

Lecture series:

## **Delivering on the Sustainable Development Goals: Systems analytical perspectives on strategies and trade-offs**

This interdisciplinary course provides students with the ability to identify adequate systems analytical approaches for solving policy problems at different scales of governance. This is relevant not only in academia, but also for policy analysts in the public and private sectors. The focus on the SDGs provides an excellent framework to illustrate the complexity of current societal challenges.

8.10.2018, Susanne Hanger-Kopp:

*Abstract*

### **“Introduction I (Systems Analysis)”**

Societal problems reflected in the Sustainable Development Goals are increasingly complex. Solving, or at least managing them requires a holistic or systems view and adequate tools to analyze and understand processes, interactions, barriers, consequences, and trade-offs. In the first introductory session to this lecture series, we talk about the origins and fundamental ideas of Systems Theories, what Systems Analysis can be in and across disciplines, and how Systems Thinking is relevant beyond academia.

In this first session, we will also introduce the overall objectives of the lecture series, as well as all the terms and modalities related to the course. We will gauge and manage expectations, and hopefully create excitement for the up-coming lectures.

*Bio*

**Susanne Hanger-Kopp** has been working at the International Institute for Applied Systems Analysis since 2010. Her work in the Risk and Resilience Program focuses on risk governance and risk management in the context of climate and societal changes. She holds a doctoral degree from the Department of Environmental Systems Science at ETH Zürich, where she currently works on risks and uncertainties associated with alternative climate mitigation pathways. Susanne also studied theoretical and applied geography and romance languages at the University of Vienna and was, for several years, actively involved in the foundation and running of a European Youth Media NGO.



15.10.2018, Verena Winiwarter:

*Abstract*

### **“Introduction II (SDGs)”**

The largest ever consultation process led to the definition of 17 goals that the United Nations have developed for the world to be reached by 2030. This Agenda 2030, also known as the Sustainable Development Goals, are further broken into 169 targets and a complex logic of interdependencies and relations is employed to make cherry-picking difficult. The SDGs were ratified by many nations, and a time-consuming and expensive monitoring and reporting process has begun, but not all countries are prioritizing the goals and it remains to be seen if they are able to change the world's trajectory towards a sustainable, inclusive and peaceful world society. Since 2015, when they were announced, the scientific community has embraced the goals and a huge amount of work related to them has since been published. This intro will

try to give you a roadmap of the SDG landscape in order to navigate through the common thread of the lecture series.

*Bio*

**Verena Winiwarter** is Professor of Environmental History at University of Natural Resources and Life Sciences. First trained as a chemical engineer, she holds a PhD in Environmental History and was granted the *venia legendi* in Human Ecology. She is full member of the Austrian Academy of Sciences, Chairperson of the Commission for Interdisciplinary Ecological Studies (OEAW), President of ICEHO, founding member of ESEH and, among others, member of the advisory boards of the Centre for Environmental History (University Tallinn), Deutsches Museum (München) and Technisches Museum Wien. Her main research interests comprise the history of landscapes, in particular rivers, images, and the environmental history of soils.



22.10.2018, Veronika Gaube:

*Abstract*

**“From farmer, livestock and biodiversity: integrating decisions on land use and climate change to assess biodiversity changes in Austrian cultural landscapes”**

Land-use and climate change are important drivers of environmental change and pose major threats to biodiversity. Even though it is expected, that systemic feedbacks between changes in climate and land use will have important effects on biodiversity, research has rarely focused on the interaction between both drivers. This talk will present an integrated socio-ecological approach for a case study in the LTSER region Eisenwurzen (Austria) consisting of three principal components: (1) an agent-based model (ABM) called SECLAND, which simulates decisions of relevant actors (mostly farm owners) between the years 2014 and 2050, (2) a spatially explicit GIS model that translates these model outputs into changes in land cover and land use patterns, and (3) a species distribution model (SDM) that calculates changes in biodiversity patterns following from both changes in climate and the land-use decisions from SECLAND. General applications of ABMs have proven their utility in analysing the dynamics of socioecological systems in which decisions of actors influence biophysical dynamics. SECLAND is based on an integration of quantitative (statistical and spatial explicit) and qualitative data, of which the latter was derived through 30 interviews with local farmers and regional decision stakeholders makers in the fields of agriculture, forestry, regional planning.

