainable Development Goals (SDGs).

We need knowledge, innovation and solutions that are adapted to societal needs and are co-produced between different stakeholders including scientists. In this process, public and stakeholder engagement is key – welcoming actors from civil society as partners to express their values and interests in scientific, technological and innovation choices. As a result, we have to re-think the scientific research process, opening spaces for the public at the beginning of a research project. The aim is to generate through participation, deliberation and mutual learning a transformation of complex systems for a sustainable and equitable future.

In this summer school, we will implement the Responsible Research and Innovation framework to exemplary case studies addressing sustainable food systems, sustainable transition pathways in the energy sector; and sustainable land use decisions.

Participants in teams work on case studies, they define the problem in the societal context, develop prototypes following value-based and human centered design approaches to the problem or develop a social practice theory and change hypothesis for setting their prototypes into practise.

Theoretical inputs to understand the concepts and methodologies, workshops on several methodologies and tools, exemplary insights in good practices and working with case studies will help the participants to understand and apply the responsible research and innovation process.

Invited speakers will make presentations on the topic of their research, give insight into their research field, conduct interactive workshops and take part in plenary discussions. They will act as mentors in the case studies group work. The outcome of the group work will be available in the proceedings.

The summer school addresses early stage researchers from food, environment, plant and energy science.

Learning objectives

By the end of the summer school, participants will:

- Understand the responsible research and innovation (RRI) framework and its application in research.
- Design their own responsible research and innovation process including public engagement and participation formats.
- Know how to carry out ethical inquiry and a value-based design processes.
- Be able to apply design thinking.
- Can implement formats of social and transformative learning in their research processes.

Individual Performance and Assessment

– Session summary
– Group work on case study
– Presentation of group work
– Contribution to the proceedings

Number of participants: 20

ECTS: 2

Organization of Student Work

Before summer school

- For PhD students not enrolled in the Response Program: Application should include description of motivation, background and description of own research project.
- Preparatory reading: Students will need to read the assigned literature before the summer school.
- All summer school participants are expected to present a poster of their research at the beginning of the summer school.

During summer school

- Sessions are composed as lectures, best cases examples, discussions, workshops and case study work.
- Group work will be done on case studies, individual working time on this group work is expected to be about 10h.
- Presentation and integration: at the end of each afternoon to the sounding board.
- Case study presentation on day 5 is 30 min per group.

After summer school

- Groups hand in a finalized version of their case study for inclusion in the proceedings. Information on this is provided during the summer school. Examples of previous work (and the format to do so) can be found here[1].

Group Enrolment

- Enrollment to the case studies and group work at OLAT learning platform. Link will be provided after registration.

[1] Maspoli, L., Peter, N. and Vonzun, S. (2017). Climate smart agriculture increasing. In: Zurich-Basel Plant Science Center: PSC Summer Schools 2014 and 2016, Agriculture in transformation – Concepts for agriculture production systems that are socially fair, environmentally safe and economically viable. Melanie Paschke (ed.), IDEA Verlag GmbH, ISBN 978-3-88793-257-2. https://www.research-collection.ethz.ch/handle/20.500.11850/218321

Zurich-Basel Plant Science Center: Proceedings of the PlantHUB Summer School 2018, Responsible Research and Innovation (RRI) in Plant Sciences. Melanie Paschke (ed.). https://www.research-collection.ethz.ch/handle/20.500.11850/404539

PROGRAM

During the week, you will define a brief outline of the process that in the end will result in the presentation and summer school proceedings.

DAY 1 REFLECTIVE QUESTIONS

Define the problem statement that describes the challenge you want to address within your case study. It needs to be linked to at least one of the SDGs.

In groups, you will discuss the following questions:

1. What is your group case about? Write down in one sentence.
2. Who are your stakeholders? (be specific!) Draw a map.
3. Put yourself in the role of the stakeholder: What questions, concerns, interests might they have?
4. How could you interact with these stakeholders?

Tell an inspirational story that explains where your ideas come from, who you would like to interact with, and why.

Explain your problem statement.

SCIENTIFIC BACKGROUND

- **What are your underlying assumptions?**
- **What facts and figures did you rely on?**

SYSTEM THINKING

- **How is the problem embedded in the ecological, societal and economical context?**

At the end of the afternoon session:
Outcome: Present your findings of day 1 to the sounding board: Daan Schuurbiers, Melanie Paschke.

MONDAY 13.09.2021

INPUT TALKS

Melanie Paschke,

Zurich-Basel Plant Science Center

The SDGs, their link to Responsible Research and Innovation (RRI)

Fritz Kleinschroth, ETH Zurich

Tracking socio-ecological transformations based on land cover changes

Marco Mazzotti, ETH Zurich

Can we go net-zero any time soon, and how?

WORKSHOP

Daan Schuurbiers,

De Proeffabriek, Arnhem, The Netherlands

The RRI framework in practice – Integrating societal considerations in your research

Invited Best Practice

Alessandra Schmidt, FabLab Barcelona

Food citizenship: Co-creation of community-driven technologies

Sonja Meller, DigitSoil

Technologies for gardeners and small-scale famers

TUESDAY 14.09.2021

DAY 2 REFLECTIVE QUESTIONS

We want you to critically reflect the following questions concerning your stakeholders and their underlying values:

1. Develop a deeper understanding of ethical implications and values of your stakeholders through filling an ethical matrix.
2. Consolidate collected information in the ethical canvas.

At the end of the afternoon session:
Outcome: Present ethical matrix and ethical canvas to the sounding board of the day: Martijn Sonnevelt, Melanie Paschke, Verena Lütschg.

INPUT TALK

Martijn Sonnevelt,

World Food System Center, ETH Zurich

Megatrends, risks and research challenges in food system science

WORKSHOP

Melanie Paschke, PSC and

Verena Lütschg, About Tomorrow Consulting, Zurich

A practical insight to value-based design

INPUT TALKS

Mascha Gugganig, University of Ottawa, Technical University Munich

Vertical Farming: Prophecies, potentials and pitfalls of a high-tech proposition for urban food production

Invited Best Practice

Philipp Bossard, Yasai

Vertical Farming and closed loops – the example of YASAI

Simon Meister, Low Impact Food

DAY 3 REFLECTIVE QUESTIONS

What is the possible solution (prototype) to your problem statement from day 1. It could be a product, a service, a policy ... Include the ethical canvas from day 2.

Critically reflect on the following questions:

1. Understand what your stakeholders / customers really need (not what they think they need).
2. Capture what motivates them, their needs, their worldviews and their (hidden) values, their barriers and what they will seize an opportunity.
3. Build a consistent view from all collected insights, highlight patterns and profiles.

FEASIBILITY

- **How feasible is your solution?**
- **Are there uncertainties related that would need further clarification?**

SYSTEMS THINKING

- **How is the problem and solution embedded in the ecological, societal, and economical context of your stakeholders?**
- **What are the implications and trade-offs of your solution for them?**

At the end of the afternoon session:
Outcome: Present your results of day 3 to the sounding board: Christian Schaffner, Michael Augsburger and Melanie Paschke.

WEDNESDAY 15.09.2021

WORKSHOP

Michael Augsburger,

Spark Works & ETH Zurich

A practical introduction to Design Thinking for technological innovation

DAY 4 REFLECTIVE QUESTIONS

How can your innovation, solution, service, product or research support the transformation of complex systems for a sustainable and equitable future?

Critically reflect on the following questions:

1. What are the social practices that link to your prototype? What does it need to make your prototype work in the social context? Define your change hypothesis.
2. How should your experimental innovation plan look like to test your change hypotheses?
3. What do you need to know to implement in the near future to evolve your prototype one step further?

At the end of the afternoon session:
Outcome: Present your change hypothesis and an experimental innovation plan at the end of the afternoon to the sounding board: Melanie Paschke, Anais Sägesser, Christian Schaffner.

