

3rd

Universität Hamburg – Kyoto University Symposium
19 to 20 June 2023

*Approaching planetary boundaries and jeopardizing
planetary health – a multi-disciplinary approach to a
sustainable future*



Contents

I. General Information	3
II. Location Map.....	4
III. General Program	5
IV. Introduction: Symposium on Planetary Health.....	6
V. Session Overview.....	8
Session I: Infection research.....	10
Session II: Climate research.....	27
Session III: Environmental Economics	44
Session IV: Biodiversity.....	58

I. General Information

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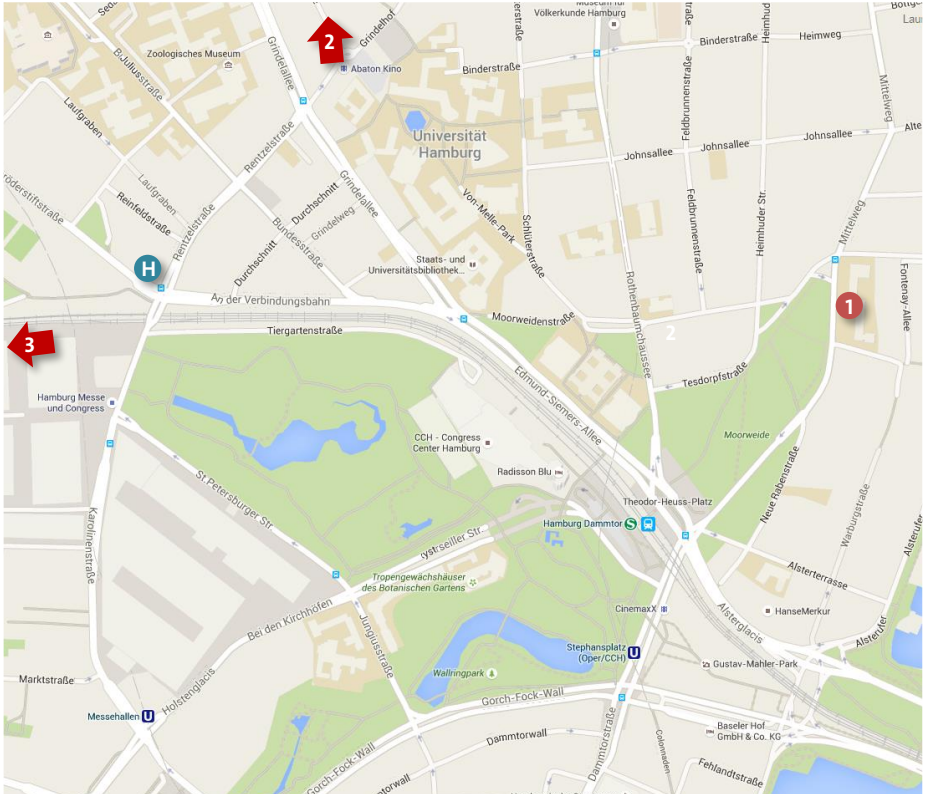
Taxi

Hansa Taxi: +49 40 2112 11
Das Taxi: +49 40 22 11 22

Emergency Numbers

Police: 110
Emergency Ambulance and Doctor Services: 112
Fire Department: 112
Emergency Medical Services: +49 40 22 80 22
Pharmacy – Emergency Services: +49 18 05 93 88 88
Poison Control Centre: +49 5 511 92

II. Location Map



1. Universität Hamburg – Main event location, *Mittelweg 177*
2. Direction to Leibniz-Institut für Virologie (LIV) and UKE, *Martinistrasse 52*
3. Direction to DESY/CSSB, *Notkestrasse 85*

H Hotel Mercure Hamburg Mitte, *Schröderstiftstraße 3*

III. General Program

Monday, 19 June

8:30 AM Hotel Mercure	Meeting in the lobby Group-pick-up at the hotel
9:00-10:00 AM Main Event Location	Opening Addresses: <ul style="list-style-type: none">• Hauke Heekeren (President, Universität Hamburg)• Nagahiro Minato (President, Kyoto University) Group photo
10:00-10:30 AM	Transfer to parallel group sessions
10:30-12:30 PM	Parallel Workshops
12:30-1:30 PM	Lunch Break
1:30-5:00 PM	Parallel Workshops (including visits at faculties, laboratories, etc.)
5:00 PM	Pick up from hotel
5:30 PM	Dinner

Tuesday, 20 June

8:30 AM Hotel Mercure	Meeting in the lobby Group-pick-up at the hotel
9:00-10:00 AM	Preparation of presentations for the plenary session
10:00-10:30 AM	Coffee break
10:30-12:30 PM	Plenary: Presentations of outcomes Closing Addresses: <ul style="list-style-type: none">• Kyoko Inagaki (Executive Vice President, Kyoto University)• Laura Edinger-Schons (Corporate Sustainability Officer, Universität Hamburg)
12:00-1:30 PM	Lunch Break
2:30-5:30 PM	Harbour and City Tour for the guests
6:30-8:30 PM	Farewell dinner organized by the Consulate General of Japan

IV. Introduction:

Symposium on Planetary Health

At a time when our planet faces societal and environmental challenges of historic scale, it has become increasingly evident that the health of the natural world is inextricably intertwined with human health and well-being. As such, our mission is to promote planetary health—a concept that recognizes the interconnections of ecological, social, and economic systems and their impact on human health and the health of the natural world.

Kyoto University and Universität Hamburg are committed to promoting sustainable practices and support research and education that prioritize the long-term health of our planet and its ecosystems. We believe that it is our responsibility to educate and raise awareness about the importance of planetary health and to work collaboratively with diverse stakeholders and the scientific community all around the world to identify and address the most pressing challenges our planet faces.

In order to achieve this goal, Kyoto University and Universität Hamburg have decided to dedicate the second phase of their strategic partnership (2023–2026) to this important topic. They will jointly hold an interdisciplinary scientific symposium on the topic of planetary health in Hamburg on 19 and 20 June 2023. As a starting point, four interdisciplinary research groups will gather to present their findings and give recommendations for concrete measures and future research, underlining the strong interconnection between various research fields such as pandemic challenges, disaster prevention, environmental economics, and biodiversity.

With this symposium, we are pursuing the following goals:

1. Fostering of multidisciplinary and international collaboration by taking a holistic view: This includes providing experts from different fields such as environmental science, public health, ecology, environmental law, and political sciences with an opportunity to come together and exchange knowledge, insights, and perspectives.
2. Stimulation of knowledge exchange: This consists of offering a platform for scientists to present their latest research findings, exchange ideas, and receive feedback from their peers.
3. Strengthening links between young researchers: This involves serving as a forum for doctoral students and early-career researchers to learn about the latest research and advances in the field of planetary health thus helping to sustain the institutional links between the two universities.
4. Provision of insights for potential policy recommendations: To entails creating a solid foundation for policy decisions by providing evidence-based insights and recommendations to policymakers.

By pursuing these goals, Kyoto University and Universität Hamburg are actively fostering planetary health research and enhancing the understanding of the complex challenges facing our planet, with the aim of contributing to a sustainable and resilient future for all.

V. Session Overview

Session I: Infection Research

UHH	Kyoto U
Tian Bai	Prof. Katsuma Hayashi
Dr. Stephanie Stanelle-Bertram	Prof. Taishi Kayano
Prof. Dr. Gülsah Gabriel	Prof. Tetsuro Kobayashi
Fabian Heinrich	Prof. Hiroshi Nishiura
Dr. Maria Schröder	
Christopher Urbschat	
Topic	
- One health – Pandemic Challenges	

Session II: Climate Research

UHH	Kyoto U
Dr. Armineh Barkhordarian	Prof. Amin Chabchoub
Dr. Leonard Borchert	Prof. Yukari Naka
Prof. Dr. Jürgen Böhner	Prof. Eiichi Nakakita
Dr. Shabeh ul Hasson	Prof. Tetsuya Takemi
Dr. Anna Pagnone	
Prof. Dr. Uwe Schneider	
Topics	
- Detection, attribution, and projections of climate change and impacts for a resilient society	

Session III: Environmental Economics

UHH	Kyoto U
Prof. Dr. Stefan Aykut	Nur Firdaus
Prof. Dr. Grischa Perino	Prof. Akihisa Mori
Solange Commelin	Prof. Seiichi Ogata
Dr. Matthew Johnson	Prof. Gregory Trencher
Topic	
- Decarbonization: Economic and social dynamics	

Session IV: Biodiversity

UHH	Kyoto U
Prof. Dr. Moritz Drupp	Prof. Katsue Fukamachi
Prof. Dr. Matthias Glaubrecht	Takuya Kageyama
Dr. Kerstin Jantke	Prof. Yukako Katsura
Prof. Dr. Nicole Ratzinger-Sakel	Prof. Shuichi Oyama
Prof. Dr. Henrik Sattler	Georgina Seera
Dr. Alexander Stark	Prof. Hirokazu Toju
	Dr. Wen Wang
Topic	
- Nature in jeopardy – Biodiversity’s contribution to Planetray Health from interdisciplinary perspectives	

Session I: Infection Research

Topic: “One health – Pandemic Challenges”

Participants Kyoto U: Katsuma Hayashi, Taishi Kayano, Tetsuro Kobayashi, Hiroshi Nishiura

Participants UHH: Tian Bai, Gülşah Gabriel, Fabian Heinrich, Maria Schröder, Stefanie Stanelle-Bertram, Christoph Urbschat

Zoonotic infections continue to cause pandemic threats with an unpredictable burden to humans and animals. In this session, we will discuss the lessons learned from previous outbreaks and pandemics, including the ongoing COVID-19 pandemic. In particular, we will focus on the transmission and ecological dynamics of viral pathogens in wildlife animals, the human-animal interface, and determinants of pathogenicity in humans. We will present and discuss data on recent outbreaks of emerging infections, such as avian influenza, which poses a high risk of causing the next pandemic. Through debates and brainstorming, we will jointly examine possibilities on how to prepare for the next pandemic in light of the overall lessons learned.



Katsuma Hayashi is an infectious disease epidemiologist at Kyoto University. He worked as an infectious disease physician at a hospital in Japan until 2019. Subsequently, he worked as a Project Assistant Professor at Hokkaido University for research on emerging and re-emerging infectious diseases using mathematical

models of infectious diseases. His main research interests include planning policies for the effective use of vaccines, assessing the risk of dengue outbreaks in Japan, elucidating the natural history of COVID-19, and planning evaluations of COVID-19 epidemic control measures. In the spring of 2020, he worked in the Ministry of Health, Labor, and Welfare in Japan as an advisor on COVID-19 epidemic control measures. In the summer of 2020, he moved his research base to Kyoto University. He continues to conduct research on the assessment of COVID-19 mortality, excess mortality estimates, and disease burden as well as the assessment of dengue fever epidemic risk and health hazard estimates in Japan in the context of climate change and population dynamics.

Abstract: Assessment of Dengue Infection in Japan over the Next Century Under Climate and Demographic Change

[Background] Japan experienced its first domestic dengue outbreak in 1945. There are few quantitative studies on the risk management of outbreaks in non-endemic countries, although climate change inevitably increases the risk of dengue. This study aimed to predict the future risk of dengue fever in Japan and examine region-specific adaptation measures.

[Methods] We applied CMIP6 (Coupled Model Intercomparison Project Phase 6) model. Representative concentration pathway scenarios were used for the climate change scenarios while shared socioeconomic pathway scenarios were used for the socioeconomic scenarios. The spatial resolution of the geographic area was 1 sq km, and the temporal resolution was set as daily. Using land-use categories and populations by scenario, the distribution of *Aedes albopictus* was calculated, and the effective reproduction numbers and extinction probability were computed using variables associated with dengue infection.

