4th Open Science Meeting of the Global Land Programme

April 24-26, 2019 | Bern, Switzerland

Conference Agenda

Overview and details of the sessions of this conference. Please select a date or location to show only sessions at that day or location. Please select a single session for detailed view (with abstracts and downloads if available).

Session Overview

Session

327R: Archetype analysis in sustainability research: meaning, methods and current applications

Time: **Thursday, 25/Apr/2019: 3:15pm - 4:45pm**
Session Chair: **Christoph Oberlack**
Session Chair: **Diana Sietz**
Session Topics: How do we support transformation?

Location: **MB-114**
Main Building, 1st floor, west wing, 78 seats

Session Abstract

Archetype analysis is a powerful approach to reveal recurrent patterns of factors and processes that shape the sustainability of social-ecological systems. Knowledge of archetypical patterns across cases has supported a better understanding of key sustainability challenges related to land use, climate change adaptation, vulnerability, biodiversity, and large-scale land acquisition. The rapid growth and diversification of archetype analyses has generated variations, inconsistencies, and confusion about the meanings, potentials, and limitations of archetype research. Archetypical patterns are analyzed using diverse qualitative, quantitative, and mixed methods (e.g. cluster analysis, qualitative comparative analysis, meta-analysis of case studies, scenario development). However, a consolidated understanding of the meanings of archetypes in sustainability research, the best practices of archetype analysis and promising combinations of multiple methods are currently a prime frontier of innovation.

This panel, organized by the GLP Working Group on Archetype Analysis, aims at presenting and discussing the current state of consolidating the multiple meanings and diverse methodologies for archetype analysis. The panel also features cutting-edge applications of archetype analysis in land system science.

The format is a research presentation session, which involves: one presentation on the multiple meanings and motivations of archetypes and their relevance for evidence-based policy-making; one presentation on methodological options, best practices, and challenges; multiple presentations of cutting-edge applications of archetype analysis; and plenary discussion.

Session Organizers: Christoph Oberlack, Diana Sietz, and Klaus Eisenack

Presentations

Full talk
ID: 694 / 327R: 1
327R Archetype analysis in sustainability research: meanings, methods, and current applications
Keywords: Archetype, land systems, social-ecological system, sustainability, vulnerability

Archetype analysis in sustainability research: Meanings, motivations, and evidence-based policy making

Christoph Oberlack[1,2], Diana Sietz[3,4], Elisabeth Bürgi[2], Ariane de Bremond[2,5], Jampel dell'Angelo[6], Klaus Eisenack[7], Erle Ellis[8], Graham Epstein[9], Markus Giger[2], Andreas Heinimann[1,2], Christian Kimmich[10], Marcel Kok[11], David Manuel-Navarrete[12], Peter Messerli[1,2], Patrick Meyfroidt[13,14], Tomas Vaclavik[15,16], Sergio Villamayor-Tomas[17]

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Archetypes are increasingly used as a methodological approach to understand recurrent patterns in factors and processes that shape the sustainability of social-ecological systems. The rapid growth and diversification of archetype analyses has generated variations, inconsistencies, and confusion about the meanings, potentials, and limitations of archetypes. Based on a systematic review, a survey, and a workshop series, this paper provides a consolidated perspective on the core features and diverse meanings of archetype analysis in sustainability research, the motivations behind it, and its policy relevance. We identify three core features of archetype analysis: recurrent patterns, multiple models, and intermediate abstraction. Two gradients help to apprehend the variety of meanings of archetype analysis that sustainability researchers have developed: (1) understanding archetypes as building blocks or as case typologies and (2) using archetypes for pattern recognition, diagnosis, or scenario development. We demonstrate how archetype analysis has been used to synthesize results from case studies, bridge the gap between global narratives and local realities, foster methodological interplay, and transfer knowledge about sustainability strategies across cases. We also critically examine the potentials and limitations of archetype analysis in supporting evidence-based policy making through context-sensitive generalizations with case-level empirical validity. Finally, we identify future priorities with a view to leveraging the full potential of archetype analysis for supporting sustainable development.

Full talk
ID: 639 / 327R: 2
327R Archetype analysis in sustainability research: meanings, methods, and current applications
Keywords: deforestation, matching, mixed methods, QCA, survival analysis, triangulation

Archetypical pathways of direct and indirect land-use change caused by Cambodia's large-scale land acquisitions

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In the global South, a 'rush' of large-scale land acquisitions (LSLAs) is occurring by government and transnational investors seeking to secure access to land in developing countries to produce food, biofuels, and other agricultural commodities. Complex interactions between regional and global market dynamics and local institutional, socio-economic, and agro-ecological conditions can lead to widely varying causal processes, land use and land cover change (LCLUC), and socio-economic and environmental outcomes. Systematic understanding of how characteristics of LSLAs across multiple social and environmental contexts produce spillover effects on local communities - ranging from employment opportunities to displacement and indirect land-use change (iLUC) - is lacking. Here, we conceptualize LSLAs as 'telecoupled' processes with distinct archetypical causal pathways through which agricultural commodity production leads to direct and indirect land-use changes. Using the case of Economic Land Concessions (ELCs) in Cambodia, we employ novel synthesis approaches combining remote sensing, spatio-temporal statistics, and case study meta-analysis to construct archetypical pathways of the causes, timing, and consequences of ELC-driven land change. We find archetypical pathways with ELCs producing 'boom' and 'gateway' commodity crops and rapid rates of land-use change tend to cause displacement and iLUC. In contrast, ELC producing commodity crops associated with more gradual land-use change and/or organized local resistance lead to less iLUC. Systematic knowledge generated through synthesis of local causes and consequences of LSLA-driven land change is now possible and needed to understand the direct and indirect consequences of LSLAs for commodity crop production.

