NEWSLETTER February 2021

Forschungszentrum

Institut für Umweltsystemforschung

Agricultural ecology and Soil science

Research Group Prof. Dr. Gabriele Broll

Publications

Broll, G., Tarnocai, C. (2020): The Nature of Arctic Soils. In: Goldstein, M.I., DellaSala, D.A. (eds.) Encyclopedia of the World´s Biomes, Vol.2, Elsevier, 295-302.

Budke, C., thor Straten, S., Mühling, K. H., Broll, G., Daum, D. (2020): Iodine biofortification of field-grown strawberries - Approaches and their limitations. Scientia Horticulturae, 269, 109317.

Drexler S., Broll G., Don A., Flessa H. (2020): Standorttypische Humusgehalte landwirtschaftlich genutzter Böden Deutschlands. Braunschweig: Johann Heinrich von Thünen-Institut, Thünen Rep 75, 200p.

Holtmeier, F.-K., Broll, G. (2020): Treeline Research - From the Roots of the Past to Present Time. A Review. Forests 2020, 11, 38.

Mathews, J., Glante, F., Berger, M., Broll, G., Eser, U., Faensen-Thiebes, A., Feldwisch, N., König, W., Patzel, N., Sommer, R., Xylander, W.E.R. (2020): *Soil and biodiversity – Demands on politics. Soil organisms 92 (2), 95-98.*

Praetzel, L.S.E., Plenter, N., Schilling, S., Schmiedeskamp, M., Broll, G., Knorr, K.-H. (2020): Organic matter and sediment properties determine in-lake variability of sediment CO_2 and CH_4 production and emissions of a small and shallow lake. Biogeosciences 17:5057-5078.

Behavioral Economics for the Environment

Research Group Prof. Dr. Stefanie Engel

Projects

Stefanie Engel and Fabian Thomas are part of a new EU Horizon 2020 project called FRAMEwork. The project aims at finding solutions to the challenges of managing biodiversity at a landscape scale. 18 partner institutions in 11 countries are beginning work with farmers, citizens, value chains, policy makers and others to promote biodiversity sensitive farming. The project is building on the success of innovative ‘Farmer Clusters’ in the UK. These are regional 'bottom-up' groups of farmers motivated to improve the biodiversity of agricultural

land supported by a facilitator who can share the latest research and useful contacts. Stefanie leads a work package on 'Behavior and Incentives'. Therein, they address what factors influence the success of the Farmer Cluster approach and how public and private incentives can help encourage groups of farmers to adopt biodiversity-friendly practices.

Publications

Engel, S. “Payments for environmental services”. 2020. In Essential Concepts of Global Environmental Governance, J. F. Morin and A. Orsini (eds.). 2nd edition. Routledge.

Lliso, B., Pascual, U., Mariel, P., Engel, S. 2020. Increasing the credibility and salience of valuation through deliberation: Lessons from the Global South. Global Environmental Change 62. https://doi.org/10.1016/j.gloenvcha.2020.102065

Lliso, B., Pascual, U., Engel, S. 2021. On the role of social equity in payments for ecosystem in Latin America: A practitioner perspective. Ecological Economics 182. https://doi.org/10.1016/j.ecolecon.2020.106928

Lliso, B., Pascual, U., Engel, S., Mariel, P. 2020. Payments for ecosystem services or collective stewardship of Mother Earth? Applying deliberative valuation in an indigenous community in Colombia. Ecological Economics 169. Available online. https://authors.elsevier.com/c/1a5lP3Hb~0MJr2

Kössler, A-K., Engel, S. Policies as information carriers: how environmental policies may change beliefs and consequent behavior. Forthcoming in International Review of Environmental and Resource Economics.

Wunder, S., Brouwer, R., Engel, S., Ezzine-de-Blas, D., Muradian, R., Pascual, U., Pinto, R. 2018. 2020. Reply to: Simplification of PES project designs can be socially and scientifically justifiable. Nature Sustainability June 2020. DOI: 10.1038/s41893-020-0545-2

Institute of Geographie

Prof. Dr. Martin Franz

Projects

CoVaCoa - Consumer decisions, Value chains & Cocoa

The international and interdisciplinary project: *'Value chains and consumer decisions - remote ef-fects of governance and product biographies using cocoa as an example'* is a project funded by the German Federal Environmental Foundation (DBU). It involves four institutes at Osnabrück University. This project focuses on cocoa cultivation in Ghana as well as the global production network with all its governance relationships and the consumption of cocoa products.