THURSDAY 16.09.2021

INPUT TALK

Walter-de-Boef, Wageningen University & Research (WUR), The Netherlands

Integrated agricultural sectors and food system framework: a holistic and multi-stakeholder approach guiding sectors in their contributions to social, food security and environmental outcomes

WORKSHOP

Anaïs Sägesser, Stride - the unSchool for Collaborative Leadership & Social Innovation

Social Innovation – changing social practices

FRIDAY 17.09.2021

INPUT TALKS

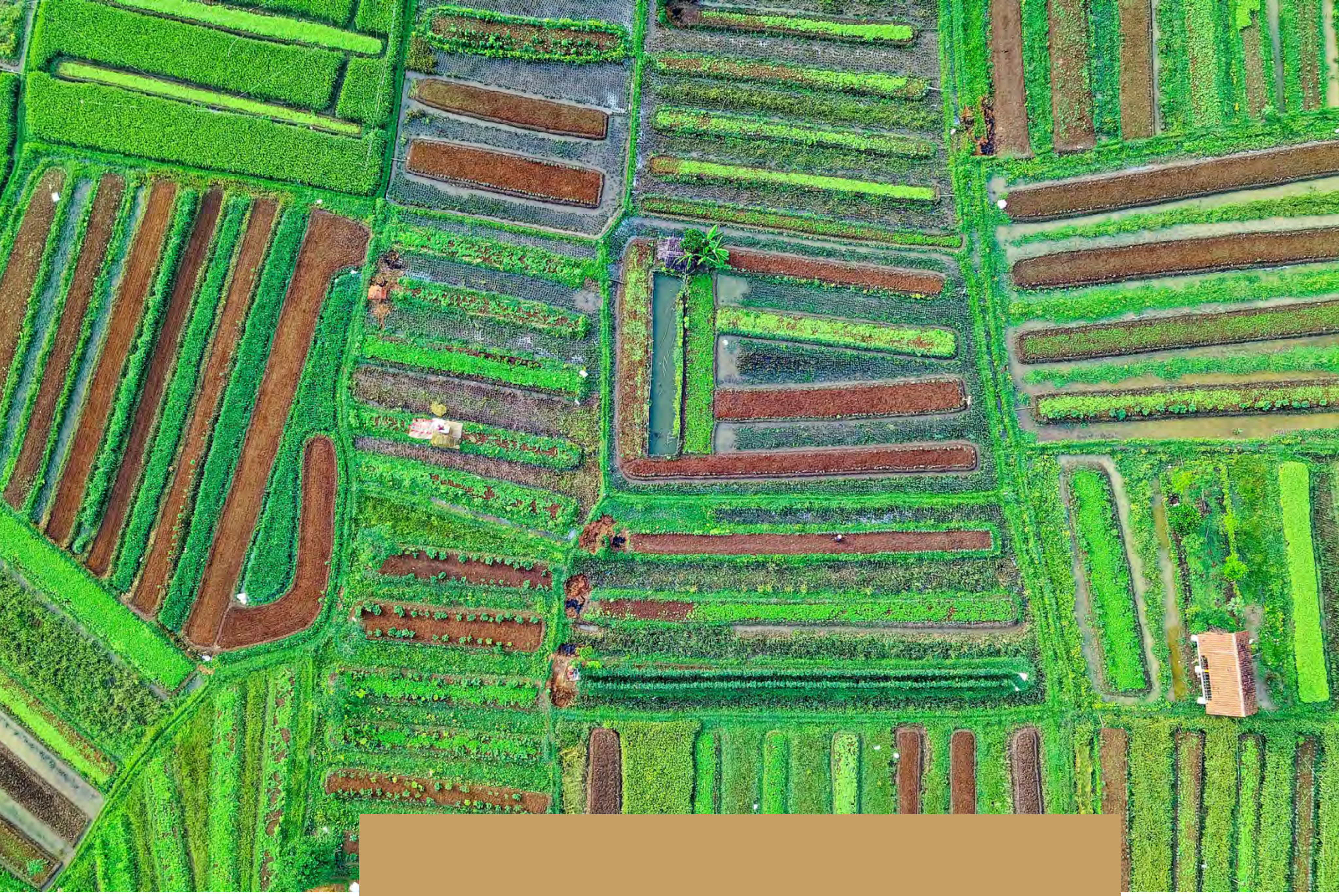
Ning Wang, ETH Zurich

Value sensitive innovation in the humanitarian context

Gerhard Schmitt, ETH Zurich

Cooling Singapore 2.0 – Designing responsive and regenerative human settlement systems

GROUP CASE PRESENTATIONS



ABSTRACTS

Michael Augsburger, Spark Works & ETH Zurich
Walter-de-Boef, Wageningen University
Philipp Bosshard, YASAI, Zurich
Mascha Gugganig, Technical University Munich
Fritz Kleinschroth, ETH Zurich
Verena Lütschg, About Tomorrow Consulting, Zurich
Marco Mazzotti, ETH Zurich
Melanie Paschke, PSC, ETH Zurich
Alessandra Schmidt, FabLab Barcelona
Gerhard Schmitt, ETH Zurich
Martjin Sonnevelt, WFSC, ETH Zurich
Daan Schurbiers, De Proeffabriek, The Netherlands
Anais Sägesser, Stride – the unSchool, Zurich
Nina Wang, University of Zurich

THE SDGS, THEIR LINK TO RESPONSIBLE RESEARCH AND INNOVATION (RRI)

Melanie Paschke, Zurich-Basel Plant Science Center, ETH Zurich

The 17 Sustainable Development Goals are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and allow economic growth while accepting the global boundaries of our planet.
RRI is an approach that anticipates and assesses potential implications and societal expectations with regard to technological innovation, with the aim to foster the design of inclusive and sustainable research and innovation (Horizon 2020, European Commission). In this introduction, we explore these concepts and their meaning for the research practice. Can we bring the two concepts together?
At the heart of the RRI process is deliberation: maximizing the decision-making power of all those included as well as on a high responsiveness and accountability of scientists towards needs, values and expectations of those targeted. The process of deliberation can lead to understanding, respect, empathy, and a balance of power. Deliberation in science is a yardstick for scientists in society in global governance.

Literature

Felt, U., Barben, D., Irwin, A., Joly, P.-B., Rip, A., Stirling, A., Stöckelová, T. (2013). Science in Society: caring for our futures in turbulent times. European Science Foundation Policy Briefing, 50: 1-36.

Stilgoe, J., Owen, R., Macnaghten, P. (2013). Developing a framework for responsible innovation. Research Policy 42: 1568-1580.

Melanie Paschke is heading the education and science-policy section at the Zurich-Basel Plant Science Center. She has a PhD in ecology and environmental sciences, has led and supervised the development of higher education programs for more than ten years. She has a record of accomplishment as educator in several areas of academic professional conduct and sustainable development. Her focus is on ethical inquiry in the plant sciences and on research integrity.

TRACKING SOCIO-ECOLOGICAL TRANSFORMATIONS BASED ON LAND COVER CHANGES

Fritz Kleinschroth, ETH Zurich

Land use is one of the most important factors contributing to and affected by global change. The way how humans produce food, manage forests, and organize their settlements has strong implications for the global carbon cycle, biodiversity conservation and many of the services provided by landscapes and ecosystems to people. Plans and policies have been developed on multiple scales, trying to restrict and influence how people use landscapes. Yet, it is frequently reported that policies are failing in the face of global economic, ecological and societal forces. To understand the effects and effectiveness of policies and societal transformations, it is crucial to keep track of changes in forests, settlements and croplands in a spatially explicit way over time and link them with decision-making on the ground.

In this talk, I will focus on infrastructure development, urbanization, and electrification processes in rural regions and link those with observable changes in land cover. Based on some of my past projects, I will provide examples of (avoided) deforestation along logging roads in managed and unmanaged forests of the Congo Basin, changing indigenous settlements in East African wetlands and proliferating floating vegetation invasions in rapidly urbanizing tropical regions. These examples all document profound landscape transformations that are detectable through remote sensing but are embedded in complex social-ecological systems. I will elaborate on the causes for these landscape transformations and the implications for ecosystems and livelihoods.

Linking observed landscape transformations to human decision-making provides an important base to assess how societal processes and policies produce intended and unintended environmental changes at different scales. Monitoring such changes is crucial for improving future policies, as I will show for the example of the FSC forest certification program. However, I will also discuss the limitations of earth observation in understanding socio-ecological transformations due to noise, strong natural vegetation dynamics and the simple (but important) truth that there is no remote sensing method to detect human needs and values.

Literature

Kleinschroth, F., Winton, R. S., Calamita, E., Niggemann, F., Botter, M., Wehrli, B., & Ghazoul, J. (2020). Living with floating vegetation invasions. Ambio, 50, 125–137. https://doi.org/10.1007/s13280-020-01360-6

Kleinschroth, F., Laporte, N., Laurance, W. F., Goetz, S., & Ghazoul, J. (2019). Road expansion and persistence in forests of the Congo Basin. Nature Sustainability, 2, 628–634. https://doi.org/10.1038/s41893-019-0310-6

Kleinschroth, F., Garcia, C., & Ghazoul, J. (2019). Reconciling certification and intact forest landscape conservation. Ambio, 48(2), 153–159. https://doi.org/10.1007/s13280-018-1063-6

Fritz Kleinschroth is a senior scientist (Oberassistent) in the Ecosystem Management group at ETH Zurich, where he also previously worked as a Postdoc, coordinating the ecosystem component of an interdisciplinary project on the Water-Energy-Food nexus. He earned a dual PhD from AgroParisTech, France and Bangor University, UK as part of the “Forest and Nature for Society” Erasmus Mundus Joint Doctorate programme with a PhD thesis on “Roads in Rainforests”. Fritz holds a “Diplom-Ingenieur” degree in landscape planning from TU Berlin, Germany with an emphasis on urban ecology, vegetation science and GIS. He has practical experience in European conservation planning through three years of work as an ecological consultant and habitat mapper in Germany. Fritz’ interests in global socio-ecological systems place him in the interdisciplinary nexus of landscape ecology, urbanism and land system science. He is focusing on spatially explicit links between land cover changes and societal transitions over time. He has long-term experience in mapping effects of human interventions on ecosystem functioning from field-based and remotely sensed information in tropical and temperate regions. He is particularly interested in the importance of built infrastructures for sustainable development and conservation and he is engaged in science-policy interactions to make his work applicable for decision-making. He is first author of 13 peer-reviewed journal articles, published in high impact journals such as Nature Sustainability, Frontiers in Ecology and the Environment, Journal of Applied Ecology and Conservation Biology.

