

8th Forum Carpaticum 2025

Taking stock and building partnership for sustainable development of the mountain and rural areas

9-11 September 2025 | Bratislava, Slovakia

**BOOK OF ABSTRACTS
AND
CONFERENCE PROCEEDINGS**

Editors

Jakub Csabay, Andrea Figulová, Kristína Grejtáková, Rudolf Škovira

Comenius University

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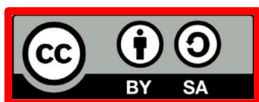
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Škoda



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FACULTY OF SOCIAL
AND ECONOMIC SCIENCES
Comenius University
Bratislava



RESDI



Science for the Carpathians



8th FORUM CARPATICUM 2025

Taking stock and building partnership for sustainable development
of the mountain and rural areas

9-11 September 2025 | Bratislava, Slovakia

Sub-theme I: "Building capabilities and facilitating participation of vulnerable groups in rural and mountain regions through SSE in multi-level sustainable development policy"

Sub-theme II: "Bridging natural and social sciences for sustainable development through transdisciplinary approaches"



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EUKI



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for the Environment, Climate Action,
Nature Conservation and Nuclear Safety



Federal Agency for
Nature Conservation

Umwelt
Bundesamt

Introduction

Dear participants and readers,

We are pleased to present the abstracts and proceedings from the 8th Forum Carpaticum, held on September 9th–11th, 2025, in Bratislava, Slovakia. This conference brought together researchers, practitioners, and policymakers dedicated to the sustainable development of mountain and rural areas, fostering dialogue between natural and social sciences and supporting transdisciplinary approaches.

Building on the success of previous editions, the conference aimed to provide a platform for the exchange of knowledge, research findings, and innovative practices. Special thanks go to the organizers, chairs, and all contributors who made this event possible.

We hope that this volume will serve as a valuable resource for researchers and stakeholders, supporting the sustainable development of the Carpathian region and beyond.

Jakub Csabay on behalf of
Organizing Committee at the Comenius University

Participation of a number of experts in the 8th Forum Carpaticum 2025 was supported in the framework of the project “Linking biodiversity, pastoralism, and cultural heritage through education for sustainable development (ESD) in the Carpathian Region”, funded by the German Federal Environment Ministry’s Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union and supervised by the German Federal Agency for Nature Conservation and by the German Environment Agency.



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Chair: *Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention and Mariana Melnykovich, Bern University of Applied Sciences BFH-HAF*

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Chair: *Agnes Nemeth, Matti Fritsch, University of Eastern Finland*

SESSION: Building Capabilities and Facilitating the Participation of Vulnerable Groups in Rural and Mountain Regions through SSE in Multi-Level Sustainable Development Policy (RPS) 70

Chair: *Dr. Krzysztof Wiedermann, Institute of Law, Administration and Economics, University of National Education Commission*

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Chair and Keynote Address: *Siddharth Saxena, University of Cambridge*

Bridging Natural and Social Sciences for Sustainable Development and Impact-Driven Research through Transdisciplinary Approaches 78

Chair: *Simone Martino, The James Hutton Institute; Maria Nijnik, The James Hutton Institute; Mariana Melnykovich, Bern University of Applied Sciences; Sam Poskitt, The James Hutton Institute; Katy Joyce, The James Hutton Institute*

SESSION: Innovative Methods and Tools for Integrating Economic, Social and Environmental Aspects to Bridge Science-Policy Interface for Better Decisions in Forestry 83

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1. LIST of Forum Carpaticum Members of Board

The Scientific Board of the Forum Carpaticum 2025 provided the scientific oversight and guidance as well as the quality assurance for the event's content. In addition, individual Members were invited to oversee the review process for panel and paper abstracts within their scope of expertise and interest. The Scientific Board met on a regular basis to discuss the evaluation of abstracts, thematic overview of the sessions, technical and logistical preparation ahead of the conference to assure a smooth flow of the conference.

Pavel Cudlín - Czech Globe - Head of Department/Scientist

Attila Varga - ELTE, Hungary - Associate Professor

Maria Nijnik - James Hutton Institute - Principal Researcher

Mariana Melnykovich - Bern University of Applied Sciences - Senior Researcher

Tamara Mitrofanenko - UNEP Vienna Programme Office, Secretariat of the Carpathian Convention - Senior Expert

Isidoro De Bortoli - EURAC Research - Senior Researcher

Hoffmann Christian - EURAC Research - Research Group Leader

Jacek Kozak - Jagiellonian University – Scientist

William Scott Keeton - University of Vermont – Professor

Joanna Zawiejska - University of National Education Commission – Professor

Nina Shatberashvili - Sustainable Caucasus – Director

Siddharth Saxena - University of Cambridge - Principal Research Associate

Gesa Geissler - Berlin Technical University – Professor

Elena Matei - University of Bucharest – Professor

Oľga Gyárfášová - Comenius University Bratislava - Associate Professor

Andrej Findor - Comenius University Bratislava – Director

Richard Filčák - Institute for Forecasting - Slovak Academy of Sciences – Researcher

Ľuboš Halada - Institute of Landscape Ecology - Research Scientist, Director

2. Conference Program

September 8th: **PRE-REGISTRATION from 14 pm – 18 pm**

DAY 1. Tuesday, 9 September 2025

8:00 – 9:00 Registration (possibility of PRE-REGISTRATION September 8th)

9:00 – 9:20 Opening of the conference

9:20 - 9:50 Keynote speech by *Stefano Sala, UNIMONT*

10:00 – 12:30 PARALLEL SESSIONS

AULA

- **Transboundary Strategies for Strengthening Carpathian Integrated Landscape Management Governance (RPS)**

Chair: *Isidoro De Bortoli, Eurac Research*

CONTRIBUTIONS:

1. *Hildegard Meyer, WWF Central and Eastern Europe*

Protected Area and Ecological Connectivity Governance in the Danube-Carpathian Region

2. *Monika Hoffmann, Greenpeace CEE*

Toward the ImPossible Park Carpathians: mapping valuable and old-growth forests for transboundary conservation

3. *Filipo Favilli, Eurac Research*

Changing Attitude of Indian Shepherds in Karnataka Towards Wolves and Wildlife Conservation

4. *Polona Zakrajšek, Carinthia University of Applied Sciences*

Development of Strategic Action Plan for Climate Change Adaptation and Resilience-Enhancing Forest Management in Ecological Corridors for Large Carnivores

5. *Paola Menzardi, Eurac Research*

Assessing and Preventing Tourism Impacts in Central Europe's Protected Areas: Interreg HUMANITA Project

6. *Anton Marcinčin, ZMOS Slovakia*

Communication, sustainable tourism and regional development: recent evidence from Slovakia

7. *Karolina Taczanowska, University of Natural Resources and Life Sciences Vienna*

Sustainable Tourism Development in the Carpathians – Publishing Opportunities in the Journal of Outdoor Recreation and Tourism

A 117

- **Empowering Local Communities to Act for Change**

Chair: *Mariana Melnykovich, Bern University of Applied Sciences*

CONTRIBUTIONS:

1. *Francesco Vettore, University of Bologna; Natalya Voloshyna and Lesya Loyko, FORZA*

Activating and Empowering Multi-Actor Rural Innovation Ecosystems for Inclusive, Participatory and Community-Based Development: The case of Zakarpattya, Ukraine

2. *Łukasz Wiejaczka, Polish Academy of Sciences*

Climate and dam reservoirs as factors shaping the thermal and ice regime of Carpathian rivers

3. *Stanislava Brnkaľáková et al., Slovak Academy of Sciences*

Climate smart rewilding: co-benefiting future for socio-ecological systems

4. *Temur Gugushvili and Gvantsa Salukvadze, The International Black Sea University*

Rural Governance in Eastern Partnership Countries: The Role of Local Action Groups

5. *Roland Lleshi, Technical University Berlin*

The Role of Citizen Energy Initiatives in Empowering Local Communities and Advancing Sustainable Development in the Carpathian Region: A Multi-Country Perspective

6. *Oksana Pelyukh, Ukrainian National Forestry University UNFU*

Engaging stakeholders in the energy transition in Ukrainian Carpathian schools

7. *Roman Romanko, Bern University of Applied Sciences, CAS Rebuild Ukraine Program, Sergii Bostan, Chernivtsi city council, Ukraine*

Empowering Ukrainian Communities through Education and Energy Solutions: A Case from the CAS Rebuild Ukraine Program in Switzerland

A 118

- **Importance of Nature-based Solutions (NbS) in Sustainable Development of Mountain Areas: A Transdisciplinary Approach (RPS)**

Chair: *Ignacio J. Diaz-Maroto, University of Santiago de Compostela* **CONTRIBUTIONS:**

1. *Fedir Hamor, Carpathian Biosphere Reserve*

Pastoralism and problems of conservation of biological diversity in the Ukrainian Carpathians

2. *Ignacio J. Diaz-Maroto, University of Santiago de Compostela*

Nature-based Solutions (NbS) as an Ecosystem-based Adaptation (EbA) approach for the temperate mountain communities

3. *József Pál Frink, National Institute for Research and Development in Forestry "Marin Drăcea"*

Bryofloristic researches in Peatlands of the Apuseni Mountains (Western Romanian Carpathians)

4. *Jonas Sommer, Eurac Research*

How can we sustainably manage biodiversity-rich grasslands in mountainous regions?

5. *Ignacio J. Diaz-Maroto, University of Santiago de Compostela*

The role of Nature-based Solutions (NbS) in addressing the vulnerability to global change of mountain socio-ecological systems

12:30 – 13:30 Lunch - School Premises

Side event: Carpathian Fair OPENING

13:30 – 16:00 PARALLEL SESSION

AULA

- **Safeguarding Carpathian Pastoralism**

Chair: *Tamara Mitrofanenko, UNEP Vienna Programme Office and Ioanna Baskerville, Romanian Academy - Iasi Branch*

CONTRIBUTIONS:

1. *Tamara Mitrofanenko and Elena Fischer, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention*

Linking biodiversity, pastoralism and cultural heritage through education for sustainable development (ESD) in the Carpathian Region

2. *Ioana Baskerville, Romanian Academy - Iasi Branch*

The uncertain future of Carpathian shepherding. Romanian transhumance for a sustainable mountain ecosystem

3. *Paulína Blahová, Slovak Academy of Sciences (online)*

Representing heritage: the role of Slovak pastoral community in the UNESCO's inscription process

4. *Fedir Hamor and Iryna Yonash, Carpathian Biosphere Reserve*

Pastoralism and problems of conservation of biological diversity

5. *Robin Rigg, Biotechnical Faculty, University of Ljubljana*

Co-creating coexistence: a vision for pastoralism and wildlife in multi-functional landscapes

6. *Jaroslava Panáková, Slovak Academy of Sciences*

Sensing with the Grasslands: Multispecies Ethnography, Sensory Knowledge, and the Biodiversity of Carpathian Pastoral Worlds

7. *Miriama Mikušová, Technická univerzita vo Zvolene*

Transhumance in Slovakia – the need to preserve traditions and protection of farm animals from large carnivores

8. *Benjamin Kostner, Eurac Research*

Pastoralism 2.0 - Navigating Ecology, Economy, and Coexistence in the Alps

9. *Filippo Favilli, Eurac Research*

Changing Attitude of Indian Shepherds in Karnataka Towards Wolves and Wildlife Conservation

B 132

- **Collaborative Environmental Justice Initiatives in Central and Eastern Europe across Urban and Rural Divides (RPS)**

Chair: *Jakub Csabay, Comenius University Bratislava*

CONTRIBUTIONS:

1. *Gergely Tagai, HUN-REN Centre for Economic and Regional Studies*

Promoting Environmental Justice for Unheard Communities in Europe

2. *Judit Bari Berecz, Hiszako Indie Nonprofit Agency - Green Legal Platform*

Housing Crisis in a Hungarian Romani Settlement Due to Environmental Damage: The Case of the Municipality of Recsk and a Local Mine

3. *András Balázs, University of Wisconsin-Eau Claire*

Segregation and environmental inequalities in Budapest's eighth district

4. *Fanni Maszlag, Hungarian Academy of Sciences Centre for Social Sciences*

Cracks in the roof, gaps in the system – Environmental injustice in north-eastern Hungary

5. *Jonathan McCombs, University of Wisconsin-Eau Claire*

Mapping Environmental Justice in Hungary: Reflections on Methodology

6. *Elene Samukashvili, Tbilisi State University and German University of Administrative Sciences Speyer*

Building a well-balanced environmentally conscious risk and crisis management system in the context of overlapping, compounding and cascading risks and crises in Georgia

A 118

- **Plastics in the Mountains - session and panel discussion - [ONLINE](#)**

Chair: *Joanna Zawiejska, University of National Education Commission Krakow*

CONTRIBUTIONS:

1. *Paweł Mikuś, Polish Academy of Sciences*

The role of wood accumulations in deposition and retention of macroplastics in mountain rivers

2. *Maciej Liro, Institute of Nature Conservation, Polish Academy of Science*

From Bottle to Microplastic: First Field Test of Experimental Method to Track Plastic Fragmentation in River Channels

3. *Anna Zielonka, Institute of Nature Conservation, Polish Academy of Science*

Plastic in Carpathian watercourses: from large scale mapping to field experiments

4. *Mehrnoosh Azodi, UNEP-BRS Conventions (online)*

Plastic Waste in Mountains and Glaciers

5. *Lucrina Stefanescu, Babeş-Bolyai University*

AULA

16:15 – 17:30

- **Plenary Session Supporting Green Recovery on Ukraine – PANEL DISCUSSION-**

Chairs: *Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention; Mariana Melnykovich, Bern University of Applied Sciences; Eleonora Musco, Eurac Research, Secretariat of the Carpathian Convention*

OPENING REMARKS: *Harald Egerer, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention*

SETTING THE SCENE: *Nadia Shevchenko, Information Center "Green Dossier"*

and Lesya Loyko, FORZA

PANELISTS:

1. *Mariana Melnykovich, Bern University of Applied Sciences*
2. *Ganna Lobchenko, WWF – Ukraine,*
3. *Natalya Voloshyna, FORZA*
4. *Günther Rautz, Eurac Research*
5. *Stephan Sicars, United Nations Industrial Development Organization (UNIDO)*

17:30 – 18:00 Keynote Speech by *Gesa Geissler, Technical University of Berlin*

18:00- 19:00 Donors Meeting

CONTRIBUTIONS:

1. *Claudia Domel, Deutsche Bundesstiftung Umwelt*
2. *Martin Vallejo, GIZ EUKI*
3. *Jiri Sykora, International Visegrad Fund*
4. *Timea Cseriova, Ministry of Labour of Slovakia*

19:30 Dinner – Restaurant Brewer

Keynote policy address by *Jozef Viskupič, president of SK8 (Self-Governing Regions of Slovakia)*

DAY 2. Wednesday, 10 September 2025

AULA

9:00 - 9:30 Welcome Online Notes

9:30 - 9:40 Policy Keynote by *Fedir Shandor, Ambassador of Ukraine to Hungary*

9:45 – 11:15 PARALLEL SESSIONS

AULA

- **Historical Ecology and Geography: New Perspectives for Conservation and Management (RPS)**

Chair: *Ewa Grabska, Dominik Kaim, Jagiellonian University* CONTRIBUTIONS - SLOT 1

1. *William Keeton, University of Vermont*

Perspectives on old-growth forest inventory, conservation, and restoration: bridging the divide between N. America and Europe

2. *Ewa Grabska, Jagiellonian University*

Identifying High Conservation Value Forests Using Historical Maps and Remote Sensing: A Case Study from the Polish Carpathians

3. *Simone Gingrich, BOKU University*

Exploring quantitative historical sources on 19th century practices of forest use in the Alpine Provinces of the Habsburg Monarchy

4. *Michał Sobala, University of Silesia in Katowice*

Reconstruction of the historical state of the traditional landscape in the Western Beskids as the basis for its protection

5. *Roman Cherepanyn, Ihor Dykyy, Taras Yamelynets, Vasyl Stefanyk Precarpathian National University*

Large Carnivore Estimation in Uzhanskyi National Nature Park — First Transboundary Synchronous Monitoring Within LECA Project in Ukraine

A 117

- **Carpathian Waters**

Chair: *Joanna Zawiejska, University of National Education Commission and Gabriela-Adina Moroşanu-Mitoşeriu, Institute of Geography of the Romanian Academy*

CONTRIBUTIONS - SLOT 1

1. *Łukasz Wiejaczka, Polish Academy of Sciences*

Perception of the dam reservoir by different social groups (Mucharz reservoir, Polish Carpathians)

2. *Anna Zielonka, Polish Academy of Sciences*

Multispectral Assessment of Seasonal Temperature and Precipitation Effects on Floodplain Vegetation Phenolog

3. *Hanna Hajdukiewicz, Polish Academy of Sciences*

Changes in extent of flooded area as a key factor shaping ecological conditions in a mountain river floodplain

4. *Georg Gruber, University of Natural Resources and Life Sciences Vienna*

Integrating longitudinal, lateral, and catchment-based connectivity for freshwater and terrestrial ecosystem restoration in the Danube-Carpathian Region

B 132

- **Session on Ukraine**

Chair: *Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention and Mariana Melnykovich, Bern University of Applied Sciences BFH-HAF*

CONTRIBUTIONS:

1. *Oleksandr Soshenskyi, Rosset Ch., et al., National University of Life and Environmental Sciences of Ukraine*

From Crisis to Resilience with Closer-to-Nature Forest Management in Ukraine

2. *Iryna Zibtseva, National University of Life and Environmental Sciences of Ukraine*

Land cover changes in the Ukrainian Carpathians based on Corine Land Cover methodology

3. *Sofiya Shutiak, UNFU*

Financial and Management Aspects: General and Special Use of Flora and Fauna Objects

4. *Nadia Schevchenko, Information Center "Green Dossier"*

Reflections on the Green Recovery for the Ukrainian Carpathians

5. *Natalya Voloshyna, FORZA*

Reflections on the Wind Energy Project and recommendations for the Carpathian Convention

6. *Olha Ilyash, UNIDO*

UNIDO Diagnostics Report on the real needs and challenges of Ukrainian municipalities in driving green recovery

B 132

11:30 - 13:00 Side event: Fostering Collaboration to Meet the Needs of Communities in the Ukrainian Carpathians

Leads: Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention, Eleonora Musco, Eurac Research, Secretariat of the Carpathian Convention, Mariana Melnykovich, Bern University of Applied Sciences BFH-HAFL

CONTRIBUTIONS: *Giorgi Todua, UNIDO*

11:30 – 13:00 PARALLEL SESSIONS

AULA

- **Historical Ecology and Geography: New Perspectives for Conservation and Management (RPS)**

Chair: *Ewa Grabska, Dominik Kaim, Jagiellonian University*

CONTRIBUTIONS - SLOT 2:

1. *Juraj Lieskovský, Institute of Landscape Ecology, SASŇ*

Mapping the anthropogenic geomorphic features in Poiplie region (Slovakia) using airborne LiDAR visualizations

2. *Márton Bence Balogh, Department of Physical and Environmental Geography, Faculty of Science and Informatics, University of Szeged*

Impact of Historical and Recent Land Use/Land Cover Changes on Biological Invasion: A Case Study from Hungary

3. *Dariia Kholiavchuk, Yuriy Fedkovych Chernivtsi National University, Ukraine*

Lessons from the past: Holocene climate change and ecosystem responses in the Carpathians

4. *Anisoara Filip, Stefan cel Mare University of Suceava*

Reconstructing Romania's palaeoclimate: synthesis of proxy data

5. *Dominik Kaim, Jagiellonian University*

Change and persistence – the trajectories of the grasslands in the Polish Carpathians

6. *Yana Popiuk, Yuriy Fedkovych Chernivtsi National University, Ukraine*

Ecological Trade-offs in the Bukovynian Carpathians: Grassland Conservation vs. Forest Restoration

A 117

- **Carpathian Waters**

Chair: *Joanna Zawiejska, University of National Education Commission and Gabriela-Adina Moroşanu-Mitoşeriu, Institute of Geography of the Romanian Academy*

CONTRIBUTIONS - SLOT 2:

1. *Gabriela-Adina Moroşanu-Mitoşeriu, Institute of Geography of the Romanian Academy*

Changes in Water And Sediment Fluxes in the Jiu River Basin (Romania) in the Context of Environmental Changes

2. *Iulian Faltinschi, Stefan cel Mare University of Suceava*

Relative elevation model for channel morphology and meander analysis of the Mureş river, Arad county, Romania

3. *Katarzyna Wasak-Sęk, Polish Academy of Sciences*

Ammonium and nitrate fate in a montane catchment (Tatra Mountains, Poland) influenced by forest disturbances of different origin

4. *Tomasz Bryndal, University of the National Education Commission*

Flash floods in small Carpathian catchments – theoretical and practical aspects for identification of the maximum probable flood risk zone

10:00- 12:30 Side event: Sustainable Journeys: Digital Integration for Cross-Border Attractions in the PL-SK Region. The Central Mountains experience.

Lead: *Isidoro De Bortoli, EURAC Research*

Venue: Staré Lýceum, Konventná 15, Bratislava

13:00 – 14:00 Lunch - School Premises

Side Event: Carpathian Fair

14:15 – 16:15 PARALLEL SESSION

AULA

- **Education for Sustainable Development: Session of the Carpathian ESD Expert Network (CESDEN) (RPS)**

Chairs: *Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention, Boglarka Kurka Ivanegová, SUSTO- Sustainability Tools and ŠPIRÁLA - the Slovak Network of Environmental Education Providers, Elena Matei, University of Bucharest*

CONTRIBUTIONS:

1. *Wioletta Kilar, University of the National Education Commission, Krakow*

Quo vadis of Education for Sustainable Development? Case study of Poland

2. *Mihaela Verga, University of Bucharest*

Project-based learning in environmental sustainability. Case study: Environmental challenges facing Danube River educational program

3. *Michal Medek, Masaryk University & Czech Institute for Heritage Interpretation*

Visitor Communication Narratives

4. *Laura Cristea, University of Bucharest*

Education for Sustainable Development in Romanian Schools

5. *Senan Gardiner, Leuphana University*

Promoting Biodiversity through Transdisciplinary Learning Interventions in the Carpathians

6. *Lucia Cuşnir, Retezat National Park*

Carpathian Day: Integrating Pastoralism, Biodiversity and Awareness-raising through dedicated local events

7. *Tamara Mitrofanenko, Elena Fischer & Boglarka Kurka Ivanegova, CESDEN*

Update and outlook from the Carpathian ESD Expert Network

A 117

- **Building Capabilities and Facilitating the Participation of Vulnerable Groups in Rural and Mountain Regions through SSE in Multi-Level Sustainable Development Policy (RPS)**

Chair: *Agnes Nemeth, Matti Fritsch, University of Eastern Finland*

CONTRIBUTIONS:

1. *Katrin Hofer, Federal Institute of Agricultural Economics, Rural and Mountain Research*

The Role of Social and Solidarity Economy in Strengthening Rural Communities: Insights from the Silbersberg Association in Lower Austria

2. *Triin Kübar, Tallinn University*

Digital Skills for Seniors: Community Learning and Social Innovation in Rural Areas

3. *Katalin Fehér, HUN-REN Centre for Economic and Regional Studies*

Navigating development on the periphery: depoliticisation and the role of civil society in poverty governance

4. *Marika Gruber, Carinthia University of Applied Sciences*

Breaking Barriers: Empowering Migrant Women for Labour Market Participation in Rural Carinthia through SSE Initiative

5. *Ida Motteran, Eurac Research*

Intersectional Critical Systems Thinking in Research on Vulnerability and Social Exclusion in Rural Areas: Lessons from the SERIGO Project

6. *Makbule Nisa Mencet Yelboğa, Eskisehir Osmangazi University*

Local Action Groups' Significance in Rural Development

A 118

- **Accessibility, Development Paths and Windows of Opportunities in Core-Periphery Systems: Challenges of Local and Regional Development in the Carpathians**

Chair: *Krzysztof Wiedermann, Institute of Law, Administration and Economics, University of National Education Commission*

CONTRIBUTIONS:

1. *Paweł Kroh, University of National Education Commission*

New Outdoor Activities: A Chance for Tourism Development, but with High-Risk Consequences – The Example of Mountain Biking Accidents in the Polish Carpathians

2. *Gábor Lados, HUN-REN Centre for Economic and Regional Studies*

Population dynamics in Central and Eastern European border regions

3. *Attila Havas, Centre for Economic and Regional Studies*

A multi-channel interactive learning model of social innovation

4. *Tina Lešnik, University of Maribor*

Farm Economics In Mountain Regions Under the New LFA Methodology of CAP 2023-27 A Slovenian Case Study

5. *Ainsley Trahan, University of Cambridge*

Disaster Risk Management in Transition: Shifting Models of Transboundary DRM across Azerbaijan and Georgia

6. *Agnieszka Pieniążek, Association for the Development and Promotion of Podkarpacie "Pro Carpathia"*

The Wallachian Culture Trail as a model of cross-border heritage management and a tool for sustainable development in the carpathian region

7. *Ninel Seniuk, Bratislava University of Economics and Management*

Determinants of Chinese Foreign Direct Investment in the V4: the case of Slovakia

AULA

16:30 – 17:30 Keynote Speech by *Andrés Rodríguez-Pose, London School of Economics and Political Sciences*, followed by a Wrap-up Session

17:45 - 19:30 RUDO SIKORA ART EXHIBITION

 Presentation on the role of winemaking in sustainable development of the Carpathian region

CARPATHIAN FAIR

19:00 City Tour (optional, registered)

DAY 3. Thursday, 11 September 2025

AULA

9:00 – 9:30 Keynote speech by *Ioanna Baskerville, Romanian Academy*

9:45 - 11:00 Side event: SERIGO COP Workshop

9:45 – 11:15 PARALLEL SESSIONS

AULA

- **Bridging Natural and Social Sciences for Sustainable Development and Impact-Driven Research through Transdisciplinary Approaches**

Chair: *Siddharth Saxena, University of Cambridge*

CONTRIBUTIONS - SLOT 1

1. *Fuad Humbatov, State Academy of Public Administration under the President of Azerbaijan*

Climate and political risks correlation in the context of international relations

2. *Dana Sitányiová, University of Žilina*

Human-Nature Interactions and the Monitoring of Tourist Activities' Impacts on Protected Areas

3. *Stefano Sala, UNIMONT*

Transdisciplinary Approaches for Sustainable Ski Resorts in the Alps

4. *Khosiyat Ismatova, National Aviation Academy*

Aerospace monitoring of risks to rural settlements during landslide processes in mountainous areas

5. *Ondřej Cudlín, Global Change Research Institute CAS*

A unified approach for assessing landscape vulnerability in the Czech-Slovak border regions