Prof. Dr. Andrea Lenschow and Miles Yannik Ahlemann (M.A.) from the Institute of Social Sciences deal with the governance structures of the cocoa sector; Prof. Dr. Martin Franz, Dr. Carsten Fel-gentreff and Jana Rülke (M.A.) from the Institute of Geography examine the production conditions and effects of different power structures in Ghana; Prof. Dr. Stefanie Engel, Dr. Ann-Kathrin Kößler and Ioana Adriana Branga-Peicu (M.Sc.) from the Institute of Environmental Systems Research, together with Prof. Dr. Karsten Müller and Shirin Betzler

(M.Sc.) from the Department of Work and Organi-zational Psychology, investigate the complexities of consumption decisions of cocoa products.

If you have any questions and / or are interested, please contact us. Additionally, you are welcome to visit our website for further information.

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Applied Systems Science

Research Group Prof. Dr. Frank Hilker

New members

- Friedemann Liebaug (Institute of Mathematics): Friedemann has started a PhD position in the research group Applied Systems Science in October 2020. Previously, he completer a master's degree in mathematics at Osnabrück University, where he came into contact with systems science in his master thesis on "Analyse der Dynamik von Räuber-Beute-Systemen mit Infektionsausbreitung in der Beutepopulation". Currently, he is interested in the use of mathematical ways of thinking to understand collective phenomena, for example the evolution and emergence of cooperation and swarming. He is also attracted to questions in biological, socioeconomical, and ecological fields.
- Franziska Ossenbrink (Institute of Mathematics): Franziska has started a PhD position in the research group Applied Systems Science in October 2020. She holds a bachelor's degree in mathematics from RWTH Aachen and a master's degree in Environmental Systems and Resource Management from Osnabrück University. In her master thesis, she developed a mathematical model about the oak processionary moth in order to investigate if its recent outbreaks can be connected to climate change. For her future research, she plans on staying in this area and to also deal with the dynamics of other forest pests (e.g. bark beetle or mountain pine beetle). Her aim is to understand their dynamics with the help of mathematical models.

PhD defense

- Sun, Anthony T. (2020). Dissertation title: "Mathematical models of social-ecological systems: Coupling human behavioural and environmental dynamics" https://nbn-resolving.org/urn:nbn:de:gbv:700-202003312720

Habilitation

- Viebahn, Peter (2020). Habilitation in Systems Science. Thesis title: "Exploring the role of carbon capture and storage (CCS) for power plants in the German and international context – a multi-dimensional assessment approach"

Videos

- MEDUWA: The following link provides videos about the work undertaken in the MEDUWA project, including online talks by PhD students Volker Lämmchen and Gunnar Niebaum (both Institute of Mathematics). The MEDUWA-Vecht(e) project develops solutions that reduce or prevent the contamination of water, soil and food by medicines and multi-resistant microorganisms. https://www.meduwa.uni-osnabrueck.de/en/library/videos/

New examination regulations

- The study degree programs in **Environmental Systems Science (BSc and *Kernfach 2FB*)** and **Environmental Systems and Resource Management (MSc)** have been fundamentally revised. They have been accepted, published, and apply since winter term 2020/21. Major changes in the BSc programs include strengthening the systems science components, more elective options, and a new interdisciplinary application section in the Mono-BSc. Major changes in the MSc program include a new, systematic adjustment section (*Angleichungsbereich*) and a more structured curriculum.

Recent publications

(bold face indicates IUSF members)