CAN WE GO NET-ZERO ANY TIME SOON, AND HOW?

Marco Mazzotti, ETH Zurich

Counteracting climate change and realizing a sustainable net-zero society, in harmony with the environment, require mitigating current CO_2 emissions as well as creating negative emissions to compensate for unavoidable emissions (from cement plants, chemical industry, agriculture, waste treatment plants…). CO_2 capture, transportation and storage systems (CCTS) and CO_2 capture, utilization and storage systems (CCUS) are going to play a major role. Point-source CO_2 capture is feasible across sectors, and we expect that permanent CO_2 storage will be accessible Europe-wide. CO_2 utilization is very energy-intensive (thus requiring clean energy and system level analysis), unless CO_2 is used in carbonate form for construction materials. Carbon Dioxide Removal can be accomplished via Direct Air Capture (direct air capture with carbon storage, DACCS) or by exploiting biomass (bio-energy with carbon storage, BECCS), but their potential is not clear. In certain sectors, such as chemicals and (aviation) fuels, there are different options to achieve carbon neutrality. Synthetic fuels (from recycled CO_2) however do not offer any “free lunch” in these sectors, while they might play an important role for the storage of intermittent renewable electricity. In any case, CO_2 management requires as a prerequisite a shared Europe-wide CO_2 network infrastructure, serving all CO_2 sources and CO_2 sinks.

Literature

https://doi.org/10.1021/acs.iecr.9b00880

https://doi.org/10.1021/acs.iecr.9b06579

https://doi.org/10.1021/acs.iecr.0c05392

https://doi.org/10.1039/D1EE00642H

Marco Mazzotti is professor of process engineering at ETH Zurich. His research activities are in the area of development of carbon dioxide capture and storage systems. Marco Mazzotti has been coordinating lead author of the IPCC Special Report on Carbon Dioxide Capture and Storage (2002-2005).

THE RRI FRAMEWORK IN PRACTICE – INTEGRATING SOCIETAL CONSIDERATIONS IN YOUR RESEARCH

Daan Schuurbiers, De Proeffabriek, Arnhem, The Netherlands

As part of ongoing attempts to strengthen the responsiveness of research and innovation to societal needs and values – most recently within the framework of Responsible Research and Innovation – scientists are called upon to 'integrate broader societal considerations in their work'. But for all the compelling rhetoric, what does this actually mean at the level of day-to-day research? What sorts of consideration are we talking about? Whose consideration are they? And how could they be applied to research?
In this workshop, we will explore how to integrate societal considerations in our group cases. After a brief introduction to the notion of Responsible Research and Innovation and its implications for research practice, we will identify the questions, knowledge requirements and possible concerns that social actors might have. Subsequently, we will explore how you might incorporate these questions as part of your research.

Literature

Schot, J., Rip, A. (1997). Technological Forecasting and Social Change
The past and future of constructive technology assessment. Technological Forecasting and Social Change 54: 251-268. https://doi.org/10.1016/S0040-1625(96)00180-1

Rip, A., Robinson, D. K. R. (2013). Constructive Technology Assessment and the Methodology of Insertion. In: Doorn, N., Schuurbiers, D., van de Poel, I., Gorman, M.E. (eds.) Early engagement and new technologies: Opening up the laboratory. Springer: Heidelberg: 37-53.

Elzen, B, Bos, B. (2016). The RIO approach: Design and anchoring of sustainable animal husbandry systems. Technological Forecasting and Social Change. https://doi.org/10.1016/j.techfore.2016.05.023.

Schuurbiers, D. & Fisher, E. (2009). Lab-scale intervention. EMBO reports 10: 424 – 427.

de Saille, S, Medvecky, F. (2016). Innovation for a steady state: a case for responsible stagnation. Economy and Society, 45. https://doi.org/10.1080/03085147.2016.1143727

European Environment Agency (2013). Late Lessons from Early Warnings could also be useful? EEA Report, 1/2013. Retrieved from: https://www.eea.europa.eu/publications/late-lessons-2

WORKSHOP

Daan Schuurbiers is director of DPF, a Dutch consultancy for responsible innovation in the Netherlands. Daan has encouraged early reflection on the possible social impacts of emerging technologies throughout his research and current advisory work. He designs training courses for researchers, builds novel interdisciplinary collaborations, advises on research policy and regularly speaks at conferences to raise awareness with researchers of the broader societal dimensions of their work.

FOOD CITIZENSHIP: CO-CREATION OF COMMUNITY-DRIVEN TECHNOLOGIES

Alessandra Schmidt, FabLab Barcelona

Alessandra Schmidt is a Brazilian born social scientist, with masters in Social Development Practice at University College London (UCL) and in Management Sciences at ESADE. At Fab Lab Barcelona, a department of the Institute of Advanced Architecture of Catalonia (IAAC), she oordinatinates EU research projects' operations, focused on supporting local communities' pathways for situated-innovation, pushing positive societal change and transformation outcomes one step forward across gloCal communities.

MEGATRENDS, RISKS AND RESEARCH CHALLENGES IN FOOD SYSTEM SCIENCE

Martijn Sonnevelt, WFSC, ETH Zurich

The way the world produces, consumes, and wastes food is far from sustainable. Producing, processing, and delivering food is resource- and energy-intensive, with the agricultural sector, together with forestry, actually accounting for 24% of yearly total greenhouse gas emissions. In addition, the UN estimates that each year, a third of the food produced worldwide worth US $1 trillion ends up rotting in waste bins or spoils because of poor transportation or harvesting practices. Fighting hunger was therefore included as a central element in the United Nations (UN) Sustainable Development Goals (SDGs). Clearly, if the world fails to increase efforts and to implement more targeted measures, we will fall far short of achieving the ambitious SDGs.

The challenge of food security is not only to produce enough food but to make it accessible and affordable to all. Food production is threatened by an overexploitation and depletion of resources, environmental degradation, climate change and poverty. Overweight and obesity are widespread while macro- and micronutrient deficiencies affect billions, creating a triple burden of malnutrition in many countries. So beyond food production, food systems must be assessed on their impact and role in creating jobs, stabilising livelihoods, reducing inequality between stakeholder and territories, and preserving and improving environmental integrity. The way the performance and efficiency of food systems are measured must be completely revised to allow to drastically reduce their impact on human and environmental health.

Literature

Overview report addressing important challenges and risks of food systems.

Dury, S., Bendjebbar, P., Hainzelin, E., Giordano, T. and Bricas, N., eds. 2019. Food Systems at risk: new trends and challenges. Rome, Montpellier, Brussels, FAO, CIRAD and European Commission. https://doi.org/10.19182/agritrop/00080

Martijn Sonnevelt is Executive Director of the World Food System Center. Martijn completed his bachelor, masters, and doctoral studies at ETH Zurich in Agricultural Economics. His doctoral thesis focused on understanding the actions and driving forces of smallholder farm households through an economic case study in the Sri Lankan hill country. He then worked as a Postdoctoral Researcher and Project Manager on a global grain value chains project, supported by a donation from Buhler, which included an expert advisory group from industry and government. Next, he coordinated a United Nations Food and Agricultural Organization program focused on incentives for ecosystem services in agriculture. Martijn was then the Deputy Head of International Affairs, Research, and Innovation at the Swiss Federal Office for Agriculture.

A PRACTICAL INSIGHT TO VALUE-BASED DESIGN

Melanie Paschke / Verena Lütschg, Tomorrow Consulting

Previous experiences and examples in several fields of technological innovation and sustainable development showed that behind deep and far-reaching societal concerns are often conflicts on overlooked or hidden values. An important idea of Responsible Research and Innovation is that engaging in ethical inquiry very up-stream in the research and innovation process, i.e. in pre-research or at the very start of a research project can resolve in more acceptance.
To get aware of core values and beliefs of stakeholders and the public related to the research area and your problem definition you will be introduced in the idea of considering values in technological innovation. You will assess through an ethical matrix if – from stakeholders' perspective – your research or innovation is in conflict or is supporting their ethical principles. Based on this, you will start a value-based design process: can you come up with a possible solution to your problem, an innovation that includes the results of your ethical inquiry?

