



# **The 1st International Electronic Conference on Land: Towards Land System Science**

**17-19 MAY 2022 | ONLINE**



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# **The 1st International Electronic Conference on Land**

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Online

17–19 May 2022

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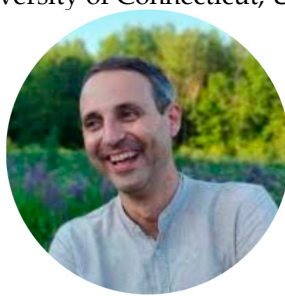
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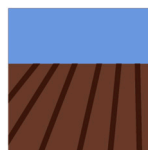
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## Welcome from the Chairs

Dear Colleagues,

It is a great pleasure to announce the upcoming conference “The 1st International Electronic Conference on Land—Towards Land System Science”, to take place virtually on 17–19 May 2022.

Conference topics we intend to address are the philosophy and key (inter- and transdisciplinary) methodological approaches of land system sciences. We want to shed a light on advances in key research areas, such as land use and land use planning, modeling from ecosystem to landscape and global scales, scaling effects, impacts of global and climate change on land systems and their resilience, global trends, such as urbanization and biodiversity losses and integrative approaches connected with the achievement of the UN Sustainable Development Goals, the Aichi Targets and the Paris Agreement. Instruments, such as the European Landscape Convention, and their relevance for protecting and restoring cultural landscapes, the natural heritage and diversity of land systems are expected to be discussed. Other relevant governance instruments and governance mixes that translate land system science outputs into policies and conventions will be debated regarding their efficiency and success and regarding how to further develop them, for instance, in the light of the UN Decade on Ecosystem Restoration and its expected outcomes and impacts.

This meeting aims to bring together the LAND community in its widest sense to discuss these latest advances, with sessions on land system science advances and their societal relevance chaired by leading researchers from across the globe.

In the interests of safety, given the present COVID-19 situation, we have decided to bring the conference to a fully online format. The conference will proceed on the same dates with the same fantastic speakers.

Importantly, we aim to select a high number of oral presentations from early-stage researchers, from their submitted abstracts.

We look forward to seeing you online!



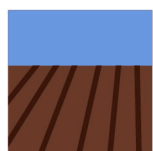
Prof. Dr. Christine Fürst  
**Conference Chair**

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## General Information



*land*

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*Land* is an international and cross-disciplinary, peer-reviewed, open access journal of land system science, landscape, soil–sediment–water systems, urban study, land–climate interactions, water–energy–land–food (WELF) nexus, biodiversity research and health nexus, land modelling and data processing, ecosystem services, and multifunctionality and sustainability etc., published monthly online by MDPI. The International Association for Landscape Ecology (IALE), European Land-use Institute (ELI), Landscape Institute (LI) and Urban Land Institute (ULI) are affiliated with Land, and their members receive a discount on the article processing charge.

Journal Webpage: <https://www.mdpi.com/journal/land>

Impact factor: 3.398 (2020)

5-Year Impact Factor: 3.235 (2020)

## Keynote Speakers



**Prof. Dr. Per Angelstam**  
Faculty of Forest Sciences,  
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**Prof. Dr. Patrick Meyfroidt**  
Earth and Life Institute,  
UCLouvain, Belgium



**Prof. Dr. Dagmar Haase**  
Department of Geography,  
Humboldt University Berlin,  
Berlin, Germany

## Invited Speakers



**Prof. Dr. Yongguang Zhang**  
Ecology and Remote Sensing  
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**Prof. Dr. Rob Marchant**  
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## Program at a Glance

| Program Structure                       |                                                      |                                         |                                                   |                                         |                                                                                                 |
|-----------------------------------------|------------------------------------------------------|-----------------------------------------|---------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------|
|                                         | Tuesday 17 May 2022                                  |                                         | Wednesday 18 May 2022                             |                                         | Thursday 19 May 2022                                                                            |
| 8:00-11:25 CEST   14:00-17:25 CST Asia  | Welcome from the Chairs<br>Keynote Speaker           | 8:00-12:00 CEST   14:00-18:00 CST Asia  | Session 3: Renewable Energy and Land Use          | 9:00-11:25 CEST   15:00-17:25 CST Asia  | Session 6:<br>Soil-Sediment-Water Systems<br>Women in Land Science<br>Land–Climate Interactions |
|                                         | Break                                                |                                         | Break                                             |                                         |                                                                                                 |
|                                         | Session 1: Land Systems and Global Change            |                                         | Session 4: Land Planning and Architecture         |                                         |                                                                                                 |
|                                         | Break                                                |                                         | Break                                             |                                         | Break                                                                                           |
| 12:00-15:50 CEST   18:00-21:50 CST Asia | Poster Session 1                                     | 13:00-17:10 CEST   19:00-23:10 CST Asia | Session 5: Landscapes Disturbance in Global South | 12:00-16:55 CEST   18:00-22:55 CST Asia | Session 7: Ecosystem Services Science for Applications in Planning and Decision Making          |
|                                         | Break                                                |                                         | Break                                             |                                         | Break                                                                                           |
|                                         | Session 2 : Land Socio-Economic and Political Issues |                                         | Poster Session 2                                  |                                         | Session 8: Landscapes and Societal Challenges<br><br>Keynote Speech<br>Closing of Conference    |
|                                         |                                                      |                                         | Break                                             |                                         |                                                                                                 |
|                                         |                                                      |                                         | Poster Session 2                                  |                                         |                                                                                                 |

## Conference Program

**Tuesday 17 May 2022**

| CEST<br>(Central<br>European<br>Summer<br>Time<br>- UTC+2) | CST Asia<br>(China<br>Standard<br>Time<br>- UTC+8) | Speaker                                                                                           | Title                                                                                                                |
|------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| 8:00-8:10                                                  | 14:00-14:10                                        | Welcome from the Chairs                                                                           |                                                                                                                      |
| 8:10-8:40                                                  | 14:10-14:40                                        | Prof. Dr. Patrick Meyfroidt                                                                       | Land system science: new directions, and ten facts for sustainability                                                |
| 8:40-9:10                                                  | 14:40-15:10                                        | Prof. Dr. Dagmar Haase                                                                            | Beyond today’s urban faces: Needs for future urban land systems under climate change                                 |
| 9:10-9:25                                                  | 15:10-15:25                                        | Break                                                                                             |                                                                                                                      |
| Session 1: Land Systems and Global Change                  |                                                    |                                                                                                   |                                                                                                                      |
| 9:25-9:30                                                  | 15:25-15:30                                        | chair: Prof. Dr. Le Yu                                                                            | Session introduction                                                                                                 |
| 9:30-9:50                                                  | 15:30-15:50                                        | Prof. Dr. Yongguang Zhang                                                                         | On the trends of the global CO2 fertilization effects during the past four decades from multiple remote sensing data |
| 9:50-10:00                                                 | 15:50-16:00                                        | Lokendra Karki                                                                                    | A review of land-based mitigation technologies and practices                                                         |
| 10:00-10:10                                                | 16:00-16:10                                        | David Pastor Escuredo                                                                             | Early-warning and rapid-response computational systems for land protection                                           |
| 10:10-10:20                                                | 16:10-16:20                                        | Zhixin Qi & Haoxuan Ma                                                                            | Monitoring land reclamation from the sea using remote sensing images in Guangdong, China                             |
| 10:20-10:30                                                | 16:20-16:30                                        | Hafssa Naciri                                                                                     | Forecasting Vegetation with Sentinel-2 Satellite Images : Morocco Capital and Its Surrounding Prefectures            |
| 10:30-10:40                                                | 16:30-16:40                                        | Pénélope G. T. Gnavo                                                                              | Effects of cattle breed on pasture diversity and soil physical properties in the Sudanian zone of Benin              |
| 10:40-10:50                                                | 16:40-16:50                                        | Chaoqing Chai                                                                                     | A new integrating framework to assess green development level of cultivated land for three decades in China          |
| 10:50-11:10                                                | 16:50-17:10                                        | Prof. Dr. Rob Marchant                                                                            | Learning lessons from past landcover changes to shape future more sustainable pathways                               |
| 11:10-11:25                                                | 17:10-17:25                                        | Q&A                                                                                               |                                                                                                                      |
| 11:25-12:00                                                | 17:25-18:00                                        | Break                                                                                             |                                                                                                                      |
| 12:00-13:50                                                | 18:00-19:50                                        | Poster Session 1:<br>The list of names, sciforum-ID and titles are the posters can be found here. |                                                                                                                      |
| 13:50-14:10                                                | 19:50-20:10                                        | Break                                                                                             |                                                                                                                      |
| Session 2 : Land Socio-Economic and Political Issues       |                                                    |                                                                                                   |                                                                                                                      |

|             |             |                                    |                                                                                                                                                                                                                                            |
|-------------|-------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14:10-14:15 | 20:10-20:15 | chair: Prof. Dr. Hossein Azadi     | Session introduction                                                                                                                                                                                                                       |
| 14:15-14:35 | 20:15-20:35 | Prof. Dr. Jason W. Moore           | Agricultural Revolutions in the Capitalist World-Ecology.: Cheap Food, Cheap Labor, and Capitalogenic Climate Crises, 1550-2030                                                                                                            |
| 14:35-14:45 | 20:35-20:45 | Bastiaan Philip Reydon             | The relationship between land rights and deforestation in Brazil                                                                                                                                                                           |
| 14:45-15:05 | 20:45-21:05 | Prof. Dr. David Lopez-Carr         | Global Economic and Diet Transitions Drive Latin American and Caribbean Forest Change During the First Decade of the Century: A Multi-Scale Analysis of Socioeconomic, Demographic, and Environmental Drivers of Local Forest Cover Change |
| 15:05-15:15 | 21:05-21:15 | Armands Auzins                     | Land resource management policy in selected European countries                                                                                                                                                                             |
| 15:15-15:25 | 21:15-21:25 | Chia-Fa Chi                        | Evaluations of Coastal Resilient Cities – Mutual Effects of Land Use Allocation and Climate Risks                                                                                                                                          |
| 15:25-15:35 | 21:25-21:35 | Salvador García-Ayllón Veintimilla | Indirect effects of land transformation on the sustainability of wetlands : three diffuse anthropization analysis from the perspective of geostatistics in Spain                                                                           |
| 15:35-15:50 | 21:35-21:50 | Q&A                                |                                                                                                                                                                                                                                            |
| 15:50       | 21:50       | End of day one!                    |                                                                                                                                                                                                                                            |

### Wednesday 18 May 2022

| CEST<br>(Central European Summer Time - UTC+2) | CST Asia<br>(China Standard Time - UTC+8) | Speaker                   | Title                                                                                                         |
|------------------------------------------------|-------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------|
| Session 3: Renewable Energy and Land Use       |                                           |                           |                                                                                                               |
| 8:00-8:05                                      | 14:00-14:05                               | chair: Dr. Mengyao Han    | Session introduction                                                                                          |
| 8:05-8:25                                      | 14:05-14:25                               | Prof. Dr. Michael Dunford | Energy dilemmas: climate change, creative destruction and the transition to a carbon-neutral development path |
| 8:25-8:35                                      | 14:25-14:35                               | Alberto Matarán Ruiz      | Energy colonialism, land use and renewable energies.                                                          |
| 8:35-8:55                                      | 14:35-14:55                               | Prof. Dr. Shaojian Wang   | When will cities reach carbon peak? A simulation under multiple scenarios and Monte Carol model               |
| 8:55-9:05                                      | 14:55-15:05                               | Giuseppe Pulighe          | Optimizing sustainable bioenergy production on marginal land through a Web-based platform                     |
| 9:05-9:25                                      | 15:05-15:25                               | Prof. Dr. Xudong Wu       | The huge amount of industrial land use induced by concentrating solar power technology: Evidence              |



|                                                   |             |                                                                                                     |                                                                                                                                             |
|---------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   |             |                                                                                                     | based on systems process analysis for a pilot plant in China                                                                                |
| 9:25-9:40                                         | 15:25-15:40 | Q&A                                                                                                 |                                                                                                                                             |
| 9:40-10:10                                        | 15:40-16:10 | Break                                                                                               |                                                                                                                                             |
| Session 4: Land Planning and Architecture         |             |                                                                                                     |                                                                                                                                             |
| 10:10-10:15                                       | 16:10-16:15 | chair: Prof. Dr. Thomas Panagopoulos                                                                | Session introduction                                                                                                                        |
| 10:15-10:35                                       | 16:15-16:35 | Prof. Dr. Kristof Van Assche                                                                        | shock, conflict and adaptation in land use planning                                                                                         |
| 10:35-10:45                                       | 16:35-16:45 | Alexandru-Ionut Petrisor                                                                            | Can planning influence the dynamics of urban green infrastructure? Answers from Poland and Romania                                          |
| 10:45-11:05                                       | 17:45-17:05 | Prof. Dr. Julia Nerantzia TZORTZI                                                                   | Defining Ecological Integrity Indexes and essential Biodiversity Variables to evaluate Urban greenness quality – The H2020 Project HARMONIA |
| 11:05-11:15                                       | 17:05-17:15 | Sabina Bhandari                                                                                     | Urban Green Space Planning in Kathmandu Metropolitan City, Nepal: Addressing Modifiable Areal Unit Problem                                  |
| 11:15-11:25                                       | 17:15-17:25 | Zhichao He                                                                                          | Peer effects in the non-conforming built-up land expansion in Zhangzhou City, China                                                         |
| 11:25-11:45                                       | 17:25-17:45 | Prof. Dr. Luís Carlos Loures                                                                        | TBC                                                                                                                                         |
| 11:45-12:00                                       | 17:45-18:00 | Q&A                                                                                                 |                                                                                                                                             |
| 12:00-13:00                                       | 18:00-19:00 | Break                                                                                               |                                                                                                                                             |
| Session 5: Landscapes Disturbance in Global South |             |                                                                                                     |                                                                                                                                             |
| 13:00-13:05                                       | 19:00-19:05 | chair: Prof. Dr. Henry N. N. Bulley<br>Prof. Dr. Sheona Shackleton<br>Prof. Dr. Cristian Echeverria | Session introduction                                                                                                                        |
| 13:05-13:25                                       | 19:05-19:25 | Prof. Dr. Amos T. Kabo-bah                                                                          | GEO Land Degradation Neutrality Initiative in Support Sustainable Land Management                                                           |
| 13:25-13:45                                       | 19:25-19:45 | Prof. Dr. Dolors Armenteras                                                                         | Are Fires an underestimated disturbance in South American Forests?                                                                          |
| 13:45-13:55                                       | 19:45-19:55 | Okyere Yeboah Emmanuel                                                                              | Impact of Land Use Land Cover Changes on the Ecosystem Services of the Atewa Range and Forest Reserve, Ghana.                               |
| 13:55-14.05                                       | 19:55-20.05 | Favretto Nicola                                                                                     | Collaboration and multi-stakeholder engagement in landscape governance and management in Africa: lessons from practice                      |
| 14:05-14.15                                       | 20:05-20:15 | Cherie Janine Dirk                                                                                  | A past-present-future lens on environmental change - integrating palaeoecology and                                                          |

|             |             |                                                                                                                                         |                                                                                                             |
|-------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
|             |             |                                                                                                                                         | participatory system dynamics modelling for land-use management                                             |
| 14:15-14:35 | 20:15-20:35 | Dr. Ramesh Krishnamurthy                                                                                                                | Conservation complexities: Integrated landscape management planning for win-win situations in Central India |
| 14:35-14:50 | 20:35-20:50 | Q&A                                                                                                                                     |                                                                                                             |
| 14:50-15:20 | 21:50-21:20 | Break                                                                                                                                   |                                                                                                             |
| 15:20-17:10 | 21:20-23:10 | Poster Session 2:<br>chaired by Prof. Dr. Hossein Azadi<br>The list of names, sciforum-ID and titles are the posters can be found here. |                                                                                                             |
| 17:10       | 23:10       | End of day two!                                                                                                                         |                                                                                                             |

## Thursday 19 May 2022

| CEST<br>(Central European Summer Time - UTC+2)                                                  | CST Asia<br>(China Standard Time - UTC+8) | Speaker                           | Title                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Session 6:<br>Soil-Sediment-Water Systems<br>Women in Land Science<br>Land–Climate Interactions |                                           |                                   |                                                                                                                                                                                     |
| 9:00-9:05                                                                                       | 15:00-15:05                               | Chair: Dr. Saskia Keesstra        | Session introduction                                                                                                                                                                |
| 9:05-9:25                                                                                       | 15:05-15:25                               | Associate Professor Patricia Saco | Links Between Changes in Hydrologic Connectivity and Degradation in Drylands                                                                                                        |
| 9:25-9:35                                                                                       | 15:25-15:35                               | Michael Nones                     | Past trends and future changes in land use/land cover in the Fincha basin, Ethiopia                                                                                                 |
| 9:35-9:45                                                                                       | 15:35-15:45                               | Serena Sapio                      | Preliminary results of the application of multiple satellite sensors for the study of water resources and land subsidence in agricultural areas. Case study: South Lombardy (Italy) |
| 9:45-9:50                                                                                       | 15:45-15:50                               | Chair: Prof. Dr. Christine Fürst  | Chair Talk                                                                                                                                                                          |
| 9:50-10:10                                                                                      | 15:50-16:10                               | Prof. Dr. Harini Nagendra         | 30 Years of Land Systems Research: A Retrospective                                                                                                                                  |
| 10:10-10:20                                                                                     | 16:10-16:20                               | somayeh Mohammadihamidi           | The Gender Gap in Land Sciences: A Review of Women's Contribution to the Editorial Boards of Peer-reviewed Journals                                                                 |
| 10:20-10:25                                                                                     | 16:20-16:25                               | chair: Prof. Dr. Heiko Balzter    | Chair Talk                                                                                                                                                                          |
| 10:25-10:45                                                                                     | 16:25-16:45                               | Dr. Nir Krakauer                  | Amplification or dampening of extreme hot temperatures by climate zone: possible role of land-atmosphere interaction                                                                |

|                                                                                        |             |                                                                                              |                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10:45-10:55                                                                            | 16:45-16:55 | Chenyu Du                                                                                    | Investigating The Trends And Drivers Between Urbanization And Land Surface Temperature: A Case Study of Zhengzhou, China                                                                           |
| 10:55-11:05                                                                            | 16:55-17:05 | Vito Tagarelli                                                                               | The influence of different plant types within the slope-vegetation-atmosphere interaction of a weather-induced active landslide mechanism: a scenario-based numerical analysis                     |
| 11:05-11:25                                                                            | 17:05-17:25 | Q&A                                                                                          |                                                                                                                                                                                                    |
| 11:25-12:00                                                                            | 17:25-18:00 | Break                                                                                        |                                                                                                                                                                                                    |
| Session 7: Ecosystem Services Science for Applications in Planning and Decision Making |             |                                                                                              |                                                                                                                                                                                                    |
| 12:00-12:05                                                                            | 18:00-18:05 | Chair:<br>Prof. Dr. Benjamin Burkhard<br>Dr. Theo van der Sluis<br>Prof. Dr. Christine Fürst | Session introduction                                                                                                                                                                               |
| 12:05-12:25                                                                            | 18:05-18:25 | Prof. Dr. Louise Willemen                                                                    | Ecosystem services in spatial planning; present and prospects                                                                                                                                      |
| 12:25-12:35                                                                            | 18:25-18:35 | Alessandro Gimona                                                                            | Analysis of two contrasting scenarios of land use change through an ecosystem services lens                                                                                                        |
| 12:35-12:45                                                                            | 18:35-18:45 | Hossein Kazemi                                                                               | Ecosystem services assessment in Iran; Current status, gaps and future vision                                                                                                                      |
| 12:45-12:55                                                                            | 18:45-18:55 | Abreham Berta Aneseyee                                                                       | Modelling and quantification ecosystem services in the upper Omo Gibe Basin, south-western Ethiopia                                                                                                |
| 12:55-13:05                                                                            | 18:55-19:05 | Duy Tran                                                                                     | Quantifying landscape multifunctionality in agricultural landscapes: A farm scale analysis in the hill country of New Zealand                                                                      |
| 13:05-13:15                                                                            | 19:05-19:15 | Muhammad Mainuddin Patwary                                                                   | Estimating the Impacts of Land Use/Land Cover Changes on Ecosystem Services Value (ESV) in a Heavily Urbanized City of Bangladesh using Google Earth Engine: Implications for Urban Sustainability |
| 13:15-13:25                                                                            | 19:15-19:25 | Abul hassan faiz                                                                             | Anthropogenic pressure on natural resource of tolipir landscape of Azad Kashmir (Pakistan): conservation, management and challenges                                                                |
| 13:25-13:45                                                                            | 19:25-19:45 | Prof. Dr. Davide Geneletti                                                                   | Upscaling nature-based solutions in cities: An urban planning perspective                                                                                                                          |
| 13:45-14:00                                                                            | 19:45-20:00 | Q&A                                                                                          |                                                                                                                                                                                                    |
| 14:00-14:20                                                                            | 20:00-20:20 | Break                                                                                        |                                                                                                                                                                                                    |
| Session 8: Landscapes and Societal Challenges                                          |             |                                                                                              |                                                                                                                                                                                                    |
| 14:20-14:25                                                                            | 20:20-20:25 | chair: Dr. Santruckova Marketa                                                               | Session introduction                                                                                                                                                                               |
| 14:25-14:45                                                                            | 20:25-20:45 | Prof. Dr. Veerle Van Eetvelde                                                                | TBC                                                                                                                                                                                                |