6. *Katarzyna Wrona, Jagiellonian University in Krakow*

The sharpest curve ahead of ski tourism in the Carpathians

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- **Innovative Methods and Tools for Integrating Economic, Social and Environmental Aspects to Bridge Science-Policy Interface for Better Decisions in Forestry (Panel discussion)**

Chair: *Simone Martino, The James Hutton Institute; Maria Nijnik, The James Hutton Institute; Mariana Melnykovich, Bern University of Applied Sciences BFH-HAFL; Sam Poskitt, The James Hutton Institute; Katy Joyce, The James Hutton Institute*

CONTRIBUTIONS - SLOT 1

1. *Diana Dogaru, Institute of Geography of the Romanian Academy*

Research domains and analysis frameworks of climate change impact on mountain areas in Europe – a systematic bibliometric review with a focus on the Romanian Carpathians

2. *Simone Martino and Maria Nijnik, The James Hutton Institute*

Innovation in natural capital valuation to improve decision-making in mountain forestry

3. *Lidiia Hryniv, Ivan Franko Lviv National University*

Creation of Spatial Sustainability Management System in Carpathian: Innovative Approach

4. *Karolina Taczanowska, University of Natural Resources and Life Sciences Vienna*

Mapping Cultural Ecosystem Services in Digital Society – Case Study of Nature-based Recreation in Central European Forests

5. *Oleh Chaskovskyy, Ukrainian National Forestry University*

Satellite-Based Assessment of Forest Disturbance Dynamics in Protected Ecosystems

11:30 - 13:00

AULA

- **Bridging Natural and Social Sciences for Sustainable Development and Impact-Driven Research through Transdisciplinary Approaches**

Chair and Keynote Address: *Siddharth Saxena, University of Cambridge*

CONTRIBUTIONS - SLOT 2

1. *Vanessa Arteaga Bernal and Eduardo Erazo Acosta, independent / Universidad de Nariño*

The power of the ancestral philosophy of *Alli kawsay* (Buen Vivir) in the indigenous movements of Colombia - Ecuador vs. the exclusion by the big mining development, contribution to the Rights of Mother Nature from the global south in middle of climate change

2. *Valentina D'Alonzo, Eurac Research*

Participatory Assessment of Climate Risks to Agriculture in the White Carpathians through the Impact Chain Approach

3. *Michal Haring, Comenius University Bratislava*

Brown bear in Slovak society

4. *Natavan Jafarova, Baku State University*

Method of Drainage Basin of Rivers of Nakhchivan Based on Digital Elevation Model

- **Innovative Methods and Tools for Integrating Economic, Social and Environmental Aspects to Bridge Science-Policy Interface for Better Decisions in Forestry (Panel discussion)**

Chair: *Simone Martino, The James Hutton Institute; Maria Nijnik, The James Hutton Institute; Mariana Melnykovich, Bern University of Applied Sciences BFH-HAFL; Sam Poskitt, The James Hutton Institute; Katy Joyce, The James Hutton Institute*

CONTRIBUTIONS: SLOT 2

1. Christian Rosset, Bern University of Applied Sciences

Putting together the puzzle of close-to-nature forest management

2. Taras Parpan, Ukrainian Research Institute of Mountain Forestry

Importance of the Deadwood and Innovative Practice for Sustainable Forest Management

3. Bogdan Andrei Mihai, University of Bucharest, Faculty of Geography

Combining Remote Sensing, GIS, and AI for the Monitoring of Natural Hazards In The Romanian Carpathians: A Case Study On Jiu River Gorge, Southern Carpathian

4. Giorgi Mindiashvili, Ivane Javakhishvili Tbilisi State University

Advancing Landslide Detection and Geological Mapping with Machine Learning: Methods and Case Study from the Republic of Georgia

AULA

13:15 – 14:30 Closing Wrap-up Session

LUNCH - School Premises

17:00 - 20:00 Science for the Carpathians (S4C) Scientific Steering Committee

3. LIST of KEYNOTE SPEECHES

Keynote speech by *Stefano Sala, UNIMONT*

Education, research and third mission: the UNIMONT model as a promoter of sustainable development in mountain areas

Stefano Sala is a research technologist and project manager at the Interdisciplinary Research Center for the Sustainable Development of Mountain Areas (Ge.S.Di.Mont.) active at UNIMONT - University of Milan, a centre dedicated to research, teaching and third mission activities dedicated to mountain areas in the hearth of Italian alps. He has gained experience on research projects for the implementation of climate change adaptation processes in mountain areas, with a specific focus on climate change adaptation, governance, policies and tourism issues. He has contributed to the study redacted by UNIMONT - "White Book on Mountain Areas" and published in May 2024: an interdisciplinary study commissioned by the Department for regional affairs and autonomy of the Italian Presidency of the Council of Ministers. The study analyses data concerning environmental, socio-economic and governance issues of mountains in Italy. He is the PM of the Horizon Europe – Mission Climate Change "MountResilience" project funded to support local communities in adaptation processes related to climate change risks.

Keynote Speech by *Gesa Geissler, Technical University of Berlin*

Energy Communities in Central and Eastern Europe

Gesa Geißler is a Full Professor at Technische Universität Berlin, where she leads the Environmental Assessments Research Group. She holds a PhD from TU Berlin, where she examined innovations in environmental assessment and planning for renewable energy projects in Germany, Europe, and the United States, and she previously worked as a Postdoctoral Researcher at the University of Natural Resources and Life Sciences, Vienna.

Her research and teaching focus on environmental assessments and environmental planning, with particular attention to the socio-environmental consequences of the energy transition, strategic planning, and conflict mitigation between renewable energy development and environmental resources. With her group she also explores participatory approaches, including research on community energy initiatives, especially in Central and Eastern Europe. Prof. Geißler currently serves as Chair of the German Environmental Assessment Association (UVP-Gesellschaft e.V.) and as Deputy Director of the Institute of Landscape Architecture and Environmental Planning at TU Berlin.

Keynote Speech by *Andrés Rodríguez-Pose, London School of Economics and Political Sciences*

The Geography of Discontent and the Regional Development Trap

Andrés Rodríguez-Pose holds the Princesa de Asturias Chair and is a Professor of Economic Geography at the London School of Economics (LSE). He currently directs the Cañada Blanch Centre at LSE and has previously served as Head of the Department of Geography and Environment. He chaired the European Union's High-Level Group on the Future of Cohesion Policy, which is responsible for shaping the EU's Cohesion Policy beyond 2027. Additionally, Rodríguez-Pose has held distinguished positions in regional science, including President and Vice-President of the Regional

Science Association International (RSAI), as well as Vice-President and Secretary of the European Regional Science Association. His research covers regional growth and inequality, fiscal and political decentralisation, institutions, discontent and populism, innovation, migration, and development strategies. His work is highly influential, frequently informing policy decisions, and he regularly advises international organisations and governments. He is also widely cited in academic circles. For the last three years, he has been recognised as the top scientist globally in urban and regional studies by the Stanford ranking, which identifies the top 2% of scientists across all disciplines. He has also appeared on Clarivate's Web of Science list of Highly Cited Researchers for the past five years. Among his many honours, Rodríguez-Pose received the 2018 ERSA Prize in Regional Science, considered the most prestigious accolade in the field. He also holds honorary doctorates from Utrecht University (Netherlands) and Jönköping University (Sweden).

Keynote speech by Ioanna Baskerville, Romanian Academy

The uncertain future of Carpathian shepherding Romanian transhumance for a sustainable mountain ecosystem

Ioana Baskerville is a linguist and anthropologist (PhD), a senior researcher at the Romanian Academy, Iasi Branch and associate professor of cultural anthropology at the "Alexandru Ioan Cuza" University of Iasi (Romania). She is the national focal point and leading expert for the implementation of the UNESCO 2003 Convention in Romania, coordinated national nomination files for the UNESCO Representative List in collaboration with the Ministry of Culture of Romania, and other national projects for intangible cultural heritage safeguarding, working closely with local heritage communities and institutions. She conducted community-based studies on sustainable agricultural living heritage as part of research on mobile pastoralism in Romania and collaborates with experts and associations in extensive animal husbandry, the Ministry of Agriculture and Rural Development and the Ministry of Environment in Romania. She led the inventorying of transhumance in Romania and recently the second extension wave of the Transhumance UNESCO file involving 16 countries. She is an accredited facilitator of the UNESCO 2003 Convention.

4. CONFERENCE ABSTRACTS

SESSION

Transboundary Strategies for Strengthening Carpathian Integrated Landscape Management Governance (RPS)

Chair: *Isidoro De Bortoli, Eurac Research*

1. *Hildegard Meyer, WWF Central and Eastern Europe and Joana Bores (Stichting BirdLife Europe), Evelyn Underwood (Institute for European Environmental Policy), Mila Sirychenko (WWF Central and Eastern Europe), Wouter Langhout (Stichting BirdLife Europe), Peer von Döhren (Humboldt University zu Berlin, Daniel Veríssimo (Rewilding Europe), Balázs Horváth, Kenny Meganck (Institute for European Environmental Policy), Alina Blaga (WWF Central and Eastern Europe), Måns Ingvarsson (Institute for European Environmental Policy), Gabrielle Aubert (Institute for European Environmental Policy), Barbara Herrero (Stichting BirdLife Europe), Matea Osti (International Institute for Applied System Analysis), Anouk Puymartin (Stichting BirdLife Europe)*

Protected Area and Ecological Connectivity Governance in the Danube-Carpathian Region

ABSTRACT:

The European Union's Biodiversity Strategy for 2030 seeks to restore biodiversity by establishing a Trans-European Nature Network (TEN-N), which aims to protect 30% of the EU's land by 2030. This network will integrate Green and Blue Infrastructure and ecological corridors to support species conservation and ecosystem resilience. To assess the readiness of EU countries to implement TEN-N, this study applied a Political Economy Analysis (PEA) framework, evaluating governance structures, policies, and financing mechanisms. Key challenges include weak regulations, unsustainable land use, and conflict management issues. While many countries have ecological connectivity strategies, gaps in legislation and enforcement hinder implementation. Data was collected from over 400 sources, 50+ interviews, 97 survey responses, and case studies from six regions: Finland, France, Portugal, Spain (Doñana), Germany (Halle-Leipzig), and the Danube-Carpathians. The findings indicate that successful governance models exist in some countries, providing insights into effective policy frameworks. To enhance ecological connectivity, the study recommends:

Regulatory reforms – Strengthen laws to integrate ecological connectivity into other policies such as spatial planning, agriculture, forestry and water management, and address contradictory elements of relevant laws.

Sustainable land use – Integrate conservation goals into urban and land use planning including strategic planning for infrastructure projects.

Stakeholder and public engagement – Involve landowners, natural resource managers, businesses, and local communities, tackle conflicts and strengthen collaborative learning where traditional methods fail.

Knowledge, capacity and awareness - Strengthen professional networks, provide training, and enhance public outreach.

Increased investment – Public and private financing should be expanded.

This study underscores the importance of coordinated governance, financial support, and integrated planning in ensuring the success of TEN-N, ultimately reversing biodiversity loss and fostering ecosystem resilience across Europe. The presentation will focus on the findings of the Danube-Carpathian region.

Keywords: EU Biodiversity Strategy for 2030, Green Infrastructure, ecological connectivity, TEN-N, Political Economy Analysis, spatial planning, biodiversity law and policy, collaborative learning

2. *Monika Hoffmann, Greenpeace CEE and Ciprian Galusca (Greenpeace CEE Romania), Robert Cyglicki*

Toward the ImPossible Park Carpathians: mapping valuable and old-growth forests for transboundary conservation

ABSTRACT:

Old-growth forests are rare, structurally complex ecosystems that provide critical biodiversity and climate resilience that, together with other vital areas, are important to restore natural connectivity and uphold cultural values. Many of these valuable forests remain unprotected and insufficiently mapped in the Carpathian Mountains. This project aims to identify and prioritize valuable and old-growth forests through existing geospatial data, spatial analysis, and ground-truthing to support the creation of a transboundary protected area. We present the conceptual and methodological framework underpinning the proposed “ImPossible Park Carpathians”—a vision for a large, unified conservation area spanning seven Carpathian countries. Our research synthesizes high-resolution spatial datasets across Poland, Slovakia, Romania, Hungary, Czechia, Serbia, and Ukraine to delineate potentially valuable forest areas. These include forest cover and loss data (e.g., Hansen 2023), canopy height models, above-ground biomass layers, Copernicus Tree Cover Density, Dominant Leaf Type, and national forest inventories where available. We are developing an integrative index to assess forest ecological value, guided by indicators such as structural complexity, disturbance history, connectivity, and degree of naturalness. Our methodological approach addresses existing data disparities and provides a replicable, transparent framework that can evolve as more information becomes available. While still in development, our preliminary findings already underscore the urgency of policy action to prevent further forest degradation and fragmentation. This research, which was carried out in collaboration with Greenpeace Central and Eastern Europe, supports the ImPossible Park Carpathians' ambitious proposal to protect the last remaining old-growth and other valuable forests in the region. By aligning scientific evidence with strategic conservation planning, the initiative has the potential to support regional biodiversity targets and contribute to broader frameworks such as the EU Biodiversity Strategy 2030 and the goals of the Carpathian Convention.

Keywords: old-growth forest, Carpathians, mapping, transboundary conservation, ecological value, remote sensing

References: Sabatini, F. M., Burrascano, S., Keeton, W. S., Levers, C., Lindner, M., Pötzschner, F., ... & Kuemmerle, T. (2018). Where are Europe's last primary forests?. *Diversity and distributions*, 24(10), 1426-1439.

3. *Filipo Favilli, Eurac Research*

Changing Attitude of Indian Shepherds in Karnataka Towards Wolves and Wildlife Conservation

ABSTRACT:

In Karnataka, India, pastoralism is integral to the livelihoods of many rural communities. Despite pastoralism in Karnataka faces numerous challenges, shepherds maintain robust social structures with effective resource-sharing mechanisms, while their livestock provides crucial liquidity. However, environmental changes, driven by both natural and human activities, pose significant challenges, such as the degradation of pastures and the depletion of resources along migratory routes, further marginalizing shepherd communities like pastoral nomads, who rely on traditional livelihoods, inhabit remote areas, and face limited access to healthcare (IPCC, 2014). From a social and economic perspective, younger shepherds are beginning to show a different attitude towards the presence of wildlife and the impact of predation on their family income. They no longer see wildlife as valuable, and view wolves as a disturbance to their livelihood. This contrasts with the traditional way of relating

to wildlife, especially wolves, which are considered sacred regardless of their impact on the family economy, as stated by the majority of the interviewed shepherds. Consequently, the valuable indigenous knowledge held by these communities is at risk, as it is seen as backward by the new generation of shepherds (Sharma et al., 2003). Some of the new shepherds are calling for government control of the predator to keep the population stable and prevent attacks on domestic animals.

We conducted 42 qualitative interviews in the field during November 2023 to analyze the future of pastoralism in Karnataka, and how the new challenges and attitudes of younger shepherds could affect the conservation of wolves. Additionally, we investigated the potential strategies that can be implemented to maintain traditional knowledge while conserving wolf populations, and if any support exist for farmers through education/training on how to mitigate conflicts.

Keywords: pastoralism, social attitude, wolves

4. Polona Zakrajšek, Carinthia University of Applied Sciences and Elisabeth Wiegele (Carinthia University of Applied Science), Daniele T. Dalton (Carinthia University of Applied Science)

Development of Strategic Action Plan for Climate Change Adaptation and Resilience-Enhancing Forest Management in Ecological Corridors for Large Carnivores

ABSTRACT:

The development of a Strategic Action Plan (SAP) for climate change adaptation and resilience-enhancing multifunctional forest management in ecological corridors is essential for maintaining transboundary habitat connectivity. The conservation of large carnivores (LC) plays a crucial role in preserving biodiversity. The Carpathian, Balkan, and Dinaric ecoregions host Europe's largest populations of LC including bear, wolf, and lynx. Populations require extensive habitat that spans political borders. Human-wildlife conflicts, habitat degradation, and habitat fragmentation create barriers to LC migration routes, thereby limiting LC dispersal and genetic exchange. Additionally, expected climate change impacts are projected to further alter the availability of food resources, increasing the likelihood of human-wildlife conflicts. This is against the backdrop of various management plans with potentially competing goals between and within countries, even those within the same ecoregions.

The SAP is a key output of the Interreg Danube project ForestConnect, in collaboration with a strategic expert group and diverse stakeholders that include protected area managers, researchers, policy-makers, NGOs, and civil society. It is based on a jointly developed transnational monitoring system for LC, digital twin models, and best practice examples from pilot sites and other ecoregions. We include an extensive and diverse network of stakeholders in the conceptualization and development of the document.

The SAP includes several key components. These include a review of existing conditions in protected area networks, governance and policy, a step-by-step plan for protected area managers, including a checklist of measures, and integration into regional and international nature conservation strategies. The SAP will contain best practice examples from the Danube region and promote peer-to-peer exchange of information.

Keywords: Bear; Wolf; Lynx; Habitat Connectivity; Adaptive Management; Transboundary Cooperation; Protected Area Management; Human-Wildlife Conflict

Acknowledgement: We would like to acknowledge the Strategic expert group members of the Interreg Danube project ForestConnect for their inputs in the development of the Strategic Action Plan.

5. Paola Menzardi, Eurac Research and Isidoro de Bortoli (Eurac research- IT), Alessandra Cordiano (Eurac research- IT), Dana Sintanyiova (University of Zilina)

Assessing and Preventing Tourism Impacts in Central Europe's Protected Areas: Interreg HUMANITA Project

ABSTRACT:

Protected Areas (PAs) are increasingly popular destinations for the growing demand and interest in outdoor experiences. This poster presents the workflow of the Interreg HUMANITA project dealing with the pressing challenges faced by PAs in Central Europe. The project aims to assist PAs' managers in evidence-based and participatory management, helping them implement measures to protect natural values while meeting visitors' expectations. HUMANITA focuses on developing innovative solutions to assess the impact of tourist activities on nature, mitigating human-nature conflicts through awareness-raising and behavioural change.

The poster provides an overview of innovative approaches to measuring the environmental impacts of tourism inside PAs, new complementary methods for tourists' involvement in practical actions to protect the environment, and learning tools to develop awareness among the public, national and EU policymakers.

Monitoring activities are carried out by pilot sites across Central Europe, including Karawanken-Karavanke UNESCO Global Geopark (AT-SLO), National Park Malá Fatra (SK), Tuscan-Emilian Apennine National Park (IT), Bükk National Park (HU), and Kamenjak Protected Areas (HR). The poster presents how the collected data supports informed management decisions, risk reduction, and the effectiveness of innovative impact assessment approaches. Monitoring activities are closely related to the key objective of the HUMANITA project to foster involvement and participation of tourists and local communities in developing a critical sense of their interaction with natural environments, leading them to adopt practical actions. The poster outlines the development of a new shared heritage narrative aimed at encouraging tourists and visitors to adopt more mindful behaviors and interactions within protected areas. By involving visitors in monitoring activities, the project promotes a sense of ownership and responsibility towards nature, supporting the livelihood and well-being of ecosystems and local communities. Through transnational cooperation and the joint development of transnational monitoring strategies and tools, HUMANITA is dedicated to preserving Central Europe's environment, safeguarding its values for future generations.

Keywords: Protected Areas; Tourism impacts; Tourists' awareness; Participatory monitoring; Human-nature interactions; Common heritage narrative

References: Ghazvini, M. et al. (2020), "Environmental concerns and attitudes of tourists towards national park uses and services", *Journal of Outdoor Recreation and Tourism*, Vol.30, 100296, <https://doi.org/10.1016/j.jort.2020.100296>.; Maino, F., De Bortoli, I., Favilli, F. (2019) "Conflict Prevention and Management Toolkit for The Ecological Connectivity in The Alps", *International Journal of Environmental Research and Technology*, <https://hdl.handle.net/10863/12041>.; Newsome, D. (2021), "The collapse of tourism and its impact on wildlife tourism destinations", *Journal of Tourism Futures*, Vol. 7 No. 3, pp. 295-302. <https://doi.org/10.1108/JTF-04-2020-0053>.

6. Anton Marcinčin, ZMOS Slovakia and Iveta Niňajová (Goethe Institut)

Communication, sustainable tourism and regional development: recent evidence from Slovakia

ABSTRACT: Slovakia suffers from high regional disparities. One way to use endogenous resources to generate employment and income is to use the wealth of national parks and cultural heritage to develop tourism. This solution is obvious, but as domestic and foreign examples show, it has its pitfalls. The most frequently discussed is the lack of finances, despite the rich financial resources from various EU programs. Much less attention is paid to tourism management, its inclusion in regional development plans and the emphasis on sustainable development. Many local governments and DMOs have started to develop tourism in a relatively naive way, without sufficient experience and support from regions and the government. Local and international communication within the quadruple helix could be a great support for them. However, a frequently identified barrier is the lack of interest of local policy makers or, conversely, stakeholders to get involved in the planning and implementation of coordinated development activities. The often cited reason is frustration from previous activities and the systemic disconnection of local activity and centrally managed development. For the past two years, we have been developing a digital communication platform aimed at enhancing communication within the travel industry on both local and international levels. The objectives include knowledge transfer, coordination, community engagement, collaborative learning, and fostering synergies. Creating such a platform necessitates the active involvement of stakeholders. Our experience indicates that DMOs and municipalities recognise the advantages of improved communication, not only in the usual coordination of activities, such as aligning timelines and seeking new partnerships, but also in developing innovative solutions. Simultaneously, they discern various local and national tourism and local development policies through their practical positive or negative impacts. Therefore, better communication can improve tourism management and local development while also providing valuable feedback to local and national policymakers.

7. Karolina Taczanowska, University of Natural Resources and Life Sciences Vienna and Fruzsina Stefán (University of Natural Resources and Life Sciences), Mariusz Ciesielski (Warsaw University of Life Sciences), David Ganhör, Simon Trap, Helena Fornwagner, Loukas Balafoutas, David Messner, Charlotte Eggert, Kamil Choromański, Dariusz Gotlib

Sustainable Tourism Development in the Carpathians - Publishing Opportunities in the Journal of Outdoor Recreation and Tourism

ABSTRACT:

In the context of a rapidly evolving technology and society, the management of nature-based recreation destinations faces transformative challenges and opportunities. This study explores the paradigm shift in managing recreational function in Central European forests, considering growing digitalization in society. Grounded in empirical research conducted between 2023–2024 in sub-urban forests in Austria and Poland, the study investigates how digital technologies reshape visitor behaviour, site management, and policy responses. The findings underscore the increasing importance of digital representations of recreational offers, the spread of user-generated content, and the rising reliance on mobile applications for trip planning and navigation (Stefan et al 2024; Pellicer-Chenoll et al 2023). Simultaneously, our study highlights the growing use of large-scale datasets—from mobile devices, outdoor apps, and social media—as complementary data resources for systematic visitor monitoring. However, challenges such as disparities in digital literacy, limitations in data accuracy, and the fragmentation of digital content management are identified as critical constraints. Overall, this study calls for extending traditional management strategies to incorporate digital tools thoughtfully and equitably, integrating both technological innovation and social dimensions to enhance recreational experiences and ensure sustainable use in forest environments.

Keywords: cultural ecosystem services, outdoor recreation, nature-based tourism, digitalisation, forests, Central Europe

SESSION: Empowering Local Communities to Act for Change

Chair: *Mariana Melnykovich, Bern University of Applied Sciences*

1. *Łukasz Wiejaczka, Polish Academy of Sciences and Danuta Piróg, Joanna Fidelus-Orzechowska*

Perception of the dam reservoir by different social groups (Mucharz reservoir, Polish Carpathians)

ABSTRACT:

Dam reservoirs, in addition to their impact on the natural environment, also have an impact on local human communities. Scientific studies on the public perception of dams and reservoirs have been ongoing worldwide since the 1960s. However, there are still many gaps in this complex issue that need clarification.

The aim of the undertaken analysis is to find out the nature of social perception of the newly constructed (2018) Mucharz dam reservoir located on the Skawa River within the Polish Carpathian Mountains. The facility is the youngest dam investment within the Polish Carpathians, and its construction lasted with varying intensity for more than 30 years.

The analysis using statistical techniques and text mining was based on qualitative material collected during in-depth interviews conducted among residents of three municipalities located around the reservoir. The research focused on recognizing and hierarchizing the factors influencing how the reservoir is perceived by different social groups. Recognition of social visions of local economic development of the areas around the reservoir was also carried out.

The results of the study showed, among other things, that perceptions of the reservoir are mainly influenced by emotional and economic variables, while personal variables are less important. Social perception of the reservoir differs significantly depending on whether the person surveyed belongs to the resettled population or not. Displaced people perceive the reservoir more negatively than those who did not have to relocate as a result of its construction. Plans for the development of the areas around the reservoir, as presented by local government authorities and local residents, differ significantly. The differences relate to both the substantive issues and the degree of generality of these plans. While the authorities focus on general and conceptual visions, local residents expect specific actions and undertakings for local development.

Keywords: social perception, local communities, dam reservoir, development, Polish Carpathians

2. *Temur Gugushvili and Gvantsa Salukvadze, The International Black Sea University*

Rural Governance in Eastern Partnership Countries: The Role of Local Action Groups

ABSTRACT:

Political participation is a cornerstone of rural governance, particularly in emerging democracies where inclusive decision-making strengthens local governance structures. This study examines the governance structures of Local Action Groups (LAGs) in Georgia within the broader context of the Eastern Partnership (EaP) countries. Since 2015, the implementation of the LEADER/Community-Led Local Development (CLLD) approach in Georgia has aimed to foster participatory rural development, yet the governance mechanisms of LAGs remain underexplored, particularly their integration into local governance frameworks. This research employs a mixed-methods approach, incorporating an online survey of LAG members, in-depth interviews with key stakeholders, and administrative data

collection from existing LAGs. The analytical framework is grounded in the concept of spatial justice, examining both distributive and procedural dimensions of decision-making. The study investigates the organizational structure of LAGs, their coordination with municipal governments and other stakeholders, and the extent to which governance structures reflect local socio-economic contexts. Special attention is given to the transparency and inclusivity of board member selection processes, the autonomy of LAGs within existing governance frameworks, and their role in shaping rural development strategies. Findings highlight significant variations in LAG governance structures across municipalities, influencing stakeholder participation, development planning, and resource distribution. The study also explores the interplay between LAGs and local self-government institutions, assessing the implications for social justice and rural community empowerment. The research contributes to the ongoing discourse on participatory rural governance by offering insights into the challenges and opportunities of LAG governance in non-EU countries.