Full talk
ID: 674 / 327R: 3
327R Archetype analysis in sustainability research: meanings, methods, and current applications
Keywords: Archetypical; global change; land system; pattern; review; synthesis

Archetype analysis in sustainability research: Methodological portfolio and analytical frontiers

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In sustainability research, archetype analysis reveals patterns of factors and processes that repeatedly shape social-ecological systems across the world. Archetype analysis helps to improve our ability to manage landscapes sustainably, reduce vulnerability, increase food security and improve land governance. During the last decade, the portfolio of methods used to investigate archetypes has been growing rapidly. However, these methods differ widely in their epistemological and normative underpinnings, data requirements and their suitability to address particular research purposes. Therefore, guidance is needed for systematically choosing methods in archetype analysis. In this paper, we synthesize strengths and weaknesses of key methods typically used to identify archetypes. Demonstrating that there is no 'one-size-fits-all' approach, we discuss a range of methodological challenges and opportunities for archetype analysis along gradients that capture the treatment of causality, normativity, spatial variations and temporal dynamics. Based on this discussion, we highlight seven analytical frontiers that bear particular potential for tackling methodological limitations. This paper enables innovative research designs in future archetype analysis contributing to the advancement of sustainability science and knowledge co-production to support viable land system transformations.

Full talk
ID: 768 / 327R: 4
333R Mapping land system through coupling the biophysical and socioeconomic attributes based on remote sensing and big data approaches
Keywords: Large Scale Land Acquisitions, Remote Sensing, Satellite Imagery, Satellite Image Time Series

Toward an integrated approach to address LSLA processes

Valentine Lebourgeois, Camille Jahel, Jeremy Bourgoin, Roberto Interdonato, Xavier Augusseau
CIRAD, France

Large Scale Land Acquisitions (LSLAs) by private companies or states have seen a sudden increase in recent years, mainly due to the increase in demand for biofuel (i.e., caused by the increase in oil prices) and the increase in food demand (i.e., caused by the increase in world population and changes in dietary habits). These highly controversial phenomena raise many questions about production models, people's rights, resource governance, and are often at the root of conflicts with local populations.
Even though global scale LSLA-related initiatives exist (i.e., GRAIN and LAND MATRIX), their data is often based on sources which may be incomplete or strongly biased (press articles, government data, individual contributions, scientific publications).
For the above reasons, we here propose an approach that aims at detecting and characterizing LSLAs by exploiting multi-source satellite images. The idea is to use a multi-scale approach, i.e., using satellite images at medium, high and very high spatial resolution. After defining the spatio-temporal criteria for the discrimination of agro-industries, the main steps of the proposed approach are: (i) detection of potential LSLAs at national scale using MSR MODIS time series available since 2000; (ii) confirmation of the presence at local scale of an LSLA with landscape metrics from HSR imagery (i.e., Sentinel-2, Landsat-8); (iii) detailed characterization of identified agro-industries based on all previously cited satellite data completed with VHSR data (SPOT 6/7 or Planet). The process can be completed/integrated by an impact analysis on a test site of the implementation of an agro-industry on the territory.
While all the steps may be performed by using classic Remote Sensing techniques, our perspective is also to test the effectiveness of advanced machine learning techniques (e.g., deep learning architectures) which can be trained on existing LSLA data to build models able to detect and characterize new LSLAs.

Full talk
ID: 612 / 327R: 5
107R Assessing, modelling, and analysing land use and land management impacts on the Earth system
Keywords: environmental trade-offs, cropping intensities, grazing intensiteis, sustainable agricultural intensification, modelling

Pathways to sustainable agricultural futures in Uganda: A modelling approach to analyze land use potentials, conflicts and challenges

Benjamin Stuch, Rüdiger Schaldach
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Global food production has significantly increased but often at the expanse of major global environmental change processes, e.g. land use and land cover change (LUCC) and disruption of the nitrogen cycle. To meet international food security and environmental sustainability targets, as outlined in the Sustainable Development Goals (SDGs), future food production needs to be harmonized with environmental conservation.

We conduct a comprehensive analysis on achieving rising food demands in Uganda by 2050. A set of LUCC simulations is conducted at a high spatial resolution (1 km²). These simulations are driven by a set of socio-economic and climate change scenarios representing a range of future development trajectories. Different agricultural management strategies e.g. land sharing, land sparing and the combination of both are investigated in regard to sustainable land use. To this end, the food production potential of each management strategy is analyzed. In addition, related environmental impacts are quantified on changes in natural land cover due to the expansion of agricultural land and on changes in soil N budgets due to intensification of agricultural production systems.

The results show that agricultural extension strategies, i.e. land sharing with baseline management practices, can increase crop production by 83 % as well as reduce soil N deficits from recently -45 kg/ha to -41 kg/ha in 2050. However, all natural land cover outside of established protected areas will be lost and still 27 % of the 73 million tons of projected future crop demands will not be satisfied. In contrast, strong land sparing with mean crop yield increase from recently 3.1 t/ha to 6.5 t/ha can meet the projected crop and livestock demands and still provides 19,037 km² of natural land cover outside established protected areas. Nevertheless, large N fertilizer quantities need to be applied to compensate the calculated soil N deficit of -119 kg/ha.