|             |             |                           |                                                                                                                                                      |
|-------------|-------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14:45-14:55 | 20:45-20:55 | Wei Zheng                 | A Dual-Case Study of Exploring Tourist Food Waste Reduction Behavior: the Roles of Personal Norm and Frugality                                       |
| 14:55-15:05 | 20:55-21:05 | Agnieszka Latocha         | Rural revival or rural destruction? Urbanization of rural areas in the Sudetes Mountains, SW Poland                                                  |
| 15:05-15:15 | 21:05-21:15 | Tomáš Chabada             | Restoration of coppicing management: a way to diversification of the societal, economic and ecological use of the forest potential in Czech Republic |
| 15:15-15:25 | 21:15-21:25 | Nicolas Marine            | Dehesas and Manors of Avila: A Methodology for Administrations to Monitor the Evolution and Citizen Perception of Centenary Cultural Landscapes.     |
| 15:25-15:35 | 21:25-21:35 | Angel Paniagua            | Old geographical materialities in new rural areas: key processes.                                                                                    |
| 15:35-15:45 | 21:35-21:45 | Zhaodi Lu                 | Reduction of industrial land beyond Urban Development Boundary in Shanghai: Assessment of perception and relationship of stakeholders                |
| 15:45-16:05 | 21:45-22:05 | Prof. Dr. Sam Turner      | Landscapes and societal challenges: a perspective from landscape archaeology (recorded video)                                                        |
| 16:05-16:20 | 22:05-22:20 | Q&A                       |                                                                                                                                                      |
| 16:20-16:50 | 22:20-22:50 | Prof. Dr. Per Angelstam   | TBC                                                                                                                                                  |
| 16:50-16:55 | 22:50-22:55 | conference chair          | closing speech                                                                                                                                       |
| 16:55       | 22:55       | <b>End of Conference!</b> |                                                                                                                                                      |





## Poster Session 1

|    |                         |                                                                                                                                               |
|----|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Fatima Zahrae RHZIEL    | Estimation of Land Surface Temperature Using VIIRS Thermal Infrared Sensor and Weather Station Data in Morocco                                |
| 2  | Prashant Sharma         | Agroforestry Suitability Analysis of Kangra District in North-Western Himalayas: Application of GIS-Based Fuzzy AHP Approach                  |
| 3  | Kaixu Zhao              | Spatial Characteristic, Environmental Response and Influencing Factors of the "Production-Living-Ecology Space" in Qinghai-Tibet Plateau      |
| 4  | Prabin Ghimire          | Soil Fertility and Soil Quality Mapping of a Cultivated Area in Resunga Municipality, Gulmi, Nepal                                            |
| 5  | Andra-Cosmina Albulescu | Effects of Forest Privatisation on Forestland Dynamics in the Post-Communist Era 1986–2018: A Comparative Case Study of Lithuania and Romania |
| 6  | Agnė Jasinavičiūtė      | Land-Use Changes in Lithuania in the Context of the Green Course                                                                              |
| 7  | Fatima Ezahrae Ezzaher  | Very High-Resolution Sentinel-2 Images to Monitor NDVI Variation in the Strait of Gibraltar and Its Surrounding Regions from 2015 to 2022     |
| 8  | Dominik Scholand        | Automated Quantification of Support Practice Contouring for Improved Estimation of Soil Erosion                                               |
| 9  | Maria Mandalari         | Debris Flow in Small and Ungagged Basins. Case Study: Scilla (Italy)                                                                          |
| 10 | Abdou Waliou ABIOLA     | Effect of Biochar Activated with Compost and Mineral Fertilizer on Agronomic Performance of Maize in the Dry and Sub-Humid Tropics of Benin   |
| 11 | Babak Mohammadi         | Streamflow Prediction in a Snow-covered Area Using Novel Boosted Machine Learning Approaches                                                  |
| 12 | Xinhai Lu               | Nudging Strategies for Cultivated Land Protection Behavior in China                                                                           |
| 13 | Stoyan Vergiev          | Landscapes and Plant Biodiversity Hotspots Mapping, Prioritization and Conservation in the the Bulgarian Black Sea Coast                      |
| 14 | Emma Torres             | Typification of Small and Medium Family Livestock Production Systems in The Ríos, Ecuador                                                     |
| 15 | Radoslava Kanianska     | Soil Contribution to Hydrological Ecosystem Services in Floodplain                                                                            |
| 16 | Mohamed Fomba           | Monitoring Urban Expansion and Changes in Green Spaces in Two Major Cities in Mali                                                            |
| 17 | Ioanna Io Carydi        | People, Crops and Bee Farming: Landscape Models for a Symbiotic Network in Greece                                                             |
| 18 | Hugo Rivera-Torres      | Land cover mapping using Google Earth Engine: a case study of the Yasuní National Park                                                        |
| 19 | Angelos Alamanos        | Digital Agricultural Management Tools for Efficient and Integrated Policy-Making                                                              |

## Poster Session 2

|    |                            |                                                                                                                                                                         |
|----|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Javier Velázquez           | Ecological Characterization of Critical Areas for the Maintenance and Improvement of Connectivity in the Face of Climate Change                                         |
| 2  | Ana Hernando               | Characterization of Critical Riparian Areas Using Lidar Data and Satellite Images to Prevent Their Fragmentation Due to the Climate Change                              |
| 3  | Sherin Babu                | Prediction Model of Pan Evaporation in Kerala Using XGBoost Algorithm                                                                                                   |
| 4  | Tanja Micić Ponjiger       | Rainfall Erosivity and Erosivity Density in the Central and Southern Pannonian Basin                                                                                    |
| 5  | Alena Harbiankova          | Digital Model as a Tool for Sustainable Development of Settlement System                                                                                                |
| 6  | Eduardo Gomes              | Territorial Implications of Socioeconomic and Demographic Imbalance in Mainland Portugal: A Conceptual Framework                                                        |
| 7  | Michael Manton             | Fire Occurrence in Hemi-Boreal Forests: Exploring Natural and Cultural Scots Pine Fire Regimes Using Dendrochronology Toward Sustainable Forest Planning and Management |
| 8  | Melpomeni-Eirini Karantoni | Investigating the Views of Social Groups on the Promotion to Eco-Protection Policies in a National Marine Park                                                          |
| 9  | Katarzyna Pietrzyk         | Spatial Planning in Small Historic Towns                                                                                                                                |
| 10 | Radu-Matei Cochei          | Urbanization Patterns in post-Socialist Romania: A Ranking of Metropolitan Areas Based on Suburbanization Dynamics Using CORINE Land Cover Data                         |
| 11 | Meenu C. V.                | Addressing the Formal-Informal Dichotomy in Urban Housing: Revisiting Urban Land and Housing Policies in Delhi                                                          |
| 12 | Jian Cao                   | An Extended Theory of Planned Behavior Integrated with Social Capital for Understanding Garbage Sorting Behavior in Rural Tourism Contexts                              |
| 13 | Jonas Appelt               | Socioeconomic Outcomes of Agricultural land Use Change in Southeast Asia                                                                                                |
| 14 | Ilze Stokmane              | The Importance and Characteristics of Landscape Sensitivity Assessment                                                                                                  |
| 15 | Xiaojuan Rao               | Towards an Integrated Model of Environmental Citizenship Behavior: A Rural Destination Resident Perspective                                                             |
| 16 | Santruckova Marketa        | Traces of History in the Present Landscape                                                                                                                              |
| 17 | Nóra Sziget                | Weeds as Cultural Heritage Objects in an Agroforestry Landscape                                                                                                         |
| 18 | J. Xiong                   | Geographical Distribution and Emission Reduction of Photovoltaic Power Generation within China                                                                          |

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|----|------------------------|-------------------------------------------------------------|
| 19 | Sergio Llerena-Montoya | Land Cover Changes within Block 47 in the Ecuadorian Amazon |
|----|------------------------|-------------------------------------------------------------|

# sciforum-059717: Estimation of Land Surface Temperature Using VIIRS Thermal Infrared Sensor and Weather Station Data in Morocco

Fatima Zahrae Rhziel, Safae Ahsissene, Mohammed Lahraoua and Naoufal Raissouni

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Consistent with global warming trends, Morocco has experienced recently many environmental problems such as rising temperatures, less precipitation, and an increase in drought. Furthermore, the average temperatures are expected to rise between 2 and 5 °C by the end of this century, while rainfall is predicted to decline 20 to 30%. Therefore, it is important to monitor the temperature variation that may affect these problems. Land Surface Temperature (LST) is one of the most important parameters in the physics of land surface processes; Its LST knowledge over large spatial and temporal scales helps researchers to appreciate the global earth system change.

In order to monitor the real change of temperature, it requires a very large interconnected network of ground stations that do spatially continuous measurements. These stations should be distributed geographically in a way that covers all the vast areas. That's why continuous measurements obtained by space-borne platforms may provide a supplement to these meteorological station networks especially, LST.

The objective of this study is to retrieve the LST calibration of the temperature values obtained from VIIRS thermal infrared data with the values of temperature by ground stations in Morocco. In this paper, using VNP21A1 product of daily LST product (land surface temperature) at 1 km spatial resolution, and collecting all daily average data of eight Moroccan cities over three years of three months in different seasons, we generate a correction algorithm by a statistical model that relates ground truth temperatures with the result of LST from VIIRS data. The result shows a very high correlation between ground temperature and LST retrieved from VIIRS data. This indicates that the model is good to estimate the average daily truth temperature for any area within 1 km<sup>2</sup> resolution in the Morocco region for any given VIIRS average daily LST of this area.



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## **sciforum-058830: Agroforestry Suitability Analysis of Kangra District in North-Western Himalayas: Application of GIS-Based Fuzzy AHP Approach**

**Prashant Sharma and D. R. Bhardwaj**

Dr Yashwant Singh Parmar University of Horticulture And Forestry, Nauni, Solan

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Lands are a country's one of the most important wealth. However, in recent years, the strain on lands has increased daily to meet the need for unprecedented population growth, which has been compounded by climate change. Therefore, there is a need for the adoption of sustainable land-use systems such as agroforestry that bridges the gap between agriculture and forestry by establishing a more integrated, diversified, productive and lucrative system. However, policymakers are still unsure about whether and where to encourage agroforestry. So, the current investigation was carried out to develop an agroforestry suitability assessment using the geographic information system (GIS) based fuzzy analytical hierarchy process method. Eleven criteria were considered, including four topographical parameters (aspect, slope, elevation and hillshade), three vegetation parameters [land use land cover, normalized difference vegetation index and normalized difference moisture index], one climate variable (precipitation) and one soil parameter (soil fertility), two other parameters (distance from road and stream) were considered and weighted overlay as per the weights and sub-weights developed from the fuzzy-AHP approach. Soil nutrients were combined with soil characteristics to assess soil fertility. The results revealed that 8.60 percent of land was classified as highly suitable for agroforestry, 19.52 percent as moderately suitable, 30.95 percent as marginally suitable, 22.05 percent as currently not suitable and 18.88 percent as permanently unsuitable. Three agro-ecological zones (AEZ) existed in the research area and about three-quarters of highly agroforestry suitable land comes under AEZ-I while about 60 percent of the currently not suitable in AEZ-III. Similarly, among the different forest density classes, the majority of the highly agroforestry suitable land comes from the non-forest class. Overall, the current study assists policymakers in making decisions decision and identifying appropriate interventions for adoption, development and management for agroforestry implementation to combat climate change.



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# sciforum-058080: Spatial Characteristic, Environmental Response and Influencing Factors of the “Production-Living-Ecology Space” in Qinghai-Tibet Plateau

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Qinghai-Tibet Plateau (QTP) is an “initiator” and “regulator” of climate change in Asia and even the northern hemisphere, studying its land use change characteristic has great practical significance and theoretical value for environmental protection on QTP. Based on 30m×30m land use/cover data of 1980, 1990, 2000, 2010 and 2020, this paper classifies different land use according to the theory of “production-living-ecology space” and uses land use shift matrix, gravity migration model, ecological quality model and GWR model to analyze its land use evolution, ecological response, and influencing factors of QTP from 1980 to 2020. The results show that: (1) During the study period, the area of living land and production land on QTP has increased, and the area of water, forest and other ecological land has also increased except for the area of grassland; (2) The pattern of “production-living-ecology space” in QTP was stable in 1980-2000 and 2010-2020, and changed significantly in 2000-2010. The gravity center of different lands moved slightly from 1980 to 2000, and moved greatly from 2000 to 2010, the movement of gravity center of different lands was small from 2010 to 2020 except for urban living land and industrial and mining land; (3) The ecological quality index decreased from 0.5634 in 1980 to 0.5044 in 2020. In 1980, 1990 and 2000, the ecological quality index in the southwest and southeast of QTP was high, showing the characteristic of double center. In 2010 and 2020, the ecological quality index in the western region decreased, that in the eastern region increased, showing the characteristic of low in the west and high in the east; (4) There are significant differences in the effects of natural and human factors on the ecological quality in QTP: terrain > rainfall > slope > altitude > population density > NPP > economic density > temperature, natural factors are the main driving factors affecting the ecological quality of QTP.



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## sciforum-059474: Soil Fertility and Soil Quality Mapping of a Cultivated Area in Resunga Municipality, Gulmi, Nepal

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Soil fertility and quality maps are crucial for sustainable soil and land use management system for predicting soil health status. The objective of this study was to develop the soil fertility and quality map of agricultural areas in Resunga Municipality, Gulmi district of Nepal using the geographical information system (GIS) technique. A total of 57 geo-referenced soil samples from the depth (0–20 cm) were taken from the agricultural land of an area of 52 km<sup>2</sup>. Soil samples were analyzed for texture, pH, organic matter, nitrogen, phosphorous, potassium, boron, and zinc status. These parameters were assembled in a mathematical model to develop the soil quality index. The kriging tool in ArcGIS 10.8 was used to interpolate measured values for those variables obtained via the geostatistical wizard, and digital map layers based on each nutrient and soil quality were developed. The result showed that the study area lies within fair (0.4 to 0.6) and good (0.6 to 0.8) range of soil quality index representing 96% and 3% respectively. Soil organic matter and nitrogen showed moderate variability exhibiting the low status in 95% and 86% of the total study area. Phosphorous and potassium showed medium status in 88% and 75% of the study area. Zinc was low and boron status was medium in a majority of the area. Soil fertility and quality map provide researchers, farmers, students, and land use planners with easier decision-making tools for sustainable crop production systems and soil and land use management systems.



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# sciforum-059183: Effects of Forest Privatisation on Forestland Dynamics in the Post-Communist Era 1986–2018: A Comparative Case Study of Lithuania and Romania

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Political and societal transformations are powerful factors that shape the dynamics of both landscapes and land use, which act as proxies of different socio-economic development paths. The fall of the communist regime in Central and Eastern Europe triggered many economic, social and legislative transitions. Forest ownership restitution/privatisation that impact forestry and land use are one example. The aim of this study is to estimate (i) historic and contemporary land covers by performing a quantitative gap analysis on the natural potential vegetation vs. current land cover, and (ii) forests, using forest canopy loss as a proxy for management intensity. The analysis follows a multi-temporal approach, relating to one time interval under the socialist regime (1986–1988), two intervals of post-communist transition (1989–2000, 2001–2005) and three intervals specific to the new democratic regime (2006–2010, 2011–2015, 2016–2020). The gap analysis shows clear land cover change, historic forest loss and an increasing wood production capacity for both Lithuania and Romania. The analyses of forest management intensity show that the Lithuanian forest canopy loss/year index fluctuated until the beginning of the 21st century and then constantly increased, while its Romanian counterpart registered an unbalanced evolution, marked by alternative ups and downs. The highest values of the index correspond to 2016–2020 period in both countries, reaching 1.61 in Lithuania and 1.33 in Romania. There is a hot debate on whether to privatise forestland or not, and how publicly and privately owned forests should be managed. Currently, the forest industry, private forest owners and conservationists groups are fighting on political arenas. The presented outcomes of forest ownership restitution and privatisation may be used as a lesson for ensuring a smoother, less environmentally-destructive transition between forest management types in the future.



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## sciforum-061146: Land-Use Changes in Lithuania in the Context of the Green Course

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The current consumer approach to nature and the belief that the main purpose of nature is to meet human needs are increasingly leading to destructive processes. The view that we have infinity is not right, just as the overuse of the landscape. Landscape naturalness is an important indicator for supporting sustainable development driven policies and suggesting associated decisions in land management. This study used CORINE Land Cover data to estimate the changes in land cover naturalness in Lithuania since 1995 to 2018. All the land cover types were ranked according to naturalness index hemeroby, ranging from almost natural landscape with no human impacts to anthropogenic landscapes with excessively strong human impacts. Calculations of changes in the structure of the landscape are performed in hexagons, which evenly cover the entire territory of Lithuania. The trends in the development of landscape naturalness were mainly related to agricultural and forestry activities in the country. The biggest reversal was in areas with moderate human impacts, remote urban areas, pastures, arable land with natural vegetation, and water bodies. During the whole analysed period, these areas decreased by as much as 11.19%. The number of areas with a particularly strong impact on human activities has also decreased. The lands cover naturalness did increase in less suitable areas for agriculture. At present, it is particularly important to care for and restore valuable landscape complexes to fulfill their ecosystem functions. One of the most important challenges is to reconcile urbanization and nature conservation so as not to reduce significant areas of the country's natural landscape. The impact of human activities on the naturalness of the landscape needs to be explored in detail at the local level, followed by appropriate spatial planning decisions to ensure ecological balance through as many sustainable solutions as possible.



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# sciforum-059500: Very High-Resolution Sentinel-2 Images to Monitor NDVI Variation in the Strait of Gibraltar and Its Surrounding Regions from 2015 to 2022

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Normalized Difference Vegetation Index (NDVI) is one of the most important biophysical indices in Remote Sensing domain, especially Land Cover & Land Use (LULC) studies, as it quantifies, in a particular area, the presence of vegetation. This last is considered one of the pillars of our ecosystem. Therefore, assessing & monitoring this index changes over time are extremely significant for sustaining life continuity on earth. The aim of this study is to monitor 2000 Km<sup>2</sup> of land surrounding the strait of Gibraltar (one of the most vital and dynamic spots in the world) using NDVI biophysical index; 1000 Km<sup>2</sup> of land above the strait of Gibraltar representing the North region, and 1000 Km<sup>2</sup> of land below representing the South region. As a first step, a total of 2736 very high-resolution Sentinel-2 (2A & 2B) satellites images from 2015 to 2022 have been analyzed. Then, for every year (2015–2022) and every region (North & South), we used four clear images representing the four seasons: Winter, Spring, Summer, and Autumn to monitor NDVI variation above and below the strait of Gibraltar. Results show that NDVI cycles hit their highest values in spring, ranging between (0.502–0.581) in the North region and (0.456–0.521) in the South region, and reach the lowest values in autumn, ranging between (0.313–0.358) in the North region and (0.255–0.295) in the South region. Final results confirm that the mean NDVI of both regions can be considered as seasonal time series, with a different level weighted in favor of the North. However, the gap between the two regions is considerably decreasing, where it starts from 7% to reach 5%.