Keywords: Rural governance, Local Action Groups, LEADER, Eastern Partnership, spatial justice, participatory development, local self-governance

Acknowledgement: This work was supported by the Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [FR-23-489]

3. Roland Lleshi, Technical University Berlin and Gesa Geissler (Technical University Berlin), Saeed Najd Ataei Sarkarabad (Technical University Berlin)

The Role of Citizen Energy Initiatives in Empowering Local Communities and Advancing Sustainable Development in the Carpathian Region: A Multi-Country Perspective

ABSTRACT:

The energy transition is gaining momentum across Europe, and the Carpathian region is actively contributing to this shift towards more renewable energy sources, including decentralised and democratised, community-driven energy systems such as citizen energy (CE) initiatives (Geißler & Lleshi, 2024). However, CE initiatives still face significant challenges that hinder development and scalability (Lennon & Dunphy, 2024). This study investigates the barriers and potential benefits through a comparative analysis in Czechia, Hungary, Slovakia, and Moldova (in proximity to Carpathian region). The research employs a mixed-methods approach, combining a systematic literature review, document analysis and semi-structured interviews. Findings reveal that a lack of public awareness, historical scepticism toward cooperative models, and limited local engagement present obstacles in most of the countries. Financial constraints and capital costs further complicate project viability, with inadequate funding mechanisms restricting growth, especially in Slovakia and Moldova. Political and regulatory uncertainties add another layer of complexity, as inconsistent policies and bureaucratic inefficiencies create uncertainty for emerging initiatives. While Czechia has made notable progress in adapting its legislative framework, others still face significant institutional hurdles. Despite these challenges, CE initiatives offer benefits for local communities (FoE Europe et al., 2024). They can help combat energy poverty, generate local income, contribute to better environmental conditions, and enhance regional energy security by lowering dependence on oil and gas imports. Successful models are emerging, such as municipal-led initiatives in Slovakia, cross-border knowledge transfers between Czechia, Hungary, and Germany, and pilot projects in Moldova. This study emphasises the need for regulatory harmonisation, financial incentives, and capacity-building to overcome barriers and support citizen-led energy transitions. The insights aim to shape policy, governance, and cooperation, positioning CE as a driver of resilience and sustainability.

Keywords: Citizen Energy Initiatives, Challenges and Benefits of Citizen Energy Initiatives, Community Resilience and Sustainability, Carpathian Region, Central and Eastern Europe

Acknowledgment: Our research for this workstream is made possible through the support of the DBU foundation with its focus on this topic, as well as the implementation by TU Berlin. Crucially, the active exchange with DBU-funded projects in Central and Eastern European countries has provided valuable practical insights into the development of citizen energy in the region.

4. *Oksana Pelyukh (Ukrainian National Forestry University), Irmi Seidl (Swiss Federal Research Institute), Astrid Björnsen (Swiss Federal Research Institute)*

Engaging stakeholders in the energy transition in Ukrainian Carpathian schools

ABSTRACT:

The Paris Agreement calls for a transition to renewable energy, but in Ukraine this process remains fragmentary. This is particularly true for schools in the mountainous region of the Carpathians. These schools are heavily dependent on forest resources, suffer from outdated infrastructure and low energy efficiency. However, in this context, the transition to energy autonomy, for instance by using local energy resources in an efficient manner, requires stakeholder involvement, which is currently compounded by the weak local and regional institutional capacity and limited stakeholder cooperation.

The presented study adapts and apply the stakeholder analysis method (SAM) (Grilli et al. 2015; Reed et al. 2009) and identifies and classifies stakeholders and their level of engagement in supporting the energy autonomy of schools. The study is conducted in three mountain communities of the Lviv region (Kozivska, Slavska, Skolivska) and based on an expert survey (n=54). According to the experts, the main obstacles to achieving schools' energy autonomy are insufficient funding, a lack of energy efficiency specialists and low civic engagement. They consider the modernization of heating systems, the transition to alternative energy sources (mainly wood), and improved thermal insulation of the buildings as most promising solutions. 24 stakeholders are identified, of which – based on the experts' statements and the SAM – three are key, namely representatives of schools, local government authorities, and international and national donors. There are six primary stakeholders. The most promising stimulant to support schools' energy autonomy is the participation of stakeholders in public hearings, community meetings, and their representation in advisory committees on sustainable development – all three activities are vested rights in Ukrainian municipalities. This makes clear that the energy transition has a strong social component. Regardless of this, stakeholders are hardly involved in addressing energy challenges. We recommend to better engage key and primary stakeholders in a collaborative and transformative process towards energy transition in schools located in the mountainous region of the Carpathians.

Keywords: expert survey, ego-degree centrality, ego-betweenness centrality, social network analysis, stakeholders' involvement, schools, energy transition, Ukraine

Acknowledgement: This paper resulted from a project entitled "Advancing the energy transition in Lviv region schools: a socio-economic and educational initiative", which was facilitated through the support of the Swiss foundation VELUX STIFTUNG. Part of this work was supported by the CA21125 "A European forum for revitalisation of marginalised mountain areas" (MARGISTAR). In addition, gratitude is extended to the experts who participated in the survey and contributed to the research project.

5. *Francesco Vettore (University of Bologna) and Natalya Voloshyna (FORZA), Lesya Loyko (FORZA)*

Activating and Empowering Multi-Actor Rural Innovation Ecosystems for Inclusive, Participatory and Community-Based Development: The case of Zakarpattya, Ukraine

ABSTRACT:

European rural communities and territories have great potential as fertile ground for the development of Rural Innovation Ecosystems (RIEs)—innovation hubs based on local resources, bottom-up initiatives, and social inclusion. However, activating truly inclusive and participatory RIEs in these areas continues to be a significant challenge. The Horizon Europe project RURACTIVE aims to successfully support a just and sustainable transition for rural and remote areas by empowering communities and promoting various forms of innovation. The project's goal is to facilitate the creation of RIEs that encourage an inclusive, participatory, and community-anchored transition, enhancing local potential and strengthening the resilience of rural territories around Europe. To support the activation and maintenance of RIEs practically, RURACTIVE has developed a step-by-step methodology that goes beyond standard approaches to rural participation. Two key principles: participation and inclusion, and three cross-cutting priorities: climate change mitigation and adaptation, social justice and inclusion, and biodiversity, are integrated throughout the methodology and guide community-led rural development, to identify, engage, and empower local stakeholders, civil society, and groups at risk of social exclusion and underrepresentation. This contribution presents the RURACTIVE methodology to engage communities and relevant stakeholders in identifying local challenges, with the goal of developing, implementing, and monitoring smart, locally rooted solutions. The contribution is strengthened by presenting the experience of one of the 12 Dynamo sites of RURACTIVE project, Zakarpattya Region of Ukraine (Ukrainian Carpathians), in activating and maintaining a local RIE in the region. It provides an overview of the different stages of the process—from stakeholder identification to their engagement in the RIE and their empowerment through Local Workshops—highlighting strengths and critical issues. This contributes to a broader reflection on participatory methodologies, methods, and tools in rural areas.

Key words: #RuralInnovationEcosystems #SocialInclusion #BottomUpInitiatives
#ParticipatoryDevelopment #SustainableTransition #LocalEmpowerment #RURACTIVEproject

6. Romanko Roman, Sofiia Kurtova, Olga Baldi, Ielyzaveta Neliubina, Volodymyr Yefimov, Alevtyna Serdiuk, Serhii Bostan and Mariana Melnykovich, Bern University of Applied Sciences

Empowering Ukrainian Communities through Education and Energy Solutions: A Case from the CAS Rebuild Ukraine Program in Switzerland

ABSTRACT:

Universities have always been seen as drivers of positive change, offering community-based solutions to support development. This role becomes even more important during times of crisis. This presentation shows how the Bern University of Applied Sciences (BFH) is actively supporting Ukrainians in Switzerland to become leaders in rebuilding their country. Through the CAS Rebuild Ukraine program—a certificate of continuing education—BFH trains Ukrainians with protection status "S" to take an active role in the post-war reconstruction of Ukraine. The program focuses on best practices in energy, construction, and nature recovery based on a "build back better" approach. Swiss universities, businesses, and government actors play a key role in this initiative, working together to empower future leaders of Ukraine's recovery projects and to build a bridge between Ukraine and Switzerland for future joint projects. During this 6-month program, participants not only learn, but also create real reconstruction projects for Ukraine based on the knowledge and support gained in Switzerland.

One outcome of such projects is "Decentralized Renewable Energy Supply for Chernivtsi City Wastewater Treatment Plant" project, developed by a group of CAS participants. Based on experiences from Swiss wastewater plants, the team prepared a concept note proposing the installation of solar panels to supply electricity locally and ensure uninterrupted energy in times of

shortages and blackouts. The proposed system would save over 2 million UAH per year for the city, with a 5-year payback, and reduce CO₂ emissions by 138 tons annually.

To support this initiative, the team organized a knowledge exchange webinar with over 80 participants from Switzerland and Ukraine. The event brought together a community of practice and researchers from both countries, creating a network of those who can support the initiative. This collaboration continues, helping move the project toward real implementation.

The CAS experience has encouraged the City of Chernivtsi and its utility company to take more bold steps. Now, CAS participants act as ambassadors for Chernivtsi—seeking international support to realize the solar project and build new partnerships.

This initiative illustrates how targeted, practice-oriented education can serve as a catalyst for capacity building, decentralized innovation, and knowledge-based resilience in post-crisis contexts, with direct relevance for the implementation of the Carpathian Convention and its thematic priorities.

Acknowledgement: The CAS Rebuild Ukraine program is implemented by the Bern University of Applied Sciences (BFH) in partnership with the Swiss State Secretariat for Economic Affairs (SECO).

7. Stanislava Brnkaláková (Slovak Academy of Sciences), Zuzana Sarvašová (Institute of Forest Ecology-SlovakGlobe), Tatiana Kluvánková (Institute of Forest Ecology-SlovakGlobe), Mária Kozová (Institute of Forest Ecology-SlovakGlobe), Olena Shelvytska (Slovak University of Technology), Zieba A. (Tatra National Park in Poland), Konczal A. (Wageningen University), Iordachescu G. (Wageningen University), Winkel G. (Wageningen University)

Climate smart rewilding: co-benefiting future for socio-ecological systems

ABSTRACT:

Nature based solutions (NBS) represent a paradigm shift from conventional, technology-driven interventions to approaches that harmonized human development with natural processes. Embedding NBS into European governance frameworks ensures not only cost-effective and sustainable strategy that addresses the interlinked challenges of climate change and biodiversity loss but also fosters resilient socio-ecological systems capable of adapting to future uncertainties.

And thus, rewilding, as an essential nature-based climate solution, makes ecological restoration financially feasible, promotes social-environmental co-benefits, safeguards cultural, socio-economic values, while enhancing rewilding's climate benefits. Rewilding paves the way for innovative governance models that integrate local stakeholder participation with adaptive management strategies, thereby aligning conservation objectives with rural development and sustainable land-use practices. The approach not only enriches natural capital but also unlocks new avenues for tourism, research, and community engagement, making it a pivotal strategy for advancing a more sustainable and resilient future. However, rewilding also faces several institutional challenges. One key hurdle is the integration of rewilding principles into existing legal frameworks, which are often tailored to traditional conservation, forestry or agricultural practices. Issues such as land tenure, property rights, and potential conflicts with established land uses necessitate stakeholder engagement and adaptive governance structures. The long-term nature of rewilding projects also demands sustained financial commitments and cross-sector collaboration, making it imperative for policies to be both flexible and innovative to accommodate ecological uncertainties and evolving socio-political dynamics.

We will firstly introduce institutional analysis of the rewilding policy framework to understand existing policy support/constraints, legal frameworks as well as economic tools for rewilding implementation at European and national level based on policy documents review, interviews and workshops held with key actors. Secondly, we introduce empirical experience of the rewilding case study Tatra Mountains - two national parks positioned on the Slovak-Polish border. Despite being a

significant conservation area of NATURA 2000 framework and belong to the Tatra Biosphere Reserve, these national parks are facing the challenge how to ensure the ecological integrity of this territory due to several nature extreme events and human activities, and how to ensure the balanced coexistence between conservation efforts and community well-being. We apply a co-creation participatory approach which involves a diverse array of stakeholders and enables to create collaboratively a comprehensive strategy for national parks.

Acknowledgement: Our research results from HE wildE project (focusing on rewilding implementation opportunities and challenges), COEVOLVERS (focusing on NBS governance) and CA MARGISTAR (focusing on sustainable development of marginalized mountain regions).

SESSION: Importance of Nature-based Solutions (NbS) in Sustainable Development of Mountain Areas: A Transdisciplinary Approach (RPS)

Chair: *Ignacio J. Diaz-Maroto, University of Santiago de Compostela*

1. Fedir Hamor, Carpathian Biosphere Reserve

Pastoralism and problems of conservation of biological diversity in the Ukrainian Carpathians

ABSTRACT:

In the Ukrainian Carpathians, for hundreds of years, intensive unsystematic grazing of livestock by flocks of many thousands was carried out, which led to pasture degradation, impoverishment of grass cover, formation of large areas covered with low-productive matgrass (*Nardus stricta*) and monk's-rhubarb or Alpine dock (*Rumex alpinus*), trampling, significant erosion processes, and a lowering of the upper forest line by 200-300 meters.

Sheep and goats cause great damage to "hot spots" of growth of rare and endemic species of plants and animals that are found only in the highlands of Ukraine and Romania.

The interaction of shepherds with large carnivores, in particular wolves and bears, is also problematic. In addition, the unsystematic management of the Polonyna pastoral farming has become one of the causes of catastrophic floods on mountain rivers, mudslides and landslides. In recent years, the number of livestock grazing on highland meadows has significantly reduced, but sheep grazing still predominates, requiring significant areas, as sheep are mobile and not very picky about the steepness of slopes, easily moving through thickets of shrubs and crooked forests.

As of 2019, for example, in the highlands of the Chornohora massif, their number was over 4 thousand heads, and in the modern species structure of livestock they constitute 82%. The rest (17%) is cattle (817 heads), and only 1% are horses (71 heads).

As it was before, the same situation is now, that a significant part of the livestock in the mountainous Rakhiv, Tyachiv and Khust districts, in the summer periods continues to graze on the mountain pastures without applying any regulatory norms and without taking into account environmental aspects. Therefore, to preserve biodiversity, it is necessary to optimize the grazing system, introduce ecological and legal norms for the pressure on highland meadows, ensure even distribution of livestock on all mountain polonynas, use a rotational grazing system, avoid "hot spots" of rare species, use special equipment for shepherd dogs, and thus achieve the optimal number of livestock in different parts of the highlands (based on the calculation of 5 sheep or one head of cattle per one conventional hectare).

Keywords: Pastoralism, biodiversity, polonyna farming, grazing, regulation

Acknowledgement: This contribution was provided in the framework of the project “Linking biodiversity, pastoralism, and cultural heritage through education for sustainable development (ESD) in the Carpathian Region”, implemented by the Secretariat of the Carpathian Convention and funded by the German Federal Environment Ministry’s Advisory Assistance Programme (AAP). The responsibility for the content of this publication lies with the authors.

2. Ignacio J. Diaz-Maroto, University of Santiago de Compostela

Nature-based Solutions (NbS) as an Ecosystem-based Adaptation (EbA) approach for the temperate mountain communities

ABSTRACT:

Nature-based Solutions (NbS) are performances to address socioeconomic challenges through conservation, planning and sustainable management, as well as the restoration of ecosystems, when necessary, furthering biodiversity, ecosystem services and human well-being. NbS play an important role in the sustainable development of mountainous areas by offering an adaptive approach that integrates ecological and social dimensions, improving the capacity to anticipate and recover from the current and future impacts due to climate change. Many NbS incorporate extensive human knowledge about nature, the improvement of ecosystem services and well-being, community participation processes and management practices such as restoration, ecosystem monitoring and biodiversity conservation. Mountain ecosystems are essential for humanity and provide many biotic and abiotic ecosystem services, both to local communities and lowland inhabitants. Healthy and well-preserved mountain ecosystems contribute to mitigating the climate change for both people and wildlife, which can be revitalized and made more resilient. These kinds of solutions support mountain communities, promote biodiversity and wildlife recovery, being part of an Ecosystem-based Adaptation (EbA) approach. EbA is a nature-based settle that harnesses biodiversity and ecosystem services to reduce vulnerability and build resilience of communities to climate change. It covers a broad set of processes from ecosystem management to the recovery and improvement of their services and are recognised as multi-purpose solutions that are often more efficient than traditional technical measures. The EU Adaptation Strategy puts a strong emphasis on ecosystem-based approaches, and particularly on nature-based solutions. These are typically stakeholder-driven and adapted to regional conditions.

Keywords: Climate change, Forest ecology, Biodiversity conservation, Ecosystem services, Sustainable management

Acknowledgement: Ignacio J. Diaz-Maroto would like to thank the OECD the invaluable support has provided by the award of the fellowship under the program “OECD Co-operative Research Programme: Sustainable Agricultural and Food Systems”, through which I was able to carry out a research stay at the Czech University of Life Sciences in Prague (CZU).

3. József Pál Frink, National Institute for Research and Development in Forestry “Marin Drăcea” and Gusztáv Jakab, Zsolt Magyari Sáska, Andrea Sass- Gyarmati

Bryofloristic researches in Peatlands of the Apuseni Mountains (Western Romanian Carpathians)

ABSTRACT:

The total area of Romanian peatlands is estimated to 7,100 hectares, which represent about 0.03% of the country’s territory. The largest ombrotrophic mires are located in the Eastern Carpathians, but the Apuseni Mts. also has a wide diversity of peatlands. All of them host many glacial relicts and

circumboreal species, vascular plants and bryophytes, too. Most of the peat bogs and fens in Romania are included in natural protected areas of national interest and in the European Natura 2000 network. The present study provides floristical and chorological data on bryophytes collected in certain selected peatlands of the Apuseni Mts., carried out within a larger project aiming to evaluate the conservation status of Natura 2000 habitats of peat bogs and fens in Romania. From our twenty-six collection sites, hitherto 64 bryophyte taxa (6 liverworts and 58 mosses) were identified. This study reports ten species with newly recorded localities, thereby refining and expanding their known distribution within this mountain unit and across Romania. The species are *Calypogeia sphagnicola*, *Odontoschisma fluitans*, *Hamatocaulis vernicosus*, *Hygrohypnella ochracea*, *Helodium blandowii*, *Leucobryum juniperoideum*, *Meesia triquetra*, *Philonotis marchica*, *Sphagnum compactum* and *Sphagnum squarrosum*. Other species are confirmed in their previously known localities. Thus, the results of this study significantly contribute to the knowledge on the bryoflora of Romania.

Key words: bryophyte conservation, Natura 2000, oligotrophic raised bog, poor fen.

Acknowledgement: The field activities were carried out within the project "Monitoring of conservation status of the species and habitats in Romania under Article 17 of the Habitats Directive (SMIS-CSNR 17655) under the Sectoral Operational Programme (SOP) Environment. JPF was financially supported for a short visit grant to the Cryptogamic Herbarium of Eszterházy Károly Catholic University in Eger, within the Domus Hungarica Scientiarum et Artium programme of the Hungarian Academy of Sciences.

4. Jonas Sommer, Eurac Research

How can we sustainably manage biodiversity-rich grasslands in mountainous regions?

ABSTRACT:

Grasslands are some of the most biodiverse ecosystems worldwide and play an important economic and cultural role in higher mountainous regions, where harsh environmental conditions restrict other agricultural uses. However, in both the Alps and the Carpathians, the extent of biodiverse grasslands has continuously decreased, influencing the ecosystem services they provide. The project 'Grasslands for biodiversity' (G4B) supports the protection of the biodiversity-rich grasslands in the two mountain ranges by researching the management processes that are necessary to maintain them.

To investigate the role of the management intensity of grassland, mainly in terms of nutrient input through fertilization and defoliation frequency, we conducted vegetation relevés in the Italian region of South Tyrol and in Switzerland and combined them with already existing data. In a second step, we conducted more than four hundred interviews with the respective farmers to collect detailed information about the management. In the interviews, we have focused on a precise quantification and characterization of the nutrient input, as scientific evidence on its effects on biodiversity over a larger area with different topographical, climate and intensities of agricultural use is largely lacking. The dataset includes now a range of grasslands from the lower montane up to the alpine zone, encompassing a management gradient from very extensive to very intensive.

The results of the study will give an insight into the role of management intensity in shaping the plant communities. Combined with other parts of the G4B project, such as a stakeholder survey, it will help decision-makers across Europe to improve the protection of species-rich grasslands and their ecosystem services.

Keywords: grasslands, management, biodiversity, ecosystem services

5. Ignacio J. Diaz-Maroto, University of Santiago de Compostela

The role of Nature-based Solutions (NbS) in addressing the vulnerability to global change of mountain socio-ecological systems.

ABSTRACT:

Nature-based Solutions (NbS) are measures to address socioeconomic challenges through conservation, sustainable management, as well as the restoration of ecosystems, promoting biodiversity and human well-being. Mountains can be considered as socio-ecological systems, a complex set of relationships and interconnections that involve not only natural features but also human populations with their culture and economic activities associated with environmental conditions. In this regard, mountain social-ecological systems are especially relevant because they are highly vulnerable to global change and effort to advance towards sustainability. Therefore, NbS, such as sustainable mountain forest management, regulate their multifunctional use to maintain ecosystem services such as soil and water regulation, which are essential for tree growth. Mountain socio-ecological systems provide a wide range of valuable ecosystem services indispensable for life. All of these services could constitute strategic resources for the local population, while the landscape and nature of the mountains are also relevant due to their interest and tourist appeal. Likewise, mountain ecosystems have high biodiversity and provide multiple benefits and values, played a fundamental role in ecological balance and possess various profitable resources in the production and service delivery processes. These goods and services, combined with a widespread environmental heterogeneity, a generally low anthropogenic impact compared to the rest of the territory and a greater impact of worldwide warming, mainly in the high mountains, make these ecosystems outstanding observers/spectators of climate change. Therefore, understanding and anticipating the consequences of global change on mountain environments is critical.

Keywords: Climate change, Mountain ecosystems, Biodiversity and Ecosystem services

Acknowledgement: Ignacio J. Diaz-Maroto would like to thank the OECD the invaluable support has provided by the award of the fellowship under the program "OECD Co-operative Research Programme: Sustainable Agricultural and Food Systems", through which I was able to carry out a research stay at the Czech University of Life Sciences in Prague (CZU).

SESSION: Safeguarding Carpathian Pastoralism

Chair: Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention and Iana Baskerville, Romanian Academy - Iasi Branch

1. Tamara Mitrofanenko and Elena Fischer, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention

Linking biodiversity, pastoralism and cultural heritage through education for sustainable development (ESD) in the Carpathian Region

ABSTRACT:

Traditional pastoralism practices play a vital role in shaping the biodiversity-rich landscapes of the Carpathian Mountains and sustaining the cultural and economic life of local communities. Yet, these practices are increasingly threatened by pressures such as land fragmentation, demographic decline, erosion of traditional knowledge, and insufficient educational and training opportunities for the young generations of herders. Recognizing these challenges, parties to the Carpathian Convention – an international agreement dedicated to sustainable development and environmental protection in the region – has identified pastoralism as a thematic priority for 2025–2026, with an emphasis on strengthening science-policy dialogue, building capacities, and linking cultural and natural heritage with local livelihoods.

To advance this agenda, the Carpathian Convention Secretariat has developed and is implementing the project "*Linking biodiversity, pastoralism and cultural heritage through education for sustainable*

development (ESD) in the Carpathian Region”, funded by the German Federal Environment Ministry’s Advisory Assistance Programme (AAP). The project aims to foster synergies between biodiversity conservation, traditional pastoral practices and actors, and cultural heritage, while strengthening cross-border and cross-sectoral cooperation. In line with the decisions of the 7th Conference of the Parties (COP7/12), which endorse greater support and recognition of pastoral practices, the Carpathian Convention Secretariat also aims to facilitate a joint nomination of “Safeguarding Carpathian Pastoralism” as a best practice to UNESCO’s Representative List of the Intangible Cultural Heritage of Humanity. By engaging regional expert networks, protected areas, and civil society actors, the Secretariat seeks to address the challenges faced by pastoral communities, while underscoring their cultural importance and securing their role in the sustainable future of the Carpathian region. The project’s activities will be presented to session participants as a framework for dialogue, inviting their input and contributions where relevant.

Acknowledgement: The project “Linking biodiversity, pastoralism and cultural heritage through education for sustainable development (ESD) in the Carpathian Region” is funded by the German Federal Environment Ministry’s Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union. It is supervised by the German Federal Agency for Nature Conservation and by the German Environment Agency. The responsibility for the content of this publication lies with the authors.

2. Ioana Baskerville, Romanian Academy - Iasi Branch

The uncertain future of Carpathian shepherding. Romanian transhumance for a sustainable mountain ecosystem

ABSTRACT:

Romanian mountain shepherds face multiple interwoven vulnerabilities that threaten the sustainability of their profession and way of life. Environmentally, they must navigate unpredictable climate changes that impact grazing conditions and livestock wellbeing. The transmission of traditional knowledge and generational renewal are also at risk, as younger generations are reluctant to take up shepherding due to the demanding nature of the work. Economic challenges further exacerbate their precarious situation, with disrupted trade chains caused by disease outbreaks, fluctuating market demand for lamb and mutton, and the near-collapse of wool merchandising. Logistics and land-related issues add to these pressures, as restrictive land regulations, shrinking grazing areas, and conflicts with other land users limit their access to essential resources. Additionally, deep-rooted social and cultural stigmas surrounding shepherding contribute to its declining appeal, reinforcing generational disinterest and marginalization within broader society. These combined vulnerabilities create a complex and urgent set of challenges threatening the future of Carpathian pastoralism.

Recognizing, strengthening, and documenting pastoral traditional ecological knowledge (TEK) is essential for demonstrating the continued relevance of shepherding in the context of sustainable development. By integrating TEK into contemporary environmental policies can challenge the longstanding marginalization of shepherding, positioning it instead as a key pillar of cultural heritage and ecological sustainability in the Carpathian region.

This presentation will provide an overview of the professional challenges encountered by the researched shepherding communities, emphasizing their precarious socio-economic conditions, environmental pressures, and the diminishing viability of their respective lifeworld. Furthermore, it will explore national and multinational initiatives aimed at safeguarding transhumance-related practices, highlighting policy frameworks and sustainable development strategies designed to

support pastoral communities for the future. By integrating local perspectives, needs and expectations within broader policy approaches, this presentation seeks to foster dialogue on effective measures to actively support the mobile pastoralism and promote climate and evidence-based resource management in the Carpathian region.

Keywords: transhumance, traditional ecological knowledge, sustainable development of the Carpathians, intangible cultural heritage.