*Bio*

**Veronika Gaube** is senior researcher at the Institute of Social Ecology (BOKU). She finished her PhD in Social Ecology and has 15 years of experience in interdisciplinary research linking socio-economic and ecological approaches in sustainability science. She is experienced in developing integrated socioecological models. These models combine agent-based and material/substance stock-flow modules to analyse the interactions between decisions of land users, land-use change, and socioecological flows of energy, materials or substances (e.g. C and N). In a range of projects (supported by EU-FP7, FWF, proVision and other funders), she developed integrated socioecological models in participatory processes, often in close collaboration with stakeholders. 2012 she was awarded the Elise Richter project (FWF) ALISEN (Analyzing linkages of socioecological nitrogen flows) allowing her to advance her approach to long-term integrated modelling of land-use decisions and substance flows.



29.10.2018, Sibel Eker:

*Abstract*

**“Systems modelling to investigate sustainable consumption dynamics”**

Achieving Sustainable Development Goals requires understanding many social, economic and technical systems, which are interconnected via complex relationships. Models, whether they are quantitative or qualitative, have long been used to capture the complexity of such systems, to enhance our understanding about them, and to provide policy recommendations. In this lecture, I will first discuss the conceptual basis of systems modelling, and I will demonstrate how we can build and use a small model. I will then present an application that addresses the sustainable production and consumption goal. With this example, we will explore the mechanisms behind global diet change dynamics and their environmental effects.

*Bio*

**Sibel Eker** is a Postdoctoral Researcher at International Institute for Applied Systems Analysis (IIASA). Dr. Eker's primary expertise lies in model-based policy analysis, especially in system dynamics modeling and decision making under deep uncertainty. She is experienced with the use and development of various modeling and simulation tools to deal with complex policy problems in a variety of areas such as energy, housing, transport, land use and social dynamics.

Dr. Eker obtained her PhD degree in 2016, from Delft University of Technology with a focus on dealing with uncertainties in the Dutch energy sector. Prior to joining IIASA, she worked at University College London on integrated decision making in housing, energy and well-being; and at Delft University of Technology on the resilience of the transport network in Bangladesh.



5.11.2018, Gerhard Reese:

*Abstract*

**“Systems in my mind – defining the psychological underpinnings of systems thinking and its consequences”**

The 17 sustainable development goals (SDGs) circle around the question of how the current world could be transformed into a sustainable one. The SDGs are diverse in their themes and complexity, are inherently linked to each other, and thus require interdisciplinary analytical approaches. All goals have in common that they can only be reached by tremendous political efforts and behavioural change on the individual and group level. This behavioural change is at the heart of environmental psychology analysis. In this talk, I will briefly discuss environmental psychology's contribution towards the SDGs, and then present a psychological approach to systems thinking. Specifically, I will introduce systems thinking as an operational psychological construct that has consequences for individuals' attitudes, intentions, and behaviours. I will present some studies developing and positioning a scale to measure systems thinking, and then present work from our own lab suggesting that systems thinkers are more likely to engage in behaviors related to many of the SDGs, including responses to migration, terrorism, and climate action. I will conclude with an outlook on ongoing, interdisciplinary research at the nexus of psychology and sustainability.

*Bio*

**Gerhard Reese** is Professor of Environmental Psychology at the University of Koblenz-Landau since September 2016. His work focuses on pro-environmental action, social and economic inequality, and globalization, with social identity representing the interlinkage between all of these. He received his doctorate degree from the Friedrich-Schiller-University Jena, Germany, in 2010, after completing his Master degree in Social Psychology from the University of Kent in Canterbury, UK, in 2006. During his Post-Doc, Gerhard worked at the Universities of Jena, Luxembourg, and Leipzig. In Mai/June 2011 he was a visiting scholar at Flinders University, Adelaide.



12.11.2018, Ted Veldkamp:

*Abstract*

**“Water and the SDGs: a systems approach to evaluate chances, threats, and trade-offs”**

Water is key to the Sustainable Development Goals, being directly linked to SDG 6 and indirectly to SDG 2 (food), SDG 3 (health), SDG 13 (climate change), and SDGs 14 and 15 (live below water and on land). In a continuously developing world (i.e. economic developments, globalization and climate change) water can act at both as a threat as well as an opportunities to societies to maintain and/or achieve the SDGs. Whilst the availability of freshwater resources over the past has boosted societies to flourish; hydrological extremes (i.e. floods, droughts) or the constant lack of resources (water scarcity) may significantly threaten or hinder socioeconomic well-being.

The world and its socio-economic structures are under constant pressure. Population numbers are rapidly growing in less developed or less stable countries, resulting in an increase in demand and use of scarce water, energy and food resources. Climate change and attribution studies suggest at the same time that climate change leads to worsening of water scarcity conditions and more extreme hydro-climatic conditions all over the globe, witnessed by extreme events such as the 2018 Northern Hemisphere Drought.