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# sciforum-057656: Automated Quantification of Support Practice Contouring for Improved Estimation of Soil Erosion

Dominik Scholand and Britta Schmalz

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The practice of tilling and planting crops parallel to the contour of the terrain has proven effective in reducing soil erosion caused by rainfall and surface runoff, especially during moderate and low intensity rainfall events. In Germany, the erosion risk from water is typically determined using the 'Allgemeine Bodenabtragsgleichung' (ABAG), derived from the Universal Soil Loss Equation (USLE), in order to estimate the average annual soil loss. However, in practical application, the P-factor accounting for erosion control measures like contouring is often neglected due to high effort for determining or lack of input data. Neglecting these measures results in overestimated erosion predictions.

In this poster, we apply existing image analysis techniques to freely available, high-resolution remote sensing images from Google Earth™ for automatically identifying linear structures such as tramlines with a line detector from OpenCV. From the detected lines, we calculate a weighted main cultivation direction for each cropland parcel. A comparison of the main cultivation direction with the main aspect makes it possible to check the measure of contouring. Depending on slope and slope length, we finally calculate an individual P-factor for a quantification of contouring as support practice for each cropland parcel.



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## **sciforum-059721: Debris Flow in Small and Ungagged Basins. Case Study: Scilla (Italy)**

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The formation of a debris flow is linked to the simultaneous occurrence of three conditions: the presence of debris material on a mountain side or in the riverbed; the contribution of sufficient quantity of water to mobilize the sediments, especially if flash floods occur; the high slope of the mountain side and the presence of areas of possible propagation. Generally, the major consequences occur when the flash floods impact small basins, characterized by short times of concentration and low storage capacity, and, also, cause a debris flow.

This issue is particularly relevant in territories such as the Italian one that is susceptible to the phenomenon of hydrogeological instability. Indeed, of the approximately 900,000 landslides surveyed in the databases of European countries, almost 2/3 are contained in the Inventory of Landslides in Italy.

The aim of this paper is to analyze the issue of debris flows through a case study in Scilla (Calabria, Italy). The analysis will cover the mechanisms of generation and propagation of the debris flow, the possible mitigation measures and will describe the modeling to support the development of alert systems.

The study area, due to its geomorphological and climatic characteristics, is prone to flash floods, especially in summer and autumn, which often cause debris flow as occurred in July 2017 and July and August 2020. These events occurred in a small and ungagged basin and will be used to calibrate the models mentioned above.



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# sciforum-059700: Effect of Biochar Activated with Compost and Mineral Fertilizer on Agronomic Performance of Maize in the Dry and Sub-Humid Tropics of Benin

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Soil degradation and the effects of climate, particularly drought, is strongly limiting maize productivity in Benin. Biochar has proven to be effective in improving crop productivity. The current study aimed to test the effect of biochar activated nutrient on maize productivity. The experimental design was a complete randomized block with two fixed factor as climatic zone (dry tropical and sub-humid tropical) and amendment with three replicates, and two random factors as year (2020 and 2021) and replicates. The treatments applied were biochar (B) activated with compost (C) at rates of 11, 22, 33 and 44 kg N/ha, named BC11, BC22, BC33 and BC44, respectively, and biochar activated with mineral fertilizer (MF) at the same rates but named BM11, BM22, BM33 and BM44, respectively. There was also absolute control (CK), biochar alone at the rate of 426 kg/ha, compost alone at the rate of 44 kg N/ha, mineral fertilizer alone at the rate (44 kg N/ha) and biochar double activated with compost (22 kg N/ha) and mineral fertilizer (22 kg N/ha) (BCM44). Data collected were maize growth and yield parameters. There was a significant treatment effect on maize growth (P0.001). The interaction between activation type, climate zone and year is significant (P0.001). The highest yield was observed in 2020 in the dry tropical zone with BM44 (3361 kg/ha). This yield was like that obtained with MF (3160 kg/ha) and BM33 (2806 kg/ha). As for biochar-activated compost, the highest yield was found in the sub-humid tropical zone in 2021 with BC44 (2605 kg/ha). This yield was comparable to that determined for BC22 (2295 kg/ha). Our results suggest that the effect of activated biochar on maize productivity depends on the climatic zone, the year, and the biochar activation source. Moreover, activated biochar increases nitrogen use efficiency by 50% while boosting maize yield.



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## **sciforum-059962: Streamflow Prediction in a Snow-covered Area Using Novel Boosted Machine Learning Approaches**

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Streamflow as an essential component in the hydrological cycle has a key role in interactions between water and land. Then simulating streamflow is a necessary task for water resource management in any region. Accurate streamflow forecasting may provide valuable information for flood control, irrigation operation, and land use planning. Snow and glaciers as main components of the cold region add more complexity to hydrological modeling studies in cold regions. Then streamflow prediction in cold regions requires considering these complexities in a hydrological model. During current research, the river flow of Sikfors station was modeled via developed machine learning approaches during 1928–2021. Measured streamflow data was evaluated and cleaned using preprocessing methods in order to model streamflow in an Arctic region. Different types of lag-time data were considered as input of machine learning models for streamflow simulating. Several machine learning approaches, including standalone multilayer perceptron (MLP) and coupled MLP via nature-inspired optimization algorithms were applied for streamflow times series simulation in the North of Sweden. Model validation is performed using a variety of quantitative and visual criterion measures, including mean absolute error, root mean square error, Nash Sutcliffe coefficient, and Kling-Gupta efficiency. The current study verified the efficacy of the standalone MLP model for streamflow simulating in a snow-covered area by acceptable accuracy. The result of the proposed coupled MLP model by nature-inspired optimization algorithms showed an improvement in streamflow prediction and the proposed machine learning-based models predicted streamflow in the north of Sweden by high accuracy.



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# sciforum-058630: Nudging Strategies for Cultivated Land Protection Behavior in China

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Cultivated land protection is critical to the sustainable development of agriculture in China and the realization acceleration of the trinity protection goal of the quantity, quality, and ecology of cultivated land. As a new program of behavioral science to promote social development, nudge has gradually gained the favor of researchers and policy makers due to its unique advantages of small cost and substantial effect. However, current research and practical exploration of cultivated land protection behavior intervention based on the idea of nudging are still lacking. Implicit nudging strategies directly target the heuristic and analytic systems of cultivated land protection behavior of each stakeholder and possess more advantages than traditional intervention strategies. Therefore, this article designs six cultivated land protection behavior nudging strategies from the perspectives of cognition and motivation to realize the theoretical discussion of “generating medium-scale returns with nano-level investment.” The nudging strategies of the cognitive perspective include default options, framing effects, and descriptive norms, while those of the motivation perspective aims to stimulate home and country, heritage, and benefit motives to promote cultivated land protection behavior of various stakeholders. The utility of nudge to cultivated land protection behavior may be controversial in practice. Therefore, the implementation in China should be based on the division of farmers, the number of options should be appropriate, and the external environment of cultivated land protection behavior should be fully considered.



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## **sciforum-059733: Landscapes and Plant Biodiversity Hotspots Mapping, Prioritization and Conservation in the the Bulgarian Black Sea Coast**

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Holistic approach of biodiversity and landscape management is based on loss reduction and defragmentation under limited financial and human resources. Therefore, fundamental task of conservation biology and landscape ecology is species and their habitats identification and prioritization in order to focus limited public financial resources to the most endangered species, their habitats and threatened landscapes.

In recent years, the newly developed evaluation systems for identification and prioritization of conservation landscapes, unlike the classical models for conservation significance, are based on cumulative criterion schemes for identification and assessment of dynamic areas.

The main goal of the present study was to create a dynamic map of plant biodiversity hotspots of the Bulgarian Black Sea Coast. A GIS model, as well as a weighted value scheme for scoring each area, were created in order to identify and to prioritize the conservation landscapes and habitats. The model was designed to identify and to estimate the areas with a concentration of species and the places of overlap of the polygons of their distribution.

A total number of defined hot spots of phytodiversity was 64. They were categorized into five classes, based on the cumulative weighted value scheme, and were indicated on the map using colour scale. Hot spots were used for landscapes identification and prioritization according to their conservation status.



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## **sciforum-057671: Typification of Small and Medium Family Livestock Production Systems in The Ríos, Ecuador**

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In the Ríos, Ecuador, small family systems that uses trees and shrubs in feed animal are recognized as a source of livestock production, so it would be practical to classify them. Whit Objective of typify livestock farms in the north of the province, with emphasis those that use trees and shrubs in animal feed. A random sampling was applied. Out of a total of 320 farms, 98 were chosen at random (case under study). The experiment was carried out in different places that comprise the cantons: Buena Fé, Valencia, Quevedo y Quinsaloma. Cases were classified by menans of multivariate analysis. Factor analysis (FA) and cluster analysis (CA) were used. For the FA several extraction methods were explored, finally selecting the method of categorical principal components. The study showed that the variables originated in order of priority three components, which explained more than 73% of the total variance. It was observed that 18 variables of the total were represented with factor loadings higher than 0.75 in some component. The hierarchical conglomerate defined the grouping and classification of the farms. At 30% of the Euclidean distance, three groups were obtained, which define the organization of the herd and the productive purpose. The groups were basically differentiated by the size of the farms, the use they give to the trees, the number of hectares dedicated to pastures, and the species of trees they have in the pastures.



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## sciforum-059212: Soil Contribution to Hydrological Ecosystem Services in Floodplain

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Water retention is important hydrological ecosystem service of active floodplain soils. Different ecosystems, land use and management can have impact on Fluvisols and their hydrophysical properties. The aim of the study was to evaluate soil chemical, physical and derived hydrophysical properties in Fluvisols having impact on hydrological ecosystem services. We selected 11 study sites along the Štiavnica river in central Slovakia, 2 of them used as arable land, 3 as alluvial grasslands, and 8 located in riparian zones. Soil samples were collected from a depth of 0–10 and 20–30 cm. In laboratory, soil physical (soil texture) and soil chemical properties (pH, soil organic carbon, humic and fulvic acid ratio) were determined. Using overall undisturbed soil samples, soil hydrophysical characteristics (particle density, bulk density, maximum capillary and field water capacity, actual soil moisture, porosity) were estimated. Recorded properties differed among the study sites, ecosystems and two layers. Hydrophysical properties correlated with all selected soil characteristics, but the most with the content of silt and sand. From analysed soil properties, ANOVA revealed a significant effect of ecosystem types with specific land use on the bulk density, total porosity, semi-capillary porosity, and pH.

The findings can serve as a basis for the management of water regulation and water storage functionalities of the floodplain soils. They can help to support new approach in future spatial planning taking into account water regulation services of different ecosystems. In addition, the content of size particles in soils can be regulated (e.g. by supply of additives) and thus it can be increased the potential and capacity of water regulating services.

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# sciforum-058040: Monitoring Urban Expansion and Changes in Green Spaces in Two Major Cities in Mali

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Urban green spaces (UGS) play a vital role in provision of urban ecosystems services and building a liveable environment for urban dwellers. However, recent rapid growth in many cities has caused many environmental damage and loss of many services' ecosystem provided by UGS. This research assessed the spatio-temporal change and dynamics of urban sprawl and its influence on Green Spaces loss and their provisioning services. Supervised image classification with Maximum Likelihood classification algorithm was applied for land use/ land cover (LULC) classification using ArcGIS 10.3 on Landsat imageries data from 1990 to 2020 were used to map the spatial pattern and change of urban sprawl and UGS in both cities. Post-classification change detection techniques coupled with landscape metrics helped to assess and quantify trends and patterns of urban sprawl. Four LULC classes were identified, namely vegetation (market gardening, forests, shrublands, flours, grassland,.), built-up, water bodies, bare land and farmland were identified and mapped. The results show that area coverage of UGS from 1990 to 2020 decreased in Bamako, 52.73% and increasing in Sikasso, 41.4%. So, among the UGS, market gardening is more increasing only in Sikasso with 41.4% and decreasing in Bamako with 84.86%. The decrease of UGS in the both cities was mainly due to the expansion of built-up areas, about 27,909 ha area of UGS were transformed into built-up areas during the period in the two cities from 31,194 ha (68.62%) to 14,545 ha (42.50%) in Sikasso and from 9002 ha (38.16%) to 4357 ha (19.11%) in Bamako. The urbanization process in the cities are seen as an increasing pressure on provisioning and regulating services of UGS and water body with are decreasing from 504 ha (1.11%) to 435 ha (1.27%) in Sikasso and from 1391 ha (5.90%) to 1298 ha (5.70%).



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# **sciforum-058021: People, Crops and Bee Farming: Landscape Models for a Symbiotic Network in Greece**

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Despite the rising awareness of the mutual benefits between pollination, agricultural production and biodiversity, Greek planning has scarcely moved towards patterns of pollinator friendly farm design models.

This paper presents data from preliminary research analysis that defined generic planting models that can enhance the symbiotic associations between farming production and bee-keeping in Greece. The main objective is to determine how tailor made planting models can act as diversity enhancements to monoculture farming and to measure the benefits for a safer poisonous-free environment for the bees simultaneously helping farmers to augment their production yields.

A preliminary study was conducted in four agricultural farming estates in Thessaly and The Peloponnese involving apple farming, citrus orchards and hemp cultivation. It combined analysis of land cover classes in each study area, description of connectivity characteristics and emerging spatial patterns of natural corridors, patches and edges at a perimeter of 6 klm from each farm. Assessment of these data informed tailor-made design models for planting enrichment. Pilot installations in the apple orchards resulted in a production of 8% to 12% bigger fruits and 30% to 50% increase of total yield.

I conclude that planting models for biodiversity enhancement are an important attribute to the fostering of ecosystem services, culture and green infrastructures. It can be developed at low cost but requires an understanding of specific geographical and landscape parameters to render planting models operational for bee farming and pollination.



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# sciforum-059058: Land cover mapping using Google Earth Engine: a case study of the Yasuní National Park

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The Yasuní National Park (YNP) is a protected area located in the Ecuadorian Amazon. In 1989 it was declared by UNESCO as one of the World's Biosphere Reserves due to its biodiversity of fauna and flora. Its territory houses ancestral wealth, however, in recent decades, it has been affected by anthropogenic activities that have altered its forest cover. The main objective of this study is to analyze the Yasuní National Park land cover, for the year 2019, using Google Earth Engine (GEE) and Geographic Information Systems (GIS). This study was carried out in three phases. The first phase corresponds to the collection and preparation of data. During this phase, a mosaic of images was created applying a cloud and shadow mask using the GEE platform. The second phase refers to the use of GEE in the supervised classification of the land cover, where the Random Forest algorithm with 30 decision trees was applied. Finally, the third phase refers to the post-processing, where the raster reclassification was carried out using the ArcGIS Pro software. The results revealed that; the area with the greatest presence of human activity was located at the north of the YNP. On the other hand, the area with no alterations whatsoever corresponds to the Tagaeri-Taromenane intangible zone. Anthropogenic activities represent 779.44 ha (0.08%) of the territory. There are also 1267.37 ha (0.12%) of exposed soil and 4345.83 ha (0.42%) that represent the hydrological network. The forest area predominates with 994,829.80 ha (97.23%). GEE proved to be an efficient and effective processing tool that allows the user to replicate the same geoprocessing in other study areas.



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# sciforum-058850: Digital Agricultural Management Tools for Efficient and Integrated Policy-Making

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The Basin District of Thessaly, Greece's driest rural region, faces a number of environmental and economic issues as a result of agricultural intensification combined with poor management. For the first time, the region's key-stakeholders committed to co-design solutions during an 18-month project. The stakeholders are representatives from all governance structures, experts and experienced professionals, start-ups and technology experts, scientists, and agricultural co-operations.

The first step towards a more resilient and sustainable management is to work towards the development of a geospatial interactive application. A GIS-based database is seen as a transparent and accessible means for covering existing gaps of complete and reliable data. Crop, soil, water use, pollution, water supply sources, irrigation methods, cultivation, production-yield, and basic economic data will be combined per farm level to provide necessary information to facilitate management and contribute to the implementation of results-based actions.

This work presents the rationale of the stakeholder group to propose this initiative and its design. A brief review of similar tools internationally (private, commercial, public, freely accessible and academic applications-tools) is also presented and the learnings are discussed. The implementation of the proposed tool, facing data limitations, is also discussed to provide useful insights for similar initiatives. The development of the proposed tool is expected to provide multiple benefits in many levels: managerial, administrative, accountability, information sharing to enhance the work of all individual actors and bodies, informed decision-making, modernization of current tools and practices, and holistic approaches in terms of a more integrated planning.



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## **sciforum-061549: Ecological Characterization of Critical Areas for the Maintenance and Improvement of Connectivity in the Face of Climate Change**

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A total of 18 critical areas for maintenance of riparian connectivity have been ecologically characterized, given the impact that Climate Change will have on them, and that they are distributed throughout the Duero Hydrographic Basin. The ecological characterization is being carried out in a research project, which consists of two phases: a characterization in the spring season and another in the fall. In this research process, different physical-chemical parameters of the water and quality indices have been determined through exhaustive field work. From the first sampling, a list of bioindicator insects has been obtained, in relation to climate change.

Thanks to this list of bioindicator species, it has been possible to determine the IBMWP index, which has required the prior collection of samples in the field, and their processing in the laboratory, through the sampling protocol and laboratory of benthic fauna of invertebrates in fordable rivers. With the results of the IBMWP obtained, the ecological status of the water masses, of each critical area, has been determined. Environmental quality indices have also been determined according to the "Hydromorphological Quality Evaluation Protocol", such as the QBR, and the IHF. All the results have been subsequently compared with the data from the control stations provided by the Hydrographic Confederation.

The results obtained show a favorable quality of the critical areas, being lower in the case of the corridors, being therefore necessary to pay special attention to the preservation of these corridors in order to favor the quality of the critical areas for the connectivity of riparian ecosystems.



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# sciforum-061550: Characterization of Critical Riparian Areas Using Lidar Data and Satellite Images to Prevent Their Fragmentation Due to the Climate Change

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In the first phases of the DUEROCHANGE project, possible future climate change scenarios and analysis of connectivity of the riparian network in the Duero River Basin (Spain) were analysed. As a result, eighteen critical areas were obtained in the study area. Once these areas were located, the objective of this study is the detection and evaluation of these critical areas using remote sensing for the assessment of the current ecological trend. They can be easily evaluated taking into consideration some forest features structure largely determined by remote sensing techniques. For this purpose, satellite data (Sentinel 2-S2) will be used and pre-processed including deriving spectral and phenological features, e.g. vegetation indices (NDVI, NDWI and EVI). Furthermore, space-borne LiDAR (ALS) data will be used in combination with S2 time series data to derive up-to-date canopy height and tree species layers. We propose a methodology to combine both high spatial resolution aerial images and mapping from ALS data using Object-Based Image Analysis (OBIA). We will include both in segmentation and in the classification process. Features relevant such as canopy height, 3D forest structure and forest edge information will be derived. To train and to validate the derived habitat maps available field data will be used. Once we will have ecological characterization of critical riparian areas, we will propose key elements to guarantee the self-maintenance of fluvial processes and riparian biodiversity and connectivity.



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## sciforum-059062: Prediction Model of Pan Evaporation in Kerala Using XGBoost Algorithm

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The evaporative demand of the atmosphere, which is widely used in water resource management and crop production, is expressed by pan evaporation. Studies have indicated that pan evaporation has declined in many regions around the world, over the last several decades. The uniqueness of this study is that this is the first prediction model for pan evaporation in Kerala region, done by the exploration of machine learning techniques. This study investigates the application of eXtreme Gradient Boosting (XGBoost) algorithm to estimate the daily pan evaporation value for Palakkad district, the granary of Kerala. This model is established as a function of meteorological parameters collected for the years 2000 to 2019. The daily meteorological surface data owned by Indian Meteorological Department is used to construct the model. The daily concentration of pan evaporation and the following meteorological parameters termed temperature, grass minimum temperature, relative humidity, vapor pressure, rainfall amount, wind speed, and bright sunshine hours are included in the data set. The XGBoost method's prediction efficiency is measured by comparing observed and expected pan evaporation concentrations using the forecast accuracy measurements of root mean square error (RMSE) and coefficient of determination ( $R^2$ ). The obtained measurements demonstrated the proposed XGBoost algorithm's excellent potential in pan evaporation estimation.