- **Adamson MW**, Dawes JHP, Hastings A, **Hilker FM** (2020) Forecasting resilience profiles of the run-up to regime shifts in nearly-one-dimensional systems. *Journal of The Royal Society Interface* 17, 20200566.
- **Adamson MW**, **Hilker FM** (2020) Resource-harvester cycles caused by delayed knowledge of the harvested population state can be dampened by harvester forecasting. *Theoretical Ecology* 13, 425-434.
- **Hilker FM**, Liz E (2020) Threshold harvesting as a conservation or exploitation strategy in population management. *Theoretical Ecology* 13, 519–536.
- **Hilker FM**, **Sun AT**, Allen LJS, Hamelin FM (2020) Separate seasons of infection and reproduction can lead to multi-year population cycles. *Journal of Theoretical Biology* 489, 110158.
- Kreienhop N, **Klasmeier J**, Beeken M (2020) Mikroplastik: Ein aktueller Forschungsgegenstand der Wissenschaft. *Naturwissenschaften im Unterricht - Chemie* 31, 2-6.
- **Lämmchen V, Niebaum G, Berlekamp J, Klasmeier J** (2021) Geo-referenced simulation of pharmaceuticals in whole watersheds: application of GREAT-ER 4.1 in Germany. *Environmental Science and Pollution Research*, DOI 10.1007/s11356-020-12189-7.
- Peters R, **Berlekamp J**, Lucía A, Stefani V, Tockner K, Zarfl C (2021) Integrated impact assessment for sustainable hydropower planning in the Vjosa catchment (Greece, Albania). *Sustainability* 13, 1514.
- Segura J, **Hilker FM**, Franco D (2020) Degenerate period adding bifurcation structure of one-dimensional bimodal piecewise linear maps. *SIAM Journal on Applied Mathematics* 80, 1356-1376.
- **Sun AT**, **Hilker FM** (2020) Analyzing the mutual feedbacks between lake pollution and human behaviour in a mathematical social-ecological model. *Ecological Complexity* 43, 100834.
- **Sun AT**, **Hilker FM** (2020) Comparison between best-response dynamics and replicator dynamics in a social-ecological model of lake eutrophication. *Ecological Complexity* 509, 110491.
- **Vortkamp I**, Barraquand F, **Hilker FM** (2020) Ecological Allee effects modulate optimal strategies for conservation in agricultural landscapes. *Ecological Modelling* 435, 109208.
- **Vortkamp I**, Schreiber SJ, Hastings A, **Hilker FM** (2020) Multiple attractors and long transients in spatially structured populations with an Allee effect. *Bulletin of Mathematical Biology* 82, 82.

- **Yakovchuk O**, Mironova I (2020) Energetic particle precipitation during extreme space weather events. *E3S Web of Conferences* 196, 01006.

Experimental ecology and evolution

Research Group Prof. Dr. Christian Kost

New members

- Sharvari Harshe (School of Biology, Department of Ecology): Sharvari has started a PhD position in the Kost Lab in February 2021 and will participate in the DFG-funded research project: “Testing the black queen hypothesis in communities of soil-living bacteria”. She has a Master’s Degree in Cell and Molecular Biology from the Maharaja Sayajirao University (MSU) of Baroda, India. Her Master’s Thesis was studying the alternative lifestyle of the bacterial pathogen Salmonella Typhimurium at the Mechanobiology Institute of The National University of Singapore (NUS).

- Swagatika Dash (School of Biology, Department of Ecology):
  Swagatika has started a PhD position in the Kost Lab in February 2021 and and will also participate in the DFG-funded research project: “Testing the black queen hypothesis in communities of soil-living bacteria”. She has a Master’s degree in biotechnology from the Kalinga Institute of Industrial Technology (KIIT) University, India.

Successful PhD defenses

- Dietel, Anne-Kathrin (2020). Dissertation title: "Identifying the molecular causes for the commonly observed AT-bias in endosymbiont genomes"
- Preussger, Daniel (2020). Dissertation title:” The evolution of metabolic cooperation in bacterial communities – causes and consequences”

Videos

- Mutualistic interactions, in which two different organisms help each other, are common in nature and profoundly affect the functioning of many ecosystems. However, it remained generally unclear why an organism should start to invest costly resources to enhance growth and reproduction of another organism, rather than utilizing these resources to improve its own fitness. Using experimental evolution, we evolve a cooperative interaction between two bacterial genotypes that reciprocally exchanged increased amounts of essential amino acids. Our work identifies positive fitness feedbacks within multicellular clusters as a mechanism that can drive the evolution of cooperation in spatially unstructured environments https://www.youtube.com/watch?v=3oJEgDn-NXw

Publications

Pauli B, Oña L, Hermann M, Kost C. (2020) Obligate mutualistic cooperation limits evolvability. bioRxiv. https://doi.org/10.1101/2020.11.06.371757