In this workshop, participants will:

- Develop a deeper understanding of ethical implications and values in research and design.
- Learn how to conduct an ethical inquiry and develop an ethical matrix and value proposition.
- Learn how value-based reflection and value statements can provide guidance for future research/design decisions.
- Get familiar with the value-based design process.

Literature

Srivatsa, N., Kaliarnta, S., & Groot Kormelink, J. (eds.) (2017). Responsible innovation: From MOOC to book. Delft University of Technology. https://repository.tudelft.nl/islandora/object/uuid:2aad6105-4723-437e-9814-06a55054d986

Van de Poel, I (2013). Translating Values into Design Requirements. In: Philosophy and Engineering: Reflections on Practice, Principles and Process (pp.253-266). https://doi.org/10.1007/978-94-007-7762-0_20

VERTICAL FARMING: PROPHECIES, POTENTIALS AND PITFALLS OF A HIGH-TECH PROPOSITION FOR URBAN FOOD PRODUCTION

Mascha Gugganig, University of Ottawa; Technical University Munich

The indoor vertical farm industry has attracted considerable attraction in the last years, based on its capabilities to reduce water, apply no pesticides, be space-efficient (especially for cities), and independent of weather conditions, particularly in the face of the increasingly worsening state of this planet. Concurrent with this sense of urgency is the large amount of Silicon Valley venture capital, despite the unresolved issue of this proposed solution, and its high energy use. This raises the question who started this trend, how it continues to attract such large amounts of investments, and who does profit from vertical farms at the end of the day. In this talk, I invite workshop participants to think critically about the prophecies, potentials and pitfalls of vertical farming, starting with an introduction to Science & Technology Studies (STS). In this interdisciplinary field, scholars inquire in various ways how (western) society is not outside, but an integral part of science and technology, and vice versa. How we understand the world – e.g. framing social and environmental problems – is how we choose to live in that world – e.g. by finding high-tech solutions to solve those problems. This understanding of co-production will lead me to lay out how vertical farming proponents establish and align the dismal stage of the agricultural system as planetary-scale problem to then propose vertical farming as technological fix. In this dynamic are also internal disagreements of vertical farm advocates being both aware of the fact that it is not solving all problems, and believing that technology development will adequately respond to these problems. I will end the talk with a proposition to think of vertical farming as educational moment, to query what the actual operating problems are, and for public engagement to ask critical questions about current forms of agricultural and food production.

Mascha Gugganig is a socio-cultural anthropologist and science & technology studies (STS) scholar whose work looks at human-environment relations in agriculture and food production in light of contested novel technologies, attending to how actors constitute and trouble respective notions of ‘expertise.’ Her current work attends both to discursive authorities of policy and industry visions of ‘smart’ farming and AI applications in Canada, and the role of innovation and technology in agroecological practices. Based on two previous research projects, she continues to be interested in the European Union’s multifarious imaginaries of ‘sustainable’ agriculture and the hopes and hypes of indoor vertical farming as viable urban food production. Her doctoral research looked at the contested use of āina – ‘that which feeds’, or land – for agricultural biotechnology research and development on the settler colonial terrain of Kaua‘i. Critical public engagement with academic research, science and technology in museums and public spaces, as well as collaborative research through arts-based, multimodal methods form another core area of her scholarship. She is an Alex Trebek Postdoctoral Fellow in AI and Environment at the University of Ottawa, and Research Associate at the Munich Center for Technology in Society, Technical University Munich.

VERTICAL FARMING AND CLOSED LOOPS – THE EXAMPLE OF YASAI

Philipp Bosshard, YASAI

Could vertical farming work through closed loops? YASAI is pioneering this new approach with its holistic circular concept for vertical farms. YASAI farms include integrated circular loops for nutrients and heat energy, as well as biowaste and CO_2. How do they work? How much input is needed and how much output is generated?
Founded in January 2020, YASAI offers "Vertical Farming as a Service" – a new approach, where we not only build a turn-key vertical farm for our customers, but also offer the operation of the farm, as well as distribution, marketing and branding over our own sales channels. This approach allows everyone to enter the world of vertical farming, without the need of an extensive knowledge base and team. YASAIs goal is to empower its customers to grow more with less and the creation of circular food production systems all over the world, especially in cities and regions lacking sufficient agricultural resources such as fresh water or fertile arable land.

Philipp Bosshard, Co-Founder & CTO YASAI, BSc Ecological Engineering at Zurich University of Applied Sciences.

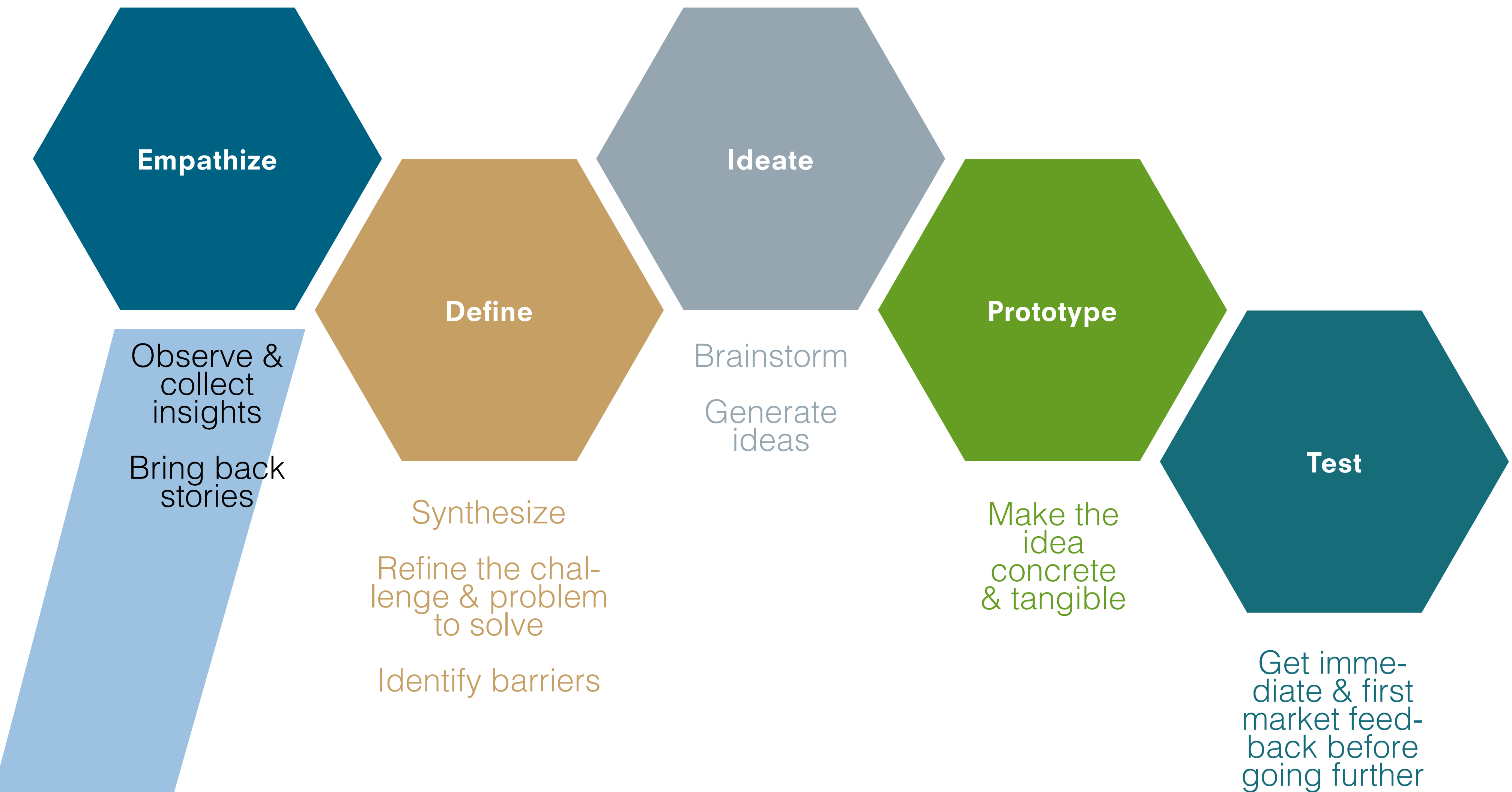
A PRACTICAL INTRODUCTION TO DESIGN THINKING

Michael Augsburger, Spark Works & ETH Zurich

During this workshop, participants will discover Design Thinking — an innovative, human-centered approach to problem solving that starts with a specific challenge and goes through multiple stages of iteration: observation, interviews, brainstorming, and prototyping.
After an introduction of the tools and methods, participants will practice in groups on a real-life challenge, from reframing the challenge, generating and describing ideas, prototyping them and exposing them to external feedback.