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## sciforum-057537: Rainfall Erosivity and Erosivity Density in the Central and Southern Pannonian Basin

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To understand the complex relationships between hydrological and soil erosion processes it is essential to estimate rainfall erosivity (*RE*) and erosivity density (*ED*). In this study, we conducted a detailed analysis of the spatial-temporal trends and variability of the *RE* and *ED* observing the study area of the central and southern Pannonian Basin. Due to the data scarcity, we used two separate datasets: 225 gridded points (E-OBS repository) and 14 meteorological stations (ECA&D repository) for the period of 1961–2014. Annual *RE* and *ED* based on station data are following the spatial pattern of precipitation distribution, with higher values in the southwest and southeast (2100–1650 MJ mm ha<sup>-1</sup> h<sup>-1</sup>) of the study area, to the minimum values in the northern part (700 MJ mm ha<sup>-1</sup> h<sup>-1</sup>). As expected, the gridded dataset displays more precise *RE* and *ED* spatial-temporal variability, ranging from minimal 250 to maximal 2800 MJ mm ha<sup>-1</sup> h<sup>-1</sup>. The long-term trends at the annual level are showing an increasing value of *RE* (from 0.20 to 21.17 MJ mm ha<sup>-1</sup> h<sup>-1</sup>) and *ED* (from 0.01 to 0.03 MJ ha<sup>-1</sup> h<sup>-1</sup>). The observed tendency for the autumn *RE* (from 5.55 to 0.37 MJ mm ha<sup>-1</sup> h<sup>-1</sup>) and *ED* (from 0.05 to 0.01 MJ ha<sup>-1</sup> h<sup>-1</sup>), and for the spring *RE* (from 1.00 to 0.01 MJ mm ha<sup>-1</sup> h<sup>-1</sup>) and *ED* (from 0.04 to 0.01 MJ ha<sup>-1</sup> h<sup>-1</sup>), can be explained by the influence of the large-scale processes of climate variability, with North Atlantic Oscillation (NAO) being the most prominent. The observed increase can lead to a higher erosive class, thus raising concerns for this type of hydro-meteorological hazard. By identifying seasons and locations of the greatest erosion risk, this study can serve as the starting point for implementation the suitable mitigation measures on a local and regional scale.



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# sciforum-059705: Digital Model as a Tool for Sustainable Development of Settlement System

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The paper proposes a digital model of sustainable development of rural areas including five main systems—ecological, economic, administrative, physical and social, which determine the significant factors of sustainable development of rural settlement. The combination of these systems establishes the necessary conditions for the successful implementation of policies at the local, regional and national levels of government. The research aim was to develop the digital model for evaluating the development of settlement system. The research methods were based on the complex and interdisciplinary approaches namely the system-element approach, the comparative analysis, spatial and mathematical modelling, factor analysis, the cartographic analysis. The practical relevance of the research is in potential of using the model as a significant tool in land use planning: the obtaining both quantitative and qualitative evaluation for through development scenarios, which are necessary at various stages of land use planning. Besides the key feature of the model is its multifunctionality, which allows to evaluate the system sustainability at any level, to set the priority areas and to develop specific measures for ensuring the sustainability of rural settlement system and its elements.



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# **sciforum-058058: Territorial Implications of Socioeconomic and Demographic Imbalance in Mainland Portugal: A Conceptual Framework**

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The current population of the European Union is around 447.0 million inhabitants. Population growth has been encouraged by numerous drivers such as political, cultural, and socioeconomic. Nevertheless, the population growth has been unbalanced, since larger cities grow faster than small-medium sized cities. This is one of the main challenges faced by some European countries. Mainland Portugal is one of those examples, where the population imbalance is stressed by higher population density in the Lisbon and Porto metropolitan areas and the Algarve region, and by lower population density in the rest of the territory. This has led to strong pressures, especially in peri-urban areas close to large-sized cities, leading to the successive loss of semi-natural or natural areas to urban areas. This has implications both from an environmental and socioeconomic perspective. Although planning strategies have encouraged population balance by promoting territorial cohesion policies, the demographic and socioeconomic gaps between small-medium cities and large cities have been increased in the last years. There are gaps in the literature in the identification of effective strategies to mitigate this imbalance and effective tools to measure it. To fill this gap, this study proposes a conceptual framework (i) to mitigate the socioeconomic and demographic imbalance between large cities and small-medium cities in Mainland Portugal by recognising the driving forces that may be responsible for the increase of population growth in small-medium sized cities; (ii) to reduce the pressure exerted on large cities, thus preventing further land-use changes and the loss of natural and semi-natural areas in these regions, and (iii) to promote spatial planning strategies that can be used by decision-makers. This conceptual framework may contribute to creating and promoting more effective territorial cohesion policies targeted at small-medium cities.



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# **sciforum-058051: Fire Occurrence in Hemi-Boreal Forests: Exploring Natural and Cultural Scots Pine Fire Regimes Using Dendrochronology Toward Sustainable Forest Planning and Management**

**Michael Manton**

Vytautas Magnus University

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Fire is an important natural disturbance and driver of hemi-boreal forest successional trajectories, structural complexity and biodiversity. Understanding the historic fire regime is an important step towards sustainable forest management including biodiversity. Focusing on Lithuania's hemi-boreal forests, we firstly mapped the potential natural fire regimes based on the relationship between site conditions, vegetation and fire frequency using the ASIO model. The ASIO model revealed that all fire frequency site types (Absent, Seldom, Intermittent, Often) are found in Lithuania. Scots pine forests dominated the "often" fire frequency category (92%). Secondly, focusing on a fire prone forest landscape, Dzukija, we analyzed fire occurrence in Scots pine forests using dendrochronological records. We sampled and cross-dated 132 Scots pine samples with fire scars from 4 dry forest stands (n = 92) and 4 peatland forest stands (n = 40), respectively. In total, the fire history analysis revealed 455 fire scars and 213 fire events during the period 1742–2019. The Weibull median fire intervals were 2.7 years (Range 1–34) for the dry forest types and 6.3 years (Range 1–27) for the peatland forest types. Analysis of results pre and post 1950, show the Weibull median fire interval increased from 2.2 to 7.2 for the dry Pine forests, but decreased for the peatland sites 6.2 to 5.2. A superposed epoch analysis revealed significant precipitation fluxes prior to fire events after 1950. Thus, the Dzukija landscape of Lithuania has been strongly shaped by both human-induced and natural induced fires. Combining theory (ASIO model) along with examination of biological archives can be used to help guide sustainable forest management to emulate forest disturbances related to fire. As traditional forest management focusing on wood production has eliminated fire, and effectively simplified forest ecosystems, we recommend introducing educational programs to communicate the benefits and history of forest fires as well as adaptive management trials that use low intensity prescribed burning of Scots pine stands.



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## **sciforum-059491: Investigating the Views of Social Groups on the Promotion to Eco-Protection Policies in a National Marine Park**

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The prospect of many plant and animal species or unique landscapes disappearing from the planet and the realization of the great danger from humans has resulted in the mobilization of humanity to take measures against this catastrophic course. For this reason, in recent years there has been an awareness and mobilization at a global level on issues relating to the natural and the man-made environment. Under the continuous deterioration of the quality of life due to nature degradation, the demands for the sustainable use of natural resources have increased. Thus, efforts are currently being made to organize action around the world for the preservation of biodiversity and the protection of natural ecosystems. The institutionalization of Protected Areas aiming at the protection and management of biodiversity as well as the conservation of areas with particular natural beauty and special characteristics is an opportunity for sustainable development that respects nature and human and leaves natural resources as a legacy to the future generations. In this paper, an attempt is made to investigate the views of the residents, hunters and fishermen of the Northern Sporades on the emergence, development and protection of the National Marine Park of Alonissos Northern Sporades through personal interviews. The local community wants to expand it unlike hunters and fishermen and everyone wants to participate in decision-making processes regarding the marine park. Their information is considered moderate as good in terms of park issues and they are updated mainly by the internet, the friendly-family environment and the Hunting – Fishing clubs. The image they have for the Management Agency and the environmental organization Mom is neutral as negative. Finally, various proposals concerning both the protection and the development and promotion of the marine park are evaluated.



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## sciforum-058465: Spatial Planning in Small Historic Towns

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Historic towns have a unique spatial arrangement, which, due to its historical values, is subject to protective measures. These activities include spatial planning and spatial policy, carried out in order to preserve the cultural heritage and spatial order. Purposeful actions, resulting from the developed planning documents, are intended to protect historic spaces. Urban spatial development plans contain guidelines necessary for the preservation of historic spaces and guidelines for their shaping, so that each of the spheres of order (historical, economic, spatial, environmental, social) is developed in the most optimal way. However, is the potential of planning documents used in small towns to protect historically shaped spaces? Are the plans appropriately structured for the historic downtown that require the most attention? In search of answers to the questions posed, the planning studies of several small historic towns in northern Poland, which were shaped during the Middle Ages, were verified. Using GIS tools, an analysis of the distribution of immovable monuments was performed, and then it was verified whether the areas on which they occur are covered by the local spatial development plan. The conducted analysis allowed to illustrate how spatial planning is shaped in historically valuable areas, which functions of space are most often indicated in planning documents and what records are used to preserve historical spaces.



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## **sciforum-058083: Urbanization Patterns in post-Socialist Romania: A Ranking of Metropolitan Areas Based on Suburbanization Dynamics Using CORINE Land Cover Data**

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In post-socialist countries, suburbanization of metropolitan areas has been the main pattern of urbanization since 1990, especially under the form of urban sprawl by residential development. Widely considered a major threat for long-term sustainability, urban sprawl has been very difficult to stop using traditional land planning instruments. Romania has experienced patterns of suburbanization very similar to other post-socialist countries, with the process mostly led by private developers, under a poorly regulated metropolitan planning framework. The objective of this ongoing research is to assess urbanization patterns since 1990 in Romanian metropolitan areas, in order to rank areas based on their suburbanization dynamic. An analysis of 1990–2018 CORINE Land Cover and Use Change data was carried out nationwide using ArcGIS Spatial Analyst tools. The results were overlapped with the limits of the thirteen Romanian metropolitan areas, in order to identify the ones with highest national suburbanization dynamics. In parallel, ancillary data from the National Institute of Statistics on the 1990–2018 dynamics of housing units were used to validate the ranking of metropolitan areas. The resulting maps illustrate the concentration of suburban development around largest Romanian cities declared National Growth Poles during the 2007–2013 programming period. The maps allow for quantifying the suburbanization of Romanian metropolitan areas, highlighting the relation between the rise of new housing units and land use changes in peri-urban areas. The findings revealed the need for specific land planning instruments at the metropolitan level, where most land use changes driven by urbanization take place. Such analyses have the potential to be replicated in other post-socialist countries, but also to countries experiencing metropolitan suburbanization irrespective of their recent political history.



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# **sciforum-059211: Addressing the Formal-Informal Dichotomy in Urban Housing: Revisiting Urban Land and Housing Policies in Delhi**

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Delhi, the national capital territory of India, is one of the largest urban agglomerations in the world and a sprawling metropolis that is increasingly gaining significance among the world's cities. As per the population projections of the Census of India, the total population of Delhi is projected to be around 24 million in 2021. Recent research also indicates that Delhi is on its way to being the most populated city in the world soon. However, as in the case of most of the megacities in the developing countries, rapid increase in population coupled with the inefficiencies in the formal land and housing market in Delhi has led to the creation of informal settlements where a vast majority of urban poor has sought residence. The existence of large unauthorized colonies and squatter settlements across the city call to question the efficacy of the land acquisition, disposal, and development policies adopted by the government in the past six decades to promote planned development in Delhi. Against this backdrop, the paper seeks to examine how the land-use plans and policies adopted and administered through the master plans of Delhi have failed to provide adequate housing for the urban poor and deprived them of housing and land rights in the city, relegating them to squatters and unauthorized colonies in the urban fringes. The findings suggest the need for a comprehensive approach in land-use planning that can accommodate and address the specificities of the informal housing system existing in the city.



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# sciforum-059427: An Extended Theory of Planned Behavior Integrated with Social Capital for Understanding Garbage Sorting Behavior in Rural Tourism Contexts

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Rural tourism potentially contributes to the sustainable use of rural land. However, the rapid growth of rural tourism significantly increases negative impacts of tourist behavior (including littering) on rural tourism destinations. Garbage sorting is an effective means to mitigate these adverse impacts. Identifying factors influencing garbage sorting behavior of tourist in rural tourism become the key to the sustainability of rural tourism and land management. Extant literature mainly focuses on garbage sorting behavior of urban residents, while research on that of visitors in rural tourism destinations is scant. Investigating garbage sorting behavior of tourists in rural tourism is not only conducive to better understanding environment conservation and improvement of rural destinations and tourist experience, but also instrumental in guiding sustainable management of rural land resources on which rural tourism depends. On this basis, it becomes imperative to explore determinants of garbage sorting behavior as a specific type of tourist pro-environmental behavior in rural tourism contexts. To fill this gap, this research draws on social capital and theory of planned behavior (TPB) to examine the antecedents of tourists' garbage sorting behavior in rural tourism. The results indicate: (1) social capital and key predictors of TPB positively influence garbage sorting behavior of tourists; (2) key predictors of TPB play mediating roles in the nexus between social capital and garbage sorting behavior; (3) the integrated framework is effective in predicting garbage sorting behavior of tourists in rural tourism. This study represents one of the first empirical efforts to delineate garbage sorting behavior of tourist in rural tourism contexts. The proposed framework of TPB integrated with social capital is an important addition to the question regarding sustainability of rural tourism and rural land management. It provides guidance for rural tourism destination managers and sustainable use of rural land.



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# sciforum-057910: Socioeconomic Outcomes of Agricultural land Use Change in Southeast Asia

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Agricultural land use is transforming rapidly in Southeast Asia, mainly manifested in change from subsistence to market oriented farming and through the introduction of large-scale agricultural land concessions. These transformations of the agricultural landscapes are often supported by development policies, aiming primarily at economic growth. However, in the context of sustainability and the Sustainable Development Goals (SDGs) it is essential to also assess other socioeconomic outcomes of these different land use changes. In this study we have systematically collected and reviewed cases from the scientific literature reporting on agricultural land use change in Southeast Asia and their socioeconomic outcomes for the local population. In total, we found 126 reported cases; divided on 67 cases of smallholder development, 31 cases with economic land concessions, 15 cases analyzing land use change from state policies, and 13 cases on land conservation. We find mostly positive socioeconomic outcomes in relation to income generation (SDG 1, 100 cases) and employment (SDG 8, 11 cases), while outcomes on health (SDG 3, 9 cases) were mixed, and outcomes for food security (SDG 2, 44 cases), gender equality (SDG 5, 13 cases), and economic equality (SDG 10, 14 cases) were mostly negative. Studies describing multiple outcomes show indications of synergies between income and food security, and between income and employment, but also potential trade-offs between income and economic equality. In addition, we find that both positive and negative synergistic outcomes are found and that economic land concessions result in multiple negative outcomes (negative synergies) more often than other types of land governance regimes. The results provide evidence that economic gains from agricultural land use change in Southeast Asia often come at a cost to other dimensions of local sustainable development.



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## **sciforum-060430: The Importance and Characteristics of Landscape Sensitivity Assessment**

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Natural and built environment is essential for people providing food and shelter and satisfying need for rest and relax. Ecosystem services known as a new expression for goods offered by nature becomes more important nowadays when amount of resources available are depleting.

Before it becomes a sense of pleasure, the landscape is a formation of the mind. It is made not only of layers of rock, but also of accumulations of memory. The body and spirit meet the forest, the river, the rock, which we not only perceive with our senses, but which bear the imprints of our consciousness, as well as that of our ancestors. After all, we have made a landscape as an object of inspiration, joy, pleasure, fear, horror, myth; without us it is simply nature.

Different methods for identifying and assessing landscape character are used in landscape studies, spatial planning and land management. They originated mainly in the 19th and 20th centuries as a concern for the protection and conservation of threatened landscapes, but have now become an approach that seeks to understand and, more importantly, manage and shape the landscape. Recent research rises importance of landscape sensitivity and capacity issues to be identified for different scenarios of potential development of any site or landscape.

The aim of research is to study and explore the approaches used for landscape sensitivity assessment process and to develop the recommendations for criteria used to characterise the current situation before any changes are made in development scenarios.



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# sciforum-059429: Towards an Integrated Model of Environmental Citizenship Behavior: A Rural Destination Resident Perspective

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Natural resources on rural land are fundamental to the development of rural tourism, while economic benefits from rural tourism have both positive and negative effects on rural environment. Environmental corporate social responsibility (CSR), as an effective means of ecological conservation in tourist destinations, also affects individual's environmental citizenship behavior (ECB) via environmental identification and commitment. However, very little research has attempted to examine the links between environmental CSR of destination residents and their ECB, as well as the mediating role of resident-environment relationship quality. Tourists are the main focus of most previous research, with destination residents in rural tourism contexts rarely studied. In fact, resident ECB has continuous impact on rural tourist destinations. As an endogenous driver and ultimate beneficiary of sustainable tourism development, residents may have more profound impact on the environment than tourists in rural tourist destinations. Improving resident ECB is critical for rural tourism sustainability. To this end, Stimulus-Organism-Response (SOR) Model and relationship quality are employed to investigate how environmental CSR and resident-environment relationship quality affect resident ECB in both private and public sphere in rural tourism contexts. The results show that: (1) resident CSR and resident-environment relationship quality positively affect ECB of rural destination resident in private and public sphere; (2) resident-environment relationship quality mediates the relationship between resident CSR and ECB in private and public sphere; (3) this research is supported by cross-validation analysis of rural cases. Within the framework of SOR model and relationship quality, this study attempts to explore ECB of rural destination residents in private and public domains. It complements extant tourism literature on CSR and ECB with a destination resident perspective and contributes to the improvement of destination resident ECB in rural tourism contexts through improvements of CSR and resident-environment relationship quality.



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## **sciforum-059608: Traces of History in the Present Landscape**

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The paper deals about landscape changes and historical landscape structures. The key question is how landscape changes and development in the past influence the present landscape, its appearance and stability. Landscape changes are studied according the old and up to date maps and aerial photographs. Identification of landscape structures is based on GIS analysis of the geographical databases, both general geographical databases (e.g., CORINE land cover, ZABAGED—basic geographical database of the Czech Republic, Geonames) and specialized databases (e.g., the database of the ponds in the first half of the 19th century, database of land cover changes in the 19th and 20th centuries in the Czech Republic, database of the architecture of villages).

We could identify different types of the historical landscapes. UNESCO distinguishes three basic categories: designed landscapes, organically enveloped landscapes and associative landscapes. All of these categories and especially organically enveloped landscapes could be specified and divided to several subcategories. In the paper, we show the diversity of historical cultural landscapes in the Central Europe, case study Kutnohorsko in the Czech Republic. We demonstrate how these landscapes contribute to the overall landscape stability and we discuss their protection and adaptation to the modern land management.



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## **sciforum-059627: Weeds as Cultural Heritage Objects in an Agroforestry Landscape**

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Institute of Advanced Studies

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Intensive agricultural technologies lead to a simplification of landscape and a decrease in biodiversity. Many agricultural weed species are sliding toward extinction because they are adapted to extensive cultivation processes but fail to survive frequent mowing or chemical use.

