



4th Open Science Meeting of the Global Land Programme

April 24-26, 2019 | Bern, Switzerland

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Conference Time: 30/Jan/2020 10:38am CET

Conference Agenda

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Session Overview

Session

328R: Applying scenario tools for sustainable mountain development

Time: Thursday, 25/Apr/2019: 3:15pm - 4:45pm

Location: MB-101

Session Chair: Aino Kulonen

Main Building, room 101, 1st floor, east wing, 80 (+14) seats

Session Chair: Robert Marchant

Session Chair: Davnah Payne

Session Chair: Andreas Heinimann

Session Chair: Adrienne Grêt-Regamey

Session Chair: Ricardo Grau

Session Topics: How do we support transformation?

VIDEO

Session Abstract

In light of the 2030 agenda, having information on how plausible futures of mountain social-ecological systems may look like under different development scenarios is key to enable dialogues and negotiations with multiple actors having claims on mountain resources. Tools such as social-ecological systems modelling and participatory scenario approaches are developed to explore these scenarios and likely outcomes for communities, livelihoods and mountain resources, with the ultimate aim to better project the impact of local to global changes in mountains and help in designing management decisions towards sustainable mountain development. These tools are developed in various disciplines ranging from climate change- and land system- to ecosystem service- and biodiversity sciences, which offers unique opportunities for interdisciplinary collaborations towards sustainable mountain development. By representing these various disciplines, the three conveners of this session - the Mountain Research Initiative (MRI), the Global Land Programme (GLP), and the Global Mountain Biodiversity Assessment (GMBA) - meet the challenge of bringing research communities together to gain a common understanding of possible solutions towards a sustainable future for mountain ecosystems and their inhabitants. We invite talks presenting mountain scenarios from different mountain regions of the world where modelling tools have been developed based on local needs. We encourage contributions from all segments of the mountain science community, including climate-, land system-, as well as ecosystem- and biodiversity scientists. We will discuss the toolsets and the challenges in applying these tools to the steep social-ecological gradients characteristic of mountains. Session Organizers: Aino Kulonen, Robert Marchant, Davnah Payne, Andreas Heinimann, Adrienne Grêt-Regamey, Ricardo Grau, and Veerle Vanacker

External Resource: - SESSION RECORDING - <https://youtu.be/pRNIA6vy3jM>

Presentations



Full talk

ID: 354 / 328R: 1

328R Applying scenario tools for sustainable mountain development

Keywords: land use change, adaptation, livelihood, agroforestry, coffee

What futures for Eastern Africa highlands under threat of climate change? Exploring alternative pathways in two traditional farming communities through participatory scenarios.

Claudia Capitani¹, Weyessa Garedew², Amsalu Mitiku², Gezahegn Yadessa², Binyam Hailu³, Janne Heiskanen⁴, Pekka Hurskainen⁴, Philip J. Platts¹, Mika Siljander⁴, Fabrice Pinard⁵, Tino Johansson⁴, Robert Marchant¹

¹University of York, UK; ²Jimma University, Ethiopia; ³Addis Ababa University, Ethiopia; ⁴University of Helsinki, Finland; ⁵Cirad, France

Climate change is amongst the greatest future challenges and threats to food security for millions of people across the African continent. Tackling climate change effects and designing transformative pathways for adaptation requires accounting for climatic and non-climatic conditions and their interactions with the human communities; these interactions are particularly acute in mountain areas due to steep environmental gradients, dense populations and often isolated geography. As a result, the capacity of local stakeholders to anticipate future changes and assess their potential impacts is key for enhancing adaptation and resilience in mountain ecosystems.

We applied a participatory scenario development framework to explore adaptation strategies to modelled climate changes by mid-21st century in the Taita Hills, Kenya, and a mountain site northwest of Jimma in Ethiopia. Potential socio-economic and consequent land use and cover changes scenarios were developed for three alternative pathways: opportunistic coping strategy (business as usual); and two alternative integrated adaptation scenarios.