3. Paulína Blahová, Slovak Academy of Sciences

Representing heritage: the role of Slovak pastoral community in the UNESCO's inscription process

ABSTRACT:

This research examines the ongoing effort to extend the nomination file Transhumance – the seasonal droving of livestock to UNESCO's Representative List of the Intangible Cultural Heritage of Humanity, with a particular focus on Slovakia. It explores the role of stakeholders—including pastoral communities, national heritage institutions, and international organisations—and how their interactions reflect broader issues of power, representation, and epistemic injustice in transnational heritage governance. The research focuses on the Slovak pastoral community's participation in the inscription process, assessing how their knowledge, values, and concerns are acknowledged or marginalised within negotiations among different actors. While the 2003 UNESCO Convention on Intangible Cultural Heritage emphasises community involvement, heritage nominations remain ultimately controlled by state parties, often resulting in power asymmetries. Slovakia's participation in the multinational nomination, alongside several other European countries, further complicates the landscape of heritage representation, as diverse national interests converge in a single heritage-making process. Drawing on participant observation and semi-structured interviews with herders, policymakers, and heritage experts, the research maps the network of actors engaged in the inscription process and analyses their respective positions and influence. By applying Miranda Fricker's concept of epistemic injustice (2007), the research interrogates how pastoral communities' knowledge is either legitimised or dismissed. Specifically, it highlights testimonial injustice—where herders' expertise is undervalued due to prevailing institutional hierarchies—and hermeneutical injustice, wherein their lived experiences and conceptual frameworks do not fit neatly into bureaucratic and legal heritage classifications.

Ultimately, this research argues that heritage inscription processes must go beyond nominal community participation and actively engage with local epistemologies in equitable and meaningful ways.

Keywords: Transhumance - ICH - participation - epistemic injustice - institutionalization - power asymmetry

4. Fedir Hamor and Iryna Yonash, Carpathian Biosphere Reserve

Pastoralism and problems of conservation of biological diversity

ABSTRACT:

In the Ukrainian Carpathians, for hundreds of years, intensive unsystematic grazing of livestock by flocks of many thousands was carried out, which led to pasture degradation, impoverishment of grass cover, formation of large areas covered with low-productive matgrass (*Nardus stricta*) and monk's-rhubarb or Alpine dock (*Rumex alpinus*), trampling, significant erosion processes, and a lowering of the upper forest line by 200-300 meters.

Sheep and goats cause great damage to "hot spots" of growth of rare and endemic species of plants and animals that are found only in the highlands of Ukraine and Romania.

The interaction of shepherds with large carnivores, in particular wolves and bears, is also problematic. In addition, the unsystematic management of the Polonyna pastoral farming has become one of the causes of catastrophic floods on mountain rivers, mudslides and landslides.

In recent years, the number of livestock grazing on highland meadows has significantly reduced, but sheep grazing still predominates, requiring significant areas, as sheep are mobile and not very picky about the steepness of slopes, easily moving through thickets of shrubs and crooked forests. As of 2019, for example, in the highlands of the Chornohora massif, their number was over 4 thousand heads, and in the modern species structure of livestock they constitute 82%. The rest (17%) is cattle (817 heads), and only 1% are horses (71 heads).

As it was before, the same situation is now, that a significant part of the livestock in the mountainous Rakhiv, Tyachiv and Khust districts, in the summer periods continues to graze on the mountain pastures without applying any regulatory norms and without taking into account environmental aspects. Therefore, to preserve biodiversity, it is necessary to optimize the grazing system, introduce ecological and legal norms for the pressure on highland meadows, ensure even distribution of livestock on all mountain polonynas, use a rotational grazing system, avoid "hot spots" of rare species, use special equipment for shepherd dogs, and thus achieve the optimal number of livestock in different parts of the highlands (based on the calculation of 5 sheep or one head of cattle per one conventional hectare).

Keywords: Pastoralism, biodiversity, polonyna farming, grazing, regulation

Acknowledgement: Participation of the Carpathian Biosphere Reserve in the Forum Carpaticum was supported by the project "Linking biodiversity, pastoralism and cultural heritage through education for sustainable development (ESD) in the Carpathian Region", funded by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union. It is supervised by the German Federal Agency for Nature Conservation and by the German Environment Agency. The responsibility for the content of this publication lies with the authors.

5. Robin Rigg, Biotechnical Faculty, University of Ljubljana

Co-creating coexistence: a vision for pastoralism and wildlife in multi-functional landscapes

ABSTRACT:

An ambitious new project, launched on 1st November 2024, has a vision of Europe in which pastoralists, hunters and landowners coexist with wildlife better than they do today. In this bright future, depredation on livestock has been reduced, wildlife management is sustainable and there are fewer socio-political conflicts in relation to large carnivores. This transformation will have come about through the integration of diverse knowledge systems, recognition of shared values and the mainstreaming of respectful, constructive dialogue where diverse stakeholders engage in collective works towards common goals.

The recovery of wildlife populations (large carnivores and large herbivores) has created many additional challenges for pastoralism, which is already under pressure from multiple socio-economic drivers. Some of the major obstacles to addressing these challenges are conflicts between stakeholders and the contested nature of relevant knowledge. These issues will be addressed by the Co-creating Coexistence project: advancing policies, practices and stakeholder engagement for integrating wildlife and livestock into sustainable multi-functional landscapes in Europe (HORIZON-CL6-2024-FARM2FORK-01). The CoCo project (<https://cocoproject.eu>) employs multi-disciplinary approaches with a strong social science representation and a Multi-Actor Approach with widespread stakeholder engagement that facilitates co-creation of knowledge with high legitimacy. Insights from farm surveys, analysis of new data, reviews and modelling will be integrated into a Roadmap for

Coexistence that produces policy-relevant recommendations for better standardisation, harmonisation and integration of pastoral and wildlife management systems.

Diverse project partners provide a mix of agricultural, social science and ecological competence, coordinated by the Inland Norway University of Applied Sciences. The project, which runs until October 2027, spans the length and breadth of Europe through 12 case studies including three Carpathian countries: Poland, Romania and Slovakia.

Acknowledgement: The CoCo project is funded by Horizon Europe (HORIZON-CL6-2024-FARM2FORK-01) and implemented by a diverse coalition of partners, coordinated by the Inland Norway University of Applied Sciences

6. Jaroslava Panáková, Slovak Academy of Sciences

Sensing with the Grasslands: Multispecies Ethnography, Sensory Knowledge, and the Biodiversity of Carpathian Pastoral Worlds

ABSTRACT:

This paper explores how sensory anthropology and multispecies ethnography can enrich understandings of biodiversity care in the Carpathian grasslands of Slovakia. Based on fieldwork in Nová Bošáca and building on the sensory turn in anthropology, it investigates how farmers, animals, plants, and landscapes co-constitute forms of ecological knowledge that are affective, relational, and embodied.

Pastoralism is not viewed merely as subsistence or production but as a multispecies practice, marked by sensory communication and reciprocal perception. Drawing on Haraway's concept of "becoming-with" (2008), and recent work on sensory collaboration (Peemot 2024; Tsing 2015), the research examines how humans and nonhumans use sight, scent, sound, and touch to coordinate movement, grazing, and care. Sensory ethnographic techniques—including immersive video documentation, olfactory and visual naming tasks (Majid & Burenhult 2014), and 'on-the-go' interviews—reveal how knowledge is transmitted across generations and species.

The Carpathian landscape itself is understood as a sentient participant in these interactions, shaping and being shaped by human–nonhuman relations. This approach challenges technocratic framings of biodiversity, foregrounding situated knowledge, sensory engagement, and emotional attachment as key drivers of land stewardship.

By highlighting these sensory dimensions, the paper offers both thick ethnographic insight and applied value for biodiversity policy. It contributes to rethinking conservation not as external intervention but as a practice of attuned cohabitation—cultivated through care, perception, and shared presence within more-than-human worlds.

Keywords: sensory ethnography, multispecies anthropology, local ecological knowledge, pastoralism, Carpathian grasslands, human–nonhuman relations, environmental perception, biodiversity conservation

Acknowledgement: This research was supported by public funds of the Slovak Research and Development Agency under the Contract no. APVV-23-0641 and Biodiversa+/2021/451/G4B.

7. Miriama Mikušová, Technická univerzita vo Zvolene,

Transhumance in Slovakia – the need to preserve traditions and protection of farm animals from large carnivores

ABSTRACT: Transhumance, the seasonal migration of livestock between summer and winter pastures, is a traditional practice of extensive sheep and goat farming. During summer, herds graze on mountain meadows, while in winter, they move to lower, more climatically favorable areas. This

practice not only supports the biodiversity of grassland ecosystems but also contributes to preserving cultural heritage and traditional shepherding in Slovakia. Despite the benefits of transhumance in maintaining landscape character and enhancing biodiversity, extensive grazing in areas inhabited by large carnivores such as the gray wolf (*Canis lupus*), brown bear (*Ursus arctos*), and Eurasian lynx (*Lynx lynx*), poses a risk of attacks on livestock. These conflicts can lead to changes in predator behavior and a decline in interest in traditional grazing practices.

Current research focuses on identifying factors influencing the risk of encounters between these predators and livestock. By analyzing attack sites concerning land cover, terrain ruggedness, distance from human settlements, and their density, we can better understand the preferences of these carnivores when selecting areas for attacks. Factors such as the presence of livestock guardian dogs and the use of electric fencing are also considered. The findings from these studies can contribute to developing effective strategies for protecting livestock, enabling the harmonious coexistence of traditional grazing practices and the conservation of large carnivores in our country.

Keyword: transhumance, regional development, conservation, sustainable use, biodiversity, livestock, predation, large carnivore

8. Benjamin Kostner, Eurac Research

Pastoralism 2.0 - Navigating Ecology, Economy, and Coexistence in the Alps

ABSTRACT:

The return of wolves to the Alps has ignited conflicts and introduced challenges that require responses at multiple levels—political, administrative, and practical. While the focus often lies on technical solutions such as herd protection measures, the underlying social and economic factors are equally crucial. Shepherds play a central role in herd protection, yet their profession remains undervalued and underfunded. The LIFEstockProtect project has worked intensively over the past five years with key stakeholders in the German-speaking Alps, from individual farmers to policymakers, to address these complex issues. Through qualitative interviews, informal field meetings, workshops, and discussion rounds, the project has identified key obstacles: Beyond the traditional belief that lethal control will resolve the issue, a major challenge is the reorganization of pasture management. This involves not only technical and financial adjustments but also overcoming resistance within farming communities, where the use of protection measures is sometimes met with hostility. Additionally, the lack of professional shepherding threatens both the implementation of herd protection and the preservation of valuable cultural landscapes. However, professional shepherding offers significant ecological benefits when combined with expertise in biodiversity and guided grazing. To address these challenges, LIFEstockProtect is exploring the implementation of a contract-based nature conservation framework in South Tyrol. This approach could provide sustainable funding for shepherds, recognizing their role not only in herd protection but also in maintaining biodiversity and ecosystem services. By professionalizing the sector and improving economic conditions, shepherds could become key actors in fostering coexistence with large predators while ensuring the long-term viability of mountain pastures. This presentation will discuss real-world examples, the challenges involved, and potential solutions for future projects and policies. It will highlight how strengthening the shepherding profession can contribute to both effective herd protection and ecological landscape management in a changing Alpine environment.

Keywords: livestock protection #pastoralism #ecosystem services

Acknowledgement: The LIFEstockProtect (LIFE19 NAT/AT/000889) project is receiving funding from the LIFE Programme of the European Union. The conference participation was funded by Eurac Research.

Changing Attitude of Indian Shepherds in Karnataka Towards Wolves and Wildlife Conservation

ABSTRACT:

Changing Attitude of Indian Shepherds in Karnataka Towards Wolves and Wildlife Conservation

In Karnataka, India, pastoralism is integral to the livelihoods of many rural communities. Despite pastoralism in Karnataka faces numerous challenges, shepherds maintain robust social structures with effective resource-sharing mechanisms, while their livestock provides crucial liquidity. However, environmental changes, driven by both natural and human activities, pose significant challenges, such as the degradation of pastures and the depletion of resources along migratory routes, further marginalizing shepherd communities like pastoral nomads, who rely on traditional livelihoods, inhabit remote areas, and face limited access to healthcare (IPCC, 2014). From a social and economic perspective, younger shepherds are beginning to show a different attitude towards the presence of wildlife and the impact of predation on their family income. They no longer see wildlife as valuable, and view wolves as a disturbance to their livelihood. This contrasts with the traditional way of relating to wildlife, especially wolves, which are considered sacred regardless of their impact on the family economy, as stated by the majority of the interviewed shepherds. Consequently, the valuable indigenous knowledge held by these communities is at risk, as it is seen as backward by the new generation of shepherds (Sharma et al., 2003). Some of the new shepherds are calling for government control of the predator to keep the population stable and prevent attacks on domestic animals.

We conducted 42 qualitative interviews in the field during November 2023 to analyze the future of pastoralism in Karnataka, and how the new challenges and attitudes of younger shepherds could affect the conservation of wolves. Additionally, we investigated the potential strategies that can be implemented to maintain traditional knowledge while conserving wolf populations, and if any support exist for farmers through education/training on how to mitigate conflicts.

Keywords: Pastoralism; social attitude; wolves

SESSION: Collaborative Environmental Justice Initiatives in Central and Eastern Europe across Urban and Rural Divides (RPS)

Chair: *Jakub Csabay, Comenius University Bratislava*

1. *Gergely Tagai, HUN-REN Centre for Economic and Regional Studies*

And Melinda Mihály, HUN REN Centre for Economic and Regional Studies

Promoting Environmental Justice for Unheard Communities in Europe

ABSTRACT:

Environmental injustice is a pressing issue all over Europe. Public policies and investments regularly ignore the risk of environmental injustice, while structural discrimination contributes to unequal environmental burdens, with environmental risks having a disproportionate impact on marginalised communities. The phenomenon of environmental racism faced by Roma communities in Central and Eastern Europe, for example, is structural and interlinked with other dimensions of racial discrimination and exclusion, including spatial segregation. These segregated communities are often subject to systemic neglect, forced to live in environmentally hazardous areas with limited infrastructure, and excluded from decision-making processes that affect their well-being.

Understanding the intersection between spatial segregation and environmental risks is crucial to effectively address environmental injustices. However, research on the specific impacts of environmental injustice on racialised and marginalised communities in Europe remains scarce. We aim to fill this gap by mapping the links between spatial segregation and environmental injustice across the continent. In this session, we will present a newly launched project under the EU's CERV

programme as an example of community-based research and policy-making on environmental justice.

Keywords: spatial segregation, environmental injustice, Roma communities, community-based research

2. Judit Bari Berecz, Hiszako Indie Nonprofit Agency - Green Legal Platform

Housing Crisis in a Hungarian Romani Settlement Due to Environmental Damage: The Case of the Municipality of Recsk and a Local Mine

ABSTRACT:

This study is about the case of Recsk, a settlement in northern Hungary where Andesite-Bau Ltd., was awarded a permit to operate during the Covid-19 pandemic. The mining pushed ahead despite being in close proximity to its Romani neighbours. Individuals were traumatised and their property was damaged by the mine's explosives; later, deforestation at the site resulted in a mudslide which inundated Romani streets below the mine. Environmental racism is at play at this contested site, for neither before the mine opening nor after the mudslide did any Recsk villagers contribute to a relocation of Romani families to safer areas. To this day, victims have not received compensation or been able to move to safe residences. The owner of the mine project does not admit any wrongdoing, although an official investigation found that the mine caused the damage. Compensation offered by the government has not been forthcoming, and housing solutions offered by the state impose additional financial burdens on the victims. It is difficult to find a legal basis that would provide a satisfactory solution to the affected community. This case highlights several systemic and legal obstacles to environmental justice in Hungary. All three pillars of the Aarhus Convention are violated and not enforced.

Keywords: Environmental justice, Housing security, Human rights, Mining, Racism, Roma

3. András Balázs, University of Wisconsin-Eau Claire

Segregation and environmental inequalities in Budapest's eighth district

ABSTRACT:

In my presentation, I will discuss segregation trends in Budapest's eighth district and the specific environmental inequalities affecting poor Roma families living there. First, I will discuss the socio-historical causes of the district's decline, then the results and limitations of post-regime change rehabilitation interventions, and finally the consequences of the lack of environmental justice principles and practices. I am also interested in whether there are differences in the dimensions of inequality and environmental disadvantages between women and men, and whether the block rehabilitation measures aimed at eliminating segregated areas in the capital offer real opportunities for social mobility.

4. Fanni Maszlag, Hungarian Academy of Sciences Centre for Social Sciences

Cracks in the roof, gaps in the system – Environmental injustice in north-eastern Hungary

ABSTRACT:

In my presentation, I examine the lack of climate justice and environmental democracy in Hungarian public policies through the lens of communities living in Roma segregated settlements in Northern and North-eastern Hungary. The theoretical framework is grounded in the intersection of spatial segregation and environmental inequalities (Bullard, 1990; Massey & Denton, 1993), with a focus on social vulnerability and multidimensional exclusion.

Although the Hungarian Climate Strategy formally embraces the principle of "leaving no one behind," it fails to adequately address the needs of socially disadvantaged groups, especially Roma communities. Access to climate protection is far from equal: the living conditions in segregated

areas—such as crumbling adobe houses, illegal utility connections, the lack of green infrastructure and healthy environments, and extremely low energy efficiency—trap families in a cycle of deprivation. The National Roma Strategy similarly avoids engaging with systemic environmental injustices, addressing them only at the level of individual behavioral changes (e.g., waste management, heating practices). My presentation highlights how energy-related investments—such as installing solar panels—are often unrealistic in these villages, where not only the rooftops but even basic infrastructure are frequently missing. Local Roma women experience greater environmental disadvantages, as they are the main caretakers of households yet have minimal influence over local decision-making processes—thus, the principles of environmental democracy are also violated. The aim of this presentation is to draw attention to the structural shortcomings of current Hungarian climate and Roma policies, and to explore how social and environmental considerations could be integrated at the local level to foster a sustainable and just transition.

5. Jonathan McCombs, University of Wisconsin-Eau Claire

Mapping Environmental Justice in Hungary: Reflections on Methodology

ABSTRACT:

This presentation presents the methodological challenges and potential solutions to mapping environmental justice in Hungary, an initiative by the Green Platform, a consortium of social scientists, legal experts, and activists concerned with environmental racism. Environmental justice refers to the propensity for marginalized groups to experience disproportionate environmental harms, resulting from those groups living in spaces in close proximity to pollution and/or hazardous waste sites, and from infrastructure inequality. In Hungary, the marginalized group we are most concerned with is Roma, Hungary's largest racial minority. Environmental justice has been difficult to study in Hungary in part because there is a lack comprehensive environmental monitoring and accurate publicly available census data on ethnic and racial minorities. To overcome this, we have used Green Platform's vast network of experts, activists, and community leaders to compile data on Roma settlements. Together, we have begun mapping Roma settlements in QGIS, where community leaders and other experts have advised us on the boundaries of their Roma settlements. I have then compiled OSM data into the GIS that maps various industrial zoning and residential sites. In this presentation, I seek to present the first results of this methodology in light of the methodological challenges outlined above.

Keywords: Mapping, Data, Environmental Justice, Racism, Pollution and hazardous Waste

6. Elene Samukashvili, Ivane Javakhishvili, Tbilisi State University and German University of Administrative Sciences Speyer

Building a well-balanced environmentally conscious risk and crisis management system in the context of overlapping, compounding and cascading risks and crises in Georgia

ABSTRACT:

Inherent vulnerabilities across societal systems, borders, and scales have an impact on Georgia. Diverse disasters, emergencies and crises such as wars in the region, economic disruptions and supply chain failures have caused societal ripple effects, human and national security issues, all exacerbated by ongoing climate change crises. Despite the unprecedented adversity and unpredictability, it is essential to plan for future risks and crises. This raises questions about the ability of small nations such as Georgia to construct a balanced system for risk and crisis management. The construction of such a system should begin with identification and prioritisation of inherent vulnerabilities. In addition, multiple strategies, such as risk assessment, scenario planning, and crisis management planning, are to be employed to address and prepare for complex risks and crises. This study accentuates significance of establishing a well-balanced risk and crisis management system in Georgia; it offers

recommendations to achieve above-mentioned objective with emphasis on climate change and Disaster Risk Management (DRR) as a cross-cutting theme throughout. Study explores questions on what are the adversities towards human and climate security issues caused by the war in the Caucasus region, economic disruptions and failures, strained and overburdened health systems, and slowed progress towards meeting global climate change, loss, and damage targets in context of overlapping, compounding and cascading risks and crises; how can one plan for future risks and disasters now, despite the fact that intertwined risks and crises have caused a level of difficulty and uncertainty that has never been seen before.

SESSION: Plastics in the Mountains - session and panel discussion

Chair: *Joanna Zawiejska, University of National Education Commission Krakow*

1. *Paweł Mikuś (Polish Academy of Sciences), Maciej Liro (Polish Academy of Sciences), Anna Zielonka (Polish Academy of Sciences), Hanna Hajdukiewicz (Polish Academy of Sciences), Joanna Zawiejska (University of the National Education Commission)*

The role of wood accumulations in deposition and retention of macroplastics in mountain rivers ABSTRACT

Mountain rivers are often perceived as pristine ecosystems, yet growing evidence suggests they can act as effective sinks for macroplastic pollution. Particularly intriguing is the role of both living and dead vegetation—especially large wood—in capturing and storing plastics transported by the flow. Although initial observations indicate that wood jams can trap significant amounts of macroplastics, the physical and ecological mechanisms driving this phenomenon remain poorly understood. Several key questions remain unanswered: Why do certain wood jams accumulate dramatically more plastic than others? How do factors such as wood roughness, hydrological regime, flood frequency, and river channel complexity interact to influence retention? Do the form and function of wood jams in unmanaged, multi-thread channels differ fundamentally from those in regulated systems in their capacity to store anthropogenic litter? Could macroplastic storage even rival wood volume in severely polluted reaches—and if so, what might this imply for the long-term transformation of mountain river habitats? Advancing our understanding of these questions could open new directions in riverine plastic pollution research. Exploring how macroplastic becomes embedded in the geomorphic and ecological fabric of rivers may reveal overlooked feedback between hydrology, landscape structure, and pollution dynamics. Such insights are urgently needed—not only for designing effective mitigation strategies, but also for reframing mountain rivers not as remote sentinels of purity, but as critical, if complex, actors in the global plastic cycle.

Keywords: macroplastic, mountain river, Carpathians, wood accumulations, river pollution

Acknowledgement: The work was supported by the National Science Centre, Poland, under research project 2023/51/D/ST10/01816 "The role of woody debris in deposition and retention of macroplastics in mountain rivers".

2. *Maciej Liro (Polish Academy of Sciences), Anna Zielonka (Polish Academy of Sciences), Paweł Mikuś (Polish Academy of Sciences)*

From Bottle to Microplastic: First Field Test of Experimental Method to Track Plastic Fragmentation in River Channels ABSTRACT:

Macroplastic fragmentation in fluvial systems is a key driver of secondary microplastic formation and associated environmental risks. While UV degradation and microbial activity have been widely studied, the mechanical fragmentation of macroplastics during transport remains poorly understood.

This gap likely leads to underestimating secondary microplastic production, especially in high-energy environments like mountain rivers, where intense water and sediment flow can readily break down plastic debris. We present results from the first field-based experiment directly quantifying macroplastic fragmentation during river transport. Using a simple, cost-effective method developed by our team—tracking mass loss as a proxy for fragmentation—we monitored 42 one-liter PET bottles over 52–65 days under low- to medium-flow conditions along a 20-km reach of the Skawa River in the Polish Carpathians. Our findings show measurable mass loss, with extrapolated annual values ranging from 0.098 to 1 g (0.29–2.97% of original mass), and surface degradation rates of 1.19–11.82 $\mu\text{m}/\text{year}$. These correspond to complete fragmentation times between 34 and 333 years (median ~127 years). Despite the absence of flood events, the results underscore mountain rivers' potential as hotspots for mechanical macroplastic fragmentation and secondary microplastic production. Field observations revealed bottle damage linked to site-specific hydraulic conditions—such as turbulence and object rotation near boulders—suggesting that fragmentation is governed not only by transport distance but also by micro-scale hydromorphological features. Our method offers a scalable framework for assessing macroplastic fragmentation under natural conditions, complementing lab and mesocosm studies. Its simplicity and replicability make it suitable for broader application across varied riverine settings. Future studies under high-flow conditions and with diverse plastic types are needed to refine our understanding of macroplastic fate in mountain rivers.

Keywords:

Acknowledgement: The work was supported by the National Science Centre, Poland, under research project 2023/51/D/ST10/01816 "The role of woody debris in deposition and retention of macroplastics in mountain rivers".

3. Anna Zielonka, (Polish Academy of Sciences), Hanna Hajdukiewicz (Polish Academy of Sciences), Pawel Mikuś (Polish Academy of Sciences), Macej Liro (Polish Academy of Sciences)

Plastic in Carpathian watercourses: from large scale mapping to field experiments

ABSTRACT:

Mountain river ecosystems, characterized by high biodiversity and distinct physical properties, are particularly vulnerable to the adverse effects of plastic waste. This study establishes a baseline assessment of these risks in the Carpathians, one of the most biodiverse mountain ranges in Europe. By integrating high-resolution river network data and catchments with mismanaged plastic waste (MPW) inventories, we mapped MPW distribution across 175,675 km of watercourses within this ecoregion. Our analysis examined MPW in relation to elevation, stream order, river basin, country, and conservation status. Additionally, to assess the regional potential for the mechanical breakdown of macroplastics into microplastics within river channels, we mapped river stream power. Our findings indicate that rivers situated below 750 m a.s.l. (142,282 km; 81% of the total stream length) exhibit the highest MPW. The majority of MPW hotspots ($>409.7 \text{ t/yr/km}^2$) are concentrated in Romania (6568 km; 56.6% of all hotspot lengths), Hungary (2679 km; 23.1%), and Ukraine (1914 km; 16.5%). Rivers with minimal MPW ($<1 \text{ t/yr/km}^2$) are predominantly found in Romania (31,855 km; 47.8%), Slovakia (14,577 km; 21.9%), and Ukraine (7492 km; 11.2%). Watercourses flowing through nationally protected areas (3988 km; 2.3% of total studied rivers) exhibit significantly higher MPW (median = 7.7 t/yr/km^2) compared to those under regional (51,800 km; 29.5%) (median = 1.25 t/yr/km^2) and international protection (66 km; 0.04%) (median = 0 t/yr/km^2). Finally, we conducted a field experiment in one of mapped hotspots that provided baseline information on the fragmentation rate of a 1-liter PET plastic bottle occurring in such a hotspot under low-flow conditions ($0.26 \pm 0.012 \text{ g/year}$). Our research identifies key MPW hotspots within the Carpathian Ecoregion, providing a crucial foundation for future interdisciplinary efforts involving scientists, engineers, policymakers, and local communities to enhance plastic waste management in the region.