Oña L, Giri S, Avermann N, Kreienbaum M, Thormann KM, Kost C. (2020) Obligate cross-feeding expands the metabolic niche of bacteria. bioRxiv. https://doi.org/10.1101/2020.11.04.368415

Giri S, Oña L, Waschina S, Shitut S, Yousif G, Kaleta C, Kost C. (2020) Metabolic dissimilarity determines the establishment of cross-feeding interactions in bacteria. bioRxiv. https://doi.org/10.1101/2020.10.09.333336

Preussger D, Giri S, Muhsal LK, Oña L, Kost C. (2020) Reciprocal Fitness Feedbacks Promote the Evolution of Mutualistic Cooperation. Current Biology https://doi.org/10.1016/j.cub.2020.06.100

Oña L, Kost C. (2020) Cooperation increases robustness to ecological disturbance in microbial cross-feeding networks. bioRxiv. https://doi.org/10.1101/2020.05.15.098103

Kost C. (2020) Evolution: Predictable Patterns of Symbiont Cointegration. Current Biology https://doi.org/10.1016/j.cub.2020.03.025

Giri S, Shitut S, Kost C. (2020) Harnessing ecological and evolutionary principles to guide the design of microbial production consortia. Current Opinion in Biotechnology https://doi.org/10.1016/j.copbio.2019.12.012 .

European Politics and Integration

Research Groups Prof. Dr. Andrea Lenschow

Projects

CoVaCoa - Consumer decisions, Value chains & Cocoa (2020-2023)

See above: *Prof. M. Franz*

Bringing the social dimension into deforestation-free supply chain initiatives: Lessons from Europe's beef and soy imports from Brazil (2020-2023)

Almut Schilling-Vacaflor leads this project funded by FORMAS together with Maria-Therese Gustafsson (Stockholm University). This project's aim is to advance the research frontier by contributing to a better understanding of how deforestation-free supply chain initiatives could be designed and implemented in a way that accounts for the rights and interests of local communities. Schilling-Vacaflor and Gustafsson first analyze the institutional design of public and private governance initiatives targeting the soy and beef supply chains from Brazil and will thereafter compare the implementation of the initiatives in two Brazilian regions on the basis of extensive field research and semi-structured interviews. Brazil is a major exporter of beef and soy and is key in the global struggle against deforestation. This project aims to enhance our understanding about how a better policy integration of human rights, the agro-food complex and climate mitigation can be achieved.

Mistra Geopolitics: Sustainable Development in a Changing Geopolitical Era (2021-2024)

Almut Schilling-Vacaflor and Andrea Lenschow participate in the second phase of the MISTRA GEOPOLITCS project, which is hosted by the Stockholm Environment Institute (SEI) and funded by the Swedish Foundation for Strategic Environmental Research. This project deepens the analysis of geopolitical risks and opportunities arising from three interconnected transformations: global environmental change, societal transformations towards sustainability, and the rapid deployment of transformative technologies. Within this

program, Schilling-Vacaflor and Lenschow focus on interconnected food security risks and examine the effects and effectiveness of diverse governance arrangements in agro-commodity supply chains from Brazil to European countries. They study food security risks at different scales and for different groups of actors, paying attention to trade-offs and questions of environmental justice.

Conferences, Panels and Workshops

European Consortium for Political Research (ECPR) conference, Innsbruck (31 August-3 September 2021)

Two panels on "Establishing foreign accountability through new due diligence regulations", (Lenschow/Schilling-Vacaflor/Gustafsson)

5th International Conference on Public Policy (ICPP5), Barcelona (6-8 July 2021)

Two panels on "New human rights and environmental due diligence regulations: Towards hardened foreign accountability?", (**Lenschow/Schilling-Vacaflor**/Gustafsson)

Two panel on "Advancing Research on Policy Dismantling", (**Lenschow/Pollex**/Burns/Brandsma/Tobin)

ECPR General Conference, virtual format (24-26th August 2020)

Panel on "Environmental Struggles in the global South" (**Lenschow**)

Panel on "Private Governance" (**Lenschow/Pollex/Eckert**)

Governect Project-Workshop at University of Brasília, Brazil (11-12 March 2020): "The Sustainability Governance of Inter-Regional Linkages: Lessons from the Brazil-Europe Soy Complex" (**Lenschow/Schilling-Vacaflor**/Newig/Cotta/Gustafsson)

Publications

Berker, L., **Pollex, J.** (2021). Friend or foe? Comparing party reactions to Fridays for Future in a party system polarised between AfD and Green Party, *Zeitschrift für Vergleichende Politikwissenschaft* (accepted, in production).