In this research, a traditional apricot plantation combined with crop fields was studied in Burgenland, focused on herbaceous diversity and species composition. The results show that the loose canopy layer of the fruit trees promotes the appearance of several herbaceous species, likely to a semi-natural grass and much more than a planted forest patch. However, the intensity of the management has a high impact on the species richness and species composition of the understory vegetation. Our results reflect that besides economic and ecological benefits, grassy strips in alley cropping systems can support the maintenance of a diverse weed community; thus, they preserve a declining segment of the natural, intangible natural, material, and intangible cultural heritage.

We successfully listed 74 herbaceous species, most of which were agricultural weeds, and appeared in the grassy strips of the alley cropping system. A few invasive species were also present in the studied plots. We assessed how well-known the plants were among the population using a questionnaire on different target groups. Additionally, we developed a detailed typology with six main components to identify the individual value of each item as feeds, medicines, chemical substances, bedding-plants, artefactual raw materials, and parts of the intangible cultural heritage (folk arts, songs, visual motifs of painting, embroidery, or woodcarving). We will present the analysis of the result and a proposal for a Citizen Science-based extension of this ethnobotanical database and look at further possibilities in the sophistication of the typology.



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# sciforum-058785: Geographical Distribution and Emission Reduction of Photovoltaic Power Generation within China

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Since China's carbon peak and carbon neutrality goals were put forward, photovoltaic power generation has gradually become one of the significant fields to accelerate low carbon transition. Through the analysis on geographical distribution and emission reduction of China's photovoltaic power generation, this study is devoted to characterizing the spatiotemporal distribution characteristics of photovoltaic power generation, identifying the driving effects of socioeconomic factors on photovoltaic development, and promoting the sustainable development of the photovoltaic industry within China. Overall, the total installed photovoltaic capacities increased to 253.17 million kW in 2020, dominated by centralized power stations. Regions including Shandong, Jiangsu, Anhui, Henan, and Shanxi showed a high-high autocorrelation, while regions such as Guizhou showed a high-low autocorrelation. Electricity consumption, carbon emission, and R&D investment were the positive driving factors for the growth of photovoltaic installed capacities, and R&D investment showed a positive impact on the growth of photovoltaic installed capacities in neighboring provinces. The potential emission reduction benefits per year of China's existing photovoltaic installations could almost reach  $2.0 \times 10^8$  tons and the accumulated emission reduction benefits could reach  $19.2 \times 10^8$  tons by 2030, which is expected to provide implications for the implementation of China's dual carbon goals and the sustainable development of China's photovoltaic industry.



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## sciforum-059059: Land Cover Changes within Block 47 in the Ecuadorian Amazon

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The oil sector has represented one of the main sources of foreign exchange for Ecuador. Currently, the Ecuadorian Amazon is experiencing an expansion of hydrocarbon projects with the purpose of satisfying international demand and insertion into the global economic market. In the Orellana province there are around 20 oil blocks, one of them corresponds to Block 47. These facilities lead to complementary engineering works, access roads, mobilization of workers and exploitation of natural resources. Activities that can alter the dynamics of Amazonian ecosystems and the regional landscape, causing loss of tropical forest, changes in land use, soil erosion, among other effects. In this context, the importance of the use of geographic information systems for the analysis of land use and cover change is highlighted, as a mechanism to identify possible alterations of the local landscape. This analysis focusing on Block 47 was processed for two scenarios. The first scenario corresponds to the previous phase of the oil block concession (2000–2008), and the second corresponds to the more recent scenario (2008–2018). During the first phase, the land cover classes were obtained and classified. The calculation of the landscape metrics took place during the second phase, with the purpose of quantitatively characterizing the alterations in each class. The results revealed that, in the more recent period (2008–2018) there was a higher level of forest fragmentation compared to the first scenario (2000–2008). This fragmentation evidences an increase of land destined for agricultural and urban use, and a decrease in forest cover. In 2000, before the oil concession, 33% of the region was covered by tropical forest. In the more recent period, that percentage lowered to only 22%. A significant reduction in the water level of the Coca River was also evidenced over the years.



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Session 1. Land Systems and Global Change

Selected Speaker

## **sciforum-059026: A New Integrating Framework to Assess Green Development Level of Cultivated Land for Three Decades in China**

**Chaoqing Chai, Bangbang Zhang, Yuanyuan Li and Wenhao Niu**

College of Economics and Management, Northwest Agriculture & Forestry University

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China has achieved food security by investing massive labor and technology in the use of cultivated land, but the overuse of fertilizer, pesticide, membrane and irrigation water has put cultivated land under threat. In order to effectively alleviate dramatic constraints on cultivated land resources, environmental degradation by intensive input and ecobolic food safety issue, it is profound to research green development level of cultivated land (GDL-CL) in time. This study aims to clarify connotation and construct a theoretical research framework and evaluation index system for GDL-CL in China. Furthermore, based on provincial data from 1990 to 2018, the entropy weight method and polynomial fitting method are used to reveal the spatial-temporal evolution patterns, the spatial autocorrelation analysis method is applied to explore the spatial-temporal differentiations, the Geodetector is equipped with investigating the driving factors on GDL-CL. The results show that (1) the GDL-CL in China showed a U-shaped development trend from 1990 to 2018. It experienced a trough period from 1997 to 2003 and reached an inflection point in 1998. Then entered a rapid improvement period in 2008. (2) It is highly that there is spatial autocorrelation on GDL-CL in China. Meanwhile, there is an obvious high-high agglomeration phenomenon in eastern China, and an obvious low-low agglomeration phenomenon in western China in the recent 30 years. (3) The acting force of temperature and precipitation increased from 0.091 to 0.491 and from 0.101 to 0.506 in 1990–2018, respectively, which has been dominating GDL-CL in China recently. Per capital agricultural output value, fixed assets investment, government expenditure, illiteracy ratio and employment figure are the core drivers of GDL-CL spatial-temporal differentiation in China from 1990 to 2018. Consequently, we address that priority should be given to the change of production mode, coordination of regional contradictions and beware of extreme weather. This study will provide reference for related research and policy proposal of cultivated land.



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Selected Speaker

## sciforum-059719: A Review of Land-Based Mitigation Technologies and Practices

Lokendra Karki <sup>1</sup>, Jenny Lieu <sup>2</sup>, David Ismangil <sup>2</sup>, Francis Johnson <sup>3</sup>, Stefan Boessner <sup>3</sup>, Maria Xylia <sup>3</sup> and Eise Spijker <sup>4</sup>

<sup>1</sup> Science Policy Research Unit (SPRU), University of Sussex

<sup>2</sup> Delft University of Technology

<sup>3</sup> Stockholm Environment Institute

<sup>4</sup> JIN Climate and Sustainability

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Land-based mitigation technologies and practices (LMTs) are considered critical for achieving the Paris Agreement's aim of limiting the rise in average global temperature well below two degrees Celsius. LMTs consider how land-based technologies and practices contribute to reducing emissions, carbon sink potential including environmental and social sustainability impacts and goals. Despite an increase in studies on mainly individual LMTs in recent years, there is still a gap in understanding the magnitude of realistic mitigation potential for LMTs. We defined 13 LMTs across 5 categories: (i) agriculture; (ii) forestry; (iii) other ecosystems; (iv) bioenergy with carbon capture and storage; and (v) biogenic-waste management. To understand a more realistic potential of LMTs, we used a comparative and collective lens, and developed a broad conceptual framework accounting for LMTs' potential, cost and barriers. Our findings showed that current studies on the potential of LMTs focused on large scale deployment of individual LMTs with larger mitigation potentials and do not take full account of non-economic co-benefits and, the possible overlapping, competition, and trade-offs between LMTs. This implies that future research should focus on exploring portfolios of LMTs at the sub-national, country, and continental level and balancing climate mitigation action, while ensuring food security, maintaining biodiversity, increasing soil health, and providing economic benefits for land users.



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Selected Speaker

## sciforum-057093: Early-Warning and Rapid-Response Computational Systems for Land Protection

David Pastor Escuredo <sup>1,2,3</sup>

<sup>1</sup> UCL

<sup>2</sup> UNICEF

<sup>3</sup> LifeD Lab

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Natural hazards become into high-impact human disasters when there is not a proper humanitarian and human response. Moreover, global change changes how livelihoods evolve and work and affect internal and international migrations. The humanitarian system and humans require computational tools to react and anticipate to large-scale social phenomena and drive to positive impact. By taking early actions and predicting dynamics between populations and global change including climate change, livelihoods are protected minimizing the socio-economic impact at mid and long term. In emergencies and forcibly displaced population phenomena, humans and land become a highly timely system that can be improved by Data and Artificial Intelligence. Not only earth observation systems can be deployed, but a comprehensive societal sensing system can be built for early warning and rapid assessment and response. By integrating remote sensing with small data sensors and big data sources, we can exploit Artificial Intelligence not only to trigger humanitarian action, but to compute estimated social, economic, human, infrastructure and land dynamics including impact assessments. Multi-indicator systems can be leveraged for humanitarian actors but also to create human protection based on Collective Intelligence beyond current systems based on social networks. This implies designing methods where AI and humans interact in real-time for better awareness and more automated-systemic decision making. Eventually, land and livelihoods can be better protected with seasonal and event-based indicators to minimize large scale socio-economic impact and increment short-term and long-term resilience world-wide.



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Selected Speaker

## sciforum-059732: Effects of Cattle Breed on Pasture Diversity and Soil Physical Properties in the Sudanian Zone of Benin

Rodrigue V. C. Diogo <sup>1,2</sup>, Pénélope G. T. Gnavo <sup>2</sup>, Luc H. Dossa <sup>3</sup> and Josiane C. Patia <sup>1</sup>

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Understanding the feeding behaviour of cattle on pasture is crucial for developing sustainable herding practices and range management plans. This study assessed the impact of three cattle breeds (Yakana, Somba and their crossbreed) on the floristic diversity and soil physical properties in the Sudanian zone of north-west Benin. Three (3) sites with different dominant breed grazing (site 1 mainly grazed by Somba, site 2 mainly grazed by crossbreed and site 3 mainly grazed by Yakana) were selected according to the flow of animal breeds there. Three control sampling sites non-grazed of 900m<sup>2</sup> each were delineated and fenced for each grazing intensity site. Phytosociological surveys were conducted, soil compaction measured using a penetrometer and field saturated hydraulic conductivity determined using a tension infiltrometer. Five monthly measurements were made during three months on the diagonals of the fenced control areas and randomly on the area grazed during the dry season. The results show that pastures vegetation cover depends on breed. The control areas show a dominance of poaceae (56.37–65.78%) followed by fabaceae (21.16–37.42%) and a very low presence of other species (6.21–13.06%). However, on the grazed sites, the presence of other species was higher (41.07–52.34%) followed by poaceae (31.44–40.21%) and fabaceae (16.22–21.36%). Soil compaction was higher on the Yakana (6.04–7.9 N/m<sup>2</sup>) and crossbreed (9.32–10.1 N/m<sup>2</sup>) sites than on the Somba (4.44–7.20 N/m<sup>2</sup>) ones. Hydraulic conductivity on soils varied according to breed: 6.05–13.3 10<sup>-4</sup> cm/s for Somba site; 4.03–13.11 10<sup>-4</sup> cm/s for Crossbreed site and 10.58–12.24 10<sup>-4</sup> cm/s for Yakana site. Higher soil compaction was observed for Yakana and poor water infiltration for Somba. The choice of the breed is key to influence vegetation cover, compaction and the hydraulic conductivity of water in a grazing management program.



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Selected Speaker

## **sciforum-059492: Forecasting Vegetation with Sentinel-2 Satellite Images : Morocco Capital and Its Surrounding Prefectures**

**Hafssa Naciri <sup>1</sup>, Nizar Ben Achhab <sup>2</sup>, Fatima Ezahrae Ezzaher <sup>1</sup> and Naoufal Raissouni <sup>2</sup>**

<sup>1</sup> Ph.D. student at Abdelmalek Essaadi University

<sup>2</sup> Professor at Abdelmalek Essaadi University

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Land cover change analysis is one of the most important tools for assessing vegetation growth over extended periods. Performing this analysis has become easier due to the high availability of high-resolution images which can be obtained by multiple sensors (i.e., Sentinel-2, Landsat, AVHRR, MODIS, IKONOS, etc.). Using Sentinel-2 images, we conducted a based time series vegetation analysis of Morocco's capital and its surrounding prefectures (Rabat, Salé, Skhirat, Témara) from 2015 to 2022. Firstly, we classified all Sentinel-2 satellite image database as cloudy and non-cloudy images, and then we selected for every year four images that represent the four seasons. Secondly, we used NDVI Thresholds Method (NDVI<sup>THM</sup>) to classify the assessed NDVI into three intervals that represent three types of vegetation areas: (i) Arid area, (ii) Transitional area, (iii) Dense area. Lastly, we estimated the cycle shape of each area using the forecasting Centered Moving Averages (CMA) method. Both forecasted and real NDVI show a cycle with a slightly increasing trend. This forecasted NDVI estimate 0.48 during spring and 0.18 during autumn. However, Sentinel-2 NDVI is between 0.45 and 0.2. Regarding real NDVI results of arid area, transitional area, and dense area surfaces, they are respectively between (150.14–1278.28), (522.60–1292.12), and (2.64–1212.74) square kilometers. As the same, forecasted NDVI results of arid area, transitional area, and dense area surfaces, are respectively between (168.35–1469.51), (681.30–1015.76), and (26.61–974.28) square kilometers.



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Selected Speaker

## sciforum-056029: Impact of Forest Degradation on Carbon Stocks of the Northeast Brazilian Amazon, Maranhão State

Raimundo Matos Pereira Neto and Celso Henrique Leite Silva Junior

<sup>1</sup> Universidade Estadual do Maranhão, UEMA

<sup>2</sup> Instituto Nacional de Pesquisas Espaciais, INPE

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The northeast Brazilian Amazon, in the state of Maranhão, is a region marked by the scars of decades of deforestation and degradation. About 23,967 km<sup>2</sup> (24%) of the original forest cover remains, 25% was degraded by fire and selective logging. However, poor is known about the amount of forest carbon stored in this region, especially in areas where secondary forests have grown.

Here, we use a remote sensing dataset to map carbon stocks in 2019 across Amazon of Maranhão state at 50-m spatial resolution. We quantify the stocks in degraded and non-degraded old-growth, secondary, and mangrove forests from the carbon map. In addition, our analyses were stratified into legally protected and non-protected lands.

Our results showed that forests stored around 279 million tons of carbon in 2019, 17% in secondary and 78% in old-growth. About 71% of old-growth forest stocks were on legally protected lands, while 83% of secondary forest stocks were outside. Degraded old-growth forests had lower carbon stocks than non-degraded forests ( $p < 0.05$ ). In Indigenous Lands, carbon stocks had an average density of 157 tons ha<sup>-1</sup> in non-degraded forests and 64 Mg ha<sup>-1</sup> in degraded forests, a decrease of 59%. In Conservation Units, carbon stocks had an average density of 158 Mg ha<sup>-1</sup> in non-degraded forests and 104 Mg ha<sup>-1</sup> in degraded forests, a decrease of 34%.

Our findings show that the Northeast Brazilian Amazon Forest remnants are a carbon source due to degradation. Thus, the region urgently needs policies to combat the degradation and restoration of already degraded forests. Furthermore, secondary forests must be protected to guarantee the permanence of their carbon stocks; these forests will sequester even more carbon from the atmosphere with the protection, thus serving carbon credit programs.



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Selected Speaker

## sciforum-059421: Land Cover Map Automatic Updating via Landsat Time Series and Temporal Trajectory Analysis Algorithms

Zhenrong Du <sup>1</sup>, Le Yu <sup>1</sup>, Yidi Xu <sup>2</sup> and Jiyao Zhao <sup>1</sup>

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Accurate and timely land cover maps can provide an important data base for earth system model development, resource management, ecological and environmental evaluation studies. However, accurate and timely land cover maps were usually not available at global or national scale due to the complexity of land cover change and the difficulty of large-scale mapping. Therefore, this paper developed a new land cover change monitoring method to update annual land cover maps automatically based on existing land cover mapping products. Taking China's Land-Use/cover Datasets-Annual (CLUD-A) products as an example, this paper obtained satisfactory land cover mapping accuracy based on the Continuous Change Detection and Classification (CCDC) and Landsat-based Detection of Trends in Disturbance and Recovery (LandTrendr) algorithms. First, the Landsat spectral time series are fed into CCDC for initial land cover change monitoring. Second, LandTrendr was used for fitting and segmentation of Landsat time series. Erroneous changed regions from CCDC due to observation frequency differences are then filtered by the analysis results of LandTrendr. Third, the changed regions were classified using Random Forest and sample migration algorithms for automatic annual updating of existing land cover mapping products.



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Selected Speaker

## **sciforum-058042: Monitoring of Human Activities in Nature Reserves Using Multi-Source Remote Sensing Data and Deep Learning Approach**

**Qianwen Lv and Zhixin Qi**

Regulated

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Land resources has becoming increasingly tense in Guangdong Province, China in the past decades because of the rapid urbanization. Reclamation of land from the sea has been implemented to deal with the land resource shortage. The intensive and unreasonable reclamation has caused serious environmental problems, such as ecological service decline and water eutrophication. Remote sensing techniques is a promising tool of monitoring land reclamation in the coastal areas. However, there are still limited studies on methods of automatically monitoring the dynamic of reclamation land. To fill in this gap, this study developed a novel method for monitoring the land reclamation using Landsat and sentinel-2 images and extracted the reclamation area of Guangdong from 1991 to 2021 using the proposed method. The results showed that (1) the reclaimed area in Guangdong increased by xxx km<sup>2</sup> in the past 30 years, mainly for urban construction and aquaculture; (2) the reclaimed area is mainly concentrated in the Pearl River Delta, accounting for xx% of the total reclaimed area. In the background of the current national restriction on reclamation and over-development, this study provides an effective method to investigate the dynamic of land reclamation at a large scale, which is helpful in strengthening the comprehensive control of reclamation and protecting the coastal ecological environment to ensure regional sustainable development.



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Selected Speaker

## sciforum-059561: Spatio-Temporal Dynamics of Habitat Quality in China's First Group of National Parks from 1980–2019

Xin Chen <sup>1</sup>, Le Yu <sup>1,2</sup>, Yue Cao <sup>3,4</sup>, Zhicong Zhao <sup>3,4</sup>, Youbo Zhuang <sup>3,4</sup>, Xuehua Liu <sup>3,5</sup>, Rui Yang <sup>3,4</sup> and Peng Gong <sup>2,6</sup>

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China announced the establishment of the first national parks in October 2021. As the most biodiversity-rich part of the national natural ecosystem, its biodiversity has long been threatened by drastic land use/cover changes caused by human disturbance, and it is necessary to grasp the spatio-temporal dynamics of habitat quality. We selected habitat quality as an indicator of biodiversity and used the InVEST habitat quality model and spatial analysis methods based on 30 m year-by-year land use/cover datasets products from 1980–2019 to assess the spatio-temporal variability characteristics of habitat quality for the first group of national parks over the past 40 years. The results show that land use changes in the national park are dramatic, due to a combination of ecological project implementation, agricultural production, and human construction activities. The average habitat quality of Northeast China Tiger and Leopard National Park (NCTL), Hainan Tropical Rainforest National Park (HTR), Wuyi Mountain National Park (WM), Giant Panda National Park (GP), and Sanjiangyuan National Park (SJY) was \*\*\*, \*\*\*, \*\*\*, \*\*\*, and \*\*\*, respectively. Since the reform and opening up, the overall habitat risk in SJY, HTR, and WM has decreased, while the overall habitat risk in GPM and NCTL has increased. Habitat quality change in SJY was dominated by improvement type (\*\*%), while degradation type dominated in the areas of habitat quality change in GP (\*\*%), NCTL (\*\*%), HTR (\*\*%) and WM (\*\*%). Among them, the habitat quality of HTR and WM showed an overall improving trend, while locally degraded areas dominated. The spatial distribution of habitat quality improvement and degradation rates varied widely among national parks but showed an overall high-high and low-low clustering pattern. The results of the study can provide an important quantitative decision basis for the development of optimal regional conservation and future restoration plans for the national park.