Literature

It is recommended to watch the 8 minutes "ABC Nightlife" report about how the company IDEO works. This video can be found on Youtube, for example here:
https://youtube/M66ZU2PCIcM



Design Thinking Process
d.school, Hasso Plattner Institute of Design at Stanford

Michael Augsburger holds an M.Sc. in Environmental Systems and Policy at ETH Zurich. His research focuses on the use of human-centered innovation processes for policy design. Believing in the benefits of interdisciplinary work, he has experience in coaching student teams to develop and push forward their own innovation projects. At Spark Works, he supports our team in the execution of agile work sessions with our clients through workshop assistance and facilitation.

INTEGRATED AGRICULTURAL SECTORS AND FOOD SYSTEM FRAMEWORK: A HOLISTIC AND MULTI-STAKEHOLDER APPROACH GUIDING SECTORS IN THEIR CONTRIBUTIONS TO SOCIAL, FOOD SECURITY AND ENVIRONMENTAL OUTCOMES

Walter-de-Boef, Wageningen University & Research (WUR),

Wageningen Centre for Development Innovation (WCDI), The Netherlands

Producing food in uncertain times calls for inclusive and resilience agricultural food sectors. Through a process of transformation, i.e. system innovations, their contribution to defined food system outcomes is enhanced in a dynamic and structural manner. As such system innovation requires coordinating improvements and learning from and adapting to emerging and changing circumstances. As such, it is a case of system thinking at food system level is putting to practice at the level agricultural sectors, i.e. zoom in and zoom out. The best practices will share cases of rapid assessments responding short term to the impact of COVID-19 on food systems and sectors, as well as designing major multi-year and multi-stakeholder sector programmes by teams of Wageningen University & Research and its partners in various countries.

Literature

Rapid assessment: https://www.wur.nl/en/Research-Results/Research-Institutes/centre-for-development-innovation/Our-Value-Propositions/Guiding-Sector-Transformation/The-effects-of-COVID-19-on-food-systems-rapid-assessments.htm

De Boef et al., 2021a. Rapid assessments of the impact of COVID-19 on the availability of quality seed to farmers: Advocating immediate practical, remedial and preventative action. Agricultural Systems. https://doi.org/10.1016/j.agsy.2020.103037

De Boef et al., 2021b. Integrating the sector and the food system framework for a nested approach to analysing system outcomes; learning from rapid COVID-19 impact assessments. Global Food Security (forthcoming).

Note the third paper will be made available shortly before the summer school, as it is still in review process.

Walter de Boef is Senior Advisor with the Wageningen Centre for Development Innovation (WCDI) part of Wageningen University & Research. Walter has more than 30 years of experience in smallholders' agricultural development. He has a MSc in Plant Breeding and PhD in Communication and Innovation Studies both from Wageningen University. At WCDI, Walter is co-leading the team working with transformation of agricultural sectors. Since joining 2020, the work has been targeted as placing this work within a food system framework. Walter manages and works in several country and multi-country collaborative programmes in the seed sector. Before, he was leading the seed system work at the Bill & Melinda Gates Foundation, was 10 year visiting professor with the Federal University of Santa Catarina in Brazil, consultant with various development organizations and worked for 10 years with the gene bank in the Netherlands. As scientist, Walter co-developed approaches that include the Integrated Sector and Food System Framework, Integrated Seed Sector Development and Community Biodiversity Management, on which he has been publishing several books and scientific papers. Walter has worked in more than 40 countries in Africa, Asia and Latin America.

SOCIAL INNOVATION – CHANGING SOCIAL PRACTICES

Anaïs Sägesser, Stride - the unSchool for Collaborative Leadership & Social Innovation

How can your innovation, solution, service, product or research efforts support the transformation of complex systems for a sustainable and equitable future? The societal challenges we face today ask for social innovation –
innovation which emerges through participatory frames and seeks societal transformation. It can relate to different contexts and social practices, like transforming the ways we eat, work, do business, travel etc. In this workshop, you will understand the idea and the key elements of the social practice theory approach and how to put it into action. You will take a look at the social practices involved in your own approach and design an experimental innovation plan in order to test your change hypotheses.

W

VALUE SENSITIVE INNOVATION IN THE HUMANITARIAN CONTEXT

Ning Wang, ETH Zurich

Emerging technologies are widely used in humanitarian, development and healthcare settings by aid agencies globally. Many of these solutions involve the use of digital technologies, such as geographic information systems, smartphone apps, predictive algorithms, blockchain, artificial intelligence, and unmanned aerial vehicles, also known as drones. The latter represents the first wave of robotic technology applied in the aid sector, demonstrating its remarkable capacity to speed up humanitarian responses and to optimize aid supply operations. However, along with enthusiasm comes uncertainty. Technological innovation intersects with values, norms, beliefs and various moral commitments. In the humanitarian sector, the use of novel technology may challenge the principle of 'Do No Harm', may raise questions related to sovereignty, and may negatively affect equality and access for at-risk populations in disaster zones and remote areas lacking sufficient healthcare services. Additionally, humanitarian innovation may also disrupt relationships between various actors including introducing new players (e.g., private for-profit companies and networks of digital volunteers), may widen inequality between those with access and those without, and may raise security and privacy risks disproportionately affecting the already vulnerable. This lecture focuses on the ethical considerations associated with the humanitarian use of drones. The findings are based on two recent field studies conducted in Nepal and Malawi, during 2019-2020, around two main applications – disaster mapping and medical supply delivery. The results are expected to inform the community on the gaps and needs with respect to the ethical challenges that humanitarian innovation may invoke in the case of the so-called "good" drones.

Literature

N. Wang, M. Christen, M. Hunt, "An Ethical Framework to Enhance Value Sensitivity in Humanitarian Innovation: Integrating Values in the Humanitarian Use of Robotic Technology", Journal of International Humanitarian Action

N. Wang, M. Christen, M. Hunt, "Ethical Considerations Associated with 'Humanitarian Drones': A Scoping Literature Review", Journal of Science and Engineering Ethics.

Ning Wang joined the Institute of Biomedical Ethics and History of Medicine (IBME) in February 2017. She acquired her Master's degrees in Applied Ethics (MA) and Political Science (MS) from Norway and Sweden respectively, during 2007-2011. From 2010 to 2013, Ning worked as an ethicist for a number of international organizations on policy development, in Geneva, Switzerland. From 2013 to 2016, Ning worked for a Swiss-based multinational company on business ethics, and subsequently a humanitarian NGO as an ethics policy advisor, in Geneva, Switzerland. In 2017, Ning returned to academia to pursue a PhD project at the Program of Biomedical Ethics and Law, University of Zurich.
In her current project, Ning works on value sensitive innovation, investigating how to integrate ethical values in the humanitarian use of drones, in collaboration with international organizations and academic institutions across Europe, North America and Asia-Pacific. Through empirical case studies, Ning intends to address the ethical, legal and regulatory challenges new technologies pose to society, propose appropriate and sensible analytical approaches in the understanding and evaluation of them, and outline feasible and pragmatic policy recommendations for the responsible development and deployment of them.

COOLING SINGAPORE: DESIGNING RESPONSIVE AND REGENERATIVE HUMAN SETTLEMENT SYSTEMS

Gerhard Schmitt, ETH Zurich and Founding Director, Singapore-ETH Centre

Human settlement systems face a new existential threat: The Urban Heat Island (UHI) effect. In combination with climate change, heat waves kill more people than any other extreme weather event: more than tornados, hurricanes, and even floods. This is why cities need to become more liveable, responsive and regenerative. Design, informed by science, site, and responsive citizens will be the enabler. Good governance, economic strength and sustainable resilience will be results. Design based on complexity science can mitigate the existential threat of climate change to citizens; and design can suggest settlement infrastructure, socio-economic and technological adjustments of settlements for inter-pandemic times. As real-time case study for this citizen-centric and science-based planning and managing approach we present the Cooling Singapore initiative.

Literature

City in Your Hands
Gerhard Schmitt, Estefania Tapias and Marta H. Wisniewska
https://books.apple.com/us/book/city-in-your-hands/id1451584143?ls=1

Cooling Singapore
https://www.coolingsingapore.sg

How Singapore uses science to stay cool
https://www.youtube.com/watch?app=desktop&v=PM101DvvG4Q

Gerhard Schmitt, Professor Emeritus for Information Architecture, ETH Zurich, Switzerland; Founding Director, Singapore-ETH Centre; Lead Principal Investigator, Cooling Singapore. Since 2005, developed Information Architecture on the urban and the territorial scale at ETH Zurich and in Asia. Since 2006, co-developed the Future Cities Laboratory in Singapore. Studies in Munich, Los Angeles and Berkeley. Formerly: Associate Professor, Carnegie Mellon University; Visiting Professor, Harvard GSD; 1994-96, Dean of Architecture ETH Zurich; 1998-2008, ETH Zurich Vice-President for Planning and Logistics; 2000. Gerhard Schmitt initiated the virtual campus ETH World in 2000 and in 2003 the sustainable ETH Science City Campus in Zurich; he received for this work the 2010 European Culture of Science award.