Lenschow, A. (2021). "Studying EU environmental policy" in: Jordan, A. & V. Gravey (eds.). Environmental Policy in the EU: Actors, Institutions and Processes, 4th edition. London: Routledge. Chapter 4 (in production).

Lenschow, A., C. Burns, A. Zito (2020). "Symposium Introduction: Dismantling, disintegration or continuing stealthy integration in European Union environmental policy?" *Public Administration* (first published online). https://doi.org/10.1111/padm.12661

Lenschow A. (2020) "Environmental Policy". In: Wallace H, Pollack M, Young A (eds.) *Policy Making in the European Union*, 8th edition. Oxford: Oxford University Press.

Pahl-Wostl, C., C. Knieper, E. Lukat, **F. Meergans**, M. Schoderer, N. Schütze, D. Schweigatz, I. Dombrowsky, **A. Lenschow**, U. Stein, A. Thiel, J. Tröltzsch, R. Vidaurre (2020). „Enhancing the capacity of water governance to deal with complex management challenges: A framework of analysis" *Environmental Science & Policy* 107, 23-35. https://doi.org/10.1016/j.envsci.2020.02.011

Pollex, J., Lenschow, A. (2020). Many faces of dismantling: hiding policy change in non-legislative acts in EU environmental policy. *Journal of European Public Policy*, 27(1): 20-40.

Pollex, J. (2020). Zielgruppen im Policy-Making der Europäischen Union. Eine vergleichende Studie der Politiken zu Nachhaltigkeits- und Tabakkonsum, Springer VS. (based on 2019 dissertation)

Schilling-Vacaflor A., A. Lenschow (2021) "Hardening foreign corporate accountability through mandatory due diligence in the European Union? New trends and persisting challenges". *Regulation & Governance* (accepted for publication).

Schilling-Vacaflor, A., A. Lenschow, E. Challies, B. Cotta and J. Newig (2020). "Contextualizing certification and auditing: Soy certification and local communities' access to land and water in Brazil". *World Development*. https://doi.org/10.1016/j.worlddev.2020.105281.

Schilling-Vacaflor, A. (2020). "Putting the French Duty of Vigilance Law in Context: Towards Corporate Accountability for Human Rights Violations in the Global South?". *Human Rights Review*. https://doi.org/10.1007/s12142-020-00607-9.

Newig, J., E. Challies, B. Cotta, **A. Lenschow and A. Schilling-Vacaflor** (2020). "Governing Global Telecoupling Towards Environmental Sustainability", *Ecology and Society*. https://doi.org/10.5751/ES-11844-250421.

Schilling, J., **A. Schilling-Vacaflor**, R. Flemmer and R. Froese (2020). "A Political Ecology Perspective on Resource Extraction and Human Security in Kenya, Bolivia and Peru", *The Extractive Industries and Society*. https://doi.org/10.1016/j.exis.2020.10.009.

Theoretical Systems Science

Research Group Prof. Dr. Horst Malchow

PhD defense

- Köhnke, Merlin C. (2020). Dissertation title: "Approaches to mathematical modeling of biological invasions". Logos-Verlag, Berlin.

Recent publications

(bold face indicates IUSF members)

- **Köhnke, M.C.** (2020). *Approaches to Mathematical Modeling of Biological Invasions*. Logos Verlag, Berlin. ISBN 978-3-8325-5151-3
- **Köhnke, M.C.**, Binny, R.N., Holland, E.P., James, A. (2020). The necessity of tailored control of irrupting pest populations driven by pulsed resources. *Theoretical Ecology* 13, 261–275. doi:10.1007/s12080-020-00449-8
- **Köhnke M.C.**, Siekmann, I., **Malchow, H.** (2020). Taxis-driven pattern formation in a predator-prey model with group defense. *Ecological Complexity* 43, doi.org/10.1016/j.ecocom.2020.100848
- **Köhnke, M.C.**, Siekmann, I., Seno, H., **Malchow, H.** (2020). A type IV functional response with different shapes in a predator-prey model. *Journal of Theoretical Biology* 505, doi.org/10.1016/j.jtbi.2020.110419

Resources Management
Research Group Prof. Dr. Claudia Pahl-Wostl

Projects

T-LaMa – Transformative Landscape Management

Achieving the goals of an improved groundwater quality and quantity as well as biodiversity are central challenges for agriculture and forestry in Lower Saxony. Researchers of the IUSF, belonging to the research groups “Resources Management” and “Agroecology and Soil Science”, want to find solution strategies in the context of a transdisciplinary project that started in spring 2020 and is funded by the German Federal Environmental Foundation (DBU).