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Session 2. Land Socio-Economic and Political Issues

Selected Speaker

## **sciforum-059760: Evaluations of Coastal Resilient Cities—Mutual Effects of Land Use Allocation and Climate Risks**

**Chia-Fa Chi and Shiau-Yun Lu**

Department of Marine Environment and Engineering, National Sun Yat-sen University

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In the past few decades, heavy rainfall and flooding have caused serious household damage and property losses along the coast of Taiwan. This creates an urgent demand to build coastal cities as resilient cities. The Coastal Zone Management Act was enacted in 2014 by the Taiwanese Ministry of the Interior. This act addresses the need for comprehensive examination of current land use allocations along coastal zones. Interactions among disaster impacts, coastal urban expansion and artificial economic interference alter the coastal human-environment systems and increase the vulnerability of coastal cities. This research conducts a land use evaluation approach to illustrate the variations of resilience for Taiwanese coastal cities associated with risks of flooding and sea level rise. This analysis is based on three phases of resilience: absorptive capacity, adaptive capacity and restorative capacity. We assess capacities in the land resilience of coastal socioeconomic systems to floods and rising sea levels, and four types of coastal cities are selected as study sites, included coastal cities whose mainly land uses are residential, industrial, agricultural, and aquacultural. Data and layers are generated and analysed within Geographic Information System (GIS). The results present the changing curves of absorptive capacity, adaptive capacity and restorative capacity in these four types of cities, which can explain the varieties among land use allocations, flood potential and sea level rise. This study aims to advocate the resilience analytical framework of three phases that could be applied to all types of coastal cities. The findings could be used as a basis for strengthening pre-disaster resilience in coastal urban areas.



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Invited Speaker

# **sciforum-061548: Global Economic and Diet Transitions Drive Latin American and Caribbean Forest Change During the First Decade of the Century: A Multi-Scale Analysis of Socioeconomic, Demographic, and Environmental Drivers of Local Forest Cover Change**

**David López-Carr <sup>1</sup>, Sadie J. Ryan <sup>2,3,4</sup> and Matthew L. Clark <sup>5</sup>**

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<sup>5</sup> Center for Interdisciplinary Geospatial Analysis, Department of Geography, Environment, and Planning, Sonoma State University, Rohnert Park, CA 94928, USA

Latin America and the Caribbean (LAC) contain more tropical high-biodiversity forest than the remaining areas of the planet combined yet experienced more than a third of global deforestation during the first decade of the 21st century. While drivers of forest change occur at multiple scales, we examined forest change at the municipal and national scales integrated with global processes such as capital, commodity, and labor flows. We modeled multi-scale socioeconomic, demographic, and environmental drivers of local forest cover change. Consistent with LAC's global leadership in soy and beef exports, primarily to China, Russia, the US, and the EU, national-level beef and soy production were the primary land use drivers of decreased forest cover. National level gross domestic product (GDP), migrant worker remittances and foreign investment, along with municipal-level temperature and area, were also significantly related to reduced forest cover. This challenges forest transition frameworks, which theorize that rising GDP and intensified agricultural production should be increasingly associated with forest regrowth. Instead, LAC forest change was linked to local, national, and global demographic, dietary and economic transitions, resulting in massive net forest cover loss. This suggests an urgent need to reconcile forest conservation with mounting global demand for animal protein.



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Selected Speaker

## sciforum-059180: The Relationship between Land Rights and Deforestation in Brazil

Gabriel Siqueira <sup>1</sup>, Bastiaan Philip Reydon <sup>2</sup> and Delaide Silva Passos <sup>1</sup>

<sup>1</sup> Instituto Governança de Terras

<sup>2</sup> Kadaster International

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The change from forests to pasture or agricultural land is the largest contributor to the greenhouse gas emissions in Brazil still today. Although Brazil was able to reduce its level of deforestation from 27,000 km<sup>2</sup> (2004) to 5,000 km<sup>2</sup> (2012), since 2014 deforestation has increased, reaching more than 10,000 km<sup>2</sup> in 2021 and expected record peaks in 2022.

There is enough evidence that deforestation occurs mostly on undesignated and unregistered land, as it is used as a speculative asset and/or in a productive way, but the appetite for more land grabbing is still worrisome. Literature shows that the availability of this kind of land in Brazil is between 50 and 100 million hectares, so the risk to perpetuate this pattern and destroy the remaining forests is rather large.

This article has as main aim to show how the Amazon deforestation reached its lowest levels, mainly due to a combination of strong command-and-control policies and an institutional setting that was able to enforce it. But most important policies designed to forest, and communities' protection played an important role, by clarifying property rights and setting responsibilities to preservation and creating the legal and institutional conditions to enforce the existing legislation. From this perspective it will be analyzed how these different settings affected the decision of players towards deforestation.

The first section will show the Amazon deforestation pattern and the link to its causes, mainly the existing policies. The next item will show the legal and institutional instruments that made possible the deforestation reduction in the 21st century. The third item will show how the nation clarified the legal rights to land and how it diminished deforestation. The fourth will evidence how those instruments were dismantled, provoking an increase in deforestation. At last, a synthesis will be presented with proposals for recovering previous results.



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Selected Speaker

## **sciforum-058360: Indirect Effects of Land Transformation on the Sustainability of Wetlands : Three Diffuse Anthropization Analysis from the Perspective of Geostatistics in Spain**

**Salvador Garcia-Ayllon**

Technical University of Cartagena, Associate professor

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One variable that is not traditionally considered sufficiently rigorously in the management and conservation of wetlands is the environmental impact of the transformation of the surrounding territory due to anthropic diffuse issues. These vulnerable protected areas of high ecological value dependent on the existence of water is complex and generally depends on the climate and rainfall in semi-arid territories such as Spain. The origins of this phenomenon are not usually easy to appreciate, since it does not necessarily occur in the environment directly closest to protected areas and it is always difficult to measure and analyze. An innovative spatiotemporal methodological framework is proposed to evaluate all these phenomena of diffuse anthropization whose indirect impacts on protected areas dependent on the existence of water are currently full of unknowns. Using GIS territorial impact indicators, a geostatistical analysis based on the concept of the area of influence of diffuse anthropization (AIDA) is raised to assess the spatial correlation between the anthropic transformation of the territory and the degradation of protected areas over time. The proposal has been applied with a comparative approach to three relevant wetlands located in Spain (Doñana, Tablas de Damiel and Albufera de Valencia parks) suffering from ecological deterioration because of water stress linked to indirect impact of economical activities. Clarifying results on the existing spatial correlation patterns between both issues are obtained allowing to implement new territorial policies in land use planning. Several actions are proposed, such as the limitation of intensive agriculture in areas whose groundwater from aquifers is essential for sustaining wetlands or the regulation of urban growth and industrial activities in territories connected to natural parks through wadis with usual surface runoff.



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Selected Speaker

## sciforum-059724: Land Resource Management Policy in Selected European Countries

**Armands Auzins**<sup>1</sup>, **Peter Brokking**<sup>2</sup>, **Evelin Jürgenson**<sup>3</sup>, **Jenny Paulsson**<sup>4</sup>, **Andis Romanovs**<sup>1</sup>, **Jolanta Valčiukienė**<sup>5</sup>, **Jānis Viesturs**<sup>1</sup> and **Kurt Weninger**<sup>6</sup>

<sup>1</sup> Faculty of Engineering Economics and Management, Riga Technical University

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<sup>6</sup> Faculty of Architecture and Planning, TU Wien

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Land use, land resource demands and landscape management practices are linked to many of the environmental, climatic and socio-economic challenges faced by contemporary society. The study aims to conduct a comparative analysis about the experience of the management of land-related resources (LRM), thus responding, to how the land-related resources are managed and what policies support it? When exploring LRM policy in selected countries, the experience of three Baltic States (Latvia, Lithuania and Estonia) and two other countries under the jurisdiction of continental Europe (Austria and Sweden) was analysed and their comparison was made. To meet the aim of the study, ten research questions have been addressed. These questions are concerned with: the existence of the common land policy, LRM model, legal framework for the use of land resources, the influence of the territorial and physical characteristics of the land on the LRM policy, the impact of the LRM policy on the land use patterns, problems and instruments targeting sustainable LRM, the institutional framework addressing cross-border issues in LRM, the provision of continuous assessment of the state of land resources, the achievement and reflection of the balance of specific sectors' interests through spatial planning, other tools (besides spatial planning) in land management to balance the sectoral interests. The study follows a qualitative research technique, thus is mainly based on the literature review, expert opinion and comparative analysis. Research experts represent the selected countries and have sufficient experience in land law and spatial planning. Based on the study's outcome, the most important comparative characteristics of LRM policies are discussed and conclusions are provided. In line with the aims and objectives of the National Research Program "Sustainable Spatial Development and Rational Use of Land Resources", this paper aims to provide suggestions for improving the legal framework regarding LRM in Latvia.



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Session 3. Renewable Energy and Land Use

Selected Speaker

## sciforum-059467: Energy Colonialism, Land Use and Renewable Energies

Alberto Matarán Ruiz <sup>1</sup> and Josefa Sánchez Contreras <sup>2</sup>

<sup>1</sup> University of Granada

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This research assumes that the transition to renewable energies constitutes a continuation of energy colonialism covered by a greenwashing strategy. In the center of this hypothesis we consider the large amount of land that is occupied and demanded for wind and solar megraprojects in subaltern territories. This makes a big difference comparing with the traditional sources of energy. We intend to confirm all this by studying five cases of renewable energy deployment in four continents: Isthmus of Tehuantepec (Oaxaca, Mexico); Sami Territory (Norway, Sweden, Finland and Russia); Occupied Territories of Western Sahara (Saharawi Arab Democratic Republic); Spain; and India. The analysis presented here has been developed with a particular focus on the question of land in relation to the following dimensions of energy colonialism: The geographical dimension of colonialism (within a country and internationally), the dimension of land grabbing and dispossession, the dimension of the territorial impacts, and finally, the dimension of resistance and social conflicts.



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Selected Speaker

## **sciforum-059196: Energy Dilemmas: Climate Change, Creative Destruction and the Transition to a Carbon-Neutral Development Path**

**Mick Dunford** <sup>1,2</sup> and **Mengyao Han** <sup>3</sup>

<sup>1</sup> Emeritus Professor, School of Global Studies, University of Sussex

<sup>2</sup> Visiting Professor, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences

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Managing a to-date far from sufficient transition to low carbon development has proved problematic with the recent emergence of energy crises creating a tension between the maintenance of economic growth and dealing with the need to avoid climate disaster. On the one side drastic reductions in carbon emissions imply creative destruction affecting an existing carbon-intensive model of development. On the other side as accelerated obsolescence of some of the existing capital stock reduces supply, and a major investment push is required to compensate for weakened supply. This double-sided problem is sometimes called an energy dilemma: the existence of a tension between ensuring secure, reliable and affordable energy provision and limiting negative environmental impacts of the use of fossil fuels. In this article this dilemma is interpreted in the light of a succession of industrial revolutions and cyclical evolutions and a case is made for an approach that centres on a developmental state, or plan-rational state seeking to achieve substantive social and economic goals rather than a regulatory, or market rational, state concerned with market prices and rules of market competition.



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Poster Presentation

## **sciforum-058784: Land Use Monitoring for Centralized Photovoltaic Power Stations in China**

**M. Y. Han**

Institute of Geographic Sciences and Natural Resources Research

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As the climate change effects of traditional energy consumption are more pronounced, renewable energy development has become increasingly essential in meeting electricity demands and mitigating carbon emissions. Photovoltaic power generation is a kind of technology that converts solar energy into electric energy, and the shift from fossil-fuel-based energy to clean energy is an imperative step for carbon emission reduction. Through combining high-precision remote sensing data, this study attempts to identify land use types of centralized photovoltaic power stations and compare the land use changes of photovoltaic power stations between 2010 and 2020. Combining remote sensing data with computer simulation is beneficial for planners to quantify and evaluate potential carbon emission reduction benefits. Based on the land use monitoring for centralized photovoltaic power stations within China, the results of this study are expected to provide implications for the implementation of China's dual carbon goals and the sustainable development of China's photovoltaic industry.



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Selected Speaker

## **sciforum-058801: Optimizing Sustainable Bioenergy Production on Marginal Land through a Web-Based Platform**

**Giuseppe Pulighe and Tiziana Pirelli**

CREA Research Centre for Agricultural Policies and Bioeconomy

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Bioenergy systems can play a central role in the transition towards sustainable, inclusive, resilient, low emissions and circular economies, while creating income opportunities, enhancing livelihood and access to energy for current and future generations, leaving no-one behind. However, the foundations of sustainable bioenergy systems need to be based on structured ex-ante analysis that considers specific contexts and assess possible trade-offs, either in terms of economic, environmental and social aspects. In this framework, the optimization of Land-Energy-Water nexus takes on a key significance to overcome context-specific challenges taking into account the multiple competitive uses of limited resources. Over the last decade, the use of marginal land has been emphasized as a valuable strategy for bioenergy systems to overcome the food vs fuel dilemma. Nevertheless, the cultivation of bioenergy crops on fragmented marginal areas in Italy can have significant trade-offs on the benefits derived from the establishment of local bioenergy systems, for instance on the energy balance or the final C-footprint of the value chain. The objective of this study is to perform an ex-ante assessment of the sustainability of bioenergy pathways in the Basilicata Region (Southern Italy), through a web-based platform, with a focus on local Land, Energy and Water nexus. The platform, developed in parallel with the Geographic Information System (GIS) maps, relies upon the methodologies of the Global Bioenergy Partnership Sustainability Indicators. The Web-GIS land-energy-water nexus analysis allows to compare and explore different and complex cropping scenarios and interlinkages that minimize input resources and optimize the nexus. The application of the user-friendly Web-GIS platform to the case study demonstrates the effectiveness and the usability for supporting investors and stakeholders in the decision-making process for new bioenergy investment projects that rely on biomass from underutilized and marginal lands.



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Selected Speaker

## **sciforum-059678: The Huge Amount of Industrial Land Use Induced by Concentrating Solar Power Technology: Evidence Based on Systems Process Analysis for a Pilot Plant in China**

**Xudong Wu, Jingyu Liu, Yongjuan Xie, Yitian Xie, Jiayi Zhou and Yimeng Xu**

Beijing Forestry University

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To reflect a crucial aspect of land use by concentrating solar power, this study has examined the industrial land use induced by solar power plant infrastructure by a case work of a pilot concentrating solar power tower plant in China. We use the systems process method that combines process analysis and systems input-output analysis. A comprehensive package of input items in the construction and operation stages are included, which are treated as sectoral products of the macro economy and supported by intensity database generated from systems input-output analysis. By accounting for the industrial land use related with each input item, we revealed the huge amount of industrial land use induced by solar plant infrastructure, which turns out to be in magnitude three times as much as the onsite land occupation. The result in this work is demonstrated to be several times as much as that of previous findings, reflecting an obvious underestimation of the indirect land use induced by plant infrastructure in previous studies. The results help provide a new perspective for viewing the land displacement by solar power deployment.



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Session 4. Land Planning and Architecture

Selected Speaker

## sciforum-056005: Can Planning Influence the Dynamics of Urban Green Infrastructure? Answers from Poland and Romania

Alexandru-Ionut Petrisor <sup>1,2,3</sup>, Lidia Mierzejewska <sup>4</sup> and Andrei Mitrea <sup>5</sup>

<sup>1</sup> Ion Mincu University of Architecture and Urbanism

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<sup>4</sup> Adam Mickiewicz University in Poznań, Poland

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The importance of studying urban green infrastructure (UGI) is justified by its ecosystem services, contributing substantially to the welfare of urban dwellers, and urban sustainability. However, planning is crucial to creating this virtuous circle, and improper or no planning can revert it. The studies presented rely on a common methodology, employing an ecological approach, in its epidemiological meaning, to look at the dynamics of UGI in Polish and Romanian cities covered by Urban Atlas data across 2006–2012 and 2012–2018. Given the potential of findings to be affected by ecological fallacy, meaning that overall results are subject to confounding and spurious associations, the methodology includes in-depth individual cases studies for selected cities. Our findings show that UGI corresponds to the four types of city nature: remnants and extensions of natural systems, landscaped areas, and spontaneous species. Overall all cities have experienced the loss of their UGI and many its transformations, with many local variations. In all analyzed cities, natural and/or agricultural green spaces make up most of the UGI, while landscaped areas constitute a small share, and are more prominent in large, populous, and dense cities. The loss seems to be proportional to the share of each UGI category, i.e., the larger the share, the larger its loss. The analysis of individual examples shows that the involvement of citizens, corroborated with their general environmental awareness, is essential for planning a healthy UGI. At the same time, local authorities play an important role in influencing planners to account for the UGI, and influence its fate positively. Overall, planners must strive keeping the existing UGI, ensuring its continuity, and adding more urban greenery; local authorities should account for scientific evidence concerning the role of urban greenery, and scientists should deliver their recommendations to politicians in a simpler and more condensed way.



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Selected Speaker

## sciforum-059528: Peer Effects in the Non-Conforming Built-Up Land Expansion in Zhangzhou City, China

Zhichao He <sup>1</sup>, Christine Fürst <sup>1</sup> and Anna Hersperger <sup>2</sup>

<sup>1</sup> Martin Luther University Halle-Wittenberg

<sup>2</sup> Land Change Science Research Unit, Swiss Federal Research Institute WSL, Birmensdorf, Switzerland

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Spatial planning is used as an essential policy tool to control built-up land expansion. However, the non-conformance between spatial planning and built-up land expansion is a widespread concern. The deliberate granting of non-conforming permissions for built-up land expansion is difficult to understand from a single government perspective since governments compete with their peers. In this study, we define five types of peer relationship and address peer effects among local governments with spatial econometric models to identify peer effects in the non-conforming built-up land expansion from 2010 to 2020 among 1662 villages in Zhangzhou City, China. We found that the peer effects are an important reason for the non-conforming built-up land expansion. Specifically, geographical peer, political peer, economic peer, geographical economic peer, and political economic peer contributed to 0.62, 0.54, 3.44, 0.58, and 0.74% increase in a village's non-conforming built-up land expansion, respectively. Based on our findings, we suggest improving the effectiveness of spatial planning in controlling built-up land expansion by enhancing the intervention of central government, breaking the economic and political dependence of local governments on built-up land, and improving supervision technology.



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Selected Speaker

## **sciforum-060432: Urban Green Space Planning in Kathmandu Metropolitan City, Nepal: Addressing Modifiable Areal Unit Problem**

**Sabina Bhandari and Chuanrong Zhang**

Department of Geography, University of Connecticut, Austin Building, 215 Glenbrook Rd #422, Storrs, CT 06269, USA

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The rapid population growth and unplanned continuous expansion of impervious surfaces due to unplanned urbanization in Kathmandu Metropolitan City (KMC), Nepal has induced changes in land use land cover and the characteristics of land surface. This has caused degradation of natural ecosystem with unsustainable land use patterns and modification in local climate resulting urban heat island. So, KMC's ability to provide ecosystem services has been severely impacted. The physical, mental, and environmental health benefits of Urban Green Spaces (UGS) have been widely put forward by research communities. Considering its benefits, planning for UGS establishment has been conducted in different parts of the world. However, depending on the size, geographic location, population, and activities conducted, urban structure, land use land cover of the city, and health of the available green spaces, the role of UGS varies. KMC being an unplanned capital city of a developing country Nepal, requires proper planning of UGS to minimize the severe effects of the rapid urbanization. We have developed composite indices for prioritizing the areas for UGS establishment in KMC. Our result includes ward-level prioritization but the areas within ward which requires extreme attention for UGS establishment could be smoothened when aggregated by ward. Therefore, to address this Modifiable Areal Unit (MAUP) problem, we have conducted hotspot analysis on a larger scale. The objectives of this paper are to: (i) define a set of indicators which are context specific to KMC, (ii) prioritize areas for UGS establishment, (iii) address Modifiable Areal Unit Problem (MAUP), (iv) encourage effort on improving the condition of available UGS to increase the efficiency of land use, and (v) ensure that the result could be put into practical action by the urban planners.