CASE STUDIES

1 DIGITAL TECHNOLOGIES IN MICRO FARMS: HOW CAN THEY LINK FARMERS AND (URBAN) COMMUNITIES?

Case study supervisors:
Paschke, Ning, Lütschg, Augsburger

Digital technology in farming is coming with a lot of promises and positive expectations for a sustainable and more productive agriculture. However, digital farming developments also raise a bunch of societal-relevant questions.
Digital technology in farming (large or small-scale) is through data collection and precision equipment, on-time soil and plant measurements by new sensors and efficient computational power and modelling together with new devices as robots and drones. With this a sophisticated and integrated decision-making of farmers on the farm should be enabled. However, the data-intensive technologies are often framed for large-scale, conventional agricultural setting and are not enabling small-scale or agro-ecological practices, for example microfarms that build up on direct interaction between farmers and communities are left out in their needs.

This is due to several lock ins that these technologies and their development currently create, for example:

- Data management in closed, establishing proprietary systems in which the farmer is part of a highly integrated food supply chain
- Technology development that is framed solely within the efficiency narrative, therefore, not having in mind consistency (circular approaches and close loops) and sufficiency related priorities (e.g. avoidance of food waste or diversity approaches).

Without taking consistency and sufficiency approaches into account the technologies are on the risk of failing the SDGs despite large investments. Could a design process that will take into account values of micro-farmers, citizen and communities and a framing within the consistency and sufficiency boundary create a more social relevant and environmental friendly technology?

- What are the societal relevant questions linked to this case?
- What norms and values or interests are underlying the case? What ethical, legal or social benefits, challenges and conflicts do you when thinking about embedding technologies into the context of small-scale and microfarms?
- Could you translate identified values and needs into a new design of the technology?

In the introduction of these use case I will introduce you to positive cases, for example the ROMI project of Fablab Barcelona (see references).

Literature

Metzner-Szigeth, A. (2019). Strategies for Eco-Social Transformation: Comparing Efficiency, Sufficiency and Consistency. http://lensconference3.org/index.php/program/presentations/item/102-strategies-for-eco-social-transformation-comparing-efficiency-sufficiency-and-consistency

Klerkx, L., Rose, D. (2020). Dealing with the game-changing technologies of Agriculture 4.0: How do we manage diversity and responsibility in food system transition pathways? Global Food Security 24, 100347: https://doi.org/10.1016/j.gfs.2019.100347

Please also have a look at the following section of the webinar: 30:46 – 45:51 by FabLab, IAAC, with their sequence on embedding robotics and environmental sensors for microfarmers: https://foodshift2030.eu/webinar-urban-and-peri-urban-agriculture/

With the Milan Urban Food Policy Pact (2015) industrialized cities are seeking to re-envision their urban food systems and link it to the SDGs. Sustainable urban food production are taking several directions: from community gardens to community-assisted agriculture or towards innovative and technological-driven urban farming enterprises (e.g. indoor vertical farming, roof farming with greenhouse facilities or integrated aquaponic systems etc.).
While in principle most of us agree to support local sustainable food production systems, the framing of these systems is of uttermost importance. We need to embed the local food production within circular food systems. It is estimated that by 2050, there will be approximately 9 billion people living on Earth, with almost 70% of them projected to live in urban areas. This increase in the global population is projected to require three times more resources than we currently use. However, around 80% of all materials are directly discarded after usage, thus highlighting the need for circular alternatives to linear models.

- Gain through working on the case study increased knowledge about Circular Economy principles and concepts and measurements in the context of SDGs.
- Identify and assess challenges and opportunities when designing Circular Food Systems.
- Develop a Circular Product-Service Combination / Food Value Chain to achieve Food Circularity.

Literature

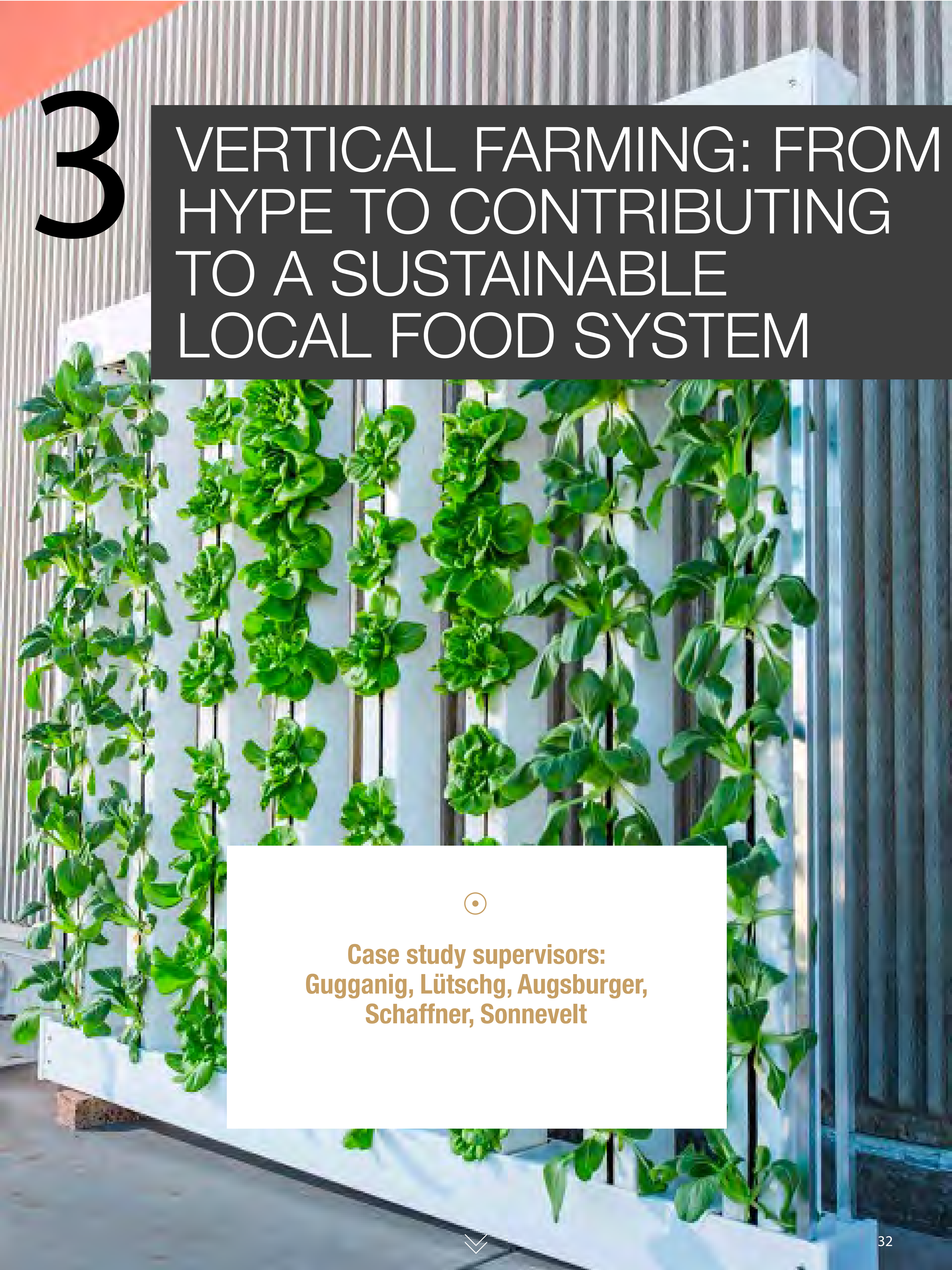
FAO and INRAE. 2020. Enabling sustainable food systems: Innovators' handbook. Rome. https://doi.org/10.4060/ca9917en

The circular design toolkit for Arthur Mac Allen Foundation, see: https://www.ellenmacarthurfoundation.org/resources/learn/circular-design-toolkit

2 HOW TO IMPLEMENT CIRCULAR APPROACHES IN URBAN FOOD SYSTEMS

Case study supervisors: Paschke, Sonnevelt

3 VERTICAL FARMING: FROM HYPE TO CONTRIBUTING TO A SUSTAINABLE LOCAL FOOD SYSTEM



Case study supervisors: Gugganig, Lütschg, Augsburger, Schaffner, Sonnevelt

Greenhouse technologies, including hydroponics, aeroponics, and aquaponics enrich the vertical farming concept. Proponents argue that compact high-tech agriculture is not only applicable in dense urban areas but also in peri-urban areas. These new high-tech systems are thought to minimizing maintenance and maximizing yield of agricultural systems while being sustainable through reduced resource needs (pesticides, herbicides, water etc.), reducing food-miles (zero mile concept) and the need of less space. However, in the moment their carbon footprint due to their high energy consumption and due to their use of expensive drinking water is still high beside other socially and value-related questions as their potential to generate work places, their contribution to food sovereignty, the access to healthy food also for all social classes or questions related to animal welfare.