This talk will focus on water in light of achieving the SDGs. As such, I will outline the importance of water as part of daily life, explain the concept of water security, and describe how climate change and socioeconomic developments may influence this. Finally, I will illustrate the role of water within the socio-hydrological system and how we can use a systems approach, e.g. by means of modelling tools and scenarios, to assess current and future chances, threats, and trade-offs related to water and the SDGs.

*Bio*

**Ted Veldkamp** is Assistant Professor at the department of Water and Climate Risk at the Institute for Environmental Studies, VU Amsterdam (the Netherlands) and a research fellow at the Water department of the International Institute for Applied Systems Analysis (IIASA), in Laxenburg (Austria). Using IIASA's water models CWATM and ECHO, her research encompasses the modelling and assessment of freshwater resources and their extremes at the global and local scale, with a focus on droughts and water scarcity. Together with colleagues from the Water department, she is further responsible for the design, development and editorial overseeing of the new ISIpedia climate-impacts service portal, an online portal for national-level, cross-sectoral climate-impact assessments, based on state-of-the-art climate-impacts simulations from ISIMIP. Ted obtained her PhD degree: “Water scarcity at the global and regional scale - unravelling its dominant drivers in historical and future time-periods” in December 2017 Cum



Laude. At the VU Amsterdam, she has an active role in various teaching courses in the BSc programme Earth Science & Economics, the MSc programme Environmental Research Management, and the MSc programme Hydrology.

19.11.2018, Stephanie Bengtsson:

*Abstract*

**“The role of education in enabling the sustainable development agenda”**

With the launch of the global Sustainable Development Goals agenda in 2015 comes an opportunity to critically reflect on the role of education in, through, and for sustainable development. While it is widely understood that there is a positive relationship between education and other dimensions of development, and populations around the world show a clear desire for more and better education, education remains an under-financed and under-prioritised sector within the development project as a whole. When education does make it onto the agenda, it tends to be over-emphasised in its role as a tool of development by non-educationists. Thus, improvements to education are typically justified only to the extent that they will increase education's instrumental value (leading to improvements in other sectors), rather than increase its intrinsic value.

In this lecture, I will explore education's role in the international development agenda to date, focusing on international target-setting exercises and attempts to measure progress. I will argue that the tendency on the part of the international community to prioritise easily quantifiable measures of progress has led to an overemphasis on education system inputs and outputs and poorly-defined proxy indicators within development initiative design and evaluation, with little to no attention paid to the educational processes of teaching and learning. In the final part of the lecture, I will propose an alternative approach to the design and evaluation of education initiatives that builds on the principle that for the many instrumental benefits of education to be realised, it needs to be improved on its own terms, for its intrinsic value.

*Bio*

**Stephanie Bengtsson** is a part-time research scholar with the World Population Program (POP) at the International Institute for Applied Systems Analysis, where she is working on education issues, socio-economic progress and human wellbeing. She also works as an education consultant with a range of international partners (including UNESCO-IIEP, UNICEF, INEE, bilateral donors, etc.), specialising in international development, teachers and teacher education, and education in emergencies and situations of displacement. She holds a Doctorate in International Educational Development from Teachers College, Columbia University, an MPhil in Inclusive Education from the University of Cambridge, and a Bachelor of Arts (cum laude) in English Literature from Harvard.



26.11.2018, Franziska Gaupp:

*Abstract*

**“Food systems risks and possible solutions for a sustainable future of food”**

Governments, financial institutions, multilateral organizations and the private sector have made commitments to “sustainable development” in 2015. This includes the goal to “end hunger, achieve food security and improved nutrition, and promote sustainable agriculture”. This talk will focus on food systems risks and on how to increase agricultural resilience to a changing climate. I will talk about long-term trends in agriculture such as soil erosion or water

quality degradation, shocks such as climate extremes and triggers that lead to cascading effects in our inter-linked food system such food prices spikes or trade bans. I will introduce possible solutions to those risk factors and talk about research that is done at IIASA to model food system risks such as a global bio-economic land-use model and other risk analysis tools.

*Bio*

**Franziska Gaupp** is a post-doctoral researcher at the International Institute for Applied Systems Analysis (IIASA). Her research focuses on risks to global food security caused by simultaneous production shocks. Using IIASA's crop and land-use models as well as different statistical approaches she investigates the risks of climate extremes or other disruptions of the global food system under different future climate and socio-economic scenarios.