In the Taita Hills, communities rely mainly on farming and non-timber forest products. Under a business-as-usual scenario, human population and activities were projected to concentrate at high elevation, triggering cascade effects on remnant forest cover, biodiversity, and ecosystem services. Alternative adaptation scenarios envisaged reforestation combined with either improved agricultural practices or with a strong focus on ecosystem restoration and relocation of human activities. In the Jimma area, coffee production is an important income source. However, rising temperatures are expected to disrupt traditional coffee production under a business-as-usual scenario, resulting in the loss of coffee-forest canopies and a reduction in forest-dependent biodiversity. To address this, the envisioned alternative adaptation scenarios included the expansion of either commercial coffee

plantations or agroforestry, including traditional coffee farming. In both Taita and Jimma, adaptation pathways trade-offs between provisioning, supporting, and regulating services are expected, as well as between livelihoods and biodiversity conservation.

Full talk

ID: 303 / 328R: 2

328R Applying scenario tools for sustainable mountain development

Keywords: Backcasting, ecosystem services, agent-based model, pathways, climate and socio-economic scenarios

Backcasting adaptation pathways for supporting the provision of demanded ecosystem services in the Alps

Sibyl, Hanna Huber, Adrienne Grêt-Regamey

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Mountain social-ecological systems are critically vulnerable to global change. Specific sustainability issues in the Alps regard the narrow socio-economic, political and ecological boundary conditions that challenge the long-term supply of vital ecosystem services, as reflected by the marginalization of agriculture, the high dependence on direct payments or steep altitudinal gradients. Furthermore, land use management is constrained by a multi-level and multi-sectoral policy system operating at different governmental levels. Securing the long-term provision of ecosystem services thus requires policy-makers to better anticipate how their actions might change land use and related ecosystem services supply from the short to the longer term.

While foresight scenario analyses are particularly helpful to illustrate emerging synergies and trade-offs between various endpoints, they however mostly focus on developing plausible, but not necessarily feasible futures. Additionally, scenarios in general tend to be static representations and the time horizon of scenarios seldom matches the short-term nature of policy cycles that affect actions of decision-makers. Backcasting has been proposed as a complementary approach to forecasting. Backcasting first creates a future normative vision, then looks back to identify how this desirable future could be achieved and proceeds to define follow-up activities, strategies and pathways leading to the desired future state.

We use a backcasting scenario approach to identify adaptation pathways supporting the long-term provision of demanded ecosystem services in two mountain case studies in Switzerland. Pathways are simulated using agent-based model, while the visions were developed with stakeholders in workshops and using a choice experiment. Results suggest that, both, policy adaptations and early interventions into the system at the landscape scale can sustainably steer land use changes and help cope with challenges of global change. Moreover, we identify the characteristics of such mountain socio-ecological systems necessary to foster resilience to climate extremes and socio-economic changes.

Full talk

ID: 471 / 328R: 3

328R Applying scenario tools for sustainable mountain development

Keywords: Coupled natural-human systems; interdisciplinary; sustainability science; transdisciplinary; stewardship

Envisioning mountain futures: a systematic review of scenario planning in mountain social-ecological systems

Jessica P. R. Thorn^{1,2}, Cara Steger², Catherine M. Tucker³, Anne W. Nolin^{4,5}, Robin S. Reid², Kelly A. Hopping⁶, Claudia Capitani^{1,7}, Robert Marchant¹, Roman Seidl^{8,9}, Vishwas S. Chitale¹⁰, Julia A. Klein²

¹University of York, United Kingdom; ²Colorado State University, USA; ³University of Florida, USA; ⁴University of Nevada, USA; ⁵Oregon State University, USA; ⁶Boise State University, USA; ⁷European Commission Joint Research Centre, Italy; ⁸ETH Zurich, Switzerland; ⁹Institute for Applied Ecology, Germany; ¹⁰International Centre for Integrated Mountain Development, Nepal