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Session 5. Landscapes Disturbance in Global South

Selected Speaker

## sciforum-060091: A Past-Present-Future Lens on Environmental Change—Integrating Palaeoecology and Participatory System Dynamics Modelling for Land-Use Management

Cherie Janine Dirk

<sup>1</sup> African Climate and Development Initiative (ACDI), University of Cape Town

<sup>2</sup> Plant Conservation Unit, University of Cape Town

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Conservation and agricultural landscapes are social-ecological systems that co-produce ecosystem services (ES), which change over time in response to environmental, biotic and social drivers. Failure to consider this variability, and the feedbacks that cause system instability, can have consequences for sustainable ES provision. A transdisciplinary approach is needed to understand the interacting processes that drive the dynamics of ES provision. This study applies a conceptual meta-framework: *past-present-future lens on environmental change* to interpret changes in land cover and ES, with the aim of informing sustainable land-use management within the Cape Floristic Region, a globally recognised biodiversity hotspot. Variability of a supporting/provisioning ES (plant biodiversity) and two land-use drivers of change (fire and herbivory) are explored in a case study from a lowland conservation site—Elandsberg Private Nature Reserve (EPNR). Palaeo-data (fossil pollen, spores and charcoal) were used to define the historical range of variability. Participatory system dynamics (including stakeholder engagement via a social-learning workshop and key informal interviews) was used to identify feedbacks in the dynamic SES structure. Palaeoecological results revealed a transition to unpalatable *Elytropappus*-dominated vegetation associated with increased disturbance from the mid-20th C. Model simulation results suggest that it may be difficult to return the ecological system to its historical range of variability even if grazing and fire are reduced. This innovative approach provides a contextual understanding of processes that influence dynamic social-ecological systems and translates long-term multi-proxy palaeoecological data into a form that can be used by policymakers and land-use managers to inform sustainable management of ES.



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Selected Speaker

## **sciforum-061140: Collaboration and Multi-Stakeholder Engagement in Landscape Governance And Management in Africa: Lessons from Practice**

**Favretto Nicola <sup>1</sup>, Susannah M. Sallu <sup>1</sup>, Tali Hoffman <sup>2</sup> and Shackleton Sheona <sup>3</sup>**

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A multitude of landscape disturbances and interconnected socio-economic and environmental impacts are emerging across Africa as a result of escalating anthropogenic drivers of global and local change. Land use changes, infrastructural developments, changing weather patterns, and population growth and mobility are transforming the continent's landscapes and social-ecological systems over time, shaping the livelihoods of the people dependent on these landscapes and the critical ecosystem services they provide. Increasing levels of degradation, conflict, poor governance, competition for land and inequality, exacerbated by climate change, are adding to the burden carried by local people, especially the most marginalised. In pursuing pathways towards a more resilient future, collaborative and multi-stakeholder governance and management of landscapes have been promoted by government agencies, NGOs and conservation organisations. Meaningful collaboration can promote the inclusion of marginalised voices, ensure appropriate actions and responses aligned to local concerns and needs, and bring frequently disconnected actors, sectors, and government institutions together in pursuit of a common goal. However, there is no single way to achieve effective collaboration, and different landscape projects have experimented with different entry points and engagement processes. This poster is grounded on a Special Issue published in the *Land* journal, which collates ten papers with case studies from five African countries (South Africa, Zimbabwe, Uganda, Kenya, and Madagascar), written by 56 authors from 29 organisations (including universities, research institutes, non-governmental and international organisations, and the private sector). Drawing on the expertise of these multiple partners in landscape governance and management in Africa, this poster summarises key upscalable lessons from practice for supporting more resilient and equitable landscapes.



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Selected Speaker

## **sciforum-059716: Impact of Land Use Land Cover Changes on the Ecosystem Services of the Atewa Range and Forest Reserve, Ghana**

**Fiati Xorllali Favour, Kofi Adu-Boahen and Okyere Yeboah Emmanuel**

Department of Geography Education, University of Education Winneba, Ghana

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This study sought to investigate the ecosystem services provided by the Atewa Range Forest Reserve (ARFR) and how land use land cover change within the forest has influenced provision of ecosystem services in the ARFR. The study employed the mixed method approach using explanatory case study design. Satellite images for the years 1990, 2003 and 2018 were acquired from USGS websites for land cover change analysis. Observation, structured interview schedules were used in gathering data for this study. The stratified random and purposive sampling techniques were used in selecting respondents for the study. The respondents easily identified the provisioning services provided by the ARFR such as snails, honey, mushrooms, bush meat and herbal medicines among others. They mentioned other services such as flood, climate and soil fertility regulation, air quality and recreation among others. The land cover change analysis conducted indicated a total decline in forest cover with a net loss of 1.4% over the period under study whilst bare areas increased by 1.3%. The loss in forest cover can be attributed to illegal chainsaw and 'galamsey' activities occurring in the ARFR. The respondents however indicated a reduction in the ecosystem services provided by the forest, which they partly attributed to the deterioration in forest cover. The study therefore recommends that the Forestry Commission, traditional authorities and local assembly should collaborate to enforce the law to protect the reserve accompanied by the necessary sanctions.



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## Abstracts

Session 6. Soil-Sediment-Water Systems  
Women in Land Science  
Land–Climate Interactions

Selected Speaker

## **sciforum-059410: Preliminary Results of the Application of Multiple Satellite Sensors for the Study of Water Resources and Land Subsidence in Agricultural Areas. Case Study: South Lombardy (Italy)**

**Serena Sapia<sup>1</sup>, Maria José Jiménez Alavarado<sup>1</sup>, Andrea Taramelli<sup>1</sup>, Mario Martina<sup>1</sup>, Beatrice Monteleone<sup>1</sup>, Margherita Righini<sup>1</sup>, Emma Schiavon<sup>1</sup>, Marcello Arosio<sup>1</sup>, Riccardo Giusti<sup>1</sup>, Marco Bianchi<sup>2</sup>, Iliana Senaldi<sup>3</sup>, Chiara Casarotti<sup>3</sup> and Emiliana Valentini<sup>4</sup>**

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The use of remote sensing is essential to obtain in-season information on crop as well as for land monitoring, in particular the synergic use of SAR and Optical data allows to investigate further various parameters to which these sensors are sensitive to. In agricultural landscapes crop practices account for the largest use of water resources (72% of total water extracted worldwide, 50% in Italy) and the amount of water extracted for irrigation purposes directly depends on the type of crops and their annual cycles. Land subsidence is a phenomenon caused by the lowering and compaction of the soil that can occur due to natural or anthropogenic causes, one of the most common being groundwater extraction.

In this study a multi-sensor approach is used to retrieve crop information and to measure local land subsidence in agricultural test sites located in Lombardy region, in northern Italy. TerraSAR-X radar datasets offer very high resolution, up to 1 meter, regardless of the weather conditions, while the Sentinel-2 mission provides optical datasets, freely available. In specific the radar datasets are used to analyze land subsidence, applying an InSAR tested method (SqueeSAR®); and to obtain crop features. From optical data, radiometric indices (NDVI, NDWI) and fractional cover compositions are extracted, using Spectral Mixture Analysis techniques.

The results of this study are crop classification maps at different growing periods and a displacement rate map of the study area. The work is strictly related to the NOCTUA project, a pilot project for the development of a commercial service for the collection, processing, analysis and distribution of radar data designed for the Lombardy region, in Italy. Obtained products from multiple sensors could support farmers and public authorities for the management of water resources to reduce the phenomenon of land subsidence and to mitigate the effects of climate changes.



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Selected Speaker

## **sciforum-056824: Past Trends and Future Changes in Land Use/Land Cover in the Fincha Basin, Ethiopia**

**Michael Nones and Motuma Shiferaw Regasa**

Institute of Geophysics, Polish Academy of Sciences

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The increasing human pressure on African regions is clearly recognizable looking at changes in land use land cover (LULC). To reduce this pressure and assure both a reduction of soil erosion and more suitable management of water resources, past trends in LULC should be analyzed critically to derive insights into possible future trajectories. Our study used the Fincha basin in Ethiopia as a case study, looking at the (i) identification of historical LULC change in the period 1989–2019, via the post-processing of Landsat satellite images representing this period; (ii) prediction of LULC in the next thirty years, combining Geographical Information Systems with modelling outcomes produced via the Land Change Modeler (LCM). Landsat5 and Landsat8 images were combined with field evidence to map LULC in three reference years (1989, 2004, 2019), while the Multi-Layer Markov Chain (MPL-MC) model of LCM was applied to forecast LULC in 2030, 2040 and 2050. The Fincha basin was classified into six classes: waterbody, grass/swamp, built-up, agriculture; forest and shrub. The results have shown that, in the past 30 years, this watershed experienced a reduction of forest and shrubs due to ever-increasing agricultural activities, and that such a trend is also expected in the future. In addition, the decrease in areas covered by natural forests can eventually drive to an increase in soil erosion, fostering the sediment siltation in the water reservoirs located in the basin. The study pointed out the urgency of taking actions in the basin to counteract such changes, aiming to safeguard the natural environment and reduce the negative effects of the present anthropogenic pressure.



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Selected Speaker

## sciforum-059839: The Gender Gap in Land Sciences: A Review of Women's Contribution to the Editorial Boards of Peer-Reviewed Journals

Somayeh Mohammadihamidi <sup>1,2</sup>, Mohammad Rezaei-Pandari <sup>3</sup>, Sima Fakheran <sup>4</sup> and Christine Fürst <sup>5,6</sup>

- <sup>1</sup> Institute for Geosciences and Geography, Department of Sustainable Landscape Development, Martin Luther University Halle-Wittenberg, Halle, Germany
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- <sup>5</sup> Institute for Geosciences and Geography, Department of Sustainable Landscape Development, Martin Luther University Halle-Wittenberg, Halle, Germany
- <sup>6</sup> German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig

Women are disadvantaged across the stages of academic publishing. In science, contribution in editorial boards of journals is evidence of a high reputation within a specialty or field. Therefore, the low presence of women in editorial boards can be considered as a disadvantage indicator for women in academia. This study aims to highlight the gap in women's contributions in Land science journals. We assessed the gender composition in editorial boards of 60 peer-reviewed journals by a meta-analysis based on a systematic literature review and obtained information on current and past editorial boards of these journals. The result shows that the current number of editorial board members is 5197 of which only 25.47% were women. Gender inequality is very evident in this group of journals. To the extent that in journals with a high impact factor, this inequality is even more than 75%. The results of the time series analysis have also shown that the presence of women in editorial boards has increased over the last decade, although this increase has been more in the Nordic countries. The geographical distribution of editorial board members is also very unequal in the North and South, 83% of female editorial board members are from northern countries, while only 12% are from the global South. According to the results, there is still a long way to go to achieve gender equality, especially in the field of land science. Thus, the academic community, editors, and journals must take proactive measures to achieve gender balance.



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Selected Speaker

# **sciforum-059723: The Influence of Different Plant Types within the Slope-Vegetation-Atmosphere Interaction of a Weather-Induced Active Landslide Mechanism: A Scenario-Based Numerical Analysis**

**Vito Tagarelli and Federica Cotecchia**

Polytechnical University of Bari

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The soil-vegetation-atmosphere interaction is becoming a subject of intense scientific research, also prompted by the wish of verifying the efficacy of selected vegetation as a sustainable mitigation measure for erosive phenomena and slope instability processes. The use of novel nature-based solutions (NBSs) making use of vegetation has been already proven to be successful in the reduction of erosion along slopes, or in increasing the stability of the shallow covers of slopes eventually; however, the efficacy of vegetation as slope mitigation measure still needs to be demonstrated for slopes location of deep landslides, whose current activity is weather-induced. Recently, both phenomenological and numerical diagnoses in literature have often found the slope-vegetation-atmosphere interaction as the triggering factor of the current activity of shallow failure mechanisms, as well as the acceleration of deep slow landslide bodies, especially with reference to the geo-hydro-mechanical context characterizing the southern Italian Apennines. In particular, a numerical simulation has been fully successful in reproducing the whole slope-vegetation-atmosphere interaction with reference to the “Pisciolo” slope, whose numerical diagnosis has been carried out by adopting the evapo-transpiration flux of the vegetation layer (winter wheat) found in situ. The aim of this contribution is to check the impact on the slope-vegetation-atmosphere interaction that different vegetation crops may have, potentially determining a different impact on the equilibrium condition of the slope system.

As such, this contribution reports about a scenario-based numerical investigation of both the transient piezometric regime and safety factor variations with time across the Pisciolo hill-slope, in relation to different vegetation crop types.



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Selected Speaker

## **sciforum-058038: Documented Review of the Establishment and Management of Forage Peanuts (*Arachis Pinto*) in Ruminant Feeding**

**Hernán Alberto Uvidia, Judid Loana Coyago, Jefferson Javier Llamoca and Natali Casigña**

Universidad Estatal Amazonica

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The research was carried out based on a bibliographic review that aimed to analyze the factors that influence the establishment, edaphoclimatic conditions, management, and nutritional contribution through different diets of *Arachis pinto* in ruminant feeding. It was evidenced that there are problems in livestock due to its low production, since it is attributed a poor feeding of the animals, due to the poor quality of the feed, as well as due to an excessive lack of knowledge in the use of pastures. Given this, the study of one of the main species of legumes little studied, but according to the literature very productive, is proposed. For this, very reliable information was sought in the different search browsers such as Google academic, Scielo, ResearchGate, Redalyc, Latindex, Network of open access repositories of Ecuador, among others, the information was classified and the results were structured, inquiry that contributes to the development of possible solutions, which will clarify the current panorama of producers dedicated to both agricultural and livestock exploitation. Through this information, it was possible to identify a great adaptation and resistance of this legume to different edaphoclimatic conditions, and it even becomes very favorable for soils and even more favorable for animals, whereby associating this legume to different diets with other grasses, they have shown very productive results in both cattle and sheep.



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Selected Speaker

## **sciforum-059651: Investigating the Trends and Drivers between Urbanization and Land Surface Temperature: A Case Study of Zhengzhou, China**

**Chenyu Du <sup>1,2</sup> and Shidong Ge <sup>1</sup>**

<sup>1</sup> College of Landscape Architecture and Art, Henan Agricultural University

<sup>2</sup> Hungarian University of Agriculture and Life Sciences

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The effect of urbanization on the urban thermal environment (UTE) has attracted increasing research attention for its significant effects on local weather and climate, and serious consequences for people. However, the systematic study on the relationship between urbanization and UTE are limitedly explored. Using quantitative thermal remote sensing and multi-buffer ring method and multiple spatial scales method, here we analyze four Landsat TM/ETM+ images of Zhengzhou in Central China acquired respectively on 28 May 2017, 28 July 2015, 6 November 2017, 9 January 2018, to investigate the spatiotemporal variations, trend and driving force in the land surface temperature (LST). Our results showed that LST generally increased with urban intensity, which was extremely obvious in spring and summer, weak in winter, but slight downward in autumn. The distance inflexion was in spring, summer, autumn, and winter, respectively. What's more, large LST variability existed within the same urban intensity and different scales, which may contribute to the urban landscape structure. Our study clearly indicates that cities provided ready-made solutions for mitigating urban heat, and we could use feasible planning and design of urban landscape to mitigate the urban heat islands.



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Session 7. Ecosystem Services Science for Applications in  
Planning and Decision Making

Selected Speaker

## **sciforum-059009: Estimating the Impacts of Land Use/Land Cover Changes on Ecosystem Services Value (ESV) in a Heavily Urbanized City of Bangladesh Using Google Earth Engine: Implications for Urban Sustainability**

**Muhammad Mainuddin Patwary <sup>1,2</sup> and Md. Mijanur Rahman <sup>3</sup>**

<sup>1</sup> Environment and Sustainability Research Initiative, Khulna, Bangladesh

<sup>2</sup> Environmental Science Discipline, Life Science School, Khulna University, Khulna, Bangladesh

<sup>3</sup> Department of Geography and Environment, Jagannath University, Dhaka, Bangladesh

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Rapid urbanization has altered the natural landscapes in the urban areas, causing a decline in many ecosystem services. A large amount of natural land has been converted to urban land that impacts the supply and demand of ecosystem services. However, dimensions of urban land-use changes and their effects on ecological systems have often been neglected. The degradation of natural ecosystems due to land-use change may require immediate attention from urban planners and policymakers. This study aimed to estimate the impact of land use and land cover (LULC) changes on ecosystem services value (ESV) in an urban area in Dhaka City. The present study estimated the impact of LULC on ESV by Google Earth Engine and the corresponding global value coefficient during 2010–2020. Trade-off/synergies of ecosystem services were measured using Pearson correlation. Results suggest that more human-modified land use (e.g. urban) have expanded rapidly at the cost of natural lands (e.g. water body, vegetation). These land-use changes have led to a significant loss (US\$ 4.7 million) of ESV during 2010–2020. Synergy relationship found among provision and regulating ecosystem services. Quantification of multiple ecosystem service values and their synergies can provide a good basis to promote sustainable urban development.



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# sciforum-059706: Analysis of Two Contrasting Scenarios of Land Use Change through an Ecosystem Services Lens

Alessandro Gimona <sup>1</sup>, Marie Castellazzi <sup>2</sup>, Bethany Wilkins <sup>2</sup>, Andrea Baggio-Compagnucci <sup>3</sup>, Paola Ovando <sup>4</sup> and Richard Hewitt <sup>5</sup>

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Land use trends depend on a combination of societal drivers, climatic influences, physical constraints and policy incentives. The influence of such drivers is mediated by the landscape structure and its potentiality to provide and constrain various benefits.

We use a spatially explicit approach to examine two contrasting scenarios of land use change for the whole of Scotland, and their effect on key ecosystem services: nutrient retention, sediment retention, connectivity of seminatural habitats, and carbon storage.

The scenarios were broadly inspired by two of the “Shared Socioeconomic Pathways” - SSP1 and SSP3 - used by IPCC, adapted to the Scottish context. Narratives were translated into land use change demands for croplands, grasslands, forests, seminatural habitats and subsequently modelled using the ApoLUS and LandFACTS tools. Climate change was accounted for through modelling changes in land capability for agriculture and forestry.

We then used a range of approaches (InVEST, individual-based movement simulator, forest growth modelling) to assess changes in ecosystem services, and we compared the present baseline to the two scenarios.

The result highlight spatially explicit differences in the losses/gains in benefits, and areas where policy intervention could mitigate the trade-offs.



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Selected Speaker

## **sciforum-058705: Modelling and Quantification Ecosystem Services in the Upper Omo Gibe Basin, South-Western Ethiopia**

**Abreham Berta Aneseyee**

Wolkite University

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Ecosystems Services (ESs) are fundamental to sustaining life. However, they are under pressure due to anthropogenic activities such as the expansion of agricultural land and the decline of forest cover, which causes the loss of ecosystem services. This study aims at quantifying and mapping ESs in the upper Omo-Gibe Basin of Ethiopia. The Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) model was used to estimate these ecosystem services. The Revised Universal Soil Erosion Equation (RUSLE) factors, topographic maps, meteorological and soil data were used as input data for modelling of soil loss and sediment delivery of the watershed. Evapotranspiration, root depth, available water content, meteorological data and Z- factors were also required to analyze the water yield. The carbon pools were estimated under each LUC to investigate the spatial carbon stock. The threat types, their maximum distance, mode of decay, and sensitivity to threats were investigated to model the habitat quality. Soil erosion modelling results showed that the total soil loss increased from 774.86 thousand tons in 1988 to 951.21 thousand tons in 2018. Cultivated fields generated the highest soil erosion rate, increasing from 10.02 t/ha/year in 1988 to 43.48 t/ha/year in 2018. This is logical as the correlation between soil loss and sediment delivery and expansion of cultivated area is highly significant ( $p < 0.01$ ). The water provision was increased by 16% in the last 30 years. Habitat degradation has continuously increased driven by agricultural expansion (25.41%) followed by population pressure (17.3%) and the majority of the area has become degraded. A substantial loss of carbon storage occurred in the watershed (11 t/ha) following the loss of forest cover at an annual rate of 35 t/ha. Overall, changes in LUC significantly affect watershed ecosystem services. This study helps decision-makers to further look into the conflict between economic development and integrated watershed development strategy.