[Results] The probability of dengue fever in Japan is relatively high in areas with a mix of vacant land and residential areas. Population urbanization and intensive mosquito control in bedtown communities have effectively reduced the risk of local epidemics.

[Conclusion] The risk of dengue infection was quantified using regional countermeasures based on climate change and socioeconomic activity scenarios.

Keywords: mathematical modelling, dengue, mosquito, climate change



Taishi Kayano is an infectious disease epidemiologist at Kyoto University. He previously worked as a field veterinarian in Japan and Uganda, and later moved into academia to study the transmission dynamics behind epidemics. His research interests focus on exploring the transmission dynamics of infectious diseases, especially zoonotic diseases, and mitigation

strategies using mathematical and statistical models. During the COVID-19 pandemic, he joined the COVID-19 Task Force set up at the Ministry of Health, Labor and Welfare in Japan and was diligently involved in various analyses, such as the estimation of the effective reproductive number in each prefecture. His recent research focuses on elucidating vaccination effectiveness at the population level, stratified by direct and indirect impacts.

Abstract: Recent avian influenza H5N1 situation and investigation of contacts exposed to suspected infected animals

The H5N1 avian influenza virus was first identified in humans in 1997 in Hong Kong, China. Since then, the virus has been detected worldwide, primarily in poultry and wild animals. Recently, there has been a rise in the number of H5N1 cases in mammals, including sea mammals, which has increased the risk of spillover to humans. In April 2023, a group of melon-headed whales washed up on the coast of Tsurigasaki, Japan; by April 5, 32 whales had washed ashore and 15 had died. This event raised concerns about the potential transmission of the virus to humans and provided an opportunity to investigate human–dolphin contact situations. This presentation will share the results of the survey conducted among those who may have had direct contact with the stranded animals on the Tsurugasaki coast. To prevent future epidemics caused by highly pathogenic avian influenza, it is crucial to explore the initial contact with suspected H5N1-infected wild animals and implement legislations to solve the issues related to wildlife management.

Keywords: zoonosis; H5N1; avian influenza; One Health; survey



Tetsuro Kobayashi

Educational qualifications

2017 M.P.H., The University of Tokyo School of Public Health (Salutatorian)

2008 M.D., Hokkaido University, School of Medicine

Professional Training and Employment

2021–present Assistant Professor, Kyoto University School of Public Health

2017–2020 Assistant Professor, Hokkaido University, Department of Hygiene and Cellular Preventive Medicine

2016–2017 M.P.H., The University of Tokyo School of Public Health

2013–2016 Fellow, National Center for Global Health and Medicine, Department of Infectious Diseases

2012–2013 Senior Resident in Internal Medicine, Tama Medical Center

2010–2012 Senior Resident in Internal Medicine, The University of Tokyo Hospital, Department of Infectious Diseases

2009–2010 Junior Resident in Internal Medicine, Ibaraki Prefectural Hospital

2008–2009 Junior Resident in Internal Medicine, The University of Tokyo Hospital

2008 Passed the Medical Licensing Examination of the National Board

Abstract: Mpox outbreak and the risk of continuing growth in Japan from 2022 to 2023

Background: Monkeypox (mpox) is a zoonotic viral disease affecting mammals, which spread globally among humans in May 2022. While a decreasing trend has been observed since August 2022, Japan has experienced an exponential growth in the infection owing to autochthonous transmission since January 2023.

Methods: Using the data up to week 10 of 2023, we collated descriptive information on the effects of this epidemic over time in Japan, including the patient's travel history, age, sex, and place of reporting. Next, the renewal equation was used to estimate the effective reproduction number.

Results:

Forty-six mpox cases had been detected in Japan as of March 18, 2023. The first, second, and fourth cases reported on September 25, 2022; September 28, 2022; and August 10, 2023, respectively, had travel histories to either Europe, North America, or Central America. All cases were males in the age group of 20–50 years and were reported in Tokyo and its vicinity. Assuming exponential growth, the effective reproduction number was estimated to be 1.25 (95% confidence interval; 0.87–1.67). The piecewise effective reproduction number, estimated every two weeks, ranged from 1.1–1.8.

Keywords: monkey pox, small pox, basic reproduction number, pandemic, spill over



Hiroshi Nishiura

EDUCATIONAL BACKGROUND

Ph.D. 2006 Graduate School of Biomedical and Health Sciences, Hiroshima University (Biostatistics)

M.D. 2002 Miyazaki Medical College (at present, University of Miyazaki)

ACADEMIC BACKGROUND

- | | |
|--------------|---|
| 2020–present | Professor, Kyoto University School of Public Health |
| 2016–2020 | Professor, Graduate School of Medicine, Hokkaido University |
| 2013–2016 | Associate Professor, Graduate School of Medicine, The University of Tokyo |
| 2011–2013 | Assistant Professor, School of Public Health, The University of Hong Kong |
| 2007–2011 | Post doctorate, Utrecht University, The Netherlands |
| 2005–2007 | Mitarbeiter, Universitaet Tübingen, Germany |
| 2004 | Academic Visitor, Imperial College, the UK |
| 2004–2011 | Training period in Europe |

2002 Junior clinical resident, Tokyo Metropolitan Ebara Hospital

Abstract: Modelling human–animal interface: SARS, MERS, and COVID-19

When a novel infectious disease emerges, enhanced contact tracing and isolation are implemented to prevent a major epidemic, and such measures have been successful in controlling severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) without causing a global pandemic. Considering that asymptomatic and pre-symptomatic infections are substantial for the novel coronavirus disease (COVID-19), the feasibility of preventing a major pandemic has been questioned. Using a two-type branching process model, we assessed the feasibility of containing COVID-19 by computing the probability of a major pandemic. We demonstrated that if there is a substantial number of asymptomatic transmissions, cutting chains of transmission by means of contact tracing and case isolation would be extremely challenging without additional interventions. Specifically, untraced cases contribute to lowering the feasibility of containment. Even if symptomatic cases are swiftly isolated after symptom onset, only secondary transmission after symptom onset can be prevented.

Keywords: coronavirus, transmissibility, emergence, pandemic, mathematical model



Tian Bai obtained a master's degree in preventive veterinary medicine from Sichuan Agricultural University, China, and joined the Chinese National Influenza Center, National Institute for Viral Disease Control, Chinese Center for Disease Control and Prevention, as a senior researcher. Bai is responsible for seroepidemiology studies for human infections with newly emerging influenza viruses and has also participated in studies on host factors related to H7N9 pathogenesis and susceptibilities. In 2019, Bai obtained a master's degree in public health from the London School of Hygiene and Tropical Medicine and joined Prof. Gülşah Gabriel's research group at the Leibniz Institute of Virology as a doctoral researcher. Bai's research focuses on the role of sex hormones in the susceptibilities and pathogenesis of male-biased H7N9 infections. Bai has published 14 papers as first author or first co-author in peer-reviewed scientific journals.

Human infections with H7N9 avian influenza A virus emerged in east China in 2013 and have caused a higher incidence in men (70%) than in women over the last five epidemic waves. However, molecular markers associated with male-biased infection are still unknown. In this study, we systematically analyzed the sex-hormone and cytokine levels in laboratory-confirmed H7N9 patients from both sexes and compared them to control groups and seasonal influenza cases ($n = 369$). Multivariable analyses reveal that H7N9-infected men present with considerably reduced testosterone levels, which is further associated with a poor outcome. Regression analyses reveal that testosterone levels in H7N9-infected men are negatively associated with the levels of several pro-inflammatory markers, such as IL-6 and IL-15.

We used a mouse model to assess whether there is a causal relationship between low testosterone levels and H7N9 infection. In male mice, the infection leads to a high viral load and inflammatory cytokine response in the testes as well as a reduction in testosterone levels. This study suggested that respiratory H7N9 influenza virus could specifically hit the hypothalamic-pituitary-gonadal axis, thus contributing to disease severity in male patients. Monitoring sex hormone levels may support individualized management for patients with avian influenza infections.

Keywords: respiratory virus, infection, sex differences, sex hormones, host factors



Fabian Heinrich is a committed medical professional with a solid academic background and practical experience in postmortem research. He is currently pursuing a master's degree medical statistics at the London School of Hygiene and Tropical Medicine, having previously completion his medical studies at the University Medical Center Hamburg-Eppendorf. Heinrich has worked as a resident physician specializing in forensic medicine and as a postmortem research assistant. Supported by a scholarship from the German Research Foundation, Heinrich gained valuable experience in the basic sciences through his involvement in the doctor of medicine graduate program within Collaborative Research Center 841. Under the guidance of Prof. Dr. Klaus Püschel, an esteemed expert in forensic medicine, he embarked on independent projects exploring the potential of postmortem research in infectious diseases, including significant contributions to the understanding of

infectious diseases such as COVID-19. Heinrich's dedication to academic excellence has been recognized through various scholarships and awards, including the Dr. Martini-Medaille. Heinrich actively participated in the Claussen-Simon Foundation's mentoring program for exceptional medical students and is a German National Academic Foundation scholarship holder. Passionate about advancing knowledge in his field, Fabian Heinrich continues to contribute to the scientific progress of postmortem and infectious disease research.

Abstract: How autopsies have informed COVID-19 pathogenesis

In the past few years, millions of people have died of COVID-19. Because suitable models for the disease were missing at the beginning of the pandemic, studies investigating the disease pathogenesis mainly focused on the COVID-19 deceased. Since then, autopsies of patients have contributed significantly to what we know about the pathogenesis of COVID-19 and associated major organ complications. This talk summarises how autopsies complemented the knowledge acquired by experimental studies, such as animal models, and how they contributed to our fundamental understanding of COVID-19, facilitating critical knowledge to improve daily clinical practice and develop therapeutic interventions. Researchers' use of advanced histopathologic and molecular genetic methods in postmortem tissues during the COVID-19 pandemic highlighted the importance of autopsies for basic virology research and clinical practice in current and emerging infectious diseases. I will take you on a scientific journey through the COVID-19 pandemic from a postmortem perspective

Keywords: postmortem research, infectious diseases, biostatistics, COVID-19



Maria Schröder, MD, is a highly qualified physician currently working as a senior physician in the Department of Intensive Care Medicine at the UKE. She completed her medical studies at the Hannover Medical School in 2004 and received her doctorate in medicine in 2006.

Since 2009, Dr. Schröder has specialized in anesthesiology, and she obtained her board certification in special intensive care medicine in 2011. Dr. Schröder has made significant contributions to her field through research projects focused on infectious diseases, which have received funding from the Faculty of Medicine at Universität Hamburg for clinical leave. Her work has been published in high-impact journals, and she currently leads the research group on invasive mycoses in critically ill patients. After two periods of maternity and parental leave, Dr. Schröder has returned to her profession with unwavering dedication. She continues to deliver high-quality care as a senior physician in the Department of Intensive Care, which serves 12 intensive care units catering to both surgical and nonsurgical patients. In recognition of her dedication to sustainability in critical-care medicine, Dr. Schröder was appointed as the environmental management coordinator for sustainable development in her department in 2023. In this role, she actively promotes environmentally friendly practices and implements strategies to increase sustainability in intensive care units.