Mountains are heterogeneous systems at the forefront of global change and development agendas. It is vital that diverse actors are prepared to observe and anticipate change in mountains to provide insights for careful resource management and to avoid potential scarcity-induced conflicts. This challenge is daunting given the complex dynamics and feedbacks in mountain social-ecological systems (MtSES). Participatory Scenario Planning (PSP) can effectively address this challenge by incorporating diverse perspectives and charting plausible futures in the face of uncertainty. However, the extent to which PSP anticipates future sustainability concerns for improved mountain research, policy and practice has not been examined. We conducted a systematic review of the peer-reviewed and non-peer-reviewed literature to investigate the state of evidence for PSP in MtSES, including key gaps in its application. We further developed a methodological framework, and explored to what extent the framework has been applied across case studies. After screening 1,989 articles, we included 42 studies in the final review. Our results demonstrate that in the past decade, studies of PSP in mountains have been growing steadily. Case studies are spread across forty countries, with over half in Western Europe. Few PSP studies are situated in tundra and urban landscapes, or systems where non-timber forest products are harvested. Governance, land use change, markets, cultural/biological diversity and demographic change are the main foci, while other aspects of global sustainability challenges have rarely been addressed. We identify the need for more quantitative modeling; explicit accounts of uncertainty, consistency, and plausibility; monitoring and evaluation; and studies that envision futures >25 years. To overcome these limitations, we propose a nine-step approach to PSP application. To better inform MtSES policy development, we recommend promoting adaptive governance systems; jointly forming research agendas with diverse stakeholders; and engaging participants after the PSP process for follow-up, dissemination, and implementation.

Flash talk

ID: 744 / 328R: 4

328R Applying scenario tools for sustainable mountain development

Keywords: social-ecological systems, scenario tools, sustainable development, stakeholders, future

Northern Tanzanian futures: multi-stakeholder perspectives from land use scenario analyses and modelling

Rebecca Kariuki¹, Colin Courtney-Mustaphi², Linus Munishi¹, Anneli Ekblom², Paul Lane², Rob Marchant³

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Pressures from changing populations and climates, socio-economic development, competing land uses/tenure systems and policies threaten sustainability and resilience to potential future trajectories for socio-ecological systems of northern Tanzania. Interactions within and between socio-ecological systems are heterogeneous, complex and with high degrees of uncertainty, making scenario analysis and modelling an effective approach for exploring divergent sustainability futures. Here, we present an exploration of plausible future land use change scenarios and their impacts on communities, biodiversity, ecosystem services and cultural heritage across the Ngorongoro-Serengeti ecosystems of Tanzania. Our approach engaged a wide range of stakeholders through participatory workshops to explore the interaction between global and local drivers in driving future land use change scenarios. We combine these different views of possible futures with spatio-temporal biophysical, ecological and socio-economic data to establish historical and future land use change trajectories. Then we model the interactions between changing climates and future land use change scenarios in a spatially-explicit platform at 1 km². We also quantify the impact of the developed scenarios of future land use patterns on ecosystem services (e.g. food, water and energy security), biodiversity and heritage conservation, and environmental sustainability. Expected outputs from our research are qualitatively driven, while also quantitative and spatially explicit, scenarios of land use changes in the face of projected climate changes and development trends up to year 2030. Other outputs include an assessment of trade-offs in ecosystem services versus alternative developed scenarios in the Ngorongoro-Serengeti ecosystems. The mapped outputs have utility in integrating researchers with policy and practice by informing sustainability options in national development agenda and land use planning under projected future climate change and socio-economic development scenarios in Tanzania.

Flash talk

ID: 249 / 328R: 5

107R Assessing, modelling, and analysing land use and land management impacts on the Earth system

Keywords: Soil loss, crop productivity, water availability, feed availability, household income

Role of integrated watershed management in reducing soil erosion and improving livelihoods in northern ethiopia

Kassa Tekla Belay

Mekelle University, Ethiopia

The study aimed at evaluating the impact of integrated watershed management on reducing soil erosion and changes in the livelihoods of rural farming households in Ethiopia. The changes in soil erosion for the years between 2002 and 2015 were estimated using the Revised Universal Soil Loss Equation model, while the impacts on livelihoods were assessed by household interviews. During the study period, the overall average annual soil loss was halved. Furthermore, crop productivity, water availability (irrigation and domestic) and fodder availability increased by 22, 33 and 10%, respectively, while an increase (56%) in household income was observed. Moreover, 72% of the sampled households were able to cover their 12-month annual expenditure demands in 2015, while only 50% of the households were able to cover these demands in 2002. It can be concluded that the implemented integrated watershed management activities seemingly resulted in reduced soil loss, enhanced vegetation cover, and additional household income. This paper also elaborates on the

hurdles for integrated watershed management expansion.

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