This case will (a) analyse the potential of vertical farms in the context of closed loop systems and potential hybrid systems (vertical farming combined with other low-tech approaches and in the local social context where they are happening for their sustainability in all three dimensions: environmental friendly, socially fair and generating livelihoods for many. You can also (b) design your vertical farming system for any local context that you want to apply using value-based and human-centred design approaches.

Literature

Vaughan, A (22 June 2019). Is vertical farming the way to a greener life? New Scientist | 15

Al-Kodmany, K. (2020). The Vertical Farm: Exploring Applications for Peri-urban Areas. Patnaik, S., Sen, S., Mahmoud, M. S. (eds.) Smart Village Technology: Concepts and Developments. Springer Nature: Switzerland: 203- 232. https://doi.org/10.1007/978-3-030-37794-6

Broad, G.M. (2020). Know Your Indoor Farmer: Square Roots, Techno-Local Food, and Transparency as Publicity. American Behavioral Scientist 2020, Vol. 64(11) 1588–1606.

Goodmana, W., Minnerb, J. (2019). Will the urban agricultural revolution be vertical and soilless? A case study of controlled environment agriculture in New York City. Land Use Policy 83: 160–173.

Lages Barbosa, G. et al. (2015) Comparison of Land, Water, and Energy Requirements of Lettuce Grown Using Hydroponic vs. Conventional Agricultural Methods, International Journal of Environmental Research and Public Health. https://doi.org/10.3390/ijerph120606879

Zhang, S. et al. (2017) A Numerical Model for Simulating the Indoor Climate inside the Growing Chambers of Vertical Farms with Case Studies, International Journal of Environmental Science and Development, Vol. 8, No. 10, October 2017.

Graamans, L. et al. (2017) Plant factories; crop transpiration and energy balance, Elsevier, Agricultural Systems 153 (2017) 138–147.

Petropoulos, S. et al. (2016) Yield and Quality of Lettuce and Rocket Grown in Floating Culture System, Not Bot Horti Agrobo, 2016, 44(2): 603-612. https://doi.org/10.15835/nbha44210611

Wong, C. et al. (2020) Seeing the lights for leafy greens in indoor vertical farming, Elsevier, Trends in Food Science & Technology 106 (2020) 48–63.

“The Food Revolution” UBS report. Download: The food revolution –The future of food and the challenges we face (ubs.com).

Sustainable and resilient agricultural systems are needed to feed and fuel a growing human population. However, the current model of agricultural intensification which produces high yields has also resulted in a loss of biodiversity, ecological function, and critical ecosystem services in agricultural landscapes. If in this complex pattern we also need to integrate the demand for renewable energy both for biomass and also for technical approaches, e.g. photovoltaics the problem is even getting more complex. A key consequence of agricultural intensification or technological intensification for producing renewable energy is landscape simplification, where once heterogeneous landscapes contain increasingly fewer crop and non-crop habitats. Landscape simplification exacerbates biodiversity losses which leads to reductions in ecosystem services on which agriculture depends.
In recent decades, considerable research has focused on mitigating these negative impacts, primarily via management of habitats to promote biodiversity and enhance services at the local scale. While it is well known that local and landscape factors interact, modifying overall landscape structure is seldom considered due to logistical constraints. The loss of ecosystem services due to landscape simplification can only be addressed by a concerted effort to fundamentally redesign agricultural and energy landscapes. Designing landscapes that are sustainable and resilient will require that scientists work with stakeholders to determine the mix of desired ecosystem services, evaluate current landscape structure in light of those goals, and implement targeted modifications to achieve them.

In this case study the group of students from different disciplines need to work together to:

- Design a system that will produce food in a sustainable and resilient way, that produce renewable energy and where biodiversity is high.
- You choose the scale: will it be a farm or region that you will take as an example? What global region?
- Could necessary technical infrastructure and innovation be included in this landscape approach?
- Analyze feasibility and sustainability of your system assessing (on a theoretical base) key indicator for example for: food security factors, resilience factors etc.

Literature

Landis, D.A. (2017). Designing agricultural landscapes for biodiversity-based ecosystem services. Basic and Applied Ecology 18: 1-12. https://doi.org/10.1016/j.baae.2016.07.005

Kremen, C. & Merenlender, A.M. (2018). Landscapes that work for biodiversity and people. Science 19, Vol. 362, Issue 6412. DOI: 10.1126/science.aau6020

Some key indicators are explained here:
Elin, R., Bojana, B., Weil, C., Andersson, E., Bossio, D., Gordon, L. J. (2021). Moving beyond organic – A food system approach to assessing sustainable and resilient farming. Global Food Security 28: 100487.

We list exemplary papers that describe challenges and criticism on including photovoltaics into agricultural settings –for Mediterranean areas and for the German context:

Mauro, G., Lughi, V. (2017). Mapping land use impact of photovoltaic farms via crowdsourcing in the Province of Lecce (Southeastern Italy). Solar Energy, 155: 434-444. Doi: https://doi.org/10.1016/j.solener.2017.06.046

Chiabrando, R., Fabrizio, E., Garnero, G. (2009). The territorial and landscape impacts of photovoltaic systems: definition of impacts and assessment of the glare risk. Renew. Sustain. Energy Rev., 13: 2441-2451.

Ketzetr, D., Weinberger, N., Rösch, C., Seitz, S.B. (2019). Land use conflicts between biomass and power production – citizens' participation in the technology development of Agrophotovoltaics. Journal of Responsible Innovation Volume 7: 193-216: https://doi.org/10.1080/23299460.2019.1647085

HOW TO CREATE SUSTAINABLE AND RESILIENT ENERGY, FOOD AND BIODIVERSITY LANDSCAPES?

4

Case study supervisors: Schaffner, Kleinschroth, Paschke, Sonnevelt

5 STEWARDSHIP OF LAND USE CHANGES – HOW CAN DRONES OFFER SUPPORT?

**Case study supervisors:
Ning, Lütschg**

Drones are mechanical devices that are, to varying degrees, mobile and can operate remotely from a human operator in aerial, terrestrial or water contexts. They can be used in varied ways to help protect the environment and can also facilitate or cause biodiversity harm. Drones / Unmanned Aerial Vehicles (UAVs) are a mix of technologies for locomotion, sensing and communication, to which other technologies can be added. Questions in this use case to work on are:

- How can they for example support communities, organisations, farmers, researchers or policymakers when managing conflicts and making decisions around land management?
- How can their developers merge processes, technology and skills from across multiple knowledge systems to create UAVs that serve needs of land stewards regarding ecosystem services?
- How can a group of people who will be using or benefitting from drone usage (a community) that are united by a common theme (domain) participate, propose, test, co-create and use technologies to best suit their needs (practice)?
- What are ethical implications that should be considered in the developing and using UAVs for environmental monitoring purposes? And why are they important?
- Do human values play a role in the development and use of UAVs? If so I what ways?

Literature

Arts, K., van der Wal, R., & Adams, W. M. (2015). Digital technology and the conservation of nature.Ambio, 44(S4), 661–673. https://doi.org/10.1007/s13280-015-0705-1

Berardi, A. (2016). Community-Based Eco-Drones for Environmental Management and Governance. The Open University. https://doi.org/10.13140/RG.2.2.19723.08484

D. Floreano & R. Wood, "Science, Technology and the Future of Small Autonomous Drones," Nature, vol. 521, pp. 460–466, 2015. https://doi.org/10.1038/nature14542.

M. A. Baytas, D. Cay, Y. Zhang, M. Obaid, A. E. Yantac & M. Fjeld, Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, 2019, No. 250, pp. 1–13. https://doi.org/10.1145/3290605.3300480.

There is a strong link between formal plant breeding and seed supply. In developed countries, it was the emergence of systematic plant breeding that generated new named varieties and stimulated organized seed multiplication and marketing by commercial companies. The rules of formal seed system are debated with questions about different interests of the participants and users of plant varieties. Discussions arise around innovations in plant varieties moving away from larger societal interests (i.e. access of farmers to seed varieties; feedbacks between the seed system and an industrialized agriculture with the potential of reducing resilience of the food system, negative impact on food sovereignty).

In this case study participants will ask:

- How can the transformation of the formal seed systems for a sustainable and equitable future happen?
- There are two systems in conflict: Participatory approaches / patent-based approaches that guarantee royalties and revenues to a single company. Could we bring them together?

Literature

Kochupillai, M. (2016). Promoting sustainable innova tions in plant varieties. Munich Studies on Innovation and Competition 5. Berlin, Heidelbeg: Springer-Verlag. DOI 10.1007/978-3-662-52796-2

Zewdie Bishaw, Z. & Turner, M. (2008). Linking participatory plant breeding to the seed supply system. Euphytica 163: 31–44.