Keywords: plastic hotspots, plastic disposal, riverine macroplastic, secondary microplastic

Acknowledgement: The study was completed within the Research Project 2020/39/D/ST10/01935 financed by the National Science Centre of Poland.

4. Mehrnoosh Azodi, UNEP-BRS Conventions

Plastic Waste in Mountains and Glaciers

ABSTRACT:

The “Plastic Waste in Remote and Mountainous Areas” project, initiated in 2019 supports implementation of the Basel Convention’s Plastic Waste Amendments by addressing the escalating problem of plastic pollution in remote, mountainous areas and in glaciers. These areas face unique challenges due to their geography and often lack appropriate waste management infrastructure.

The project has advanced in three phases: data collection and analysis, baseline report development, and pilot project implementation. The first phase produced a comprehensive assessment report that mapped plastic waste sources and pathways, identified hotspots, and highlighted successful local practices. The second phase finalized the report as an internal baseline, which informed the development of targeted educational, awareness-raising, and outreach materials. These tools are designed to strengthen stakeholder understanding and engagement on plastic waste issues in mountainous contexts. Currently, the third phase is supporting pilot projects across multiple countries— great results have been achieved in Kazakhstan, North Macedonia, Peru, Tajikistan and Uzbekistan and other projects are making progress in Argentina, Chile, Eswatini, Lesotho, Rwanda, and Seychelles. These projects aim to build national and local capacity for managing plastic waste through practical interventions such as clean-up campaigns, installation of waste collection systems, policy and legal reviews aligned with the Basel Convention's Plastic Waste Amendments, and the creation of national plastic waste inventories. Furthermore, the Secretariat of the Basel, Rotterdam and Stockholm (BRS) Conventions and the Carpathian Convention are preparing a dedicated analysis of the state of plastic pollution in the Carpathian mountains, contributing to global efforts to minimize and prevent plastic pollution in ecologically sensitive areas.

Keywords: Plastic waste, mountainous regions, Basel Convention, Plastic Waste Amendments, waste management, Carpathian region, environmental protection, BRS Conventions

Acknowledgement: The project is financed by the Government of Norway, France, Netherlands and Germany, the Norwegian Agency for Development Cooperation, Norwegian Retailer’s Environment Fund.

5. Lucrina Ștefănescu, Monika Meltzer, Babeș-Bolyai University

ABSTRACT:

Plastic pollution poses a critical threat to Romania’s ecosystems, as the country accounts for the largest share of mismanaged plastic waste hotspots in the Carpathian region. Specifically, more than 50% of the total identified hotspot length for mismanaged plastic waste across Carpathian watercourses is concentrated along Romanian rivers (Liro et al., 2023). This indicates not only high levels of local waste generation and inadequate management but also the country’s key role in the regional dynamics of plastic pollution.

This paper presents the results of two citizen science projects (*ECOVOCE* and *EcoVoce Speak Up!*) addressing environmental pollution in the Apuseni Mountains by engaging citizens in monitoring environmental issues. Through a co-designed mobile app developed with four local communities along the Arieș River, citizens were empowered to report pollution incidents across five major categories. The app-based reporting system was integrated into a broader engagement strategy that

included in-person trainings, environmental education events, eco-blitzes, and gamified clean-up activities such as “waste hunting.” Approx. 180 reports were submitted in one year period, with plastic waste and illegal dumping emerging as the most frequently reported problems. The spatial distribution of reports highlighted recurrent pollution hotspots downstream of small towns and near informal settlements. These findings reveal a clear mismatch between waste generation and waste management capacity at the local level, but also a low engagement of the residents in reporting environmental crimes (Ștefănescu et al., 2025).

Projects like these and other citizen science projects mapped by the first Romanian Citizen Science Platform developed by Babes-Bolyai University in Cluj-Napoca, can generate relevant environmental data, increase community awareness, and inform local policy interventions (Schürz et al., 2024). Given the outcomes of the pilot, there is strong potential to upscale this approach nationally and integrate it with larger European initiatives, such as *Plastic Pirates*, especially in riverine and mountain contexts. Such alignment could strengthen cross-border monitoring efforts and support harmonized data collection in the wider Danube-Carpathian region.

Keywords: plastic pollution, Apuseni Mountains, citizen science, deficient waste management, environmental monitoring.

Acknowledgements: This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, ECOVOCE, project number PN-III-P1-1.1-TE-2021-0897, within PNCDI III. The EcoVoce - Speak up project was supported by the [IMPETUS Accelerator](#) programme, IMPETUS is funded by the European Union’s Horizon Europe research and innovation programme under grant agreement number 101058677.

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PLENARY SESSION: Supporting Green Recovery on Ukraine – PANEL DISCUSSION

Chairs: Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention; Mariana Melnykovich, Bern University of Applied Sciences; Eleonora Musco, Eurac Research, Secretariat of the Carpathian Convention;

Contributors: Harald Egerer, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention; Nadia Shevchenko, Information Center “Green Dossier” and Lesya Loyko, FORZA; Mariana Melnykovich, Bern University of Applied Sciences; Ganna Lobchenko, WWF – Ukraine; Natalya Voloshyna, FORZA; Günther Rautz, Eurac Research; Stephan Sicars, United Nations Industrial Development Organization (UNIDO)

The plenary focused on the needs, challenges and opportunities for Ukraine's EU-aligned, sustainable recovery, discussing legal frameworks, scientific input, and coordinated action to build back better. It highlighted gaps such as weak environmental integration, limited municipal capacity, funding shortfalls, and war-related demographic pressures, while stressing the role of education and research in addressing these challenges. Ecosystem restoration and close-to-nature forest management, applying strong environmental safeguards and impact assessments were identified among urgent priorities. The session concluded that effective recovery depends on sound legislation, empowered local authorities, international partnerships, and transparent, science-based governance to protect long-term resilience and natural capital.

SESSION: Historical Ecology and Geography: New Perspectives for Conservation and Management (RPS)

Chair: *Ewa Grabska, Dominik Kaim, Jagiellonian University*

1. *William Keeton, University of Vermont*

Perspectives on old-growth forest inventory, conservation, and restoration: bridging the divide between N. America and Europe

ABSTRACT:

In both North America and Europe, continental-scale inventories of primary and old-growth forests have been completed, although there are major differences in how these maps are being used to guide conservation, restoration, and adaptation. Moreover, inventory methodologies differ substantially between the two continents (Sabatini et al. 2020, Woodall et al. 2023). In the United States a directive under the Biden Administration would have protected all remaining old-growth forests on federal public lands, although this was later canceled. By comparison, the European Commission has mandated old forest protection within the pan-European Natura 2000 network and by other means, including the Biodiversity Strategy 2030. Conservation strategies on both continents call for the restoration of additional old-growth, yet the options for achieving this goal remain unclear and highly contentious -- among indigenous communities, conservationists, and the forest industry. Foresters in the U.S., Canada, and across much of Europe are exploring innovative, but somewhat different, ways to restore and sustainably manage forests using methods that more closely emulate natural dynamics, including indigenous cultural practices (Aszalos et al. 2022). In the Carpathian region, variants of what has been broadly termed "close-to-nature" silviculture are employed both in practice and experimentally, although rarely for the explicit purpose of old forest restoration, leaving an opportunity for modifications designed to achieve this objective. Yet rapid climate change-induced shifts in natural disturbance regimes present unprecedented challenges universally. Old forest restoration must be adaptive in this context. This talk will compare approaches in N. America and Europe, including the Carpathian region specifically, drawing on the speaker's recent Fulbright experience focused on "bridging the divide" in perspectives and extensive research on both continents.

Keywords: Old-growth Forests, Inventory Methodologies, Conservation, Restoration, Adaptation, Close to Nature Silviculture

Acknowledgement: This research and related multilateral scientific exchanges were supported by grants from the Trust for Mutual Understanding; the United States Department of Agriculture, McIntire-Stennis Forest Research Program; and a European Union funded LIFE project (LIFE 4 Oak

Forests). The author is grateful to the United States Department of State, Fulbright Scholars Program, for funding the bi-lateral exchanges of scientists that led directly to development of this paper.

2. *Ewa Grabska, Jagiellonian University*

Identifying High Conservation Value Forests Using Historical Maps and Remote Sensing: A Case Study from the Polish Carpathians

ABSTRACT:

High Conservation Value Forests (HCVFs) play a crucial role in maintaining ecological balance by preserving biodiversity, protecting rare and endangered ecosystems, and providing vital environmental services. Accurately identifying and classifying these areas is essential, as many remain unprotected, including the Polish Carpathians—a region rich in valuable forests.

The availability of various, often openly accessible, spatial datasets presents new opportunities for identifying forests with high conservation value. High-quality historical maps dating back to the 19th century enable the identification of areas with persistent forest cover, meaning forests that have never been converted to agricultural land. Additionally, remote sensing datasets, such as Landsat and Sentinel-2, allow for the assessment of the current state of forests and the detection of changes over recent decades. Finally, LiDAR data—freely available in many countries, including Poland—provide a more detailed picture of forest structure.

In this study, all these data sources were integrated to identify potential HCVFs. Specifically, a method combining mid-19th-century historical maps with remote sensing was used to pinpoint forests that have persisted for over 150 years. Testing in a 20,000 km² region of the Polish Carpathians revealed that 4,200 km² of persistent forest remains, with 50% lying outside protected areas, highlighting a key conservation opportunity. Furthermore, dense time series of Sentinel-2 satellite data combined with bi-temporal airborne LiDAR were used to identify and characterize different types of HCVFs, including old-growth forest sites and riparian forests.

Keywords: remote sensing, the Polish Carpathians, historical maps, conservation

Acknowledgement: The research has been supported by a grant from the Priority Research Area (“Anthropocene”) under the Strategic Programme Excellence Initiative at Jagiellonian University and by the National Science Centre (NCN), Poland (Grant No.: UMO-2024/55/D/ST10/00369).

3. *Simone Gingrich, BOKU University and Hannah Koch, Florian Weidinger*

Exploring quantitative historical sources on 19th century practices of forest use in the Alpine Provinces of the Habsburg Monarchy

ABSTRACT:

In the 19th century, forests in the Alpine Provinces of the Habsburg Monarchy experienced a forest transition, i.e. the beginning of forest recovery after long-term deforestation and forest degradation. At the institutional level, the period is characterized by major legal changes, notably the imperial forest act, that aimed at securing forest protection and continuous timber production, which at the same time effected a reduction of multifunctional forest uses. While considerable effort has been made to quantitatively characterize dynamics in forest area, timber harvest, and biomass carbon stocks through empirical assessment of quantitative historical sources and modelling, much less is known on the material dimensions of the multifunctional forest uses. In this contribution we present the results of an empirical source investigation exploring the availability and quality of quantitative historical sources at provincial level that allow to comprehensively quantify the multiple practices of forest use and management in the 19th century Alpine Provinces, focusing on forest grazing and litter extraction. Shedding light on the multitude of practices of forest use in this period will enable assessing the legacy effects that these practices have imposed on forest dynamics and characteristics

in the 20th and 21st centuries. For example, given the current decline of the carbon sink in Austrian forests, legacy effects of nutrient depletion or oversaturation can help to understand current dynamics and inform sustainable forest use.

Keywords: forest transition, forest grazing, litter extraction, forest history

Acknowledgement: The presentation is based on research conducted as part of the FWF-funded project INFEST 10.55776/PAT1172323

4. Michał Sobala, University of Silesia in Katowice

Reconstruction of the historical state of the traditional landscape in the Western Beskids as the basis for its protection

ABSTRACT:

Landscape changes are inevitable and result from a consecutive reorganisation of the land to adapt its use and spatial structure to changing human needs. For many centuries, the changes were local and gradual, and in particular regions, traditional landscapes developed with distinct and recognisable features (Antrop, 1997). The dynamics and magnitude of changes increased with the industrial, social, and political revolutions in the 18th and 19th centuries. This increase accelerated after the Second World War, causing the shrinkage of many traditional landscapes (Vos & Meekes, 1999). Because these landscapes are perceived as valuable and occupy areas of high nature value, they are often subject to protection activities (Honrado et al., 2017). The first stage before introducing these activities is reconstructing the historical state of traditional landscapes.

This presentation will discuss the problems of traditional landscape reconstruction using different data based on studies conducted in the Western Beskids. In this area, the disappearance of the traditional landscape of the seasonal mountain economy is caused mainly by land abandonment. The traditional landscape is relatively durable in areas still utilised by residents or protected using nature conservation activities. Nevertheless, individual landscape elements are also relatively well preserved in abandoned areas that have become forested. Preserved traces of past human activity are mainly connected with tillage and settlement, as past mowing and grazing did not lead to the creation of tough terrain forms. However, only pastures in the study area's higher parts are currently protected. If the current landscape conservation in the Western Beskids continues, only small fragments of the traditional landscape will be preserved as relics.

Keywords: traditional landscape, seasonal mountain economy, landscape conservation, reference landscape

5. Roman Cherepanyn, WWF-Ukraine, Vasyl Stefanyk Precarpathian National University and Ihor Dykyy (WWF- Ukraine), T. Yamelynets (WWF-Ukraine), Nelya Koval (Uzhansky National Nature Park, Jakub Kubala (Technical University in Zvolen)

Large Carnivore Estimation in Uzhanskyi National Nature Park — First Transboundary Synchronous Monitoring Within LECA Project in Ukraine

ABSTRACT:

The LECA project (Supporting the coexistence and conservation of Carpathian Large Carnivores of the European Union Interreg Central Europe program) aims to establish cross-border cooperation in monitoring, conservation, and management of large carnivores (Eurasian lynx, brown bear, grey wolf) in the countries of the Carpathian region, aligning with the objectives of the Carpathian Convention tasks. In Ukraine, the designated pilot area for research and synchronization of monitoring at the international level is the Uzhanskyi National Natural Park, part of the trilateral transboundary East Carpathian Biosphere Reserve (Ukraine, Slovakia, Poland).

To ensure the successful implementation of the LECA project, a pre-project assessment was conducted to evaluate the status and distribution of large carnivore populations in the Uzhanskyi

National Nature Park and adjacent areas. Capacity-building activities were implemented, including training for the park's staff on systematic deterministic (winter) and opportunistic (year-round) monitoring.

The spatial grid system (10x10 km, 5x5 km, and 2.5x2.5 km) for the project area was elaborated by the standardized LECA project methodology. For deterministic monitoring, 30 stations/locations (with 2 photo traps in each location — 60 photo traps together) within a 2.5 by 2.5 km grid were selected and installed. This monitoring effort was conducted from December 2024 to March 2025. Additionally, 10 locations within a 2.5 by 2.5 km grid were selected for opportunistic camera trap monitoring.

The LECA project aims to enhance the conservation and management of large carnivores in the Carpathians more effectively and sustainably — to implement coordinated monitoring in collaboration with local stakeholders and international partners. Synchronous transboundary monitoring will provide comprehensive, up-to-date data on large carnivore populations across the Carpathian region, forming a foundation for developing evidence-based strategies to mitigate human–wildlife conflicts and poaching.

Keywords: large carnivores, transboundary monitoring, stakeholder engagement, Carpathians.

Acknowledgement: WWF-Ukraine and Technical University in Zvolen coordinated all work, which was funded via the "Supporting the coexistence and conservation of Carpathian Large Carnivores" project (funded by Interreg Central Europe and co-funded by the European Union — Grant agreement ID CE0100170 "LECA").

6. Juraj Lieskovský, Institute of Landscape Ecology, SAS and Petra Gašparovičová (Slovak Academy of Sciences), Dana Lieskovská, Noemi Matušicová (Slovak Academy of Sciences)

Mapping the anthropogenic geomorphic features in Poiplie region (Slovakia) using airborne LiDAR visualizations

ABSTRACT:

As human societies have advanced, landscape modifications have increased in both scale and complexity, making it essential to understand the formation, evolution, and historical layering of anthropogenic features. Our research focused on comprehensively mapping these features. We employed the latest LiDAR data and visualization techniques to visualize, map, and analyze the development of anthropogenic geomorphic features in two cadastral areas in South Slovakia: Kiarov and Kovačovce. Additionally, we utilized historical maps and aerial images to estimate the age of these features and assess their current use. We identified 426 polygons of anthropogenic geomorphic features, covering a total of 456.89 hectares. Of these, 238 features are still in use, while 188 have been abandoned. The most commonly used features are water infrastructure, symbolic elements, and habitation sites. The largest areas in use are related to transport/exchange and subsistence features, while the largest abandoned areas are also associated with subsistence and transport features.

Keywords: landscape features, abandonment, Ipeľ, DEM"

Acknowledgement: This research was supported by the project Scientific Grant Agency VEGA 2/0031/23 "Analysis and evaluations of the environmental history of selected types of Slovak landscape from the early prehistory to the present"

7. Márton Bence Balogh, Department of Physical and Environmental Geography, Faculty of Science and Informatics, University of Szeged and Zalán Tobak (University of Szeged, Department of Atmospheric and Geospatial Data Science, Dominik Kaim (Jagellonian University of Kraków), Péter Szilassi (University of Szeged, Interdisciplinary Research Group of Natural and Environmental Hazards)

Impact of Historical and Recent Land Use/Land Cover Changes on Biological Invasion: A Case Study from Hungary

ABSTRACT:

The distribution of invasive species is impacted by numerous geographical factors, including topography, climate, soil characteristics, and hydrology. The relative importance of each factor varies according to the characteristics of the particular species in question. A further significant influencing factor that must be given full consideration is historical and recent changes in Land Use/Land Cover (LULC). While LULC changes may facilitate the establishment of certain invasive species, the duration of their impact on biological invasions remains uncertain. Our study investigated the potential connections between historical LULC patterns over the past 200 years and the recent emergence of four common invasive plant species in Hungary: *Ailanthus altissima* (tree of heaven), *Asclepias syriaca* (common milkweed), *Elaeagnus angustifolia* (Russian olive) and *Solidago* spp. (goldenrod). The analysis drew upon Geographic Information System (GIS) data and utilised statistical methodologies (like Odds Ratio analysis) to comparatively evaluate historical (1848-1990) and recent (1990-2018) changes in Land Use/Land Cover (LULC) with the spatial distribution of these invasive species in 2018. The findings suggest that *Asclepias syriaca* is more influenced by recent changes in LULC, while *Ailanthus altissima*, *E. angustifolia*, along with *Solidago* spp., are more affected by historical changes. *A. altissima* and *E. angustifolia* have been observed to thrive in areas of high LULC change intensity. In contrast, *A. syriaca* has been shown to be more prevalent in areas characterised by mixed and decreasing LULC change intensities, while *Solidago* spp. has been identified as being predominant in regions exhibiting continuously increasing and decreasing LULC change intensities.

Keywords: historical maps, Land Use/Land Cover change, plants invasion, Hungary, change intensity

8. Dariia Kholiavchuk and Daryna Shkaieva Yuriy Fedkovych Chernivtsi National University

Lessons from the past: Holocene climate change and ecosystem responses in the Carpathians

ABSTRACT:

This study synthesizes 119 Holocene paleoenvironmental reconstructions from the Carpathian Mountains, revealing significant regional asynchronicity in thermal and moisture patterns. Multiple proxy data, including tree rings, documentary records, isotopic compositions, and qualitative paleodata, demonstrate that Holocene climate trends in the Carpathians broadly align with European patterns while exhibiting distinct regional variations. Maximum warming (0.5–2°C above the 1991–2020 average) during the Atlantic period drove forest boundaries 200–300 meters higher than present tree lines. The Western and Eastern Carpathians followed Atlantic-continental paleoclimatic trends, whereas the Southern Carpathians displayed more continental characteristics, with climatic optimum timing differences reaching up to 2,000 years between regions. The Late Holocene saw increased climatic variability, with cooling periods (up to 0.7°C below long-term averages) correlating with reduced solar activity. The Medieval Warm Period (~900–1300 CE) promoted high-altitude forest expansion, with beech distribution serving as a sensitive climate indicator; its prevalence in foothill ecotones doubled compared to the early 20th century. The Little Ice Age (~1300–1850 CE) brought temperatures ~1°C lower than current averages, coinciding with intensified human activity, deforestation, and soil erosion. Recent centuries have seen gradual warming, accelerating since the 1980s, with anthropogenic influences increasingly masking natural climate cycles. These findings underscore the need for regionally differentiated conservation and management strategies that account for varied climate sensitivities and multirhythmic cycles.

Keywords: paleoclimate, Carpathians, Holocene, forest dynamics, paleoenvironmental reconstructions, climate variability, anthropogenic impact

9. Anisoara Filip (Stefan cel Mare University of Suceava, Romania and University of Bucharest, Romania) and Marcel Mindrescu (Stefan cel Mare University of Suceava and Geoconcept Association of Applied Geography, Flutura, Romania)

Reconstructing Romania's palaeoclimate: synthesis of proxy data

ABSTRACT:

The palaeoclimate dynamics in Romania remain poorly integrated into continental-scale palaeoreconstructions, primarily due to the fragmented data availability and local-scale interpretations in the studies. This work compiles the palaeoclimate records available from Romania, using publicly accessible datasets (e.g., Neotoma, NOAA, PANGAEA), published literature, and unpublished archives and datasets, with the goal of creating a comprehensive synthesis of the availability and coverage of past climate change studies in the region. A range of proxy types is encompassed, including pollen, diatoms, geochemical markers, stable isotopes, and, where available, subfossil chironomid remains. This work addresses challenges in harmonizing the datasets, including the variable temporal resolutions, calibration methods, incomplete datasets, and the unavailability of metadata. Preliminary analysis shows pronounced spatial heterogeneity in Romania's palaeoclimate: (1) Northwestern sites (dominated by cave records) show a stronger Atlantic influence, especially during the middle Holocene, while (2) the Romanian Carpathians (dominated by high-altitude lake and peat records) exhibit stronger seasonal and inter-regional contrasts and (3) the lowlands are poorly represented in the palaeoclimate literature. This synthesis demonstrates the imperative for centralized data repositories, increased accessibility to old datasets and diversification of proxy studies in Romania, in order for the palaeoclimate literature to be representative for the past climate changes in the region, while also indicating priority areas for future sampling and analysis in order to fill the gaps in regional and continental-scale climate change reconstructions.

Keywords: palaeoclimate records, Romania, climate change history, palaeoenvironmental proxies

10. Dominik Kaim, Jagiellonian University

And Magdalena Sobczak, Michał Jakiel, Natalia Tokarczyk, Šimon Opravil, Robert Pazur

Change and persistence – the trajectories of the grasslands in the Polish Carpathians

ABSTRACT:

The grasslands are among the most biodiversity-rich habitats in Europe. However, due to diverse land use changes, the grasslands are at risk, especially in the remote, mountain areas. In this work we analyse changes in grassland area and assess their persistence over time in the Polish Carpathians. We used the detailed POLSA 2024 land cover map and compare it with the historical Carpathian land use dataset (Lieskovský et al., 2018). Our results showed that the overall area of the grasslands increased from 15% to 23% in the period 1980-2024. However, at the same time, only 26% of the grasslands in 2024, were grasslands also in the 1980s, while more than 60% were at that time the arable lands. It shows the overall decrease of the land use intensity in the area. It suggests also that the grasslands are not persistent type of the land use in the mountain area of the Polish Carpathians. There is a need to better plan the policy towards the grassland persistence in future to protect their biodiversity. Probably the changes in the CAP might have a substantial impact on the future of the Carpathian grasslands in Poland.

Keywords: grasslands, land use change, the Polish Carpathians, land use legacies

Acknowledgment: This research was funded through the 2021-2022 Biodiversa+ COFUND call, under the European Biodiversity Partnership programme, and with the funding organisations: National Science Centre Poland, Schweizerischer Nationalfonds zur Förderung der Wissenschaftlichen Forschung, Slovak Academy of Sciences, Autonomous Province of Bolzano/Bozen, South Tyrol, Deutsche Forschungsgemeinschaft e.V., BMBF-VDI/VDE INNOVATION + TECHNIK GMBH and The Executive Agency for Higher Education, Research, Development and Innovation Funding; UMO-2022/04/Y/ST10/00088.

11. Yana Popiuk, Yuriy Fedkovych Chernivtsi National University, Ukraine

And Dariia Kholiavchuk (Yuriy Fedkovych Chernivtsi National University), Bogdan Ridush, Serhii Kyryliuk, Illia Chornei (Yuriy Fedkovych Chernivtsi National University), Tetiana Kurhultseva

Ecological Trade-offs in the Bukovynian Carpathians: Grassland Conservation vs. Forest Restoration

ABSTRACT:

This study aims to evaluate the ecological consequences of natural forest expansion into subalpine zones and determine the optimal balance between natural succession processes and the conservation of rare mountain ecosystems in the Bukovynian Carpathians. Using a combination of historical cartographic analysis, multi-temporal satellite imagery interpretation, and repeated field surveys, we documented the upward advancement of the forest line. We quantified the subsequent reduction of subalpine meadow areas. The research focuses on the highest and most remote southwestern part of the Bukovynian Carpathians, encompassing the Yarovytsia-Tomnatyk (1574 m a.s.l.) and Chornyi Dil (1483 m a.s.l.) ranges, one of the least studied regions of the Ukrainian Carpathians. Most of these territories are located within the Cheremosh National Nature Park, characterised by two primary landscape types: dominant coniferous forest and subalpine ecosystems. While spruce-dominated coniferous forests constitute the original landscape matrix, subalpine meadows cover the summits and near-summit areas at elevations above 1400 m. These meadows include secondary mesic and heath grasslands used as pastures or hayfields, primarily on the southern slopes of Yarovytsia-Tomnatyk, and species-rich carbonate-based subalpine and alpine meadow communities on the south of Chornyi Dil, which harbour numerous rare and endemic species. Our research reveals a significant dynamic shift in vegetation cover over recent decades. While overall forest cover in the Bukovynian Carpathians has decreased due to logging and storm damage, these high-elevation areas exhibit natural forest expansion. This natural reforestation process threatens several valuable ecosystems: endemic subalpine and alpine meadows on carbonate substrate at Zmievon Mountain; unique rock communities on the "Velykyi Kamin" geosite; the traditional polonyny (mountain meadows) of Yarovytsia and Chornyi Dil; and various wetland habitats harbouring glacial relict species, including raised bogs on Zhupania massif, carbonate spring habitats in "Bilyi Potik," slope peatbogs on Yarovytsia ridge, and rare carbonate bog communities near Sarata village. Conserving these rare habitats requires a thorough analysis of qualitative and quantitative parameters of forest expansion, identification of key factors influencing these changes at the local level, comprehensive inventory of bogs and spring habitats, and appropriate protection measures. Our study addresses the complex dilemma between allowing natural forest succession and preserving the exceptional biodiversity of these subalpine ecosystems, providing a framework for informed conservation decisions in this ecologically significant but vulnerable mountain region.