Franziska joined IIASA following a DPhil (PhD) at the Environmental Change Institute at the University of Oxford. She holds a MSc in Ecological Economics from the University of Edinburgh and a BSc in Economics from the Freie Universität Berlin.



3.12.2018, Alison Heslin:

*Abstract*

**“Natural Disasters and Urban Displacement: The Gentrifying Effects of Disaster-Induced Outmigration”**

With so many major cities located in coastal areas throughout the world, efforts to ensure safe, resilient, and affordable urban housing must engage with the increasing severity of natural disasters, particularly in coastal areas. This lecture addresses the role that destructive natural disasters play in displacing urban populations and how the process of rebuilding changes the socioeconomic make-up of cities. This research links the growing flow of people pushed by disaster from their homes to the subsequent gentrification of affected urban areas. Using existing theory at the intersection of migration, urban sociology, and natural disasters, this lecture uses the example of the United States to understand what happens to urban communities after the recovery from natural disasters. Drawing on census data pre- and post-natural disaster, we can identify patterns in who is displaced by disasters and who is able to return and rebuild. Efforts to ensure sustainable, inclusive urban housing must take these tendencies into account when building resilience for increasingly severe coastal storms.

*Bio*

**Alison Heslin** is a postdoctoral researcher at the International Institute for Applied Systems Analysis, where she studies political economy in the World Population and Risk and Resilience programs. Her research broadly addresses the social consequences of environmental changes, specifically, how occurrences of natural disasters or acute food shortages affect violent conflict and inequality. Prior to joining IIASA, Dr Heslin worked as a Visiting Professor at New York University. She holds a PhD in Sociology from Emory University in Atlanta, USA, where she studied food insecurity and political stability.



10.12.2018, Jessica Jewell:

*Abstract*

**“Tensions between global and national priorities: implications for the climate SDG (13)”**

Climate change is a global problem and its effects will be felt worldwide. Yet the political power and resources to solve it are concentrated at the national (and partly local) level. Given that national priorities have shorter time horizons and narrower constituencies, can we expect national policies to deliver on this global challenge? This lecture explores this question with two specific policy cases: fossil fuel subsidy removal and energy independence. While both have been promoted as a means to align global climate goals with national energy priorities, the actual interplay is much more interesting, complex and instructive. I show how systems analysis tools can be used to analyse the interaction between competing priorities at different scales and probe into the implications of solving climate change and other energy goals.

*Bio*

**Jessica Jewell** is a Research Scholar at the International Institute for Applied Systems Analysis and Adjunct Associate Professor at University of Bergen, Norway. Her first degree was in Geology from Brown University and she holds a Masters and PhD in Environmental Sciences and Policy from Central European University. She was a Contributing Author in the IPCC Working Group III and is a member of a number of editorial and advisory boards including Energy Research and Social Science and Environmental Research Communications. Her research focuses on understanding how political, economic, and technological constraints shape future energy systems in different countries and she currently leads a project which aims to understand the historical precedents and future prospects of declining energy industries. It has appeared in outlets like Nature, Nature Energy and Energy Policy.



17.12.2018, Katya Perez-Guzman:

*Abstract*

**“Global trade of commodities and the SDGs: a network analysis of the input-output databases related to mining”**

Global trade of commodities is a driver of many of the challenges we face in our societies today. Environmental pollution, inequality, underdevelopment, injustice in global value chains are few of the problems that have as a common cause the extraction and export of natural resources. The input–output tables are one of the main databases where a detailed country-sector network of the flows of goods can be analyzed. More recently, network analysis has been used to extract valuable information on the structure of global trade, which determines many of its unintended negative effects. Still, much remains to be done, since most of the centralities and methods of graph theory are ill-suited for the specificities of input-output tables. In the end, the combination and improvement of these methodologies can provide good insights about how the structure of global trade of raw materials like mining products affects the potential for attaining several of the Sustainable Development Goals.

*Bio*

**Katya Perez-Guzman** is a Mexican environmental advocate and researcher who is passionate about advancing quantitative methods to inform public policy in climate change mitigation, and systems thinking. She worked for ten years in the civil society and government environmental sectors, where she learned that only through efforts that are collective, or institutionalized (in the broadest definition of this term) will we be able to meet the challenges ahead of us. Systems analysis leverages the best tools available to study collective structure and behavior. She is excited of the recent development in these fields, and the promise they hold for the future.