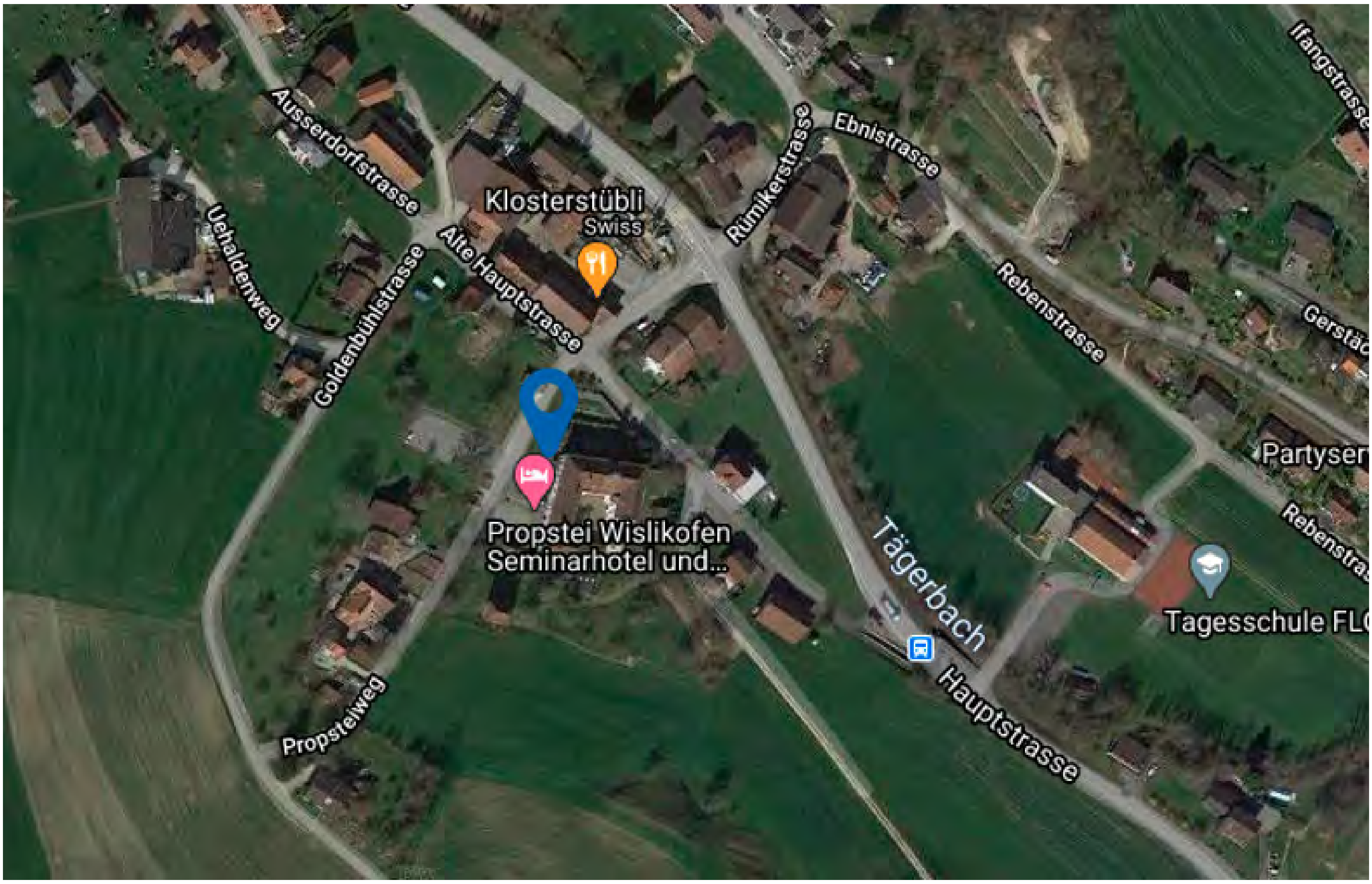
Dawson, J.C. & Murphy, K.M., Jones, S.S. (2008). Decentralized selection and participatory approaches in plant breeding for low-input systems. Euphytica 160: 143–154.

Tscherchsich, J. (2021). Norm conflicts as governance challenges for Seed Commons: Comparing cases from Germany and the Philippines. https://doi.org/10.1016/j.esg.2021.100097

Mulesa, T.H., Dalle, S.P., Makate, C., Haug, R., Westengen, O.T. (2021). Pluralistic Seed System Development: A Path to Seed Security? Agronomy 11(2), 372: https://doi.org/10.3390/agronomy11020372

6 RESPONSIBLE INNOVATION IN SEED SYSTEMS

Case study supervisor: Paschke



Accommodation

We are staying at the former Monastery in Wislikofen. The hotel provides meals of well-balanced nutrition, and wherever possible using produce from the region. Breakfast is buffet continental style. The Propstei Wislikofen is a place with special charisma. Among other things, it is known for its historic ambience, tasteful rooms and excellent cuisine. There are lots of hiking tracks within the area of the hotel.

Contact information

Propstei Wislikofen
Propsteiweg
5463 Wislikofen
Tel. +41 (0)56 201 40 20
info@propstei.ch

Hotel website:
https://www.propstei.ch

How to get to the venue in Wislikofen

Take the train to Baden (from Basel, Bern etc.) respectively to Niederweningen (from Zurich, Lucerne etc.). Check the SBB online timetable for your detailed connections:
http://fahrplan.sbb.ch/bin/query.exe/en

Buy a single train ticket to Wislikofen.

Travel plan from Zurich main station to Wislikofen
(Bus stop: Wislikofen Dorf)

From: Zürich HB
To: Wislikofen, Dorf
Via:
Date: Mo, 13.09.21 Calendar
Time: 08:00 Departure Arrival

Advanced search · New request · Return journey · Continue journey · Search connection

Station/Stop	Time	Duration	Chg.	Travel with	Information	Fare

Connections for Mo, 13.09.21

1	Station/Stop	Time	Platf./ Edge	Travel with	Occupancy	Comments
	Zürich HB	dep 08:22	41/42	S 15		Urban train 15 19528 Direction: Niederweningen
	Niederweningen	arr 08:56	1			OM
	Niederweningen			walk		2 min., Y
	Niederweningen, Bahnhof					
	Niederweningen, Bahnhof	dep 09:03	A	B 354		Bus 354 35417 Direction: Kaiserstuhl AG, Bahnhof
	Wislikofen, Dorf	arr 09:15				OM

Duration: 0:53;
runs daily

Ecocalculator · Map · Calendar · Text view · Fully accessible connection · Price list

Show intermediate stops · Fare/Buy

From Baden or Niederweningen take bus no. 354 (direction Kaiserstuhl) to the bus stop Wislikofen Dorf. From there it is only about 50 meters to Propstei Wislikofen. Upon arrival at the Hotel, go to the main desk and ask for Dubravka Vrdoljak.

Region

In terms of landscape, Wislikofen is located in the charming Zurzibiet along the course of the Tägerbach. Within the Zurzibiet, Wislikofen belongs to the Rhine Valley, which includes the area from Rietheim to the border with the canton of Zurich.

For more information about the hotel:
https://www.youtube.com/watch?v=6n1pkWN76rQ

Publisher

The Zurich-Basel Plant Science Center (PSC) is a competence center for the plant science research community at ETH Zurich, University of Zurich and at University of Basel. The center promotes research, education and outreach and provides platforms for interactions with peers, policymakers, industry, stakeholders and the public.

Zurich-Basel Plant Science Center
ETH Zurich
Tannenstrasse 1
8092 Zurich

www.plantsciences.ch

Pictures

FORETS – Pilot farm in Yangambi - DRC by Axel Fassio, CIFOR – Flickr. Solar panels by James Moran – Pexels (frontpage).

The Jewel, Singapur Airport by Lynde – Pexels (page 2).

Terrace rice field in Yunnan Province, China. March 2003 by Jialiang Gao www.peace-on-earth.org (page 5).

Cisauk, Indonesia by Tom Fisk – Pexels (page 10).

Vertikal farming – YASAI (page 19).

Energy systems, solar Energy by Taryn Elliott – Pexels (page 26)

Drone by Kira Hoffmann – Pixabay (page 27).

MetskiGarden – Pixabay (page 30).

Salad hydrophonics – Pixabay (page 31).

Crops grow under PV arrays in a test plot at the UMass Crop Animal Research and Education Center in South Deerfield MA. The project is part of the DOE InSPIRE project seeking to improve the environmental compatibility and mutual benefits of solar development with agriculture and native landscapes – Flickr (page 34).

Conceptual view of the CYbER drones during flight and sampling inside tree canopies by Stefano Mintchev, ETH Zurich (page 35).

Bean Diversity at CIAT by Cary Fowler, Global Crop Diversity Trust – Flickr (page 38).

Citation

Zurich-Basel Plant Science Center (2021). Workbook and Program: Responsible Research, Innovation and Transformation in Food, Plant and Energy Sciences. Summer School 2021.