Abstract: One Health pandemic challenges encompass various topics, and critical care medicine plays a vital role in mitigating the impact of pandemics on human health. Maria Schröder, a senior physician at the University Medical Center Hamburg-Eppendorf (UKE) who specializes in critical care medicine, will present her experiences during

the SARS-COV-2 pandemic at this symposium. She will specifically address the unique aspects of COVID-19 infections in critically ill patients. Schröder's presentation will not only highlight the limitations faced by critical-care medicine in managing severe cases of COVID-19—including high patient volumes, resource scarcity, and the need for advanced life support techniques—but will also delve into the gender-specific differences observed in COVID-19 infection and its outcomes. She aims to shed light on how the virus affects men and women differently. Additionally, she aims to raise awareness about the immense strain on health-care systems during pandemics and advocate for preparedness strategies. Furthermore, Schröder will explore the environmental consequences of the pandemic, considering the significant behavioral changes and their impacts on the environment. She will emphasize the environmental effects resulting from the increased production and disposal of medical waste. By adopting the One Health approach—which recognizes the interdependences between human, animal, and environmental health—Schröder's presentation will offer valuable insights into the complex dynamics between pandemics, critical care, and the environment. Her findings will contribute to a multidisciplinary understanding of the challenges and the necessary steps toward a sustainable future.

Keywords: invasive pulmonary aspergillosis, candidemia, Covid-19, sex-specific differences, life-cycle assessment in intensive care



Stephannie Stanelle-Bertram is a senior scientist in the Viral Zoonoses – One Health department at the Leibniz Institute of Virology in Hamburg, Germany. She studied biology at the Universität Hamburg and obtained her doctorate in 2011 from the Institute of Virology at Hannover Medical School (MHH) and Leibniz University Hannover in Germany. From 2011 to 2013, she held the position of postdoctoral fellow within the Infection Biology Unit at the German Primate Center, Göttingen, Germany. In 2012, she was awarded the Jürgen Wehland Preis by the Helmholtz Center for Infection Research in Braunschweig. In 2019, she was awarded the Wissenschaftspreis for clinical research by the GlaxoSmithKline Stiftung in Munich. Her research focus is to understand the pathogenesis of influenza A viruses and coronaviruses in animal models.

Abstract: CYP19A1 mediates severe SARS-CoV-2 disease outcome in men

Male sex belongs to one of the major risk factors for severe COVID-19 outcome. Here, we identified the testosterone-to-estradiol metabolizing enzyme CYP19A1 (alias aromatase) as a host factor that contributes to worsened disease outcome in men infected with SARS-CoV-2. We analyzed human exome sequencing data obtained from a large human COVID-19 cohort using a machine learning approach and identified a CYP19A1-activity-increasing mutation associated with the development of severe disease in men but not women. We also analyzed human autopsy lungs and detected increased pulmonary CYP19A1 expression at the time of death in men but not women. Using the golden hamster model, we confirmed that SARS-CoV-2 infection causes increased CYP19A1 expression in the lung, which was

further associated with dysregulated sex hormone levels and reduced long-term pulmonary function in men as compared to women. Treatment of SARS-CoV-2-infected hamsters with a clinically approved CYP19A1 inhibitor (letrozole) improved impaired lung function and supported recovery of imbalanced sex hormones in males but not females. Our study identifies CYP19A1 as a contributor to sex-specific SARS-CoV-2 disease outcome in men. Furthermore, inhibition of CYP19A1 with the clinically approved drug letrozole may offer a new therapeutic strategy for individualized patient management and treatment.

Keywords: Influenza A virus, Human Coronavirus, Pathogenicity, Animal models



Christopher Urbschat studied molecular biology at Johannes Gutenberg University Mainz and Universität Hamburg. As an early career researcher in the Department of Obstetrics and Fetal Medicine at the University Medical Center Hamburg-Eppendorf, his research focuses on examining how environmental adversities during pregnancy—such as infections, stress, and pregnancy complications—shape the immunological competence and health of the offspring later in life. To answer those questions, he conducts interdisciplinary and translational research using a broad variety of animal models as well as human birth cohorts. In addition to wet lab research, Christopher Urbschat has a keen interest in big data methods and concepts that enable handling multidimensional datasets to understand what mechanisms underlie child health.

During pregnancy, a fine-tuned adaptation of the maternal immune system is required to promote immune tolerance toward the allogeneic fetus, while the capacity to respond to pathogens must be simultaneously maintained.

However, recent evidence supports the finding that pregnant women are more vulnerable to a severe course of infections (e.g., SARS-CoV-2 and influenza A virus) due to an ineffective antiviral immune response. Furthermore, adverse environmental factors (e.g., prenatal stress, medication, and diet) have been shown to have detrimental effects on fetal development, as they trigger the transfer of related mediators such as cytokines and hormones across the placenta. Conversely, the transplacental transfer of antibodies and maternal immune cells supports the developing fetal immune system, hereby improving early-life immunity.

In light of these insights, the topic of vaccination during pregnancy is currently receiving significant scientific attention. However, the current data on the success of the vaccination response for mother and child is still very scarce, since pregnant women are regularly excluded from vaccination trials. To better understand how vaccination during pregnancy can improve maternal and infant health, we utilize various animal models and human pregnancy cohorts to improve future vaccination strategies for pregnant women.

Keywords: reproductive immunology, developmental immunology, fetomaternal cross talk, fetal programming



Gülşah Gabriel is head of the department Viral Zoonoses—One Health at the Leibniz Institute for Virology in Hamburg. She is also a professor of virology at the University of Veterinary Medicine Hannover. Her research focuses on understanding the molecular basis of avian-to-human transmission of influenza A viruses as well as viral pathogenesis in humans. She has received many prestigious awards for her research, including the Robert Koch Advancement Award, the Best Minds Award from the Leibniz Association, and the DZIF Prize for Translational Infection Research from the German Center for Infection Research (DZIF).

Gülşah Gabriel is coordinating the session on Pandemic Challenges on Hamburg side.

Session II: Climate Research

Topic: “Detection, attribution, and projections of climate change and impacts for a resilient society”

Participants Kyoto U: Amin Chabchoub, Yukari Naka, Eiichi Nakakita, Tetsuya Takemi

Participants UHH: Armineh Barkhodarian, Leonard Borchert, Jürgen Böhner, Shabeh ul Hasson, Anna Pagnone, Uwe Schneider

Meteorological hazards such as tropical and extratropical cyclones, heavy rainfalls, high winds, and monsoon dynamics can spawn natural disasters from flooding, inundation, landslide, storm surge, and high waves, and therefore have significant impacts on societies. Detection, attribution, and projection of these hazards and associated disasters determine whether and to what extent their intensity and likelihood have changed due to human influence on climate so far and how they will change in the future under possible and plausible warmer worlds. These findings inform decision-making for a more resilient society. In this session, we will share recent developments and exchange ideas on meteorological, hydrological, and oceanography issues that will be the focus of our research in Germany and Japan. Through discussing those issues deeply, we hope that this session would be the foundation for our future collaborations.



Amin Chabchoub received a MSc in Applied Mathematics / Mechanical Engineering from the University of Bremen, a PhD from Hamburg University of Technology and is currently Associate Professor at Kyoto University's Hakubi Center for Advanced Research & Disaster Prevention Research Institute. He previously had a tenured Associate Professor appointment in Environmental

Fluid Mechanics at the School of Civil Engineering of the University of Sydney and was Assistant Professor of Hydrodynamics at the Department of Mechanical Engineering of Aalto University. Prior to these faculty roles, he was a Postdoctoral Researcher at Imperial College London, Swinburne University of Technology, and The University of Tokyo. His areas of expertise and research interests include extreme waves, nonlinear dynamics, environmental fluid mechanics, and physical oceanography.

Abstract: On Extreme Ocean Waves Modeling, Prediction, and Prevention – An Overview of Experimental Activities

Extreme wave events are known to appear in offshore and coastal areas. The mechanisms of large wave focusing, when considering the wave dynamics only, have been intensively studied in the last decades. That said, wave processes near the coastlines are complex, for instance due to the presence of reflected waves, which interact with the incident ones, currents, diffraction and refraction dynamics etc. Indeed, experimental studies can improve our understanding of rogue wave formation mechanisms and statistics when such complex processes are at play. This talk will summarize experimental research activities tackling the pivotal understanding of extreme wave focusing

in constant or variable water depth conditions with a particular focus on the role of wave nonlinearity in the wave evolution. Moreover, a variety of research activities of the DPRI's Coastal Disaster Research group, which include for instance tsunami modeling and prediction as well as climate change impact on global coastal processes, will also be presented and discussed.

Keywords : Ocean Engineering, Environmental Fluid Mechanics, Physical Oceanography, Wave Hydrodynamics



Yukari Naka is an assistant professor in hydrometeorological disaster research at Disaster Prevention Research Institute (DPRI), Kyoto University. She received the Kyoto University Mazume Research Encouragement Award and visited the University of Bristol for one month in 2020 on scholarship.

She was a research fellow (DC2) at the Japan Society for the Promotion of Science from 2019 to 2021. In 2021, she obtained a Ph.D. degree in Engineering from Kyoto University. Subsequently, she took up her current post. Her research interests include hydrometeorology, mesoscale convective system and related disasters, multi-scale connection of climatology and meteorology, and climate change, with a special focus on extreme frontal rainfall.

Abstract: Future projections on the line-shaped convective system associated with the Baiu front in Japan

During the rainy season, which is known as “Baiu,” in Japan, back-building line-shaped convective systems associated with a stationary front called as the Baiu front often occurs and causes extreme rainfall

(hereinafter, Baiu extreme rainfall). Baiu extreme rainfall is a localized phenomenon that lasts for several hours in the same area and causes severe water-related disasters, such as landslides as well as pluvial and fluvial flooding in Japan. Thus, it is important to predict future changes in this phenomenon. In this study, we estimated the future changes in the Baiu extreme rainfall in Japan and investigated the mechanisms of those changes by analyzing the simulation of a high-resolution 5-km-mesh non-hydrostatic regional climate model (NHRCM05) and conducting pseudo-global warming (PGW) experiments with $O(100\text{m})$ resolution. Findings revealed a gradually increasing trend in the frequency and rainfall amount of Baiu extreme rainfall as the warming scenario increased. In the PGW experiments, the Baiu extreme rainfall increased more than the Clausius–Clapeyron rate due to the nonlinear effect of the intensification of the cumulonimbus structure.

Keywords: extreme rainfall, back-building structure, Baiu front, climate model, numerical simulation



Eiichi Nakakita has been the Director of Disaster Prevention Research Institute (DPRI) since 2021 and Deputy Executive Director of Kyoto University and special advisor of the Ministry of Education, Culture, Sports, Science, and Technology in Japan since 2022. After graduating from the Graduate School of Engineering, Kyoto University, he worked as an assistant professor until 1985, associate professor until 1991 at the DPRI, and associate professor at the Graduate School of Engineering, Kyoto University until 2000. He has served at his current position

at the DPRI since 2004. He concurrently served as a visiting Associate Professor at the University of Iowa and visiting Research Professor at the National University of Singapore.

His specialties include radar hydrology and hydrometeorology. He has been involved in various governmental committees on heavy rain and flood forecasting using weather radar and assessment of the impact of climate change on the disaster environment for several years. Additionally, he is engaged in disaster survey teams at home and abroad, such as Hurricane Katrina. He was the former Chairman of the Committee on Hydrosience and Hydraulic Engineering at the Japan Society of Civil Engineers. He has been leading disaster prevention research that combines civil engineering and meteorology.

Abstract: No-regret climate change adaptation with a paradigm shift in water-related disasters

Climate-related disasters have become increasingly severe in recent times. Therefore, the immediate implementation of adaptation measures is warranted. While scientific research is underway to better assess climate change and its impacts, which could be used for the formulation of adaptation measures, we must pay attention to the changes in and speed of climate risk. There are evident uncertainties in the prediction of climate change and its impacts. However, for ‘no-regret adaptation,’ we should apply the precautionary principle, and the lack of scientific evidence or information should not be grounds for inaction. Action without delay is imperative. While bottom-up approaches based on local realities are essential at the national level, it is also necessary to enhance cooperation among relevant government agencies and promote collaboration with both academic and DRR communities. The Japanese government has decided razing

water-protection standard and the transition to “River Basin Disaster Resilience and Sustainability by All.”