7.1.2019, Adriana Keating:

*Abstract*

**“Disaster resilience: useful systems concept or meaningless buzzword?”**

Disasters pose a growing threat to the achievement of the SDGs. Disaster risk management efforts have largely failed to arrest the underlying drivers of increased global risk: uncontrolled urbanization and proliferation of assets in hazardous areas. Resilience has risen to the fore as a concept with the potential to tackle this challenge - everyone is now claiming to be ‘building resilience’! Is the resilience buzz meaningful, or simply rhetoric? This lecture will argue that if the systems analysis roots of resilience are embraced, then it does indeed provide an opportunity to confront the social-ecological foundations of risk and development. Yet to-date it has been vaguely conceptualized, without offering a concrete approach to operationalization. This lecture will present a systems based conceptual framework of disaster resilience centered on well-being. This framework will help students understand the interconnections between disasters and achievement of the SDGs, and outline how it is being operationalized in practice.

*Bio*

**Adriana Keating** is a Research Scholar with the Risk and Resilience (RISK) Program at the International Institute of Applied System Analysis (IIASA) and a Visiting Research Fellow at the Centre for Urban Research, RMIT University, Melbourne, Australia. Her research focuses on the human dimensions of disasters and climate change adaptation. Currently, Dr. Keating's main research focus is on disaster resilience, with particular reference to socioeconomic systems analysis, and measurement and decision-support methodologies. She has a special interest in incorporating social and environmental considerations into economic analysis and vice versa, and in meeting the research needs of policy-makers and other end-users.



14.1.2019, Piotr Magnuszewski:

*Abstract*

**“Navigating complexity through social simulations”**

Climate change. Shrinking natural resources. Growing inequalities and resulting conflicts. Natural and man-made disasters. The complexity behind these challenges requires insight and collaboration at many different levels, from local to global. The urgency is clear. However, far too often, promising efforts fail due to misconceptions, lack of trust, or poor communication. How can we make sense of complex problems on such a scale? Can we safely explore multiple ideas to tackle sustainability challenges? Social simulations offer a combination of group scenario building, role-playing, and game-like mechanisms. They bring together stakeholders

with diverse backgrounds and values. For a couple of hours, they interact with each other in a shared, safe environment, which reflects the key aspects of the real world. In this simulated reality, participants take on specific roles, representing different sectors: research, administration, business, NGOs. In this way, they have a chance to face real problems, confront opposing views, and solve conflicts via negotiations and dialogue. Together, they creatively experiment, tinker, and test in practice new ideas by instantly facing the outcomes of their decisions

This lecture will explain the underlying concepts of social simulations and its participatory approach to systems analysis. It will also present many examples of applications including the areas linked with the SDGs.

*Bio*

**Piotr Magnuszewski** works on the question of what makes things complex and how to understand and manage this complexity. He has been working for decades as a systems modeler, game designer, professional trainer, facilitator and researcher to provide tools for people in all sectors to make better policies and decisions about the society and environment. He designed and applied many social simulations and role-playing games addressing the



issues of resilience and sustainability such as climate change, energy transition, management of natural resources. The tools he designed and applied enable more effective collaboration for groups and organizations. Piotr has been working with diverse groups of scientists, businesses, NGOs and international organizations including the European Commission, OECD, African Development Bank and the Zambezi Watercourse Commission. Piotr works as a research scholar at the International Institute for Applied Systems Analysis (Austria). He is also co-founder and managing director of the Centre for Systems Solutions (Poland). He is an author of many research and educational publications.

21.1.2019, Verena Winiwarter:

*Abstract*

**"A spiral of risk. Understanding the environmental, social and economic consequences of tourism in fragile landscapes"**

In 2016, about 5% of Austria's GDP and about 6 % of the jobs came directly from tourism. The indirect share was calculated at about 15% of GDP and 17% of employment, making the sector a relevant part of Austria's economy. 79.000 ha of the country were skiing domain, and 3016 ski transportation facilities created a turnover of 901 Million Euros already in 2003/04. Ski transportation facilities (commonly known as "lifts") and the related infrastructure, from roads to snow making equipment are an important and often contested feature of the Alpine regions of the country. Climate change is moving the regions of safe snow further up fragile mountain slopes and makes snow storage and artificial snow imperative. Many of the ski tourism enterprises are hardly profitable and face dire consequences from increased costs. Looking at the development of ski tourism from the 1920s onwards presents us with the unique opportunity to investigate the factors that lead to the present situation. Stakeholders' perspectives give insight into the reasons for their decisions and how they deal with their consequences. The spiral of risk concept, holding that successful dealings with one perceived risk more often than not lead to an unintended consequence that demands further action, but will again lead to unintended side-effects has proven a useful heuristic model to develop a respectful, but analytically productive interpretation of long-term developments in Alpine Ski tourism.