Keywords: forest expansion, subalpine meadows, biodiversity conservation, Bukovynian Carpathians, habitat monitoring, traditional land use, wetland ecosystems, sustainable mountain development.

SESSION: Carpathian Waters

Chair: Joanna Zawiejska, University of National Education Commission and Gabriela-Adina Moroşanu-Mitoşeriu, Institute of Geography of the Romanian Academy

1. Łukasz Wiejaczka, Polish Academy of Sciences

And Danuta Piróg (University of the National Education Commission), Joanna Fidelus-Orzechowska (University of the National Education Commission)

Perception of the dam reservoir by different social groups (Mucharz reservoir, Polish Carpathians)

ABSTRACT:

Dam reservoirs, in addition to their impact on the natural environment, also have an impact on local human communities. Scientific studies on the public perception of dams and reservoirs have been ongoing worldwide since the 1960s. However, there are still many gaps in this complex issue that need clarification.

The aim of the undertaken analysis is to find out the nature of social perception of the newly constructed (2018) Mucharz dam reservoir located on the Skawa River within the Polish Carpathian Mountains. The facility is the youngest dam investment within the Polish Carpathians, and its construction lasted with varying intensity for more than 30 years.

The analysis using statistical techniques and text mining was based on qualitative material collected during in-depth interviews conducted among residents of three municipalities located around the reservoir. The research focused on recognizing and hierarchizing the factors influencing how the reservoir is perceived by different social groups. Recognition of social visions of local economic development of the areas around the reservoir was also carried out.

The results of the study showed, among other things, that perceptions of the reservoir are mainly influenced by emotional and economic variables, while personal variables are less important. Social perception of the reservoir differs significantly depending on whether the person surveyed belongs to the resettled population or not. Displaced people perceive the reservoir more negatively than those who did not have to relocate as a result of its construction. Plans for the development of the areas around the reservoir, as presented by local government authorities and local residents, differ significantly. The differences relate to both the substantive issues and the degree of generality of these plans. While the authorities focus on general and conceptual visions, local residents expect specific actions and undertakings for local development.

Keywords: social perception, local communities, dam reservoir, development, Polish Carpathians

2. Anna Zielonka, Polish Academy of Sciences and Hanna Hajdukiewicz (Institute of Nature Conservation), Maciej Hajdukiewicz, Edward Walusiak

Multispectral Assessment of Seasonal Temperature and Precipitation Effects on Floodplain Vegetation Phenolog

ABSTRACT:

Riparian ecosystems are vulnerable to anthropogenic disturbances, particularly river channel modifications that alter hydromorphology and influence vegetation dynamics. Channelization-induced incision often leads to drier floodplain conditions, promoting terrestrialization and facilitating invasive species expansion (Catford et al., 2011). While dam impacts are well studied, riparian vegetation changes across adjacent river sections with different morphologies remain less understood.

Our study compares riparian vegetation in channelized and unmanaged sections of three mountain rivers in the Polish Carpathians. Multispectral UAV imagery analysis (NDVI Normalized Difference Vegetation Index; NDRE Normalized Difference Red Edge Index; MTCI MERIS Terrestrial Chlorophyll Index) revealed distinct seasonal dynamics in riparian vegetation. Invasive species exhibited significantly higher NDRE values in early spring, indicating a competitive advantage due to their faster development compared to native species. NDVI values for native and non-native species correlated strongly with total precipitation, particularly within the 20–30 days preceding UAV surveys. Invasive species, however, displayed minimal dependence on precipitation but showed stronger correlations between early spring NDRE values and temperature ($R^2 = 0.34$), suggesting an enhanced ability to

establish under warming conditions. MTCI values were highest for invasive species at the start of the growing season but later favored native species, reflecting different photosynthetic activity patterns. Due to the varying NDRE and MTCI index values recorded for different plant species, particularly for spring conditions, it is advisable to include both indices in the analysis.

These findings highlight the ecological risks associated with invasive species spread in channelized river systems under climate change. The study underscores the importance of restoring natural hydrological conditions to sustain riparian forests and proposes a remote sensing-based methodology for evaluating vegetation status.

Keywords: invasive plant species, riparian vegetation, river channel morphology, river channelization, multispectral imagery

Acknowledgement: The study is carried out as part of Research Project: 2023/49/B/ST10/01387 financed by the National Science Centre of Poland

3. *Hanna Hajdukiewicz, Polish Academy of Sciences and Maciej Hajdukiewicz, Virginia Ruiz-Villanueva, Artur Radecki-Pawlik, Joanna Zawiejska (University of National Education Commission)*

Changes in extent of flooded area as a key factor shaping ecological conditions in a mountain river floodplain

ABSTRACT:

During the 20th century, many mountain rivers in Europe experienced intensive human interventions, significantly altering their channel morphology. However, the impact of these changes on past river hydrodynamics and floodplain vegetation remains unclear. This study employs hydraulic modeling based on archival aerial photographs to assess how human-induced modifications affected flood hydraulic parameters between 1964 and 2012, influencing the extent of flooded areas in the Czarny Dunajec River (Polish Carpathians) and, consequently, floodplain ecological conditions. Digital Elevation Models (DEMs) were derived from archival aerial photographs (1964, 1983) and Airborne Laser Scanning data (2012) to extract channel elevation data. Hydrodynamic changes and the flood extent were examined using the 2D Iber hydraulic model for three years (1964, 1983, and 2012) and various flood scenarios, ranging from frequent to extreme events. Hydraulic parameters such as water depth and flow velocity for four flood scenarios of varying magnitudes increased significantly between 1964 and 1983. These changes led to higher unit stream power, promoting the flushing out of finer sediments and accelerating channel incision, as previously documented (Hajdukiewicz et al., 2019). The increase in channel capacity due to channel incision reduced flood frequency and significantly decreased the extent of the flooded area, particularly between 1964 and 1983. The floodwater was transferred, intensifying flood hazards downstream along the river reach. Between 1983 and 2012, changes in hydraulic parameters were less pronounced, and the reduction in the extent of flooded area was less significant. However, channel adjustments remained persistent. The decreased floodwater retention potential altered floodplain vegetation composition, leading to the establishment of mature forests and sparse shrub vegetation. In contrast, a nearby multi-thread channel section, where human intervention was less extensive, now supports a young, diverse forest, highlighting the significant ecological consequences of anthropogenic modifications.

Keywords: extent of flooded area, hydrodynamic changes, floodwater retention, hydraulic modelling, channel capacity, floodplain vegetation

Acknowledgement: The study is carried out as part of Research Project: 2023/49/B/ST10/01387 financed by the National Science Centre of Poland

4. *Georg Gruber, University of Natural Resources and Life Sciences Vienna*

And Rafaela Schinegger (Institute of Landscape Development, Recreation and Conservation Planning), Georg Gruber (Institute of Landscape Development, Recreation and Conservation Planning), Florian Borgwardt (University of Natural Resources and Life Sciences), Johannes Kowal (University of Natural Resources and Life Sciences), Carina Seliger (University of Natural Resources and Life Sciences)

Integrating longitudinal, lateral, and catchment-based connectivity for freshwater and terrestrial ecosystem restoration in the Danube-Carpathian Region

ABSTRACT:

Connectivity is a fundamental property of river basins, enabling the exchange of water, sediment, nutrients, and organisms across multiple spatial and temporal scales. In the Danube-Carpathian region, freshwater and terrestrial connectivity are increasingly fragmented by hydromorphological alterations, infrastructure development, and land-use change. Disruptions in longitudinal connectivity (river network fragmentation), lateral connectivity (floodplain disconnection), and catchment-wide connectivity (cumulative impacts of multiple stressors) threaten biodiversity and ecosystem functionality. The EU Biodiversity Strategy 2030 and, more recently, the Nature Restoration Regulation mandate the restoration and reconnection of at least 25,000 km of free-flowing rivers and associated floodplains and wetlands to address this issue.

Within the Horizon Europe project NaturaConnect, we develop a multi-dimensional approach integrating graph- and circuitscape theory to assess and enhance ecological connectivity in the Danube-Carpathian Region. The overarching aim is to create a holistic approach to identify priority areas for restoration. Our longitudinal connectivity assessment focussing on rivers builds on a reach-based scoring approach, evaluating habitat availability and quality, barrier location and passability, and hydromorphological conditions. This methodology allows the quantification of the restoration potential under different passability scenarios, providing targeted insights for improving freshwater continuity. The assessment of lateral connectivity focuses on the connection to floodplains and applies a resistance-based modelling framework with Omniscap using Copernicus Riparian Zone datasets. This approach quantifies the structural and functional connections between rivers and adjacent floodplains, identifying areas with high restoration and reconnection potential. Additionally, we incorporate land-use resistance layers to evaluate how different landscape types influence riparian connectivity. At the catchment level, we integrate stressor assessments with ecological prioritization tools. By analysing Functional Elementary Catchments (FECs), we account for multiple spatial scales, identifying sub-catchments where restoration would yield the highest ecological benefits. We also propose an integrated connectivity index that combines longitudinal and lateral dimensions to provide a holistic view of freshwater-terrestrial connectivity.

5. Gabriela-Adina Moroşanu-Mitoşeriu, Institute of Geography of the Romanian Academy

And Liliana Zaharia, Philippe Belleudy, Gabriel Minea

Changes in Water And Sediment Fluxes in the Jiu River Basin (Romania) in the Context of Environmental Changes

ABSTRACT:

This research investigates the temporal variability of water and sediment flows in the Jiu River Basin in order to identify possible alterations that could be induced by environmental changes, mainly climate and anthropogenic. Located in southwestern Romania, the study area spans approximately 10,080 km², with altitudes ranging from 2,519 to 15 m at the confluence with the Danube River. The research mainly focuses on the upper (mountainous) and middle (hilly) sectors of the Jiu River Basin, which are among the most vulnerable to climate and human pressures.

The objectives of this study include: (1) highlighting the natural (climatic) and anthropogenic (hydropower works, mining industries) factors that affect water and sediment fluxes, using

graphical and cartographic tools, and (2) analyzing the spatial and temporal dynamics of both liquid and solid discharge, in relation to the influence of climate change and human interventions.

The changes in climatic and hydrological parameters were investigated by using the Mann-Kendall test (for trend detection) and Pettitt test (for change point detection). As climate parameter we investigated the air temperature and precipitation (annual and monthly) from eight stations, over the period 1961 to 2013. Hydrological data refers to data series (annual and monthly) of liquid discharge (from 53 hydrometric stations) and sediment load (from five stations). The length of the hydrological data series varied depending on the starting year of measurements and the last available data year (2013). The analyses showed both increasing and decreasing trends in water flows, these latter ones being mainly induced by hydrotechnical projects (mainly in the upper/ mountain and middle/ sub-Carpathian and piedmont sector of the river basin) and secondarily, by climate variability. Temperature show significant increasing trends, except for Bechet's annual minimums, while precipitation reveal mixed trends without statistical significance, except for significant summer decreases in the Carpathian (upper) sector of the basin (Petroșani station, especially) and seasonal increases in autumn and spring, at station in the same upper sector. The trends in suspended sediment discharge showed a general decrease in sediment transport, especially after the 1990s, which correlates with the closure of mining activities in the Carpathian basin, that previously contributed significantly to the sediment load. The results indicate that while climate change impacts mainly smaller tributaries (less anthropogenically affected), at most gauging stations the variations in streamflow and sediment load are more influenced by human interventions, particularly hydropower and water supply infrastructure. These findings underscore the complex, multifaceted nature of hydrological changes in the Jiu River Basin, and the need for integrated approaches to manage both natural and anthropogenic factors in river basin management.

Keywords: Jiu River Basin, Southern Carpathians, hydroclimatic trends, hydrotechnical works, environmental changes, mining activities

Acknowledgement: The first author expresses gratitude to the Institute of Geography of the Romanian Academy for providing the opportunity to develop and submit this research as a chapter in the forthcoming Atlas of Climate Change Impacts and Resilience in Romania. Acknowledgements also go to the Romanian Institutions of Water Management (ABA Jiu and the Institute of Hydrology) and the Meteorology Administration for supplying the essential data needed to conduct this study.

6. Iulian Faltinschi and Marcel Mindrescu, Stefan cel Mare University of Suceava

Relative elevation model for channel morphology and meander analysis of the Mureș river, Arad county, Romania

ABSTRACT:

This study presents the development of a high-resolution Relative Elevation Model (REM) aimed at enhancing the visualization and interpretation of fluvial landforms along a lowland reach of the Mureș River in Arad County, western Romania. We used the recently released LiDAR-derived Digital Terrain Model (DTM) provided by ANCP, and we processed the data in QGIS to extract subtle geomorphic features that are not readily visible in the raw elevation data. The resulting REM highlights detailed morphological features such as meander bends, cutoff oxbows, abandoned channels, point bars, and terrace remnants. In particular, the REM clearly delineates relict meander loops and low-lying floodplain depressions, some of which correspond to historical channel traces visible in aerial imagery and past cartographic sources. The relative elevation values also allow the identification of the river bed as the continuous zone of zero elevation in the REM.

Keywords: floodplain, river, REM, LiDAR

7. Katarzyna Wasak-Sęk, Polish Academy of Sciences and Joanna P. Siwek, Dominika Chmolewska, Mateusz Stolarczyk, Łukasz Jelonkiewicz, Mirosław Żelazny

Ammonium and nitrate fate in a montane catchment (Tatra Mountains, Poland) influenced by forest disturbances of different origin

ABSTRACT:

The Tatra Mountains, the highest mountain range in the Carpathians, have been affected by large-scale forest disturbances in recent years. Windthrow, which occurred in the western part of the Tatra Mountains in 2013, was followed by a bark beetle outbreak. The aim of the study was to determine the response of inorganic N in soils and stream water to the forest disturbances occurring in the following order: windthrow deforested 5 years before the study (WD), currently bark beetle deforested (BB) and undisturbed forest (F) catchments. Forest disturbances strongly influence the NO_3^- and NH_4^+ cycles in the catchments. The main source of NH_4^+ in the soils and in the stream water of the disturbed catchments is the ammonification process in the soils, which is more intensive in autumn than in spring. It leads to an increase of NH_4^+ concentration in stream water in autumn compared to spring in both disturbed catchments. NH_4^+ concentrations in stream water are low compared to NO_3^- , most likely due to effective sorption of NH_4^+ ions within the soil exchange complex. The BB catchment is a larger source of NO_3^- in stream water than the WD catchment. The main sources of NO_3^- in the catchment are snowmelt combined with a pronounced reduction of N uptake by the dying stand. A key role in the high supply of NO_3^- to the stream in the BB catchment is played by the soil O horizon due to its high permeability and ability to leach NO_3^- through the soil pores. Although the surface A horizon is a large reservoir of NO_3^- in the WD catchment, it is not as effective in supplying NO_3^- to the stream. Nitrification does not seem to be an important process for the supply of NO_3^- to the soils.

Keywords: nitrogen cycle, soil, stream water, windthrow, bark beetle

8. Serhii Kyryliuk, Yuriy Fedkovych, Chernivtsi National University

Assessment of River Basin Health by Means of Hydromorphological Zoning and Risk Analysis

ABSTRACT:

A comprehensive hydromorphological assessment and geoecological monitoring of small river systems were conducted using a newly developed universal algorithm tailored for sustainable river basin management. This approach included a SWOT analysis and led to the creation of interpretation maps for three representative rivers – Hukiv, Dereluy, and Vyzhenka. The relevance and applicability of the study affirm the effectiveness of the proposed methodology for addressing both theoretical and practical issues related to the dynamics of "basin–river–human" and "basin–river–channel" systems. Emphasis is placed on the need to transform prevailing consumption-oriented approaches to natural resource use, while encouraging sustainable, conservation-driven practices within small river catchments. Building upon prior studies and analytical modeling, the hydromorphological algorithm enables spatial differentiation of basin segments according to their sustainability status. This multidimensional tool incorporates a variety of environmental indicators that collectively reflect the condition of small river basins. It involves the sequential aggregation of scores across thematic blocks, including: transformation of the river network (by length and tributary order), anthropogenic alterations, land-use conflicts (based on frequency, trends, and intensity), erosion susceptibility, floodplain utilization, risks associated with channel processes, hydromorphological state of riverbeds and riparian zones (evaluated by quality class), land-use patterns, and basin study coverage. Scores

range from 14 to 57, with higher values indicating more intensive impacts. Though versatile, the algorithm does not incorporate social or economic dimensions of sustainable development.

This diagnostic framework allows for early detection of problematic interactions within the ""channel–floodplain–basin–human"" system, enabling proactive and targeted responses. Regular observation and map-based scenario modeling are vital to support adaptive management and reduce the influence of both internal and external stressors.

Keywords: hydromorphological assessment, sustainable river basin management, riverbed dynamics, human impact.

9. Tomasz Bryndal and Rafał Krocak, University of the National Education Commission

Flash floods in small Carpathian catchments – theoretical and practical aspects for identification of the maximum probable flood risk zone

ABSTRACT:

The Carpathian region is prone to flash floods. Considering the nature of these floods, preparedness actions are regarded as the most effective solutions for flood mitigation. In this context, identifying areas vulnerable to flash floods is one of the key elements.

The goal of this study is to present a proposed procedure for delineating flash flood hazard zones in small Carpathian catchments (area < 50 km²). The procedure uses the envelope curve and hydraulic modelling methods. The use of spatial data and freely available informatics tools resulted in a procedure that can be applied in practice. It was tested in catchments where flash floods had occurred. The results revealed that the procedure effectively identifies flash flood-prone areas, and the detected zones are at least twice as large as the 1% flood-prone areas defined in local spatial development plans. It was also found that analyzing the extent, water depth, and velocity within flood-prone areas can provide valuable information for implementing preventive actions aimed at reducing the negative effects of flash floods.

SESSION

Session on Ukraine

Chair: *Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention and Mariana Melnykovich, Bern University of Applied Sciences BFH-HAF*

1. Oleksandr Soshenskyi, National University of Life and Environmental Sciences of Ukraine And Christian Rosset (Bern University of Applied Sciences), Natalya Voloshyna (FORZA), Petro Diachuk (Polissia National University), Liubov Kondratiuk (Ukrainian National Forestry University), Mariana Melnykovich (Bern University of Applied Sciences)

From Crisis to Resilience with Closer-to-Nature Forest Management in Ukraine

ABSTRACT:

Ukraine's forests are under severe threat from the combined impacts of climate change and war-related disturbances. These challenges have intensified the demand for timber for military use and reconstruction, highlighting the urgent need for sustainable forest management approaches that balance ecological, social, and economic priorities. In this presentation, we discuss Closer-to-Nature Forest Management (CNFM) practices to be implemented in Ukraine within an ongoing Swiss–Ukrainian project that aims to strengthen forest resilience and support Ukraine's post-war recovery. CNFM offers a multifunctional, ecologically grounded system of forest management that enhances biodiversity, increases resilience to climate change, and supports sustainable timber production. It promotes the conservation of natural forest structures and processes such as species and habitat diversity, tree size variation, and deadwood presence—thereby improving the overall health and ecosystem service delivery of forest landscapes. The project follows a "science to practice" approach

and seeks to build the capacity of Ukrainian forestry researchers, professionals, policymakers, and the next generation of forest practitioners. Our core initiatives within this project include developing educational materials, establishing demonstration plots (martelosopes), and organizing training workshops and knowledge exchange events. These efforts are supported by digital tools, including the Swiss platform martelage.sylvotheque.ch and its mobile version MSC Mobile, which provide accessible, interactive learning experiences for diverse forestry stakeholders in Ukraine.

CNFM can play a transformative role in supporting biodiversity conservation, boosting forest resilience, and securing the long-term sustainability of forest ecosystem services in Ukraine. By fostering collaboration between Swiss and Ukrainian institutions, creating a national stakeholder network, and developing a roadmap for integrating CNFM into Ukraine's forest recovery strategy, this initiative contributes to a more resilient and sustainable future for Ukraine's forests.

Keywords: Closer-to-Nature Forest Management, resilience, innovative solutions, post war recovery

Acknowledgement: This research is supported by the Velux Stiftung within the project "From Crisis to Resilience with Closer-to-Nature Forest Management in Ukraine" and is jointly implemented by the School of Agricultural, Forest and Food Sciences HAFL at Bern University of Applied Sciences (BFH-HAFL), the National University of Life and Environmental Sciences of Ukraine (NUBiP), and WWF Ukraine, in collaboration with the NGO "FORZA", the Ukrainian National Forestry University (UNFU), and Polissia National University.

*2. Iryna Zibtseva, National University of Life and Environmental Sciences of Ukraine
And Oleksii Petrov (Agroresurssystems)*

Land cover changes in the Ukrainian Carpathians based on Corine Land Cover methodology

ABSTRACT:

In recent years, the climate change alongside with intense anthropogenic activity have drastically affected the landscapes all over Ukraine, including the Carpathian region. Implementation of constant ecosystem monitoring is crucial for understanding the processes that are ongoing in the Carpathian Mountains and helps develop a plan of actions on how to use the land more effectively and in a sustainable way, how to protect biodiversity and prevent any emergencies, forest dieback, assess any possible risks etc.

Within the EU project "EU4ENVIRONMENT – Water Resources and Environmental Data" the land use changes (2018 - 2023) were mapped in the Zakarpattia and Ivano-Frankivsk regions on an area of 26 694.1 km² using the Corine Land Cover (CLC) methodology.

The results demonstrate that the land use structure of the AOI is dominated by forested land (14 402.6 km²), agricultural land (8 199.7 km²), and built-up areas (3 471.6 km²). These land categories account for 97.68% of the total area. During the period 2018-2023, the largest changes occurred due to an increase of agricultural land (410.2 km²) that took over pastures, complex cultivation patterns, forests. In addition, the area of forests decreased by 89.6 km², while the area of land covered with shrubs and young trees increased by 85.6 km².

Thus, there is a decrease in the area of forests and extensive-use agricultural lands in favor of an increase in the area of arable lands and transitional woodland. This situation leads to a potential reduction in the area of the ecological network and threatens to intensify the negative trends of the decline in the area of natural habitats and biodiversity populations.

Keywords: land use, land cover, land cover change, Corine Land Cover, Ukrainian Carpathians

3. Sofiya Shutiak, UNFU

Financial and Management Aspects: General and Special Use of Flora and Fauna Objects

ABSTRACT:

The legal framework in Ukraine outlines the principles of general and special use of natural resources, yet numerous managerial and financial challenges persist in practice. Key issues include determining permissible volumes of resource collection for personal use, annual adjustments based on ecological

factors, enforcement of free collection limits, and mechanisms for resource-related payments to bolster local budgets. While existing research predominantly focuses on legal regulation and rational resource use by economic entities, the rights of individuals—especially within territorial communities—remain understudied. This study addresses gaps in local governance by proposing solutions to enhance the valuation and sustainable management of natural resources in communities lacking economic actors. Emphasis is placed on regulatory improvements, fiscal mechanisms (e.g., local taxes, ecological levies), and community awareness to mitigate biodiversity loss and illegal trade. The analysis highlights constitutional obligations (e.g., Article 66, 142 of Ukraine's Constitution) and critiques inconsistencies in tax and budget codes regarding non-timber forest resources. Recommendations include amendments to fiscal legislation, clearer collection protocols, and robust oversight frameworks to align resource use with ecosystem services and local economic development.

Keywords: ecosystem services, local taxes and fees, ecological tax, general use, special use, natural resource management, territorial communities.

4. Olha Ilyash, Viktoriia Khaustova, Tetiana Salashenko, UNIDO

UNIDO Diagnostics Report on the real needs and challenges of Ukrainian municipalities in driving green recovery

ABSTRACT:

UNIDO has prepared a Diagnostics Report that looks at the real needs and challenges of Ukrainian municipalities in driving green recovery. The report highlights gaps in areas such as urban planning, service delivery, and support for local businesses, while also pointing to opportunities for innovation and growth. The report will provide evidence based foundation for policies and investments that put municipalities at the center of recovery efforts.

Acknowledgement: The presentation was provided in the framework of the project “Green industrial recovery through municipality-based development in Ukraine”, to which the Secretariat of the Carpathian Convention is contributing in close collaboration with the United Nations Industrial Development Organization, and which is funded by the Federal Ministry for Economic Cooperation and Development of Germany (BMZ).

SIDE EVENT: Fostering Collaboration to Meet the Needs of Communities in the Ukrainian Carpathians

Leads: Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention, Eleonora Musco, Eurac Research, Secretariat of the Carpathian Convention, Mariana Melnykovich, Bern University of Applied Sciences

CONTRIBUTION: *Kateryna Yermak, Giorgi Todua, UNIDO*

This intervention builds on six pilot projects designed to link local priorities with international expertise, enabling Ukrainian communities to rebuild in a greener and more resilient manner. In the Lviv region, for instance, the initiative “Powering the Future Together” unites Truskavets, Boryslav, and Drohobych with the German municipality of Wathlingen to convert organic waste into biogas, addressing environmental challenges while enhancing local energy resilience and promoting inter-municipal cooperation. Collectively, these pilots serve as demonstrative models of how international partnerships can accelerate sustainable recovery and lay the foundations for long-term economic growth in Ukraine.

Acknowledgement: The contribution was provided in the framework of the project “Green industrial recovery through municipality-based development in Ukraine”, to which the Secretariat of the Carpathian Convention is contributing in close collaboration with the United Nations Industrial Development Organization, and which is funded by the Federal Ministry for Economic Cooperation and Development of Germany (BMZ).

SESSIONS

Education for Sustainable Development: Session of the Carpathian ESD Expert Network (CESDEN) (RPS)

Chairs: Tamara Mitrofanenko, UNEP Vienna Programme Office, Secretariat of the Carpathian Convention, Boglarka Kurka Ivanegová, SUSTO- Sustainability Tools and ŠPIRÁLA - the Slovak Network of Environmental Education Providers, Elena Matei, University of Bucharest

1. Wioletta Kilar, University of the National Education Commission, Krakow

Quo vadis of Education for Sustainable Development? Case study of Poland

ABSTRACT:

Education for Sustainable Development (ESD) is an issue that both theoretically and practically links science, policy and practice. Implementing the results of research work, into policy and practice is necessary for ESD to be applied at all stages of education.