The project “Transformative Landscape Management to improve water quality and to protect ecosystem services within the water-energy-food nexus” identifies and analyses innovative approaches in the Weser-Ems region (e. g. innovative and nature-based business models or cooperations). Innovations that have the potential to contribute to a transformation towards a more sustainable and resilient management of the cultural landscape are of particular interest for the project. After a first stocktaking of the current situation we want to identify leverage points, which support the further development of innovations. Together with stakeholders, we finally examine sustainable future visions for the agriculture and forestry sectors using diverse participatory modelling techniques.

Cooperation partners of the project: Oldenburgisch-Ostfriesischer Wasserverband, Niedersächsische Landesforsten and Landwirtschaftskammer Niedersachsen.

More information on the project can be found here: https://www.usf.uni-osnabrueck.de/en/research/resources_management/transformative_landscape_management.html#c20645

Contact: Dr. Johannes Halbe, Nadine Müller, Felizia Göltenboth, Prof. Claudia Pahl-Wostl, Prof. Gabriele Broll, Dr. Hans-Jörg Brauckmann

New IUSF Project on protecting livelihoods and biodiversity in Costa Rica

With funding from DAAD, IUSF has this month initiated a new four-year project, ‘*Transformative research and capacity building in the education sector to protect livelihoods and biodiversity in Costa Rica.’* Costa Rica is known as a biodiversity hotspot and, in contrast to other countries in the region, has invested heavily in environmental protection over the past two decades. Nevertheless, Costa Rica is struggling with a series of persistent social-ecological conflicts that are difficult to resolve (Estado de la Nación 2019). These social-ecological conflicts are characterized mainly by competition between various sectors that together guarantee the country's economic prosperity as well as by trade-offs between biodiversity protection and economic development, increasingly to the detriment of the

former. The Convention on Biological Diversity highlights the complexity that needs to be addressed in strategies for biodiversity protection (UN, 1992; CBC, 2000).

In collaboration with Universidad Técnica Nacional de Costa Rica (UTN), the goal of the IUSF project is to develop inter- and transdisciplinary approaches in research and education to solve these complex social-ecological conflicts. This will be achieved through, on the one hand, joint inter- and transdisciplinary research on sustainability innovation and transformation, on the other, the implementation of capacity building activities in the academic sector including the development of new inter- and transdisciplinary courses and leadership skills. The project is focusing on the Gulf of Nicoya on Costa Rica's west coast for its case study. The gulf is one of the most productive tropical estuaries in the world and is a paradigmatic example of social-ecological conflict and associated trade-offs.

A long-term impact of this cooperation would be achieved by supporting UTN in their efforts to develop a facility for inter- and transdisciplinary research and education with international recognition. Through the exchange on sustainability innovation and leadership skills, this partnership will contribute to fostering transformational change in Costa Rica as well as in Germany in terms of the protection of biodiversity and ecosystem services. At UOS, this cooperation will allow students and researchers to gain experience in and a good understanding of the linkages between biodiversity and development issues through first-hand experience in research and teaching.

In IUSF, the project is led by Prof. Susanne Schlunder (IfR) and involves Johannes Halbe (IfGProf. Claudia Pahl-Wostl (IfG), Jana Rülke (IfG), Dr. Philipp Gorris (IfG), and Caroline van Bers (IfG). More information: cvanbers@uos.de

STEER: Increasing Good Governance for Achieving the Objectives of Integrated Water Resources Management

After 39 months, the STEER project funded within the BMBF GRoW initative has ended in September 2020. In this article, we want to provide an overview of the results that are available or still in preparation.