Keywords: climate change prediction, climate change adaptation, water-related disasters, disaster risk reduction, no-regret adaptation, flood control plan



Tetsuya Takemi is a professor in severe storm and atmospheric environmental research at Disaster Prevention Research Institute (DPRI), Kyoto University. After obtaining a Ph.D. degree from Kyoto University in 1999, he joined Osaka University as an assistant professor. Concurrently, he was a visiting scientist at National Center for Atmospheric Research in USA from 2001 to 2002. He moved to Tokyo Institute of Technology as a lecturer in 2004. He then joined DPRI, Kyoto University as an associate professor in 2007 and became a full professor in 2021. His major is mesoscale and microscale meteorology focusing on extreme phenomena, such as heavy rainfalls; tropical cyclones; and other severe storms, atmospheric environmental research including turbulence and dispersion dynamics, and numerical modeling of regional meteorology and microscale turbulence. He is also studying applied fields, such as urban meteorology, applied and engineering meteorology, and climate change impact assessment on extreme weather. His academic services include Editor-in-Chief of Scientific Online Letters on the Atmosphere (SOLA), Editor of Advances in Atmospheric Sciences, and Secretary of Atmospheric Science Section of Asia Oceania Geoscience Society (AOGS). At present, he is the head of the Research Division of Atmospheric and Hydrospheric Disasters in DPRI.

Abstract: Extreme weather impacts on airflows and air quality at urban scales

Forecasting extreme weather conditions that cause heavy rainfall and strong winds is a challenge in numerical weather prediction (NWP) modeling. Although the current operational NWP models employ a spatial resolution of the order of 1 km and are able to resolve atmospheric processes relevant to extreme weather, they cannot resolve airflows within urban districts. Turbulent flow and dispersion in urban districts can be represented through building-resolving computational fluid dynamics (CFD) models (for e.g., large-eddy simulation (LES)). Therefore, a hybrid approach combining NWP and CFD models is feasible for quantitatively reproducing airflows in urban districts. I will introduce our recent studies on the LES modeling of turbulent airflows in urban districts. Using a hybrid approach, we quantitatively assessed the airflows in an urban district during typhoon landfall in Japan. Simulations of air pollution in urban districts revealed that pedestrian-level dispersion fields were strongly affected by the geometrical features of urban districts. Such numerical modeling of urban scales is useful in understanding the processes relevant to flow and dispersion as well as in predicting airflows and dispersion in urban districts. Assessing the impact of climate change on urban-scale processes is a future task for disaster prevention, disaster mitigation, and climate change adaptation.

Keywords: extreme weather, urban environment, atmospheric dispersion, computational fluid dynamics, numerical weather prediction



Armineh Barkhodarian is a senior researcher at the Institute of Oceanography at Universität Hamburg. She received her doctorate in climate science from Universität Hamburg. She has a master's degree in meteorology and a bachelor's degree in physics, majoring in solid-state physics and minoring in quantum mechanics and crystallography. Her professional work experience includes positions at Helmholtz-Zentrum Hereon, NASA Jet Propulsion Laboratory, and University of California, Los Angeles. She has expertise in statistical climatology and applying statistical methods to the detection and attribution of climate change analysis. She has experience in extreme-event attribution analysis (e.g., droughts, marine heat waves), the impact of compound extremes on crop failure, causal effect detection (convergent cross mapping causality), and emergent constraints on climate and carbon-cycle feedbacks from atmospheric aridity in Earth system models.

Abstract: Greenhouse-Gas-Induced Marine Heat Waves Exacerbate Climate-Change Impacts in the Arctic

We show that the summer of 2007 marked the beginning of a shift toward a new era of marine heat waves (MHWs) over the Arctic Ocean's eastern marginal seas, superimposed on a greenhouse-gas-induced (GHG, $P < 0.05$) systematic increase in sea surface temperature. We employ an extreme-event attribution technique to identify the fraction of the likelihood of an Arctic MHW's magnitude that is attributable to GHG forcing. The results of this assessment provide insights into the role of GHG forcing in driving Arctic MHWs and their

potential future occurrence. Results reveal that extreme MHWs, such as those that occurred in 2007 and 2020, have an occurrence probability of less than 1 percent under no GHG forcing. Extremely intense MHWs with 140° Celsius days cumulative heat intensity are eight times more likely to occur under GHG forcing. In summary, prolonged Arctic MHWs triggered by abrupt early summer sea-ice melt will accelerate Arctic warming and cause Arctic sea ice to shrink even faster in the near future, if GHG emissions continue to increase.

Keywords: extreme-event attribution, impact of compound extremes, climate and carbon-cycle feedback



Leonard Borchert is a researcher and lecturer at the Research Unit Sustainability and Climate Risk at Universität Hamburg. He studies extremes in the climate system as well as their interactions with society. As such, his research is highly interdisciplinary, drawing on approaches from economic, agricultural and physical sciences. This is also reflected in his teaching activities; he offers highly interdisciplinary classes such as “Interactions between natural and social systems.” A climate scientist by training, Dr. Borchert applies global Earth System Model simulations to understand and predict climate extremes, and then draws on empirical evidence and model data to trace interactions and cascading effects into society. One current research focus of his is assessing the value of near-term climate predictions up to 10 years into the future for society, and understanding changes in global and regional agricultural yields under global warming. Dr. Borchert holds a bachelor of science in geosciences from the

University of Bremen, a master of science in integrated climate system sciences from Universität Hamburg and a doctorate in earth system sciences from Universität Hamburg in cooperation with the Max Planck Institute for Meteorology. He has held postdoctoral positions at the Max Planck Institute as well as at Sorbonne Université and the Institute Pierre Simon Laplace in Paris, France.

Abstract: Extremes in the Earth System—Dynamics, Interactions, and Impacts

An increase of extreme events such as heat waves and droughts is one of the most prominent and potentially impactful effects of climate change on society. In the working group Climate Statistics and Climate Extremes, we are working to understand how climate, ecosystems, and societal actors interact in the face of extreme events and climate change. Our tools are global and regional high-resolution Earth system models, economic models, sectoral models, and datasets based on observations of nature and society.

Here, we present an exemplary study that deals with changes of extremely low agricultural yields under climate change. Studies on projected agricultural yields focus on end-of-century scenarios. Simulations from phase 3b of the Global Gridded Crop Model Intercomparison (GGCMI) project show conflicting results for global and regional changes of different crops for the end of the century. We run the same simulations, focusing on year-to-year variations in agricultural yields for the staple crops of maize, rice, soybeans, and wheat.

An ensemble of GGCMI models shows that year-to-year variations in projected crop yields become more pronounced over time, especially in the case of extremely low crop yields. As a result, the frequency of low global crop yield extremes increases with global warming. We show that these low yield extremes may occur for individual or

multiple crops at the same time and may occur in individual or multiple regions. North America dominates global maize and soybean yield, and Southeast Asia and South Asia are important for rice extremes, while regional results are inconclusive for wheat. Multicrop extremes occur most commonly for the combination of maize and soybean and are dominated by the North America region. Our results show how specific climatic boundary conditions can govern the change of year-to-year extremes in staple crops under climate change, highlighting the potential to adapt to such events in the future.

Keywords: climate modeling, climate prediction, impact studies, climate risk, extremes



Jürgen Böhner is a professor of physical geography and is head of the section Physical Geography at the Center for Earth System Research and Sustainability (CEN) at Universität Hamburg. He graduated from the University of Göttingen in geography, meteorology, and bioclimatology and gained his doctorate in 1993 with a thesis on secular climate changes and

recent climate trends in Central and High Asia. Until 2006, he was a scientific assistant and associate professor at the Institute of Geography in Göttingen, coordinating and participating in research projects on Late Quaternary climate variability, climate impact assessment, and environmental dynamics. His publications mirror his major interests in modeling topoclimates and related environmental processes. Presently, Jürgen Böhner is cochair of the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS) and heads several third-party-funded research projects that all ultimately aim to

operationally couple regional climate and environmental modeling approaches for climate-impact research.

Abstract: System for Automated Geoscientific Analyses (SAGA) applications in regional climate and environmental modeling—current state of development and implementation

Case studies and climate impact assessments place multiple demands on the spatiotemporal resolution, extend and parameter space of climate data input, rarely covered directly by pure physical modeling approaches. In order to support climate and environmental modeling applications at commensurate scales, we propose a rather generic modeling framework that merges top-down (numerical) and bottom-up (empirical) approaches within a programmable geographic information system (GIS) environment. The amalgamation of dynamic and statistical downscaling with response-surface and digital-elevation-model-based surface parameterization techniques enables a physically consistent approximation of topoclimatic variables (continuous fields), forced by reanalyses, general circulation models, or regional climate models. The presentation aims to highlight the current state of research, development, and implementation, exemplified by selected environmental applications. Most of the presented methods and modeling routines are embedded in the Hamburg-based SAGA, a modularly organized, programmable, free and open-source, GIS platform that was developed by the Physical Geography section (<http://www.saga-gis.org>).

Keywords: regional climate modeling, statistical and dynamical downscaling, environmental modeling, GIS development, high asia



Shabeh ul Hasson is the interim professor for terrestrial remote sensing at the Institute of Geography, Universität Hamburg, where he also heads the Hydroclimatology and Remote Sensing of Mountain Environment (HAREME) working group. He is also a member of the CLIVAR/GEWEX Monsoons Panel and various

other community projects. He represented the Postdoc Council at the Hamburg Research Academy and served as a postdoctoral researcher in A4: African Asian Monsoon Margins in the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS). He received his doctorate in earth science from Universität Hamburg. With a multidisciplinary background including kilometer-scale dynamical downscaling, hydrological modeling, and terrestrial remote sensing, his research focuses on the detection, attribution, and projections of mean and extreme climatic changes and their transition into hydrological disasters at the monsoon margins and in complex terrain.

Abstract: Climate Change Impact Attribution of Himalayan Water Resources

Amid a heated debate on what are possible and plausible climate futures, ascertaining evident changes that are attributable to historical climate change can provide a clear understanding of how warmer climates will shape our future habitability. Hence, we detect changes in the observed streamflow from the Jhelum river basin in three observational datasets for the period 1901–2019 and analyze whether these changes can be attributed to observed climate change. For this, we first calibrate and validate the hydrological and flood inundation model and then force it with both factual and counterfactual climates prepared under the phase 3a protocol of the Inter-Sectoral Impact

Model Intercomparison Project. In contrast to no trend under counterfactual climate, our results suggest that mean annual streamflow under factual climate features a statistically significant decreasing trend. Such an annual trend, which is more pronounced after the 1960s and during summer, can be attributed to the weakening of the monsoonal precipitation regime in a factual climate. Furthermore, discharge volumes in the recent factual climate dropped compared to the early twentieth-century climate, prominently during summer. Subsequently, flood inundation extents and depths are declining. These findings clearly suggest the monsoonal precipitation regime plays a critical role in disrupting the hydrology of the Jhelum river basin and declining water availability.

Keywords: climatic change, dynamical downscaling, monsoon margins, remote sensing, impact assessment



Anna Pagnone holds a master's degree in environmental physics and a doctorate in physics. In her thesis, she investigated the oceanic iron cycle and its relation to the climate system. She worked with a biogeochemical model, performed laboratory experiments, and took part in an expedition to the Southern Ocean on board the research vessel Polarstern. At Universität Hamburg, she researches plausible climate futures and is coeditor of Hamburg Climate Futures Outlook 2023 (<https://www.cliccs.uni-hamburg.de/research/climate-futures-outlook.html>), which brings together more than 60 natural and social scientists involved in the research of climate change. She is interested in

interactions between climate and society and in science communication.