In primary and secondary schools, the core curricula are the basic documents in which the assumptions of the ESD must be included, but also the learning objectives must be formulated clearly and operationally. Derivatives, i.e. textbooks, exercise books and other educational materials, are based on them. In Poland, these documents are set at the national level and, in the form of an act, form the legal basis for the directions of education, defining also the scope of content provided in formal education.

The object of this research is to analyse the core curriculum for primary and secondary schools in Poland. In the paper, I will aim to identify the place of ESD in compulsory education in Poland. Gaps in this area will be identified and key issues to be supplemented in compulsory formal education at different stages of education will also be proposed.

Keywords: ESD, education, core curriculum

2. Mihaela Verga, University of Bucharest And Luminița Măruțescu, Corina Bradu, Carmen Postolache, Paulina Anastasiu, Marian Marin, Radu Pintilii

Project-based learning in environmental sustainability. Case study: Environmental challenges facing Danube River educational program

ABSTRACT:

Project-based learning in environmental sustainability represents a transformative strategy for advancing STEM education in higher education. Through a challenge-driven approach, students participate in authentic research that evokes the excitement of discovery and cultivates a strong sense of ownership over their work - both of which are critical in reinforcing their identification as scientists (Hurley et al., 2021). This study aimed to develop and evaluate a course grounded in a challenge-driven educational model, designed to address complex environmental issues within the Danube River Basin. The program sought to promote interdisciplinary and transdisciplinary collaboration, foster social learning, and strengthen students' scientific and civic identities through engagement with real-world sustainability challenges. The course was implemented over a three-year period (2023–2025) in Romania and brought together students and faculty from diverse disciplinary

backgrounds. It utilized an evidence-based pedagogical approach wherein student teams addressed societally relevant research questions with unknown outcomes. Learning was structured around collaborative inquiry, with faculty serving as facilitators rather than content deliverers. Data were collected through student reflections, faculty interviews, and assessments of group project outcomes to evaluate both learning processes and skill development.

The findings demonstrate that the challenge-driven, transdisciplinary framework fostered deep engagement with environmental issues and facilitated the development of key workforce competencies, including problem-solving, communication, and collaboration. Moreover, the course promoted social learning across disciplinary boundaries and between students and faculty, enhancing students' identification with scientific practice and their commitment to environmental stewardship. These results highlight the potential for integrating applied, collaborative, and societally engaged learning models into STEM curricula in higher education.

Keywords: challenge-driven approach, interdisciplinarity, transdisciplinarity, environmental sustainability

Acknowledgement: Authors acknowledge the conceptual support of the Science Us project funded by the European Commission under the call HORIZON-WIDERA-2023-ERA-01-08.

*3. Michal Medek, Masaryk University & Czech Institute for Heritage Interpretation
And Elena Matei (University of Bucharest)*

Visitor Communication Narratives

ABSTRACT:

Visitor communication is one of the tools to balance tourism and conservation needs in protected areas. However, standard educational methods have limited success when visitors are in “leisure-time” mode. The contribution will examine the specifics of such communication using a comparison of several studies on interaction with interpretive panels as case studies. A manual for creating communication narratives developed within the framework of the Interreg Central Europe HUMANITA project will also be presented.

Keywords: communication, visitors, education, conservation, heritage interpretation

Acknowledgement: Eurac Research

4. Laura Cristea, Elena Matei, University of Bucharest

Education for Sustainable Development in Romanian Schools

ABSTRACT:

Education for Sustainable Development (ESD) represents a growing priority within the Romanian education system. Consequently, a series of reforms have been implemented in the national secondary education curriculum, notably the introduction of two dedicated weeks: “Green Week” focusing on environmental education, and “School in a Different Way” which promotes outdoor and non-formal learning activities. The present study aims to evaluate the feedback of teachers regarding the ESD-related activities organized within their schools during these two designated weeks. In this context, interviews were conducted in 2024 with a sample of 88 Romanian Geography teachers. The collected responses were analyzed using SPSS v.29, applying the Multidimensional Scaling (MDS) method. The results indicate an increased familiarity among teachers with environmental issues, the development of geographical competencies, and the adoption of appropriate teaching methods. Although the feedback provided by the respondents was generally positive—suggesting an ongoing adaptation to the principles of ESD through experiential and open-ended learning activities—certain challenges persist. Frequent regulatory interventions by the Ministry of Education have, at times, led to superficial engagement with these initiatives. Furthermore, the lack of financial support

mechanisms, the absence of formal assessment procedures, and an over-reliance on specific actors within the educational process have contributed to reduced student participation. In many cases, students perceived these activities as merely an additional vacation period rather than an opportunity for meaningful engagement with sustainability concepts. In light of these findings, it is imperative that policymakers, in collaboration with the educational community, reconsider strategies to enhance civic awareness among students and parents. Strengthening the perceived value and effectiveness of such initiatives is essential to ensuring that they contribute substantively to the development of sustainability competencies, preparing students to become active, responsible citizens.

Keywords: Green Week, ESD, School in Different Way, Romania, open learning activities

5. *Senan Gardiner, Daniel Fischer, Leuphana University*

Promoting Biodiversity through Transdisciplinary Learning Interventions in the Carpathians

ABSTRACT:

The ProBioTIC project stands for PROMoting BIOdiversity through Transdisciplinary learning Interventions in the Carpathian region. The project emerged from collaboration with project partners involved across the Carpathian Convention, on topics across the Strategic Objectives of the Carpathian Biodiversity Framework (CBF). These partners are the Leuphana University Lüneburg, Jagiellonian University Krakow and the Hungarian Centre for Ecological Research. Part of the ProBioTIC project involved the development of a seminar in both the Leuphana and Jagiellonian universities investigating cross-sectoral biodiversity issues of the Carpathians and developing transdisciplinary solutions- oriented learning interventions in response (Lang et al. 2012). This involved working with stakeholders to cocreate research questions and answer them through specific learning interventions. Seven student groups engaged in the seminars delivered their learning interventions over the summer of 2025.

The resulting projects of the students will be explored as well as thematic analysis of their evaluation and learning journals. Key Findings include the use of transdisciplinary methods, particularly: stakeholder mapping, the learning interventions themselves, the use of "consumption" as a boundary object, student recommendations on policy and the development of a resulting "best practice" guide for other teaching practitioners. Throughout the presentation the role of the Carpathians as a unique and diverse space for ESD and the intrinsic value of its biodiversity will be foregrounded. A major focus of the findings will build on the development of the students as emerging transdisciplinary researchers, understanding their competence development (Brundiers et al 2020) and how to support them.

Keywords: Biodiversity, Education for sustainable development, Transdisciplinary research, Stakeholder engagement, Consumerism, education for sustainable consumption, ecotourism, traditional ecological knowledge

Acknowledgement: Project ProBioTIC is supported by the Deutsche Bundesstiftung Umwelt (DBU)

6. *Bhimsen Devkota, Tribhuvan University*

Developing Social Entrepreneurship for Sustainable School Education Through Participation of Vulnerable Groups in Nepal

ABSTRACT:

Education serves its transformative purpose when it becomes meaningful for learners, including disadvantaged and vulnerable groups. Learners' involvement in what to learn and how to learn are paramount in the learning process. In Nepali public schools, most children come from working and

migrant families. The participatory action research (PAR) project called Rupantaran (meaning transformation) was carried out in ten community schools in rural hilly and plain areas of Nepal from 2017 to 2023. Graduate students of the southern universities facilitated the projects on eco-san, school gardening, social entrepreneurship, menstrual hygiene and school meals. The project demonstrated how education could be empowering and transformative in the lives of disadvantaged children and their parents. It was a collaborative project implemented by Tribhuvan University and Kathmandu University of Nepal, and the Norwegian University of Life Sciences. Five projects completed demonstrated the transformative power of education through PAR. The findings indicate that meaningful engagement of students, parents, and teachers in school activities embedded with the curricular contents makes learning meaningful for students and brings positive transformation in school education and the community. The PAR projects have addressed the issues of school sanitation, early adolescent health and nutrition education in schools. They also demonstrated how students could gain experiential learning and develop collaborative social entrepreneurship skills from the school garden drip irrigated with human urine from the school toilets as fertilizer. Schools produced vegetables, medicinal herbs, mushrooms, fruits, pigs, chickens, and fish from the collaborative school entrepreneurship. The schools that could hardly cover administrative costs started to make and sell produce from the school garden and invest a reasonable amount of savings from entrepreneurship activities in children's health, sanitation, nutrition and other educational activities. It is recommended that schools scale participatory entrepreneurship activities to sustain public education and conserve and protect the environment in the mountainous country Nepal, which is at high risk of disasters, extreme weather, and climate change.

Keywords: Social entrepreneurship, Participatory Action Research, Sustainable Education, Nepal

Acknowledgement: Tribhuvan University

7. Lucia Cuşnir, Retezat National Park

Carpathian Day: Integrating Pastoralism, Biodiversity and Awareness-raising through dedicated local events

ABSTRACT:

The Conference of the Parties to the Carpathian Convention endorsed the establishment of *Carpathian Day*, following the best practices of Romanian partners, as a platform to strengthen the protection and sustainable development of the Carpathian region, while promoting the visibility of the Convention's activities at multiple levels. Facilitated via the Carpathian Education for Sustainable Development Expert Network (CESDEN) with the support of the Carpathian Convention Secretariat and active engagement by members of the Carpathian Network of Protected Areas (CNPA) and the Science for the Carpathians Network (S4C), annual celebration of Carpathian Day is promoted throughout the region. Celebrated in many Romanian protected areas on 26 September, Carpathian Day events aim to highlight the region's rich biodiversity and unique mountain landscapes, as well as rich cultural heritage, including pastoralism, crafts, folklore, and local cuisine. It aims to foster a shared Carpathian identity by strengthening pride, belonging, and cross-border connections while advancing environmental and cultural awareness. By integrating both natural and cultural heritage, Carpathian Day emphasizes the longstanding human–nature interactions that define the region and provides opportunities to showcase traditional knowledge alongside contemporary sustainability efforts. Ultimately, it serves as a catalyst for cooperation, awareness-raising, and community-driven action to safeguard the Carpathians for future generations. The contribution will provide examples of

diverse Carpathian Day events from Romanian protected areas and make a proposal for celebrating the International Year of Rangelands and Pastoralists that highlights the cultural and ecological values of pastoralism in the Carpathians, their role in supporting biodiversity, and the importance of youth engagement, education, and cross-border cooperation across the Carpathian region.

Acknowledgement: Activities of the Carpathian Convention Secretariat and its partners on promoting Carpathian Day, including this contribution, are supported by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union. It is supervised by the German Federal Agency for Nature Conservation and by the German Environment Agency. The responsibility for the content of this publication lies with the authors.

8. Tamara Mitrofanenko, Elena Fischer & Boglarka Kurka Ivanegova, CESDEN

Update and outlook from the Carpathian ESD Expert Network

The Parties to the Carpathian Convention recognize the crucial importance of awareness raising and public participation, as outlined in Article 13 of the Convention, "Awareness raising, education and public participation." This cross-cutting issue contributes to capacity building across all dimensions of sustainable development and aligns with the Education for Sustainable Development (ESD) Strategy of the United Nations Economic Commission for Europe (UNECE), as well as the global process led by the United Nations Educational, Scientific and Cultural Organization (UNESCO), including the ESD 2030 Framework. Implementing the Convention's ESD-related provisions requires strong cooperation among diverse actors in science, policy, and practice. To support this collaboration, the Carpathian ESD Expert Network (CESDEN) has been established and formally recognized by the Convention Parties at the 7th Conference of the Parties (COP7) in 2023. The network operates through regular meetings facilitated by the Secretariat in cooperation with national and international experts. Contributors will provide updates to Forum Carpaticum ESD Session participants on recent and upcoming CESDEN activities, including cooperation with the UNECE Steering Committee on ESD, Carpathian Day events, Carpathian ESD Seminars, and initiatives relevant to the Carpathian Biodiversity Framework Strategic Objective 7—particularly those linking ESD with biodiversity and pastoralism. Participants will be encouraged to reflect on these efforts and provide feedback.

Acknowledgement: Activities of the Carpathian ESD Expert Network (CESDEN) are supported by the Cyprus Ministry of Education, Sport and Youth and by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union. It is supervised by the German Federal Agency for Nature Conservation and by the German Environment Agency. The responsibility for the content of this publication lies with the authors.

SESSION

Building Capabilities and Facilitating the Participation of Vulnerable Groups in Rural and Mountain Regions through SSE in Multi-Level Sustainable Development Policy (RPS)

Chair: Agnes Nemeth, Matti Fritsch, University of Eastern Finland

1. *Katrin Hofer and Somaye Latifi, Federal Institute of Agricultural Economics, Rural and Mountain Research*

The Role of Social and Solidarity Economy in Strengthening Rural Communities: Insights from the Silbersberg Association in Lower Austria

ABSTRACT:

In rural areas, vulnerable groups with disabilities often face unique challenges due to geographical isolation, limited infrastructure, and restricted access to essential services, leading to social exclusion and reduced participation. The Horizon Europe project SERIGO addresses this by promoting social justice, equality, and collective action, exploring the role of the Social and Solidarity Economy (SSE) fosters inclusion, resilience, and well-being in rural Europe. One of SERIGO's case studies is the Silbersberg Association (SBG), which uses a Green Care approach to provide family-like, community-based, and client-centered care for mentally and physically disabled individuals. This association integrates living and working spaces for both disabled and non-disabled individuals in Schwarzaau im Gebirge (SiG). SiG is located in the Höllental valley, Lower Austria. With a population of around 630, SiG faces significant demographic challenges through outmigration and ageing population. The area is characterized by extensive forest cover, comprising almost 90% of the land, which contributes to a low population density. The local economy is heavily dependent on the primary sector, with nearly 50% of employment opportunities centered around forestry. Additionally, the region experiences slow tourism development and has limited social infrastructure. Regarding the demographic, economic and infrastructural situation of SiG, this study examines the role of the Silbersberg Association (SBG) in empowering disabled individuals and influencing community development. Using a mixed-methods approach, the research integrates quantitative data with qualitative insights from interviews with decision-makers, stakeholders, and participant observation. The outcomes will demonstrate how the Social and Solidarity Economy (SSE) support vulnerable individuals to engage in society while strengthening the resilience of the SiG community. Additionally, the study will provide policy recommendations for improving social inclusion in rural areas.

Keywords: Social inclusion, Social and Solidarity Economy, Austrian Case, Green Care, rural community development"

2. *Triin Kübar, Tallinn University And Katri-Liis Lepik*

Digital Skills for Seniors: Community Learning and Social Innovation in Rural Areas

ABSTRACT:

As digital technology becomes increasingly central to daily life, rural seniors face significant barriers to digital inclusion, including access, confidence, and digital literacy. These challenges contribute to social isolation and limit opportunities for civic engagement, lifelong learning, and access to essential online services. This study explores community-based learning as a form of social innovation to address these challenges by fostering inclusive and sustainable digital education. Grounded in Social Innovation Theory (Mulgan, 2006; Murray et al., 2010) and the Theory of Change (Weiss, 1995), this research investigates how grassroots digital education initiatives foster long-term behavioral change. Additionally, it examines the role of governance and policy support in enabling and scaling community-led learning programs to ensure broader digital participation. The study highlights the effectiveness of community learning in small, peer-led instructional groups where community members act as digital change agents. Findings suggest that these models not only enhance digital literacy but also boost confidence, motivation, and social participation. By embedding learning within existing social networks, seniors develop a sense of agency in their digital engagement.

Results indicate that socially embedded learning models offer sustainable solutions for rural digital inclusion, contrasting with top-down training programs that often fail to engage older learners

effectively. Peer-led instruction fosters trust, adaptability, and personalized learning experiences, making digital skills more relevant to local needs. However, challenges such as technological hesitancy, infrastructure gaps, and the need for ongoing support remain. This research underscores the potential of community-led digital education as a viable alternative to traditional approaches, emphasizing social innovation as a key driver of digital inclusion. Policy recommendations focus on supporting local actors, investing in community-driven initiatives, and ensuring long-term engagement through tailored learning strategies that empower seniors in an increasingly digital world.

Keywords: Social Innovation, Digital Inclusion, Community-Based Learning, Rural Seniors

Acknowledgement: The results are drawn from "Rethinking smartification from the margins: Co-creating Smart Rurality with and for an Aging Population" (#SmartRurality) project

3. Katalin Fehér, HUN-REN Centre for Economic and Regional Studies

Navigating development on the periphery: depoliticisation and the role of civil society in poverty governance

ABSTRACT:

Examining social development in a de-industrialised middle-sized town on the Hungarian periphery, we explore which developmental organisations have been able to implement social programmes, and what opportunities and constraints they encounter throughout their activity. In a context of democratic backsliding and expanding centralised control of institutions, poverty governance is becoming more and more outsourced. Institutional depoliticization has led to the co-optation of certain organizations as part of the restructuring of the financial, political, and institutional structures influencing civil society's role in poverty alleviation at the national level. Within the multi-level governance system, the interaction between the EU, national, and local policy levels has shifted the dominant developmental actors and the types of social interventions in the locality. On the local level, initiatives remained durable through the depoliticisation of social policy in their developmental interventions, signifying a shift of focus from collective communities to individuals, in conjunction with tendencies of responsabilisation. While civil society organisations face constraints from various levels, leading to depoliticised poverty reduction, they also hold potential for (re)politicisation. This developmental environment particularly supports childhood-focused development programmes, however it did not eliminate their variance. The diversity of outcomes and principles of implemented developmental programmes - whether framed as innovative initiatives, supported by EU schemes or integrated into basic child welfare services – can be attributed to factors, such as resource availability, volume, social mobilisation capacity, the combination of basic needs and empowerment approaches, the distribution of power and capacity within organisations, levels of participation and the position of main actors (insider or outsider). Based on qualitative data, we will explore which qualities of organisations are context-dependent and which areas remain autonomous, what common practices can be drawn upon, and how organisations are embedded within and networked across in the locality.

Keywords: social development, locality, depoliticisation, periphery, civil society, poverty alleviation

4. Marika Gruber, Carinthia University of Applied Sciences and Birgit Aigner-Walder, Selina Strasser

Breaking Barriers: Empowering Migrant Women for Labour Market Participation in Rural Carinthia through SSE Initiative

ABSTRACT:

In Austria, third country nationals show a significantly lower labour market participation rate than Austrian nationals and EU-migrants. This is even more true for female migrants. However,

participation in the labour market can be seen as crucial not only for economic, but also for social integration and should therefore be increasingly strived for.

Based on two case studies, this contribution examines firstly the situation of female (refugee) migrants in Carinthia, a predominantly rural province in Austria, with a special focus on their qualifications, economic and social situations, and their attempts for labour market integration. Secondly, the role of Social and Solidarity Economy (SSE) initiatives to build bridges between vulnerable groups (female migrants) and labour market players and to foster women's empowerment and social participation will be analysed with a grounded theory approach.

Case study 1 "my way – Jobwerkstatt Kärnten": supports women with a migrant background in entering the labour market. Funded by the Federal Chancellery and the labour market service, it offers career guidance, job application training, IT training, German language training and socio-educational support for up to 12 female participants. One day of practical training per week supports practical experience; psychological and occupational health counselling round off the programme. So far, 45 women had the chance to be successfully placed in the labour market thanks to the programme.

The second case study "femme! empower, employ, emulate me": project aims to integrate displaced females from Ukraine into the labour market or enable them to find further education possibilities through qualification, perspective building, targeted information and initiating contacts with enterprises. The project also offers childcare during course times, as well as coaching and counselling in Russian and Ukrainian.

Keywords: female migrants; labour market integration; Social and Solidarity Economies; rurality; social and economic inclusion; empowerment; Carinthia

5. *Ida Motteran, Eurac Research And Marzia Bona, Cristina Dalla Torre, Alexandra Tomaselli*

Intersectional Critical Systems Thinking in Research on Vulnerability and Social Exclusion in Rural Areas: Lessons from the SERIGO Project

ABSTRACT:

Research conducted within the conceptual framework of the Horizon Europe SERIGO project has highlighted a recurring issue: rural communities are often treated as homogenous entities, with limited focus on power imbalances and vulnerable and marginalised groups within these communities. While some studies address these groups, few examine them as active subjects in the development process, rather than merely as targets of empowerment or development policies. Moreover, there is a scarcity of research that explores the interaction between marginalised communities and social and solidarity economy, despite its potential relevance in rural contexts.

In response to this gap, we developed a methodological framework within the SERIGO project, aimed at supporting researchers in conducting more inclusive and intersectional research. To address this, we introduced the concept of "intersectional critical systems thinking" (ICST), an innovative approach that integrates two established analytical frameworks: intersectionality (Crenshaw, 1989; Collins, 2006) and critical systems thinking (Reynolds, 2014; Stephens et al., 2018). Both approaches share a commitment to transformative research, aiming not just to observe systemic inequalities but to actively challenge and reshape them. ICST builds on the synergies between these frameworks to provide a holistic, nuanced lens for examining rural communities without flattening the diverse experiences of individuals and marginalised communities. ICST has been operationalised through practical tools devised to guide researchers throughout different phases of the research process: research design, data collection, and analysis. These tools help researchers critically reflect on their own positionality, critically assess the systems and boundaries that shape their case studies and consider the intersectional social categories that are most relevant to their research. This framework aims to support research that goes beyond identifying systemic barriers to actively addressing them, ultimately driving sustainable change and empowering marginalised groups in rural communities.

Keywords: intersectionality; critical systems thinking; methodology; social vulnerability; rural

6. Judit Keller, *Centre for Economic and Regional Studies, Institute for Regional Studies*

Serving the poor or serving the state?: Ambiguities of social innovation under authoritarian governance

ABSTRACT:

In recent decades, nonprofit organizations have increasingly become involved in welfare service delivery for marginalized populations across Europe. This trend aligns with the spread of neoliberal governance in transformed welfare states, where neoliberal economic policies and the marketisation of welfare services have led to the collapse of state services for marginalised populations while also undermining democratic principles of social citizenship. As states selectively withdrew from the provision of public services for vulnerable groups, they increasingly outsourced these to NGOs and faith-based organisations, while restricting their public discourse. These organizations have often become implicated as co-opted partners of de-democratizing/authoritarian states, supporting conservative agendas and legitimizing neoliberal policies rather than advocating structural change and social justice. Since 2010, Hungary has exemplified de-democratization, marking it as the first undemocratic member state of the EU. The Hungarian state has employed sector-specific strategies against civil society organizations, depending on their political alignment with the neoconservative discourse. This has led to the "religionization of the welfare state" (Lendvai-Bainton and Szelewa 2021), where churches and faith-based organizations (FBOs) have become the state's preferred partners in delivering social services to the poor. A notable example is the Hungarian Charity Service of the Order of Malta (Málta), which has taken on the role of providing complex services in rural, marginalized communities abandoned by the state. Over time, Málta has gained significant power, shaping policies, advancing a large-scale social integration programme, directing its resource distribution, and determining the list of implementing organisations and the methodology for service delivery. Málta's operations have been marked by a tension between co-optation and progressive experimentation with institutional changes aimed at tackling poverty. This presentation will explore whether Málta, embedded in the governing elite, can introduce innovative and alternative approaches to addressing inequalities and marginalization within Hungary's authoritarian political system. We will examine this on three levels: welfare policy discourse, the institutional system of social integration, and local-level practices.

Keywords: authoritarian neoliberalism, faith-based organisations, social innovation, co-optation, social integration

Acknowledgement: The presentation is based on the research project "Assemblages of local agency for social innovation in peripheral localities", funded by the National Research, Development and Innovation Office (NKFIH K143606)

7. Makbule Nisa Mencet Yelboğa, *Eskisehir Osmangazi University*

Local Action Groups' Significance in Rural Development

ABSTRACT:

Local Action Groups (LAGs) are important actors that promote local development within the framework of social economy and solidarity economy, support community-based initiatives, and strengthen economic solidarity in rural areas. The EU has prioritized the LEADER program since the early 2000s to enhance rural development through a bottom-up, integrated, and innovative approach.

LEADER, derived from the French phrase "Liaison Entre Actions pour le Développement de l'Économie Rurale," is a local development method that mobilizes rural communities. The difference between the LEADER approach and more traditional rural policy measures is that the LEADER approach determines 'how' development will be achieved, rather than 'what' needs to be done. Local actors participate in decision-making, shaping strategies and projects tailored to their regions. LAGs, formed through public-private partnerships, bring together representatives from government, businesses, and civil society to strengthen regional cohesion and drive sustainable development. The LEADER approach empowers farmers, women, youth, and other rural stakeholders, fostering inclusive participation in the economy and social life. In Turkey, 100 LAGs have been established across 26 provinces, promoting economic resilience, sustainable production, and stronger community ties. This study examines the role of LAGs in rural development, analyzing their strengths and weaknesses. For this purpose, the role of these initiatives in promoting sustainable economic development at the local level and their adoption in the public and private sectors particularly in terms of vulnerable groups and the solidarity economy will be analyzed, based on primary data collected through direct interviews with LAGs in Türkiye and secondary data obtained from previous research.

Keywords: Solidarity economics, social economics, LEADER, local action groups, Türkiye

SESSION

Accessibility, Development Paths and Windows of Opportunities in Core-Periphery Systems: Challenges of Local and Regional Development in the Carpathians

Chair: *Dr. Krzysztof Wiedermann, Institute of Law, Administration and Economics, University of National Education Commission*

CONTRIBUTIONS:

1. *Paweł Kroh, University of National Education Commission*

New Outdoor Activities: A Chance for Tourism Development, but with High-Risk Consequences – The Example of Mountain Biking Accidents in the Polish Carpathians

ABSTRACT:

Tourism in the Carpathian Mountains provides significant income for the local community and is one of the most important elements of the economy in mountain regions. One form of such tourism is mountain biking (MTB). In the Polish Carpathians, interest in mountain cycling has increased significantly over the last decade. Mountain biking trails, known as "single tracks," have been built in many areas. Ski resorts have also invested in them as an opportunity for summer operations.

However, the rapid development of single-track infrastructure is not aligned with the skills of MTB users. This situation has led to a sharp increase in mountain accidents associated with this activity. The Mountain Rescue Service (GOPR) statistics show that rescue missions for injured cyclists account for almost 30% of all missions in some regions. These rescues are challenging for several reasons. First, access to the accident scene is difficult—single tracks are narrow and winding, making it nearly impossible to reach them quickly using off-road vehicles or ATVs. Second, many of these accidents result in severe injuries, as they are high-energy impacts caused by collisions with trees or the ground. Third, many single-track users do not consider the risk of accidents. When using a chairlift, they perceive themselves as "ski resort customers," where they assume that risk assessment should be the responsibility of the operator rather than the individual.