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Selected Speaker

## **sciforum-059442: Anthropogenic Pressure on Natural Resource of Tolipir Landscape of Azad Kashmir (Pakistan): Conservation, Management and Challenges**

**Abul Hassan Faiz**

Women University of Azad Kashmir, Bagh

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Humans rely on ecosystem services and the livelihood options of mountain communities are agriculture, livestock maintenance and tourism. Tourism depends on pristine landscapes, high biological diversity, well-managed protected areas and snow cover. The mountain people are categorized as rural or urban; and majority live in rural settings. The poverty and vulnerability increases with elevation. The mountain people of transition countries are vulnerable to food insecurity and chronic hunger and believe that the mountain poverty has to be understood in the light of fragility of ecosystems, remoteness, poor accessibility and marginalization of mountain communities from the mainstream; lack of equity in terms of access to basic facilities such as health care, education, and physical infrastructure, as well as to markets, political power, and representation; lack of employment opportunities; and proneness to natural disasters. Looking from other side the biophysical fragility of mountain ecosystems is regarded as direct consequence for the socioeconomic vulnerability of mountain people and migration of mountain people is important for the development of mountain areas

The present study describes anthropogenic pressure in Tolipir landscape of lesser Himalayas by using GIS tools, questionnaire and field sampling surveys were used to estimate threats in landscape of Tolipir landscape. The anthropogenic pressure was determined by populace estimate and uses of natural biotic resources in mountainous landscape. The uses of natural resources was determined by documenting fuel wood consumption, grazing of animals in wild areas and hunting pressure. The results of anthropogenic pressure was compared with international standard of other hilly areas and management plan was designed to save mountain ecosystem of Tolipir Landscape.



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Selected Speaker

## **sciforum-058053: Ecosystem Services Assessment in Iran; Current Status, Gaps and Future Vision**

**Hossein Kazemi <sup>1</sup> and Christine Fürst <sup>2</sup>**

<sup>1</sup> Department of Agronomy, Faculty of Plant Production, Gorgan University of Agricultural Sciences and Natural Resources (GUASNR), Gorgan, Iran

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Iran contains an enormous diversity of ecosystems. Also, the number of its species indicates biodiversity richness. We reviewed the Iranian literature as desktop research and analyzed the current status, gaps and trends in the operationalization of the ecosystem services (ES) concepts in Iran. Findings revealed that studies differed strongly with respect to their spatial scope, the ecosystem type, ES assessed and the methodologies applied. The most studies related to natural ecosystems focused on the monetary valuation of services. Generally, almost studies in Iran carried out the ES assessment based on Millennium Assessment (MA) approach. Our review showed that there is a need to address the status of ES in the ecosystems of Iran using internationally accepted methods and frameworks. Also, our review highlights the need for assessments of ES in agroecosystems, rangelands, wetlands and aquatic ecosystems and some of ES such as provision services are more frequently studied in ecosystems, although ecosystems provide a wide range of services. The assessment of some services such as cultural services is mostly missing. Our review showed that there are only three reports of research projects based on the InVEST as an ES mapping and modelling tools. Also, further studies, such as visioning and scenario development are needed to deepen the understanding of the relationship between ES and management ecosystems. Key recommendations for further studies and for mainstreaming ES in policy and decision making in Iran are ES monitoring in natural ecosystems and agroecosystems, developing ES concepts, theories, and policies, and trade-off analysis of ES under land use change scenarios.



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Selected Speaker

## **sciforum-059463: Effect of Landscape Structure on Land Surface Temperature in Different Essential Urban Land Use Categories: A Case Study in Jiaozuo, China**

**Xiaoli Jia, Peihao Song, Ang Li, Kun Wang, Kaihua Zhang, Chenyu Du, Yuan Feng, Kexin Qu, Meng Wu and Shidong Ge**

Department of Urban Planning, College of Landscape Architecture and Art, Henan Agricultural University, Zhengzhou 450002, China

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Urbanization has a significant impact on land use by replacing natural and artificial vegetation with residential and commercial areas and their related infrastructure. Understanding the relationship between different essential urban land use categories and urban thermal environment is of great importance for urban planning, resource allocation and decision support. However, the spatio-temporal correlation and interaction effects of the relationship between them are limitedly explored. Here, using multi-source remote sensing image, correlation analysis and stepwise regression method, we elaborated the relationship between landscape structure (landscape metrics) and land surface temperature (LST) across the different seasons of 850 planning management units in Jiaozuo, China. Our results show that the degree of explanation of surface temperature by landscape structure increased with a fine division of land use. The imprint of urban-rural gradients on LST was largely masked by the land-use categories at the regional scales. LST increased with landscape fragmentation in parkland and industrial land, which was caused by the uneven percentage of green space on impervious surfaces. Moreover, the tridimensional structure of buildings significantly affected the LST of residential regions, and the large number of low-rise buildings in urban planning practice contributes to high LSTs. Meanwhile, the lower LST in public administration and public service land could be ascribed to the configuration of grass and impervious surfaces. Our study clearly indicates that we could intensify the efforts of rebuilding old urban residential areas and use naturalistic planning solutions to regulate the urban thermal environment.



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Selected Speaker

## **sciforum-059025: Quantifying Landscape Multifunctionality in Agricultural Landscapes: A Farm Scale Analysis in the Hill Country of New Zealand**

**Duy X. Tran and Diane Pearson**

School of Agriculture and Environment, College of Sciences, Massey University

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As natural landscape has been simplified or modified for agricultural production, important ecosystem services (ES) can be lost with associated impacts on the functioning and resilience of the landscape. Recreating multifunctional landscapes offers a potential solution to challenges faced around sustainable agricultural production as this can offset some of the negative impacts that agricultural practices have been having on the environment and land resources. As such, a comprehensive assessment of the ES and its change in relation to landscape simplification form an important basis to inform landscape planning and management of sustainable multifunctional landscapes. This research applies a wide range of spatial models/tools and methods to quantify the landscape multifunctionality and associated ES provision in agricultural landscapes. The hill country of New Zealand is used as a case study because it is facing significant environmental issues due to intensive agricultural production and climate change. To quantify the provision of multiple ES provided by the hill country farm landscape, the tools provided by InVEST and ArcGIS were employed. The Analytic Hierarchy Process (AHP) was applied to characterise the landscape multifunctionality. Hotspot/coldspot analysis using Getis Ord  $G_i^*$  statistic was employed to examine the spatial patterning of multiple ES. Results from this study enable important questions to be answered regarding ES provision and how LULC structure and pattern can influence landscape multifunctionality. This can provide valuable information to inform appropriate actions associated with future land use planning and management.



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# sciforum-058566: Relation between Perceptions of Nature-Based Solutions and Motivations for Stakeholder Engagement

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Cities are facing a broad range of social and environmental challenges due to the current pressure of global urbanization, and nature-based solutions (NBS) have been used to improve people's health and wellbeing. Stakeholders engagement on these solutions is gaining increasing attention to enhance socio-ecological systems resilience. However, the evidences of the benefits from NBS are often not enough to promote the public involvement. This paper analysis stakeholders' perceptions about costs and benefits of NBS and their motivations toward engagement on NBS implementation process. There are much personal and social motivations influencing the involvement of citizens and stakeholders on NBS, mainly related with the health and well-being improvement; nevertheless, climate risk reduction, environmental protection and contribution to sustainability are important drivers for their perception of NBS and understanding of different ecosystem services. Economic aspects, in other way, motivate less the involvement of citizens and stakeholders. Delineation of environmental education and awareness-building strategies on NBS are essential to motivate the participation of citizens and stakeholders on NBS planning, design, management and maintenance activities. For such purpose, the collaboration between the local administrations and the Universities is of great importance. Cost benefit analysis should be included in any new development project in order to provide evidence on the advantage of NBS compared to conventional solutions.



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Session 8. Landscapes and Societal Challenges

Selected Speaker

## **sciforum-059725: Restoration of Coppicing Management: A Way to Diversification of the Societal, Economic and Ecological Use of the Forest Potential in Czech Republic**

**Tomáš Chabada**

Faculty of Social Studies, Masaryk University

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The contribution will present the developments in the restoration of coppicing management in the Czech Republic. The results of research into the perception of coppice management among representatives of target groups will be presented. In-depth interviews were held with representatives of nature conservation, forest managers, and researchers who are involved in the restoration and establishment of young forests in various localities.

There are many reasons for the restoration of coppices. The most common motive is the protection of nature, especially biodiversity, young forests represent a specific habitat for various plants and animals and can support many non-forest species. Another widespread motivation is the preservation of the cultural and historical heritage that respondents consider coppices. The role of coppices is also crucial in terms of the need to diversify forest management, which is currently facing serious challenges in the Czech Republic. Moreover, these forests may be more resilient to the effects of ongoing climate change or may be better able to adapt to changing conditions. For some forest owners, especially small and medium-sized ones, it can also be an economically viable alternative.

According to professionals in the field, the restoration and establishment of coppices are significantly limited by various barriers that prevent their expansion. The identified barriers will be presented and discussed.



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Selected Speaker

## **sciforum-058013: Autonomous Motivation and Tourist Civility Intentions: Merging Theory of Planned Behavior and Self-Determination Theory**

**Wei Zheng <sup>1</sup>, Hongliang Qiu <sup>2,3</sup>, Alastair M. Morrison <sup>4</sup> and Wei Wei <sup>5</sup>**

<sup>1</sup> School of Tourism and Foreign Languages, Tourism College of Zhejiang

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Civility as a historical term has long associated with notions of citizenship, political activity, civil organization, and the realm of manners and politeness. Its significance is acknowledged as nurturing interpersonal relationships, establishing trust, creating a harmonious atmosphere, enhancing collaboration, strengthening leadership, and improving organizational performance. Civility has been applied into various domains with tourism poorly discussed. Regarding its essence lies in reciprocal respect, tolerance, and considerateness, and it has a close bearing on morality and codes of behavior, there is a high possibility to apply civility into tourism context with tourist civility as the focus. In fact, tourist civility is a hot concern for tourism authorities aside from scholars. Uncivil tourist behaviors not only damage destination landscape, cause environmental deterioration, hamper energy efficiency, but also tarnish the images of peoples and countries, posing threats to destination sustainability and social development. All the challenges indicate that it is pivotal to effectively counsel tourists toward civility by intensifying their inner motives. To better address the gap, the research employs theory of planned behavior (TPB) and self-determination theory (SDT) to predict tourist civility intentions in a rural context. The findings suggest: (1) autonomous motivation, attitudes, subjective norms and perceived behavioral control positively influence tourist civility intentions; (2) attitudes, subjective norms and perceived behavioral control respectively mediate the relationships between autonomous motivation and tourist civility intentions; and (3) the cross-validation analysis of rural and urban cases documents support for the research. The research extends civility literature to tourism context, by using the theory of planned behavior and self-determination theory as well as the cross-validation approach to examine tourist civility intentions. It offers a reference for tourism destination practitioners to promote tourist civility through the enhancement of autonomous motivation, attitudes, subjective norms and perceived behavioral control.



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Selected Speaker

## sciforum-058014: A Dual-Case Study of Exploring Tourist Food Waste Reduction Behavior: the Roles of Personal Norm and Frugality

Wei Zheng <sup>1</sup>, Hongliang Qiu <sup>2,3</sup>, Alastair M. Morrison <sup>4</sup> and Wei Wei <sup>5</sup>

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Food waste is posing great environmental, economic, and social challenges globally. It becomes more severe in tourism. Tourists play a leading role in impacting food service sector of destination development. Generally, they consume more food at destinations than at home and are more likely to cause food waste, which aggravates littering, pollution, landscape destruction, ecological devastation, financial burden and revenue losses of food supply chain, thus intensifying negative impacts at different levels. It is of utmost importance to comprehend tourist food waste reduction behavior so as to ensure environmental and social sustainability. The research on food waste reduction is growing, but contexts are limited to households and hospitality with a scarcity in theory-based studies. To address the gap, the research applied the theory of planned behavior (TPB), norm activation model (NAM), and value-attitude-behavior (VAB) model to predict tourist food waste reduction behavior in a rural land context. The findings indicated: (1) personal norm, frugality, attitudes, subjective norms and perceived behavioral control positively influence tourist food waste reduction behavior; (2) attitudes mediate the relationships between personal norm and tourist food waste reduction behavior, and frugality and tourist food waste reduction behavior, as well as personal norm mediates the connections between frugality and tourist food waste reduction behavior; (3) government publicity positively moderates the associations between attitudes and tourist food waste reduction behavior; and (4) a cross-validation method of rural and urban cases documents support for the research. This study extends the literature by integrating the theory of planned behavior, norm activation model, value-attitude-behavior model and cross-validation approach to explore tourist food waste reduction behavior. It provides a perspective and reference for destination practitioners to effectively enhance tourist food waste reduction behavior.



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Selected Speaker

## **sciforum-058769: Old Geographical Materialities in New Rural Areas: Key Processes**

**Angel Paniagua**

Spanish Council for Scientific Research

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The current rural geography is at a crossroads of theoretical options. Geographical studies on processes of rural change usually have a social perspective, based on the loss of traditional populations and the immigration of new populations, and on the analysis of social-territorial conflicts between the locals and the newcomers. Rematerializing rural studies through experimental materiality is an interesting option to revitalize rural geography. The experimental process of recovering rural houses generates a fluid hybridization process between human-materiality realities, but it can also lead to a disassemblage process between people and materiality (rural house). In this contribution, various types of disassemblage processes of recovered material realities (rural houses) and the people who carried out the experimental recovery of the house are reviewed. The methodology is qualitative and is based on the examination of six case studies in rural areas of Spain. The disassemblage process generates new pluralities and material realities in peripheral rural communities.



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Selected Speaker

## sciforum-058009: Dehesas and Manors of Avila: A Methodology for Administrations to Monitor the Evolution and Citizen Perception of Centenary Cultural Landscapes

Nicolas Marine <sup>1</sup> and Cecilia Arnaiz-Schmitz <sup>2</sup>

<sup>1</sup> Universidad Politecnica de Madrid

<sup>2</sup> Universidad Complutense de Madrid

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The inclusion of Cultural Landscapes in land-planning policies has forced administrations to renew their tools for the study and management of this heritage. Today, constantly updated information allows a "living management" of the landscape: an adaptive governance system, able to prevent the deterioration of our environments in a much more effective way. In this context, we present a method applicable by any government administration to obtain, from land use and social network information, tools capable of detecting and updating the threats and opportunities of valuable cultural landscapes.

As a case study, we have selected the historic landscapes formed by *dehesas* and manors in the region of Avila (Spain). These are large estates with pastureland, holm oak woodlands, cereal crops, and hunting grounds. In addition, they have a renaissance building and garden, with irrigation systems and ponds. These ensembles of productive land and recreational sites are part of the agro-livestock culture of the country and form centenary landscapes of very particular aesthetic qualities. Although they are recognized as cultural landscapes at the national level, there are no specific studies or plans for their protection.

For all these reasons, the cultural landscapes of the *dehesas* and manors are presented as a suitable case of landscape analysis using contemporary tools. The specific method consists of three parts: (1) Obtaining LULC on-line open data and analyzing spatial patterns evolution; (2) Obtaining georeferenced photographs from social media platforms and analyzing spatial distribution and characterization, and (3) Developing online surveys open to the public. The results can be the base of protection and promotion plans that reinforce these landscapes facing their weaknesses and enhancing their strengths. Likewise, they are of interest for promoting the *dehesas* and manors as tourist resources of international projection.



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Selected Speaker

## **sciforum-059707: Participatory Modeling of Stakeholder Perceptions of Risks and Trade-Offs of Land-Use Based Mitigation Portfolio Implementation in Alberta, Canada**

**David Ismangil**

TU Delft

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Land-use-based mitigation technologies and practices (LMTs) in the Agriculture, Forestry, and Other Land Use (AFOLU) sector are considered key tools for achieving the Paris Agreement's aim of limiting the rise in average global surface temperature below two degrees Celsius. While LMT strategies often flow from top-down commitments, their implementation is inherently local, especially in the AFOLU sector. Stakeholder inclusion and acceptance is key to increase the long-term feasibility of these approaches, while providing for their participation in modelling efforts is still problematic. Our research project, LANDMARC, is addressing this through a combined quantitative assessment of LMTs with qualitative inputs from stakeholders' knowledge. We incorporate stakeholders' understanding of risks and trade-offs of LMT portfolios in the modelling process, to understand how this might help decision making, as well as to increase the understanding of risks and trade-offs of LMT implementation in general. For this research, we are exploring the possible implementation of LMTs in the oil sands region of Alberta, Canada, while considering risks and trade-offs from a local (indigenous), regional, and national perspective. The region is an important site for resource extraction and source of economic development. It is also the location of vast stocks of carbon both in the oil sands and as a natural wetlands area. We investigate how our model system can be used in a stakeholder setting and help stakeholders at different scales such as land use managers and policy makers understand risks and trade-offs of implementing LMT portfolios.



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Selected Speaker

## **sciforum-058019: Reduction of Industrial Land Beyond Urban Development Boundary in Shanghai: Assessment of Perception and Relationship of Stakeholders**

**Mengyao Xu <sup>1</sup>, Zhaodi Lu <sup>1</sup>, Zhengfeng Zhang <sup>1</sup> and Xiaokun Gu <sup>2</sup>**

<sup>1</sup> Renmin University of China

<sup>2</sup> Shanghai Jiaotong University

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With the rapid development of urbanization, Shanghai is facing a situation in which the scale of construction land is reaching its “ceiling” in terms of city planning. Against the background of increasingly severe constraints on land resources, population and environment, Shanghai has issued policies in recent years about industrial land reduction beyond the Urban Development Boundary (UDB), in order to get extra urban construction land quota and control the disorderly spread of rural construction land. Understanding the perception of industrial land reduction beyond the Urban Development Boundary (UDB) and the adaptation strategies of different stakeholders are very important for the development and implementation of appropriate land-use and land-cover(LULC) policies. According to stakeholder theory, this study first identified six stakeholders including municipal government, district government, county government, collective community, entrepreneur and villager, then systematically constructed a theoretical framework of their relationship in the process of industrial land reduction, and finally explained the empirical adaption of industrial land reduction through typical case studies of three counties of Langxia County of Jinshan District, Zhuqiao County of Pudong New District and Liantang County of Qingpu District in Shanghai, which also verifies the industrial land reduction framework. These findings will provide beneficial and theoretical reference for rural renewal and revitalization, improve the existing reduction policies and be popularized in dealing with rural industrial land reduction issues in different regions in China.



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Selected Speaker

## **sciforum-058996: Rural Revival or Rural Destruction? Urbanization of Rural Areas in the Sudetes Mountains, SW Poland**

**Agnieszka Latocha, Katarzyna Kajdanek, Paulina Miodońska, Dominik Sikorski, Robert Szmytkie  
and Przemysław Tomczak**

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The political and socio-economic transformations, which are observed in Poland in the last 30 years (collapse of the communist system, open of free market, joining EU and Schengen zone), have been already mirrored in the landscape. This is especially well visible in the peripheral rural areas in the Sudetes Mountains, which were subject to a long-term depopulation and economic decline, including the abandonment of land and settlements. However, recently the region witnesses a huge increase in human impact, which is especially pronounced in the landscape as a “construction boom”. In the last 15–20 years many new buildings were built in the region, also in the remote and previously depopulating areas. They include: single-family houses for permanent living, holiday and weekend houses (second homes), homes for rent and investments related to tourism infrastructure such as hotels, guesthouses, apart-hotels etc. In many areas these new buildings have negative impact on the landscape as they do not match the historical spatial layout of the village or the regional architecture. The aim of the study is to present the quantitative and qualitative analysis of that new trend, its spatial diversification, and the social perception of the landscape transformations related to the intensification of urbanization of rural areas. Additionally, the study also tries to identify the main driving forces of this trend and forecast the potential future changes and threats to the landscape. It is also discussed if the observed processes should be perceived as the symptoms of rural revival or rather as the destruction of the rural landscape. The study was conducted in the Kłodzko region (central and eastern part of the Sudetes), and is based on diverse sources of information: statistical databases, cartographic materials from different time periods, and field surveys, including questionnaires, interviews and focus groups.



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