Limiting global warming to 1.5° Celsius is not plausible under current conditions and, thus, cannot be realistically expected. This is shown in Hamburg Climate Futures Outlook 2023, published by the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS). The assessment of the plausibility of climate future scenarios is of utmost importance for climate discourse, climate action, and decision-making processes at large. Our analysis takes an integrative and interdisciplinary approach, examining the social drivers and physical processes that influence the pathways toward or away from a specific climate future scenario. This approach to climate futures research is unique in its combined focus on social and physical dynamics. For this purpose, 10 key social drivers of decarbonization and six physical processes that are often discussed in public were examined. The study sees human action as a fundamental condition (but also an uncertainty) when researching plausible climate futures. Social change is crucial for attaining the temperature limits of the Paris Agreement. So far, however, this has been insufficient.

Keywords: plausibility research, social transformation, decarbonization, tipping points, climate futures



Uwe Schneider is an agricultural and resource economist who is also trained in agronomy and environmental sciences. His interdisciplinary research focuses on possible and plausible land-use futures and land-sector contributions to sustainable development. He has designed and programmed a variety of mathematical models to depict agricultural decisions and their consequences at local, regional, and global scales. These consequences include land-use synergies and conflicts between the production of food, timber, and bioenergy; the preservation of ecosystems, climate, and other resources; and the provision of livelihoods, climate mitigation, and other ecosystem services. Prof. Schneider and his colleagues also quantify the market and welfare effects of agricultural and environmental policies. Prof. Schneider has decades-long expertise in advanced mathematical programming with the general algebraic modeling system (GAMS) and has contributed several open-source software tools. As a member of Universität Hamburg's Cluster of Excellence Climate, Climatic Change, and Society (CLICCS), he cochairs the project Sustainable Land-Use Scenarios: Soil, Biodiversity, Water, Food and Energy Security. At Universität Hamburg, he teaches courses on sustainability, mathematical programming, and agricultural sector modeling.

Abstract: Assessing possible and plausible land futures

Diverse land-use and land-management systems provide multiple market and nonmarket services to society but also employ substantial resources and affect multiple environmental qualities. Unfortunately, many agroenvironmental hazards remain unregulated and at undesirable magnitudes. To regulate these heterogeneous and complex

hazards efficiently, policymakers need guidance from inter- and transdisciplinary scientific assessments. Here, we introduce a methodology that starts with biophysical process models to simulate economic and ecologic land-use impacts for alternative soil climate regimes and for alternative land-management choices. Simulated land-management options and their local consequences then feed into regional and global agricultural sector models that compute market equilibriums for land-based commodities and services. To assess plausible land-use futures, agricultural sector models depict heterogeneous motivations and restrictions of agricultural decision-makers derived from stakeholder communications.

Keywords: Food – water – energy - biodiversity nexus, Agricultural sector modeling, Land use competition, Agroecological externalities, Mathematical Programming

Session III: Environmental Economics

Topic: “Decarbonization: Economic and social dynamics”

Participants Kyoto U: Nur Firdaus, Akihisa Mori, Seiichi Ogata, Gregory Trencher

Participants UHH: Stefan Aykut, Solange Commelin, Matthew Johnson, Grischa Perino

The panel explores the societal and economic dynamics of sustainable energy transitions, as well as social, political, and economic drivers, enabling factors of, and barriers to decarbonization. We will present framework and methodologies for identifying and assessing relevant social and economic processes of deep decarbonisation, analyses of the formation of voters’ preferences over specific mitigation strategies, explanatory factors for companies’ climate ambitions, incumbent firms’ behaviors such as networked business model innovation, sectoral coupling, and carbon offsets. Presentations will also examine the role of social movements and climate activism in corporate sustainability transitions.



Nur Firdaus

2021–2024: Coal divestment and sustainable transitions in Asia, with a focus on decarbonization and financing for energy transitions in Indonesia

2020–2023: Stranded asset risk and the dynamics of sustainable energy transition: The case of Indonesia

2022: Stranded assets and energy transitions in the Southeast Asian Region: Implications for international investors

2022: Technology development and innovations in Indonesia's energy sector

2020: Financing for sustainable infrastructure projects

2019: Climate actions in Indonesia's business sector

Abstract: The dynamics of Indonesia's coal industry behavior post the Paris Agreement and energy transition narratives

Given that Indonesia is a coal-rich country, it is important to assess the extent to which the coal industry adapts to energy transitions. For instance, changes in companies' strategies and behavior regarding core competencies or capabilities can explain the dynamics that drive incumbents to transform their business and political orientations in achieving long-term sustainability. This includes how and why companies drive institutional change and enact specific strategic actions

in response to climate challenges. The assessment emphasizes the interactions between coal mining companies and the power generation sector. In this talk, I will present the results of such behavioral changes after the Paris Agreement and their implications for transition narratives. My analysis aims to identify the strategies implemented by coal mining companies to mitigate energy transitions under stranded asset risk. It attempts to provide insights into narratives related to the energy sector to develop plausible storylines for the transition pathways by considering the perspectives and strategies of incumbent actors in the coal regime.

Keywords: climate change, coal, stranded asset risk, strategy, sustainability transitions



Akihisa Mori

2021–2024: Coal divestment and sustainable transitions in Asia, with a focus on business model innovation in the financial and power sectors and macroeconomic and geopolitical impacts

2019–2023: The Belt and Road Initiative in Southeast Asia: The debt curse perspective with a focus on debt sustainability, economic dependency, and governance in Southeast Asia

2018–2022: China’s carbon-energy policy and Asia’s energy transitions, with a focus on the economic and environmental implications of China’s foreign investments in the energy sector and its domestic

carbon-energy policy; the research results were published in 2021 by Routledge under the same title

2015–2017: China’s climate-energy policy focusing on its domestic and international economic and environmental implications for coal-exporting countries in the Asia-Pacific region; the research results were published in 2018 by Routledge under the same title

2014–2023: Electricity system transitions in Japan, with a focus on coalitions around the incumbent power companies, politicians, central and local governments and media, and grid systems that can make maximum use of distributed renewable energy

Abstract: Co-evolution of complementary elements in the electricity sector

A socio-technical system has various elements of complementarity, such as technologies, infrastructure, institutions, and organizations. Each element has its own logic, direction, and speed of change, which may destabilize a system and delay transitions. Co-evolution among the elements, networked sustainable business model innovation, and coopetition among organizations emerge as enablers for incumbent companies to adapt to changes, leading to a sustainable transition in the system.

This presentation considers the Chinese electricity sector as a case study to analyze the factors that enable networked sustainable business model innovation and coopetition between incumbent power generators and manufacturers. It then explores the application of the framework to other sectors (e.g., the financial sector) and countries (e.g., Japan and Germany).

Keywords: sustainable energy transitions, co-evolution, networked business model innovation, electricity sector, China



Seiichi Ogata

A study on the Socioeconomics of Agrivoltaic Systems

This study aimed to examine the realization of decarbonization and green economic transition in rural areas. Agrivoltaic is the concept of coproduction of agriculture and energy through the advanced use of agricultural land. This study assessed the impact of introducing this technological system on the socioeconomic system and proposes the development of social implementation.

Research on Corporate Sustainability and Corporate Management

It is essential to conduct awareness surveys on the "triple bottom line" of corporate activities and corporate sustainability to determine the elements of corporate sustainability. We have been conducting a multifaceted analysis of corporate management in Thailand and Japan.

Building an Integrated Mathematical Model for a Carbon-Neutral Economy

Scenario assessments and long-term forecasts must be validated to realize carbon-neutral businesses. For this purpose, it is necessary to conduct an integrated evaluation of the technological and economic aspects as well as socio-environmental impacts. Our research

attempts to build an integrated mathematical model to verify a carbon-neutral economy and proposed business model.

Abstract: Sector Coupling and Carbon-Neutral Economy: Case study on Agrivoltaic Systems in Japan

Sector coupling, or industrial convergence toward carbon neutrality, holds great promise. Our study provides an economic analysis of sectoral coupling and a new socioeconomic system. This presentation will specifically focus on agrivoltaic systems in Japan, with an emphasis on understanding the business model of sector coupling. Agrivoltaic systems have emerged as a means of harnessing renewable energy on agricultural land, thereby presenting a viable decarbonization business model. Against the backdrop of declining agricultural productivity and a decreasing number of farmers in Japan due to rural depopulation and other factors, the potential economic decline in rural areas has become a major concern. Consequently, agrivoltaic systems have garnered attention as a business model that can revitalize rural areas. This report presents the carbon reduction effects of agrivoltaics, analyzes their social acceptance in rural areas, and discusses socio-technical transition scenarios for social change.

Keywords: business model, Power-to-X, Internet of Energy, social acceptance, transdisciplinarity, socio-technical transition



Gregory Trencher

- Net-zero strategies and factors contributing to coal lock-in in Japanese utilities, efforts to commercialise next-generation coal technologies with a focus on ammonia co-firing and CCS
- Net-zero and offsetting strategies in the corporate and energy sector. The first study focuses on the case of oil-and-gas majors (BP, Shell, Chevron, ExxonMobil) and examines the features of net-zero strategies, commitments to phase-down fossil-fuel production, and offsetting behaviour. The study is under review in Climatic Change. The second study focuses on the world's top-10 largest corporate buyers of offsets quantitatively examines the nature of offsets used, comparing trends regarding avoidance vs removal and credit vintages.
- Next-generation mobility in Japan, California, China and Germany. One area focuses on hydrogen fuel cell vehicles, 'Roadblocks to fuel-cell electric vehicle diffusion: Evidence from Germany, Japan and California' and appears in Transportation Research Part D (2022). The other focuses on trials of autonomous vehicles and Mobility-as-a-Service (MaaS) for the elderly in Japan.
- The phase-out of unsustainable technologies, substances and industry practices. The first study was published in Environmental Research Letters (2022). The other study is under review with One Earth.

Abstract: Offsetting behaviour in the corporate sector: A legitimate short-cut to net-zero?

Emissions-intensive companies are under pressure to support the Paris Agreement and are adopting net-zero targets, with many pledging to reach zero emissions on a net-zero basis by 2050. Many are using carbon offsets to fast-track progress to towards net zero. In this talk I will present the results of two studies that examine the characteristics of the carbon offsets purchased by oil majors (BP, Shell,

Chevron, ExxonMobil) and the world's 20 largest corporate buyers. My analysis of the oil majors also examines the core features of net-zero strategies, commitments to phase-down fossil-fuel production, and the way in which offsets are integrated into business models. The analysis on offsets uses data on carbon credit retirements from registries in the voluntary carbon market. After presenting the results of my study on the oil majors' offsetting behaviour, I will then showcase how the methodology is being applied to a follow-up study, which examines the quality of offsets purchased by the world's largest corporate buyers of offsets, a group of companies which includes Delta Airlines, Volkswagen, Audi, Gucci and Boeing.

Keywords: energy transitions, business strategies, decarbonisation, phase-out



Stefan Aykut is Mercator Professor of Sociology, specializing in the social dynamics of ecological transformation, and director of the Center for Sustainable Society Research at Universität

Hamburg. His research examines how modern societies deal with global ecological problems (particularly climate change), how ecological problems are socially and politically channeled into transformation programs, and how both new conflicts and forms of social coordination emerge in this process. He is (co)author of *Gouverner le climat? 20 ans de négociations internationales* (2015), *Globalising the climate. COP21 and the 'climatisation' of global debates* (2017), and *Climatiser le monde* (2020). In 2017, he was awarded the Heinz Maier-Leibnitz Prize for early career researchers by the German Research Foundation.