Overview of the STEER project

Water is a valuable resource for many users, such as agriculture, the energy sector or private households. If different uses of water and related land resources are not coordinated effectively, the availability of water or its quality can degrade so severely that certain types of use are restrained and ecosystems are impaired. The STEER project aims to find innovative ways to increase good governance to solve complex water resources problems. New forms of coordination and cooperation are at the centre of interest. STEER examines the influence of the governance and management system on the solution of complex water resource problems. The impact of societal and environmental conditions is also examined to find out under which circumstances elements of effective governance systems can be transferred. On the basis of these analyses, STEER will develop solution strategies for current usage conflicts around water resources.

Stakeholders were systematically involved in the project's activities. In our in-depth case studies (Weser-Ems, Emscher, Guadalquivir, Khaara and uMgeni) we investigated how certain

factors (e.g. organizational structures, legal requirements, environmental conditions) affect the effectiveness of coordination and cooperation and thus the success of an integrated water resource management. At a scientific level, STEER makes an important contribution to the further development and application of diagnostic approaches in water governance research.

Policy briefs

The STEER project comprised six major case studies in South Africa (uMngeni), Spain (Guadalquivir), Mongolia (Kharaa), Iran (Zayandeh Rud) and Germany (Emscher and Weser-Ems). For these, we undertook comprehensive assessments of the water governance and management systems. These assessments revealed specific strengths and weaknesses and identified leverage points for improving governance to solve complex water resource problems. Based on these findings and together with stakeholders, we identified innovative approaches for enhancing cross-sectoral cooperation and coordination in each case study. We summarised the main findings relevant to policy-makers in six policy briefs. These can be accessed via the STEER website: https://www.steer.uni-osnabrueck.de/results/

STEER water governance tool

The diagnostic water governance tool allows online users to make a simple diagnosis of the water governance and management system for their region. The diagnosis reveals regional strengths and weaknesses and proposes coordination instruments to improve deficient aspects. The tool includes a database of the STEER cases and with further cases, as a basis for additional analyses in the future. The tool can be accessed here: https://watergovernance-tool.eu/

A short video that explains the governance tool can be found here:
https://www.youtube.com/watch?v=T6DkNJfQaXY&feature=youtu.be

For further questions, please contact Claudia Pahl-Wostl and visit the project website
https://www.steer.uni-osnabrueck.de/

2020: Dissertationen

Herzog, L. M. J. 2020. Micro-Pollutant Regulation in the River Rhine. Cooperation in a Common-Pool Resource Problem Setting. Bern, Switzerland. [online] URL: https://www.springer.com/gp/book/9783030367695

Heitmann, F. 2020. Environmental System-of-Systems Engineering for integrated Nexus design - Developing participatory approaches to design decision making processes in complex human-nature-technology systems. Osnabrück, Germany. [online] URL: https://nbn-resolving.org/urn:nbn:de:gbv:700-202011113679

Lumosi, C. K. 2020. Shaping Transboundary Water Governance - How Learning Spaces Shape Transboundary River Basin Management Practices and Processes in the Omo-Turkana and Zambezi River Basins. Osnabrück, Germany. [online] URL: https://repositorium.ub.uni-osnabrueck.de/handle/urn:nbn:de:gbv:700-202009233565

Publications

Pahl-Wostl, C., Gorris, P., Jager, N., Koch, L., Lebel, L., Stein, C., Venghaus, S., Withanachchi, S., 2020. Scale-related governance challenges in the water-energy-food nexus: toward a diagnostic approach. Sustainability Science. doi: https://doi.org/10.1007/s11625-020-00888-6

Lumosi, C. K., Pahl-Wostl, C., Scholz, G., 2020. Evaluating trust and shared group identities in emergent social learning processes in the Zambesi river basin. Humanities & Social Sciences Communications 7, 172. doi: https://rdcu.be/cbT8t

Halbe, J., Holtz, G. and Ruutu, S., 2020. Participatory modeling for transition governance: Linking methods to process phases. Environmental Innovation and Societal Transitions 35, 60-76. doi: 10.1016/j.eist.2020.01.008

Herrfahrdt-Pähle, E., Schlüter, M., Olsson, P., Folke, C., Gelcich, S. and Pahl-Wostl, C. 2020. Sustainability transformations: socio-political shocks as opportunities for governance transitions. Global Environmental Change 63, 102097. doi: 10.1016/j.gloenvcha.2020.102097

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