- 2017–2023: Assistant professor at Universität Hamburg, focusing on ecological crises and conflicts, global climate governance, and the role of societal agents in deep decarbonization
- 2012–2017: Postdoctoral researcher at Université Paris-Est Marne-la-Vallee, focusing on the construction of energy futures in expert commissions and public debates and comparing energy transition in Germany and France
- 2008–2012: Doctoral studies at EHESS in Paris with thesis titled “How to govern a new global risk? The construction of climate change as a public problem, in Germany and France, Europe and at the global level”

Abstract: Assessing the social dynamics of the German climate transformation – a framework for analysis

Germany has set itself ambitious targets for attaining climate neutrality by 2045. However, although social dynamics are essential for such a transformation, they are rarely systematically captured in research to date. In particular, there is a lack of methodology for analyzing and summarizing relevant social processes that would allow us to assess the extent to which the deep and rapid decarbonization of an economy like Germany’s is not only technically and economically possible but also plausible from a social and political perspective. The paper presents a project and an assessment framework for Germany’s climate transformation. The framework draws on the methodology of the Hamburg Climate Futures Outlook (Stammer et al. 2021; Engels et al. 2023). It complements existing approaches that use techno-economic models to simulate optimal transition pathways, examine the feasibility of sociotechnical transition pathways, or identify social tipping points for accelerated decarbonization by placing the focus on 12

social processes that act as potential drivers of deep decarbonization. It examines the historical dynamics of these processes as well as key contextual conditions that could promote or inhibit these dynamics in the future.

Keywords: Social plausibility, energy transition, transformation, climate policy, societal agency



Solange Commelin is a doctoral candidate and research associate in the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS) at Universität Hamburg. Her main focus is climate movements, particularly their direct and indirect impact on corporate sustainability. For her research, she recently participated in a three-month research stay as part of an ongoing exchange program between the Universität Hamburg and Kyoto University. During this time, she conducted research with climate activists in several Japanese cities. She completed a master's degree in public and nonprofit studies at the Faculty of Business, Economics and Social Sciences at Universität Hamburg. In addition to her academic background, Solange Commelin has practical experience in business, having worked in foreign trade for nine years prior to her current position.

Abstract: You won't fool the children of the revolution – Assessing the direct and indirect impact of climate movements on corporate sustainability efforts

Global decarbonization, or achieving the Paris climate goals, depends on corporate participation. It is therefore not surprising that

numerous climate movements have drawn attention to this fact and addressed these circumstances in their protests. Past research on climate movements demonstrates that they can impact businesses both directly (e.g., by fostering new markets) and indirectly (e.g., by fostering consumer flight shame). Nevertheless, the body of research analyzing the relationship between climate movements and businesses is limited, and the available analyses predate the youth-led surge in climate movements since 2018 with the creation of Fridays for Future.

Thus, the research presented here proposes a contemporary assessment of the relationship between these two actors from multiple perspectives. Individual papers explore corporate, climate movement, and employee perspectives. During the symposium, insights will be provided into the first two studies, which show, on the one hand, the role climate movements currently play in the context of corporate sustainability transitions and, on the other hand, how climate movements address companies in their actions and what consequences their activism has or may have on their career paths.

Keywords: climate movements, climate change, corporate sustainability



Matthew Johnson is a postdoctoral researcher and team leader in the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS) project Decarbonization: Global Research on Effects in Enterprises and Societies (D°GREES) at Universität Hamburg. His main research interests include corporate decarbonization strategies, broader

sustainability management topics, sustainable entrepreneurship, and business model innovation for sustainability. He is currently researching various carbon management activities in large international companies. He has published his research in management and sustainability journals, including *Entrepreneurship Theory & Practice*, *Journal of Small Business Management*, *Journal of Industrial Ecology*, *Organization & Environment*, and *Business Strategy and the Environment*. Before joining CLICCS, Dr. Johnson received his doctorate from Leuphana University Lüneburg, researching the proliferation of sustainability management in German small and medium-sized enterprises. He has previously worked as research assistant and lecturer at Leuphana University Lüneburg, Ernst-Abbe University Jena, and the Fraunhofer Institute for Material and Beam Technology. He also has five years of professional experience as an international sales and marketing manager for two German companies. He obtained a master's degree in international business from the University of St Andrews, Scotland, and a bachelor's degree in German and international trade from Clemson University, South Carolina.

Abstract: Raising the Bar. What Determines the Aspiration Level of Companies' GHG-Emission-Reduction Targets?

Since the launch of the Science Based Target initiative (SBTi), we have witnessed an increase in companies committing to reduce greenhouse gas (GHG) emissions. While recent studies have shown how various reduction targets can be established through SBTi—including near- or long-term net-zero targets—we still do not understand the explanatory factors that determine companies' target aspirations. Thus, this qualitative study carries out a two-step research design with a sample of 22 international companies: first, by assessing their GHG targets and assigning them to a particular aspiration level and,

second, by matching particular factors explaining the different GHG targets. For instance, companies with high target aspirations (i.e., long-term net-zero targets) reveal salient factors including continual management support, employee involvement, and stakeholder collaborations during the target development stages, while companies with low target aspirations (i.e., short-term non-net-zero targets) demonstrate influential factors from external stakeholder groups (e.g., investors and NGOs) at the beginning of the target-setting process without further salient factors. This study not only establishes a wider spectrum of target aspiration levels but also contributes to understanding the salient factors for higher carbon-reduction goals.

Keywords: corporate responses to climate change, sustainability management tools, organizational capabilities and resources for sustainability, sustainable entrepreneurship, business model innovation for sustainability



Grischa Perino's research interests include several areas in environmental, climate, and applied microeconomics. In particular, he is interested in instrument choice, intrinsic motivation to protect the environment, environmental policy preferences, and environmental innovations. The methods used in his research tend to build on applied microeconomic theory and survey-based experiments.

He is an expert on carbon market design and, in particular, the market stability reserve in the European Union emission trading system. He has advised the European Commission (Directorate-General for

Climate Action), the Federal Ministry for Economic Affairs and Climate Action, and the German Environment Agency on the matter.

Abstract: Revealed Preferences for Mitigation Options and the Role of Public Expert Assessments

This paper reveals preferences over abatement measures and how they change in response to public assessments by experts in individual and collective choice settings. The survey-based experiment was conducted with 1,204 German households in 2022. Based on the decisions taken by participants, real allowances of the EU emission trading system were canceled and output of real coal-fired power was reduced, each by several hundred tons of carbon dioxide.

The key finding is that expert advice impacts voting decisions in two ways. First, new information on the relative environmental effectiveness of a mitigation option can lead individuals to change their preferred option. Second, observing a public expert assessment affects participants' second-order beliefs—that is, what they believe about what others believe to be the most effective abatement option. This changes how an individual casts their vote on top of any change in their preferred mitigation option.

The findings help us to understand how voters form preferences for specific mitigation strategies, how science and science communication in particular impact both preferences and voting behavior, and the importance of strategic considerations and their potential to create lock-ins.

Keywords: decarbonization instruments, voting, revealed preference evidence, randomized controlled trial

Session IV: Biodiversity

Topic: “Nature in jeopardy – Biodiversity’s contribution to Planetary Health from interdisciplinary perspectives”

Participants Kyoto U: Katsue Fukamachi, Takuya Kageyama, Yukako Katsura, Shuichi Oyama, Georgina Seera, Hirokazu Toju, Wang Wen

Participants UHH: Moritz Drupp, Joachim Matthias Glaubrecht, Kerstin Jantke, Nicole Ratzinger-Sakel, Henrik Sattler, Alexander Stark

Approaching Planetary Boundaries and Jeopardizing Planetary Health: A Multidisciplinary Approach to a Sustainable Future

Human impact on Earth is paramount. *Homo sapiens*, whose exponentially increasing population is currently more than eight billion people, has become a powerful force and dominant evolutionary factor. Approaching the Anthropocene, our potential to change the environment at the planetary level relates not only to the geosphere but also the biosphere. Therefore, the biodiversity crisis no longer merely affects a few isolated species but rather the global functioning of entire ecosystems on which humankind relies, thus posing an existential threat. Modern society’s economic structure risks exceeding the limits of planetary stability. We have the moral imperative to ensure an inhabitable Earth not only for future generations but also for other living organisms. As one of four parallel sessions held at Universität Hamburg from 19 to 20 June 2023, our research group will discuss biodiversity—namely, biological diversity at the level of genes, species, and ecosystems—from different perspectives, including biology (particularly ecology), economy, and law. Together, we will focus on three aspects:

- (i) *Nature at risk*—protecting areas for species
- (ii) *Nature as asset*—the economics of biodiversity
- (iii) *Nature as legal entity*—toward a new perception of nature

(i) One major target stipulated by the United Nations at the Kunming-Montreal Conference (COP15) on the Convention on Biological Diversity (CBD) in December 2022 was the conservation of 30 percent of the world's land and sea area by 2030 in order to help protect biodiversity. Thus, one of the challenges of this decade will be figuring out how to conserve the remaining natural areas and/or to rewild them in order to best achieve the Montreal goal on a global scale given humans' growing resource and spatial demands, particularly in terms of food security and green energy solutions.

(ii) Biodiversity and conservation (e.g., within protected areas) contribute to economies and society but, to date, have been vastly underestimated. However, there is a growing concern that contemporary patterns of economy are unsustainable, giving rise to an increasing awareness of pervasive externalities – namely, consequences mostly unaccounted for (e.g., the tragedy of the commons and the lack of self-correction in the marketplace)—in consumption and the use of our natural environment; this was most recently summarized in *The Economics of Biodiversity: The Dasgupta Review*.

(iii) Addressing biodiversity decline is also an inescapable responsibility of society, with legislation increasingly required to adapt to changing perspectives on nature, accompanied by adequate philosophical perceptions of nature and humankind's relationships with it. This is all the more true in a transcultural context, as illuminated, for

example, by comparing European and Asian intellectual histories, legal traditions, and juridical trajectories.

Given that our planet's geological and biological systems are under pressure, we need to address biodiversity in the context of ecology, economy, and law—as well as other societal aspects—for which a broader public understanding of the planetary crisis and wider political recognition is essential. The aim of our research group is to highlight ways to integrate these three different perspectives on nature and to understand and address synergies.



Katsue Fukamachi has a Doctorate degree (Ph.D.) in Agriculture. Her main research interests include the ever-changing relationship between people and nature reflected in the satoyama landscape; conservation and utilization of region-specific landscapes; and interrelationship among values, behavior, culture, and biodiversity. In addition, she is conducting research on environmental design that integrates ecological and cultural values into green environmental conservation.

Oct. 2008 Associate Professor, Department of Landscape Ecology Planning, Graduate School of Global Environmental Studies, Kyoto University

Nov. 2004 Assistant Professor (Associate Professor), Department of Environmental Design, Faculty of Human Environment, Kyoto Prefectural University

Sept. 1993 Transferred to the Kansai Branch of the Forestry and Forest Products Research Institute

Apr. 1992 Joined the Forestry and Forest Products Research Institute

Recent works

- Fukamachi, K., & Watanabe, T. (2022). Satoumi: prolonged interaction between humans and nature. In G. Pungetti (Ed.), *Routledge Handbook of Seascapes*. Routledge.
- Fukamachi, K. (2022). Satoyama landscapes: Creating resilient socio-ecological production landscapes in Japan. In A. Rastandeh & M. Jarchow (Eds.), *Creating resilient landscapes in an era of*

climate change: Global case studies and real-world solutions.
Routledge.

Abstract: Restoration of satoyama landscape and biodiversity conservation through citizens' activity in Kyoto

Kurama in northern Kyoto is known for its satoyama landscape, forestry, and stone production. Forests in this region have undergone substantial changes since the 1960s due to the dieback of pine and oak trees, exacerbated by deer feeding on the vegetation. The annual Kurama Fire Festival held at the Yuki Shrine plays a vital cultural role and is the most important ceremony in Kurama. Torch designs for the festival are made from plants sourced from the local satoyama forests. To preserve the natural resources and the festival, the "Creating Satoyama to Support Traditional Culture and Biodiversity in Kurama" project was initiated. It aims to revive plant communities for the fire festival, raise awareness of Kurama's cultural environment, and promote the conservation of rare species and sustainable land use. It also focuses on preventing deer damage, restoring forest ecosystems by replanting important local species, and managing thinning overgrown forests. The revitalization efforts primarily target the Yuki Shrine Forest and aim to improve the growth of mixed, broadleaf, and plantation forests and grasslands in this area. In addition, monitoring activities combined with community-based educational activities will be prioritized around the forest which will deepen our understanding of traditional satoyama landscapes.

Keywords: satoyama landscape, biodiversity, nature restoration, citizens' activity, Kyoto



Takuya Kageyama

In his undergraduate course, Mr. Takuya Kageyama conducted an island biogeographic research focusing mainly on macroscale ecological phenomena. This research could contribute to elucidating species–area relationship. After that, he has been studying soil ecosystems at the Toju Laboratory, Kyoto University. In his current research, DNA metabarcoding technology was used to clarify the ecological processes in soil ecosystems.

Abstract: Reconstructed interaction networks by time series analysis in soil ecosystems

Soil ecosystems are home to a great diversity of organisms whose population dynamics are influenced by those of other species and environmental factors. The structure of such causative networks in biological communities varies considerably over time. Many theoretical and a few empirical studies have shown that these changes can drive community dynamics as well as eco-evolutionary dynamics. However, there are numerous challenges in assessing the changes in the interactions between soil ecosystems, and our understanding has not yet improved. In my current research, I attempted to clarify the biotic and abiotic interaction of soil ecosystems from the perspective of time series analysis. In this symposium, I will present some of the results of my study and extend them to the perspective of nature as an asset. I believe that understanding soil ecosystems will help develop ecosystem services that the society can sustainably enjoy.

Keywords: soil ecosystem, ecosystem stability, biotic interaction, agriculture, biodiversity



Yukako Katsura graduated from the five-year doctoral course of the Department of Evolutionary Studies of Biosystems, School of Advanced Sciences at The Graduate University for Advanced Studies (SOKENDAI) in Japan. Her dissertation was on the evolution of mammalian sex chromosomes. She was a JSPS (Japan Society for the Promotion of Science) Overseas Research Fellow (Postdoctoral Researcher) and visited UC Berkeley, Pennsylvania State University on scholarship. After serving as an assistant professor at Nihon University School of Medicine, Ms. Katsura assumed her current position in 2019. She specializes in phylogenetics, genome analysis, and other areas of evolutionary genetics.

Abstract: Unique evolution of endangered Japanese frogs

The Japanese wrinkled frog (*Glandirana rugosa*) is unique in having both XX-XY and ZZ-ZW types of sex chromosomes within the species. Genome sequencing and comparative genomics with other types of frogs are important to understand the mechanisms of sex chromosome turnover within a species or during a short period. We analyzed the newly sequenced genome of this species and found that sex chromosomes differed in frogs depending on their location in Japan. Frogs have disappeared from some parts of Japan. This is because they live in relatively clean water with fewer currents and are rapidly disappearing from urban areas in Japan.

Keywords: frogs, sex chromosomes, Japan, evolution, genetics



Shuichi Oyama

1999 Ph.D. in Human and Environmental Studies, the Graduate School of Human and Environmental Studies, Kyoto University

Member of International Geographical Union

Member of International Society of Ethnobiology

Member of African Studies Association

Member of Japan Association for African Studies

(Executive Board: 2011–2016, 2019–2022; Editorial Board: 2005–2007, 2014–2016)

Member of Japan Society of Tropical Ecology

Member of the Japanese Society of Human Geography (Executive Board: 2016–18)

[Recent works]

Oyama, S. 2022. Waste valorization and African potential: The forgotten life of things and their rebirth in mass consumption capitalism. Ohta, I., Nyamunjoh, F. B., & Matsuda, M. (Eds.). *African Potentials: Bricolage, Incompleteness and Lifeness*. Langaa Publishers, 225–251.

Oyama, S. 2021. Renewed patronage and strengthened authority of chiefs under the scarcity of customary land in Zambia. Takeuchi, S. (ed.). *African Land Reform under Economic*

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(Open Access). Springer, 65–86.

Oyama, S. 2020. Action research and reverse thinking for anti-desertification methods: Applying local revegetation techniques based on the ecological knowledge of local farmers in the Sahel of West Africa. In Tobias, H. and Zingerli, C. (Eds.). *Towards Shared Research: Participatory and Integrative Approaches in Researching African Environments*. Transcript Publishers, 47–89.

Abstract: Dump-heap hypothesis and urban waste valorization for greening the land in the Sahel, West Africa

Municipalities in the urban areas of sub-Saharan Africa face waste management challenges. The urban population is rapidly increasing, and urbanization promotes enormous food consumption. Cities accumulate nutrients due to solid waste management problems whereas rural areas face desertification and land degradation issues caused by soil nutrient depletion. According to the chemical analysis, the urban waste that is thrown away by the residents from their homesteads does not get immediately contaminated by heavy metals and can be used for land restoration.

In this study, we aimed to emphasize the chemical effects of urban waste and termite biological activity on land restoration. Urban organic waste is slightly alkaline, neutralizes soil acidity, and adds nutrients to the soil. Termites build shelters over organic matter, elevate small grains of silt and clay in the soil, and mix them with wind-blown sand. Termite tunnels penetrate the hard sedimentary layer, allowing rainwater to easily infiltrate it. In addition, termites create an aggregated soil structure, which is porous, allows plant roots to grow and penetrate the ground as well as contains oxygen and moisture. To

develop sustainable cities and land management, we need to create organic matter circulation between cities and rural areas.

Keywords: desertification, Republic of Niger, greening, cleaning, termites



Georgina Seera is a Ugandan postdoctoral research fellow at the Center for African Area Studies, Kyoto University where she has been stationed for the last two years. She graduated from the Division of African Area Studies at Kyoto University with a Doctor of Area Studies Degree in March

2021. Concurrently, she completed the Inter-Graduate School Program for Sustainable Development and Survivable Societies. She has a background in human nutrition and is passionate about the survivability of individuals and global society as a whole. Georgina has recently conducted research on the global obesity epidemic that is quietly increasing in emerging economies alongside the age-old issue of undernutrition. She has published a book that highlights how the uncertainty surrounding food availability and limited monetary access to various food options paradoxically triggers a positive energy balance among women in urban Uganda, predisposing them to obesity. She continues to conduct research on ways to ensure an adequate, reliable, nutritious, and diverse food supply chain to feed both rural and urban populations in Uganda while maintaining sustainable agricultural systems, such that they are not heavily dependent on the use of fertilizers, pesticides, herbicides, or improved seeds.

Abstract: Obesity as a consequence of limited food crop diversity in Uganda

Habitat loss due to land conversion is a key driver of biodiversity loss. Formerly forested areas are continuously cleared to establish “pure” agricultural plots of food crops. It is estimated that out of more than 30,000 known edible plant species, 120 are cultivated, but only 9 provide more than 75% of the human food requirements. The limited diversity of food crops is associated with the global prevalence of obesity. For instance, a study of obesity among women living in urban Uganda revealed that less than a third of the women achieved the baseline for a diverse diet and that their energy intake exceeded their energy requirement due to the consumption of large portion sizes of a limited variety of food items. Majority of the energy intake came from the food crops that are easily available in Uganda, such as maize, kidney beans, green cooking bananas (“matooke”), and cassava. Thus, food crop diversity and population health are inextricably linked. This is concerning because the social cost of obesity in terms of disability-adjusted life years is extremely high such that it is a risk for even the most developed nations of the world, let alone emerging economies, such as Uganda.

Keywords: obesity, plant species, food crops, dietary diversity, disability-adjusted life-years



Hirokazu Toju

After completing doctoral research on the co-evolutionary interactions between insects and plants, Associate Prof. Hirokazu Toju expanded his research targets to complex webs of interactions involving hundreds or thousands of species. At the Center for Ecological Research, Kyoto University, where he launched his laboratory in 2017, he is leading projects on the dynamics of species-rich ecosystems targeting plant–microbe, animal–microbe, and microbe–microbe interactions.

2017–present Associate Professor at Center for Ecological Research, Kyoto University

2015–2016 Visiting Scholar at the Department of Biology, Stanford University

2012–2017 Assistant Professor at Graduate School of Human and Environmental Studies, Kyoto University

2010–2012 Assistant Professor at Hakubi Center for Advanced Research, Kyoto University

2008–2010 Postdoctoral Fellow of the Japan Society for the Promotion of Science (JSPS)

Abstract: Deciphering entangled webs of species interactions: hidden biodiversity for sustainable Earth ecosystems

In nature, species form entangled webs of interactions, whose dynamics determine their biological functions at the ecosystem level. With the emergence of high-throughput DNA sequencers, we uncovered the root microbiome structures of hundreds of plant species

across various ecosystem types. We found that diverse taxonomic groups of root-associated fungi ubiquitously interacted with plant communities, potentially playing crucial but often overlooked roles at the ecosystem level. Based on the patterns found in plant–microbe and microbe–microbe networks, we designed optimal core microbiomes for managing agroecosystems with high resource efficiency and stress resistance. I will discuss how interdisciplinary research can advance our ability to manage sustainable agroecosystems and restore degraded ecosystems.

Keywords: ecosystem functions, microbiomes, symbiosis, community stability, species interactions



Wen Wang

Ph.D. in Agriculture, Kyoto University, March 2022

Research interests: landscape ecology, landscape architecture, and satoyama management and conservation.

Dr. Wen Wang was born in Yunnan, China, a region rich in nature and culture, and spent most of her childhood vacations in the rural areas of Yunnan. These experiences led her to become interested in the landscape and biodiversity of satoyama in Japan. As a research fellow at the Graduate School of Global Environmental Studies, Lab of Landscape Ecology Planning, Kyoto University, she conducted research on

the characteristics of satoyama landscapes and mechanisms underlying their management and conservation.

Since 2018, Dr. Wang has been a member of the Eco-DRR Project (Research and Social Implementation of Ecosystem-based Disaster Risk Reduction as Climate Change Adaptation in Shrinking Societies) at the Research Institute for Humanity and Nature.

Since 2022, she has been a member of the Environment Research and Technology Development Fund of the Environmental Restoration and Conservation Agency established by Japan's Ministry of the Environment.

Dr. Wang has authored or co-authored eight papers in Japanese and Chinese academic journals and contributed to the writing of three books as a co-author. For further details, please refer to the profile at <https://researchmap.jp/wangwen>.

Abstract : Land use change and biodiversity related to premises forests in dispersed villages in the Tonami Plain, Toyama Prefecture, Japan

The Tonami Plain, located in the western part of Toyama Prefecture, Japan, is a typical Japanese satoyama landscape with dispersed villages, which were established in a slightly elevated area of the alluvial fan deposits of the Sho River basin. In the conventional style, the land-use pattern involves procuring the food and fuel necessary for daily life from small fields and grass fields while cultivating rice. Each house had its own premises forest, which functioned as a source of disaster prevention and microclimate improvement and provided habitat for local biodiversity. However, changes in the social structure and lifestyle since the 1960s have led to a decrease in premises forests and considerable changes in the landscape. The forms of premises forests

have gradually diversified into different types with characteristic flora and management. To determine the current situation of premises forests, this study investigated the composition of trees, buildings, and water systems in the Tonami Plain. In addition, we surveyed the flora to understand the tree species, numbers, and breast height diameters and quantified the dominance pattern. By clarifying the land use and composition of premises forests, we hope to inform future efforts to protect and sustainably manage this unique satoyama landscape.

Keywords: dispersed village, premises forests, land use, biodiversity, Tonami Plain



Moritz Drupp is a professor of sustainability economics at Universität Hamburg, where he is also member of the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS), the Center for Earth System Research and Sustainability (CEN), and the Hamburg Center for Health Economics (HCHE). He also serves on the editorial board of the *Journal of Environmental Economics and Management*. Moritz Drupp's

research is mostly concerned with the design and evaluation of public policies, such as those that aim to mitigate climate change, address air pollution and health effects, and conserve biodiversity, with a special focus on distributional issues. Drawing on theory, modeling, and various empirical approaches, his research seeks to inform the transition toward more sustainable futures. He regularly consults governments and international organizations on climate economics and natural capital valuation. His research has been repeatedly published

in general economics journals (e.g., *American Economic Journal: Economic Policy*, *European Economic Review*) and interdisciplinary journals (e.g., *Nature Climate Change*, *Nature Human Behaviour*) and has informed public policy of, among others, the European Union, Germany, the Netherlands, Sweden, the United Kingdom, the United States, and the World Bank.

Abstract: Biodiversity, Natural Capital, and Sustainability

Economists have long recognized the many diverse benefits that humans derive from ecosystems. Some benefits, such as timber, are regularly exchanged in market economies but others, often referred to as nonmarket goods, provide real value to humans outside market transactions. Examples of these nonmarket benefits include enjoyment of natural areas through recreation or aesthetic appreciation, cultural and spiritual importance, and valuing the existence of biodiversity. *The Economics of Biodiversity: The Dasgupta Review* has documented our considerable state of knowledge as well as key knowledge and implementation gaps. In implementing the Aichi biodiversity targets, governments are increasingly making progress in integrating biodiversity values in project appraisals and accounting. However, most still fall short to date. My talk will highlight recent advances in the economic analysis on valuing biodiversity, which recognizes the increasing relative scarcity of ecosystem services and their limited substitutability vis-à-vis human-made market goods in line with the idea of sustainability. I will show how recognizing the importance of biodiversity for planetary health requires us to use much higher asset prices in project appraisals and national accounting. I illustrate the general result in the context of *The Changing Wealth of Nations* by the World Bank.

Keywords: Environmental economics, sustainability, climate, biodiversity, public policies

Keywords: research focus, biodiversity, biosystematics, biogeography, evolution, species concepts and delimitation



Kerstin Jantke holds a *Diplom* in environmental sciences from Leuphana University Lüneburg (2003), Germany, and a doctorate in geosciences from Universität Hamburg (2011). She was a postdoctoral researcher at Universität Hamburg (2013–2015) and at the University of Queensland, Australia (2017). Since 2019, she has coordinated the project Sustainable Land-Use Scenarios: Soil, Biodiversity, Water, Food and Energy Security in the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS) at Universität Hamburg. Her interdisciplinary research focuses on biodiversity conservation and protected areas at the interfaces of conservation biology, land economics, and climate science. This includes applying systematic conservation planning methods to conservation problems across multiple spatial scales from local to global, the developing and applying new metrics and tools to evaluate protected area systems, tracking progress toward internationally agreed conservation targets (e.g., SDGs 14 and 15, CBD targets), implementing economic concepts in conservation planning (e.g., cost efficiency or land-market feedback), and exploring synergies in simultaneous planning for biodiversity conservation and climate change mitigation.

Abstract: How to Protect 30 Percent of the Planet? Methods and Tools from Systematic Conservation Planning

Biodiversity is vital for planetary health, but one million species are at risk of extinction due to drivers like land- and sea-use change, climate change, and the overexploitation of resources. A key measure to combat biodiversity loss is to conserve natural habitats and ecosystems through the designation of protected areas. Global targets were adopted in Aichi, Japan, in 2010 to protect 10 percent of the ocean and 17 percent of the land by 2020 in “effectively and equitably managed, ecologically representative and well-connected systems of protected areas.” Although these targets were not met, there was a considerable expansion of protected areas. The recently adopted Kunming-Montreal Global Biodiversity Framework now calls for a dramatic expansion of protected areas—that is, to protect 30 percent of the planet by 2030—which will increase trade-offs between conservation and intensive land use. Systematic conservation planning with transparent criteria and reproducible metrics is well suited to scientifically guiding such actions. It provides methods and tools for evaluating past and current conservation efforts, monitoring progress toward formal goals, identifying protection gaps, and locating regions suitable for cost-effective expansion of protected area systems.

Keywords: biodiversity conservation, protected areas, systematic conservation planning, ecological representation, climate-smart conservation



Since 2016, **Nicole Ratzinger-Sakel** is a professor of auditing and accounting at Universität Hamburg. Her main research interests include audit quality, the audit market, sustainability reporting, assurance on sustainability reports, and corporate governance. She has published her work in lead-

ing journals such as *Auditing: A Journal of Practice & Theory*, *European Accounting Review*, *International Journal of Auditing* and *Journal of Accounting Literature*. She is part of the editorial board of the *International Journal of Auditing*. Furthermore, she is a member of the advisory board of the Financial Experts Association and the German Institute of Internal Auditors.

Abstract: Biodiversity from an Economic Perspective: Accounting for and Corporate Disclosures on Biodiversity— (Lack of) Intentions and Challenges

While the accounting community covers climate change, particularly with regard to greenhouse gas emissions, it has neglected biodiversity. However, given that the biodiversity crisis is considered one of the greatest current threats to Earth, it is crucial to analyze and understand the role of accounting and corporate disclosures in preserving and enhancing biodiversity on the planet.

Therefore, as part of an interdisciplinary biodiversity research group, this presentation focuses on the challenges and (lack of) intent within biodiversity-related accounting and corporate disclosures. More specifically, it discusses the problems underlying biodiversity accounting as well as the widespread but incorrect assumption that biodiversity is a free good and, therefore, does not have to be costed or routinely recognized in corporate accounts. Furthermore, it provides some

descriptive evidence of biodiversity-related corporate disclosure. Finally, it explains why corporations do or do not release biodiversity disclosures.

Keywords: audit quality, audit market, sustainability reporting, assurance on sustainability reports, corporate governance



Henrik Sattler is a professor of marketing and branding and head of the Institute for Marketing at Universität Hamburg. He has been a visiting scholar and/or adjunct professor at the Massachusetts Institute of Tech-

nology, Cornell University, the Australian Graduate School of Management at University of New South Wales Sydney, and the University of Technology Sydney. He has published five books and more than 50 international peer-reviewed articles, mainly in the area of brand management, social media marketing, and the marketing of hedonic media products. His papers have appeared in *Journal of Marketing*, *Journal of Marketing Research*, *Marketing Science*, *International Journal of Research in Marketing*, *Journal of Retailing*, and *Journal of Service Research*, among others. He has been ranked several times among the top 1 percent of researchers in business administration in Germany. He has served on the editorial boards of *Customer Needs and Solutions* (reviewer), *International Journal of Research in Marketing* (reviewer and guest area editor), *Recherche et Applications en Marketing* (associate editor), and *Marketing: ZFP—Journal of Research and Management* (editor in chief).

Abstract: Approaching Planetary Boundaries and Jeopardizing Planetary Health: A Multidisciplinary Approach to a Sustainable Future—Consumer Perspectives on Nature As an Asset

Companies aim to offer branded products and services that meet consumer preferences. In recent years, ethical and sustainability issues have become more and more important for consumers—that is, consumers increasingly perceive nature as an asset that has a price and should be preserved. Accordingly, companies increasingly position their brands to meet such consumer preferences. While consumers generally state that they prefer brands that address ethical and sustainability issues and that they would be willing to pay a premium for such brands, the majority of consumers hesitate when it comes to actual behavior—that is, they are not actually willing to pay a substantial amount of extra money for such brands at the point of purchase. The book *The Myth of the Ethical Consumer* by Timothy Devinney and colleagues (2010) provides overwhelming evidence that while consumers profess a social consciousness in surveys (where there is no cost), they fail to live up to this when their behavior is examined directly. This consumer behavior puts companies in the dilemma of knowing that even if they increase consumer preferences by investing in branded products and services that help biodiversity and the conservation of nature, most consumers will not be willing to cover these investments by paying a premium.

Keywords: brands as an asset, brand management, social media marketing, and marketing of hedonic media products.



Alexander Stark is a postdoctoral researcher at Universität Hamburg, where he received his PhD in 2019 for a thesis in legal philosophy. He studied law and philosophy in Augsburg, Hamburg and Wuhan and has been a visiting researcher in Oxford and Beijing. His research focuses on issues of analytical legal philosophy, environmental philosophy, climate change law, and nature conservation law.

Abstract: The rights of nature approach seeks to shift the paradigm of environmental protection and conservation by recognizing intrinsic rights of the natural world, ultimately aiming to create a more sustainable and balanced future for both humans and nature. It represents a paradigm shift from viewing nature as mere property to acknowledging its inherent value and rights. The approach aims to ensure the well-being and preservation of the environment, promoting sustainable development and biodiversity conservation.

The approach raises both legal and philosophical questions. Legal issues surrounding the rights of nature theory include, inter alia, determining how to enforce and defend these rights and addressing potential conflicts with existing legal frameworks that prioritize human interests. It raises questions about the scope of application, the extent of these rights, and the practical implications of granting legal personhood to natural entities. From a philosophical perspective, the approach challenges anthropocentrism and promotes an ecocentric worldview, emphasizing the interconnectedness and interdependence of all life forms. It prompts discussions about humanity's role as a steward of the Earth and redefines our relationship with the natural world, advocating for a more harmonious and respectful approach.

Keywords: legal philosophy, climate change law, environmental law



Joachim Matthias Glaubrecht is a professor of animal biodiversity at Universität Hamburg and scientific director at the Leibniz Institute for the Analysis of Biodiversity Change (LIB), where he is responsible for the reconstruction of the former Natural History Museum as the Evolutioneum. Born in 1962, he studied biology and palaeontology at Universität Hamburg. After completing his doctorate and working as a postdoctoral researcher at the Australian Museum in Sydney 1996, he became curator at the Museum für Naturkunde Berlin (1997–2014), where he also served as its first research director (2005–2009), before becoming founding director of the Center for Natural History (CeNak) in Hamburg, which was transferred to the LIB in 2021. Glaubrecht has published around 250 scientific articles and was an expert reviewer for the German Research Foundation (2008–2015). In addition, he writes for newspapers and magazines and has been a scientific consultant for films on natural history. He has published several award-winning nonfiction books on evolution and biological diversity, such as *Das Ende der Evolution: Der Mensch und die Vernichtung der Arten* (2019, 2021; The end of evolution: Man and the destruction of species) and *Die Rache des Pangolin: Wild gewordene Pandemien und der Schutz der Artenvielfalt* (2022; Revenge of the pangolin: Pandemics gone wild and the protection of biodiversity). His popular books also include biographies of Charles Darwin, Alfred Russel Wallace, and Adelbert von Chamisso.

Matthias Glaubrecht is coordinating the session on Biodiversity on Hamburg side.