The growth of MTB and single tracks in some regions presents an opportunity for summer tourism development, especially for local communities that rely on ski resorts in winter. At the same time, the

rising number of MTB accidents highlights the need for local stakeholders in mountain communities to consider all consequences—not only the positive economic aspects but also the risks, accidents, the need for education, medical support, and the legal and financial implications.

Keywords: tourism development, mountain biking, mountain rescue service, accidents

2. Gabor Lados, HUN-REN Centre for Economic and Regional Studies

Population dynamics in Central and Eastern European border regions

ABSTRACT:

The European Union's development policy has managed to reduce inequalities between countries in many areas but has not helped the peripheral and rural areas of Central European countries to recover. Inequalities between regions were increasing, in terms of economic, social and access to public services, and marginalisation is persisting in many regions. For this reason, it is particularly important to examine the background of the current processes, to explore their origins and, as a first step in this analysis, to identify the causes of population trends. In our previous analysis (Horeczki-Nagy-Lados 2025), we examined the population dynamics of Central-Europe in terms of urban-rural, cross-border and non-border areas concentration. In this study we would broaden the analysis with further aspects such as urban-rural relations, mountain regions, and identify the most demographically vulnerable areas in Central-Europe especially in the Carpathian macro-region, show that topography can also be a factor modifying spatial concentration.

Keywords: demographic change, NUTS3, Central and Eastern Europe, population decline

Acknowledgement: Project no. 146586 (financed under the K-24 funding scheme) has been implemented with the support provided by the Ministry of Culture and Innovation of Hungary from the National Research, Development and Innovation Fund.

3. Attila Havas, Centre for Economic and Regional Studies

A multi-channel interactive learning model of social innovation

ABSTRACT:

We develop a new model of social innovation (SI) inspired by the multi-channel interactive learning model of business innovation. As opposed to the linear models of innovation, this model does not identify 'stages' of business innovation. Rather, it stresses that innovation is an interactive process, in which collaboration among various partners are crucial, as they possess different types of knowledge, all indispensable for successful innovation activities.

Having considered numerous definitions of SI, first we propose a new one, then adapt the multi-channel interactive learning model to SI. To do so, we identify the major actors in an SI process, their activities, interactions, modes of (co-)producing, disseminating and utilising knowledge. We also consider the micro and macro environment of a given SI.

We illustrate the analytical relevance of the proposed model by considering three real-life cases. The model can assist SI policy-makers, policy analysts, as well as practitioners when devising, implementing or assessing SI.

Acknowledgement: Financial support from the National Research, Development, and Innovation Fund, Hungary (grant agreements No. 124858 and No. 143606) is gratefully acknowledged.

4. Tina Lešnik, University of Maribor

Farm Economics In Mountain Regions Under the New LFA Methodology of CAP 2023-27 A Slovenian Case Study

ABSTRACT:

Slovenia is a mountainous country with 72,3% of its territory defined as LFA mountains (EU Directive 57/268/EEC). The Alps dominate the northern part, and the Dinaric mountains dominate the southern and southwest of Slovenia. As LFA Mountains also hilly regions in the middle of Slovenia and Mediterranean hills are considered. Farming in mountain regions faces persistent natural constraints and socio-economic challenges. The abandonment of mountain farms remains a key problem, threatening landscape conservation and accelerating the overgrowth of agricultural land and rural development. However, LFA subsidies are still crucial for sustaining predominately fragmented family farm structures in hilly and mountain regions of Slovenia (Knific, K., 2015). In the CAP period 2023-27, the new classification redefined eligibility and payment levels for LFA support based on changed biophysical criteria. The study examines two typical mountain farms in the pre-Alpine region with different biophysical characteristics and the financial consequences for farms of the new LFA payment scheme. Our results show that the farm with high altitude maintained or slightly increased its payments, while the lower-altitude farm experienced a slight reduction or unchanged support annually. This can lead to socio-economic adjustments in the long term, such as reduced production and delayed investments, and ultimately contribute to accelerated abandonment of farming. Slovenia's low-altitude hills cover almost half of the mountain area, so the number of farms with modified conditions is high. These farms will need deep monitoring and greater attention in the next CAP period.

Keywords: LFA, mountain farming, Slovenia, CAP, comparative analysis

5. *Ainsley Trahan, University of Cambridge*

Disaster Risk Management in Transition: Shifting Models of Transboundary DRM across Azerbaijan and Georgia

ABSTRACT

This research seeks to examine the extent of cross-border disaster risk management (DRM) that occurs between Azerbaijan and Georgia today as understood within the context of differing ongoing post-socialist transitions. Formally institutionalised by Moscow during the Soviet Union alongside the global development of earthquake science and the shifting paradigm of DRM as more than emergency response, DRM plays an important role in the connected geology and geography of the Caucasus. In 1991, the institutions that governed DRM in the newly independent former Soviet republics began to undergo structural changes that happened alongside the broader navigation of brutal (differing) transitions from socialism towards market economies. These institutional shifts have impacted the extent and impact of DRM in both countries today, and the way in which national DRM institutions navigate the broader space shared across the geographically-small South Caucasus region. Specifically, this presentation will explore (1) the changes to DRM institutions that have occurred in Azerbaijan and Georgia since independence, (2) the impacts this has on national DRM governance, and (3) the impacts of institutional transitions on transboundary DRM across the two countries today. Ultimately, whilst the politics of institutional disaster governance are ever-changing, this study posits that it is crucial that current arrangements are read against broader regional and national development histories.

Keywords: Azerbaijan, Georgia, transboundary disaster risk management, post-Soviet transitions

6. *Agnieszka Pieniażek, Association for the Development and Promotion of Podkarpacie "Pro Carpathia"*

The Wallachian Culture Trail as a model of cross-border heritage management and a tool for sustainable development in the carpathian region

ABSTRACT:

The Wallachian Culture Trail is a cross-border cultural initiative developed in Poland and Slovakia (with elements of cooperation with Ukraine), aimed at protecting, promoting, and reinterpreting the shared pastoral heritage of the Carpathians. By referring to the migratory traditions of the Wallachians—Balkan pastoralist communities who played a key role in shaping the cultural identity of mountain societies—the Trail becomes an innovative platform for local, regional, and international cooperation. This presentation introduces the Wallachian Culture Trail as a model for managing intangible heritage that integrates cultural, educational, tourism, and economic functions. Referring to the findings of the report “Carpathian Products: Their Producers and Business Environment Institutions” (Pro Carpathia, 2021), the author analyzes the potential of the Trail as a tool for activating local communities and strengthening networks of traditional and regional product producers in peripheral and historically marginalized areas across the borderlands of Czechia, Slovakia, Poland, and Ukraine. The report was the first to systematically collect data on local products, their producers, support systems, and distribution channels across four countries operating under different legal and institutional frameworks. It also shows that these products originate from a common pastoral heritage and that their development can be enhanced through integrated cultural initiatives—such as the Wallachian Culture Trail. The presentation also reflects on the role of cross-border cooperation in light of unequal access to EU resources (with Ukraine remaining outside the EU), presenting the Trail as a living example of collaboration rooted in shared heritage and identity.

Keywords: Wallachian Culture Trail, pastoral heritage, Carpathians, cross-border cooperation

7. Ninel Seniuk, Bratislava University of Economics and Management

Determinants of Chinese Foreign Direct Investment in the V4: the case of Slovakia

ABSTRACT:

This research investigates the determinants, drivers, and motives (DDM) of Chinese Foreign Direct Investment (FDI) in Slovakia within the context of the broader EU countries and the Belt and Road Initiative (BRI). Utilizing the UNCTAD modified DDM methodology, the research first identifies the capabilities and needs of the Chinese economy in relation to the EU market. It also considers Slovakia's economic status and investment policies amidst a volatile, uncertain, complex, and ambiguous global environment. The research highlights that despite the significant global investment expansion by China, its OFDI in Slovakia and the EU countries remains relatively low. A comparative analysis from 2007 to 2021 of the Slovak economy and V4 countries provides insights into the macroeconomic and political drivers affecting these investments. The findings indicate a significant gap in research regarding the investment motivations of Chinese high-tech MSMEs in Slovakia, especially in light of recent geopolitical shifts and techno-nationalist policies in Europe. The research concludes that a nuanced understanding of these dynamics is essential for leveraging new investment opportunities in Slovakia, driven by evolving China-EU relations and the strategic importance of CEE countries in global value chains.

Keywords: FDI, OFDI, China, Slovakia, Visegrad Four

SESSIONS

Bridging Natural and Social Sciences for Sustainable Development and Impact-Driven Research through Transdisciplinary Approaches

Chair and Keynote Address: *Siddharth Saxena, University of Cambridge*

1. Fuad Humbatov, State Academy of Public Administration under the President of Azerbaijan

Climate and political risks correlation in the context of international relations

ABSTRACT:

The paper is devoted to the study of correlation of environmental and political risks in the context of the international relations. In order to provide a quantitative analysis of the correlation aspects between climate change risks and political security risks, there was introduced a new approach and relevant methodology of assessment of a degree of propensity or predisposition of any country to be negatively impacted by so called "climate conflicts" entailed by direct and indirect consequences of the global climate change in the paper. In this regard, the paper studies a number of cases of climate conflict risks in various regions, including South Caucasus and Caspian basin, as well as considers a role of international cooperation institutions towards prevention of such risks.

2. *Dana Sitányiová, University of Žilina*

Isidoro De Bortoli (EURAC Research), Alessandra Cordiano, Paola Menzardi (EURAC Research), Andrea Segalini (University of Parma), Lilia Schmalzl, Alessandro Valletta (University of Parma)

Human-Nature Interactions and the Monitoring of Tourist Activities' Impacts on Protected Areas

ABSTRACT:

Increased demand and interest in outdoor activities present great opportunities but also challenges for each protected area to meet visitors' expectations while also protecting natural values. This presentation introduces the ongoing results of the HUMANITA project. The project seeks to support managers of protected areas in Central Europe by promoting evidence-based and participatory management, which remains unexploited in practice. It helps them implement effective measures in the right locations, make informed decisions, mitigate negative impacts and human-nature conflicts, and minimize risks through a step-by-step approach. This paper introduces a set of complementary monitoring tools and methods designed to assess the impact of tourism. Developed collaboratively, these tools enhance the evaluation of environmental conditions and trends, support targeted managerial actions, and provide valuable insights for national and EU policymakers, as well as the general public. The innovative aspect lies in the combined analysis between environmental indicators and various tourist activity indicators, which are usually monitored and assessed separately. However, human activities are linked to the use of resources and the environment and have significantly impacted nature, potentially leading to degradation and biodiversity loss. The authors examine the temporal and spatial variations in visitor activities, analyzing their correlation with environmental indicators to highlight the potential effects of human presence on different environmental datasets. These include physical, ecological, and hydrological impacts, as well as effects on wildlife.

Keywords: indicator, environment, impact, tourists, nature protection

Acknowledgement: HUMANITA project (Human-Nature Interactions and Impacts of Tourist Activities on Protected Areas) is supported by the Interreg CENTRAL EUROPE Programme 2021-2027 with co-financing from the European Regional Development Fund.

3. *Stefano Sala, University of Milan - UNIMONT (Mountain University)*

And Veronica Manara, Federica Nova, Laura Pasinetti, Antonella Senese, Annamaria Giorgi, UNIMONT

Transdisciplinary Approaches for Sustainable Ski Resorts in the Alps

ABSTRACT:

Currently, European mountain regions, especially those that rely on winter tourism, face increasing climate challenges, including reduced snow reliability and shifting seasonal patterns. Europe is home to approximately 1,200 ski resorts that are not just centers of recreation, but also vital economic hubs that support local communities, providing employment and fostering businesses linked to the tourism

industry. However, these mountain economies are highly seasonal, with much of their income relying on the winter months when snowfall attracts tourists. A transdisciplinary approach, involving collaboration across various fields of expertise and local communities, is crucial for tackling complex, mountain-related issues. It enables a deeper understanding of both scientific data and community needs, fostering sustainable solutions that are grounded in local realities.

Nowadays, ski resorts are confronted with megatrends and driving forces in the spheres of climate and ecology, society and economy as well as governance and participation (Scott 2005; Steiger et al 2024). Taking this into account, the Interreg Alpine Space TranStat project focuses on co-constructing sustainable solutions for ski resorts facing climate challenges across the Alpine Arc following a multi and transdisciplinary approach.

The project is based on the idea of participatory transition: a process involving a broad range of local stakeholders through the establishment of Living Labs. These stakeholders include residents, businesses, youth, tourism representatives, and local authorities. Transdisciplinary research brings together experts from different fields to collaborate with societal stakeholders, addressing real-world challenges (Bergmann et al., 2021). By ensuring that community voices are heard, TranStat enables the translation of theoretical solutions into practical actions.

Our contribution will focus on two case studies—Maniva Ski and Chiesa in Valmalenco, located in the Italian alps—two ski resorts with low altitude and unfavorable exposure, threatening their winter seasons. The key challenge was the lack of community involvement in decision-making. By using a transdisciplinary approach, collaboration between project partners, academic actors, regional authorities, and private companies was facilitated. The consortium worked to translate complex scientific data, like weather forecasts, into accessible information for the local community. This approach emphasized stakeholder engagement, knowledge exchange, and the co-production of solutions, culminating in policy recommendations at local, regional, and European levels.

Keywords: winter tourism, climate change, sustainable transition

4. Khosiyat Ismatova, National Aviation Academy

Aerospace monitoring of risks to rural settlements during landslide processes in mountainous areas

ABSTRACT:

The presentation will demonstrate methods of using aerospace and geoinformation technologies to monitor the risk of landslide situations and possible risks to rural settlements.

The region under study is the Kurmuk and Kish river basins in the mountainous areas of northern Azerbaijan, where there are risks of mudflows and landslides.

The consequences of landslides are quite serious. They cause the destruction of roads, buildings, communications and various important objects, harm agricultural land, settlements and lead to human casualties. To prevent landslide processes, it is necessary to know and take into account the factors leading to this extreme situation.

In the work, using high-resolution satellite information, a digital elevation model and geoinformation technologies, the factors and intensity of slope processes, their types and patterns of distribution are studied. Another factor is anthropogenic impact, in particular, irrational land use.

Based on the digital terrain model, assessments are given of such natural factors as its height, slope, exposure, slope steepness, and climatic conditions (temperature fluctuations, degree of moisture) are considered based on the construction of index images. High-resolution satellite information and 1:50,000 scale topographic maps were used to create a digital land use and land cover map..

Based on the maps of risk factors for mudflows and landslide situations, classification and assessment are given according to a five-point system of classes of steepness of the slopes of the study area. Landslide situations in the region under study can develop under the following factors: slope steepness of more than 15%, precipitation of 1400-1600 mm/year, if the vegetation cover is represented by meadows, semi-shrubs, bare rocky areas, and the presence of populated areas contributes to the risks. Thus, the work demonstrates transdisciplinary approaches to assessing the impact of mudflows and landslides on rural settlements at risk of their occurrence in the basin of mountain rivers.

Keywords: aerospace and geoinformation technologies, digital terrain model, risk factors for mudflows and landslide situations

5. Ondřej Cudlín, *Global Change Research Institute CAS and Vilém Pechanec (Palacky University), Peter Mederly (Constantine the Philosopher University in Nitra Faculty of Natural Sciences and Informatics), Jiří Jakubínský (Global Change Research Institute CAS), Michal Ševčík (Constantine the Philosopher University in Nitra Faculty of Natural Sciences and Informatics), Karel Macků (Palacky University, Faculty of Science, Dept. of Geoinformatics)*

A unified approach for assessing landscape vulnerability in the Czech-Slovak border regions

ABSTRACT:

The influence of anthropogenic and climatic factors leads to an increased vulnerability of the area to land degradation towards desertification. Appropriate analyses must be used to determine the most vulnerable areas. The basic principle for mitigating main impacts to these areas is to understand the causes, identify the hotspots and design appropriate adaptation and mitigation measures. Analyses implemented within the cross-border areas of two countries are difficult to interpret and do not allow to propose efficient adaptation measures. At present, there are two important methodological approaches to assess the landscape vulnerability in the Czech and Slovak republics: ESAI+ (Environmental Sensitivity Assessment Index) in the Czech Republic and "Vedúca, Horia obce" (Leader, the villages are on Fire) in the Slovak Republic. However, both approaches are partially different and based on different available national datasets and therefore the vulnerability of the natural areas lying on both sides of the Czech-Slovak border (e.g. Beskydy Mts., Biele Karpaty Mts.) is assessed differently on each border side. Regarding to the European Commission aims to coordinate and link data, especially about the life environment, it is necessary to unify data and methods for landscape vulnerability and ecosystem service assessment on the Czech-Slovak borderland, which is the main objective of the Interreg project JIZKES NFP403201DPH4. In the first step, both approaches were compared in terms of the assessment concept and the data used. This was followed by an analysis of the equivalent data set availability and application of both methods to produce seamless maps of the whole cross-border study area. The main differences in results were caused by the different elaboration of present and modelled future climate data used and the different concept of the habitat map used.

Acknowledgement: This work was supported by the Interreg project JIZKES NFP403201DPH4.

6. Katarzyna Wrona, *Jagiellonian University in Krakow, Poland*

The sharpest curve ahead of ski tourism in the Carpathians

ABSTRACT:

Looking at the diagrams showing the increase of the global surface temperature or the carbon dioxide concentration in the atmosphere, it is not difficult to notice their changing shape. Year after year, the

diagrams are getting more curved and pointing more upwards, indicating sharper rise in these numbers. But is this general trend noticeable in the Carpathian Mountains? And what potential consequences can be expected of these changes?

One of the most vulnerable human activities in terms of climate change is the ski tourism. Hundreds of thousands of people visit the Carpathians in winter to experience fun on slopes and during après ski. Millions of people, often in secluded mountainous communities, make their living out of winter tourism. But tourism itself also contributes to climate change – the snowmaking process alone consumes a lot of water and energy, let alone all other environmental costs of tourism connected with transport, waste management, etc.

The interactions between the natural environment, especially the climatic conditions, and the human activities connected with skiing are both fascinating and complicated. It is possible that we are now facing a turning point in the history of ski tourism in the Carpathians. This research aims to answer the question: what are the possible mechanisms causing the endangerment of ski tourism by climate change? And - how can we integrate the environmental and social factors to increase resilience of the most vulnerable actors?

Keywords: ski tourism, climate change, Carpathian Mountains, mountainous communities, sustainability

7. Vanessa Arteaga Bernal and Eduardo Erazo Acosta, independent / Universidad de Nariño

The power of the ancestral philosophy of *Alli kawsay* (Buen Vivir) in the indigenous movements of Colombia - Ecuador vs. the exclusion by the big mining development, contribution to the Rights of Mother Nature from the global south in middle of climate change

ABSTRACT:

The purpose of this research is to present the urgency of listening to indigenous epistemologies of Sumak Kawsay (in kichwa language: Buen vivir-Good Living) and also to accompany the care/defense of the biodiversity-rich indigenous territories of the Andean region. As a research question: How is the anthropocene affecting the indigenous territories and with it the threats of the epistemologies of the Sumak Kawsay/Buen vivir?

This ethnographic research has been carried in the last 7 years, in Republics of Colombia and Ecuador, in Indigenous Regional Council of Cauca CRIC, and The Indigenous Confederation of Ecuador CONAIE. Theoretical references: epistemology of indigenous communities, indigenous intellectuals. The anthropocene affects considerably the species of flora and fauna, the glaciers, water reserves, páramos understood as places where the water is born for the species. With it the territories Pan Amazonas region of native communities are strongly affected in their cosmovision to know.

Due to its high impact in high mountain areas, climate change affects the melting of glaciers, strong droughts, seasonal changes for food production, water shortages and with this the displacement of animals and indigenous people and with it affects their traditions and cosmovisions due to geographical relocation and spatial - socio-cultural changes.

Ethnographic work is used: interviews, participant observation, and documentary analysis. Key to comment how from the epistemologies, their spirituality's, indigenous cosmovision, the elders (grandparents and grandmothers) announce that if there is no respect for the species on earth comes catastrophe, which from modern science is already evident.

Keywords: ethnicity, urgent call, anthropocene, proper right

8. *Valentina D'Alonzo, Eurac Research, and Silvia Cocuccioni, Liz Olaya Calderon, Massimiliano Pittore, Eurac Research*

Participatory Assessment of Climate Risks to Agriculture in the White Carpathians through the Impact Chain Approach

ABSTRACT:

Climate change poses growing challenges to mountain regions and their socio-economic sectors. Within the EU Horizon 2020 IMPETUS project, Eurac Research has applied the Impact Chain approach to identify climate-related risks in mountain areas.

Impact Chains are conceptual models that help visualize and analyze how climate hazards interact with environmental, social, and economic systems, leading to specific risks. They identify cause-effect relationships linking climate drivers to potential impacts, while also highlighting the role of vulnerability and exposure. The approach can be used for both qualitative and semi-quantitative assessments and is especially applied in participatory settings, where it supports shared understanding across disciplines and sectors. It is a useful tool to inform climate change adaptation planning, prioritize actions, and identify key points for improving risk management.

Originally tested in the mountain demonstration site of Valle dei Laghi (Italy), the method was replicated in the White Carpathians and their foothills in the Czech Republic. The activity centered on a participatory workshop involving experts from diverse disciplines, including agriculture, biodiversity, climate science, and regional governance.

The objective was to collaboratively identify key climate risks affecting the agricultural sector and explore potential pathways for improved risk management. Special attention was given to challenges such as extreme weather, water scarcity, soil degradation, and loss of traditional knowledge. Participants included local sectoral experts and public servants from the Zlín region, while observers from neighboring Carpathian countries contributed to cross-border exchange and mutual learning. The workshop fostered interdisciplinary dialogue and highlighted both vulnerabilities and adaptation potentials in local farming practices. It also showcased the utility of the Impact Chain approach as a flexible tool for participatory climate risk assessment. This activity contributes to strengthening regional collaboration and advancing climate resilience in the Carpathians by building a common understanding of key risks and management options.

Keywords: climate change adaptation, risk assessment, agriculture, impact chains, participatory methods, Carpathians

Acknowledgement: This work was carried out within the EU Horizon 2020 IMPETUS project (Grant Agreement No. 101037084). We thank all participants from the Zlín region and observers for their contributions, the Mountain Research Initiative for the financial support, the Carpathian Convention, and Veronica Centrum for helping in workshop organization.

9. *Michal Haring, Comenius University Bratislava and Dušan Janák*

Brown bear in Slovak society

ABSTRACT:

In recent decades, the brown bear (*Ursus arctos*) has become not only an object of conservation and research, but also a highly polarizing element of social debate. In Slovakia, home to one of the most stable bear populations in Central Europe, the presence of brown bears is increasingly becoming the focus of public interest, political debate and media campaigns. The aim is to analyse how bears are

perceived by different population groups and how these attitudes are translated into concrete policies and measures. It draws on an interdisciplinary approach combining environmental sociology, ecology and public opinion analysis. The presentation also shows that the bear debate goes beyond conservation and reflects broader tensions between nature and society, and also raises the question of how we can find solutions for human-bear coexistence under conditions of increasing social polarization.

Keywords: Brown bear, Coexistence, Public opinion, Slovakia, Society

10. Natavan Jafarova, Baku State University

Method of Drainage Basin of Rivers of Nakhchivan Based on Digital Elevation Model

ABSTRACT:

Currently, geoinformation technologies are widely used in hydrology for operational calculations and assessment of water resources. The use of aerospace technologies, in particular, digital three-dimensional relief models, makes it possible to quickly carry out automated complex analysis and interpretation of materials from

the hydrological analysis of river networks. This article provides a detailed description of the stages of building a model of the river drainage basin on the territory of the Nakhchivan Autonomous Republic of Azerbaijan (NAR) based on a digital elevation model and the use of hydrological analysis tools in a geographic information system. As a result of the study, the morphometric of the relief were generalized into operational-territorial units of analysis - river basins. For each river basin, average, minimum, and maximum heights, range of heights, average values of slope steepness, exposure, erosion potential of the relief, and other statistical parameters are determined. A number of hydrological maps have been compiled. A feature of the constructed model for the Nakhchivan Autonomous Republic, presented in this article, is the ability to extend it to the creation of a drainage basin of any territory in an automated mode, changing only the initial data.

Acknowledgement: Not specified

SESSION

Innovative Methods and Tools for Integrating Economic, Social and Environmental Aspects to Bridge Science-Policy Interface for Better Decisions in Forestry (Panel discussion)

Chair: *Simone Martino, The James Hutton Institute; Maria Nijnik, The James Hutton Institute; Mariana Melnykovych, Bern University of Applied Sciences; Sam Poskitt, The James Hutton Institute; Katy Joyce, The James Hutton Institute*

1. Diana Dogaru, Institute of Geography of the Romanian Academy and Gabriela-Adina Moroşanu-Mitoşeriu (Romanian Academy), Mihaela Sima (Romanian Academy), Laura Valentina Lupu (Romanian Academy), Marius-Victor Bîrsan (Romanian Academy)

Research domains and analysis frameworks of climate change impact on mountain areas in Europe – a systematic bibliometric review with a focus on the Romanian Carpathians

ABSTRACT:

Mountain regions have been acknowledged as among the most sensitive to the effects of climate change, facing extensive environmental impacts, including depletion of snow/ice reserves and biodiversity loss, aspects that are critical for world's water supply and ecosystems' health. Through a scientometric analysis and systematic review of science literature concerning climate change impact

on mountain areas in Europe, our study identifies major research directions and methodological frameworks. To this end, a dataset of profile scientific documents was collected from the Web of Science Core Collection Database, considering publications before December 31, 2024. Following a regular descriptive analysis, procedures of science mapping were implemented to clarify the social, intellectual, and conceptual structure, as well as the evolution of the research field concerning European mountain climate change using VOSviewer and Bibliometrix R-package tools. Remarkably, based on intellectual structure, the investigated topic demonstrated an association with four research domains: "mountain vegetation and biodiversity", "climate variability and climate models", "hydrology and mountain water security", "Holocene and paleoclimate". The main research gaps identified in this analysis refer to (1) uneven geographic distribution of research in the European mountain regions and (2) lack of integrated biophysical – ecosystem conservation – socioeconomic research. While these findings are relevant to all European mountain areas, they also provide valuable insights into the Carpathian region of Romania, a key case study for climate change impacts in Central and Eastern Europe. We comment advances on these four domains that have gained importance in the scientific community, and have the potential to guide future actions as well as inspire future research questions. Therefore, our study contributes to the understanding of the (European) effort to advance mountain climate change analyses and quantify its effects, with particular relevance for the Carpathians, to achieve clearer and more viable pathways for mitigation and adaptation in mountain ecosystems.

Keywords: European mountains, climate change impact, mountain vulnerability, bibliometrical analysis, Romania

Acknowledgement: The authors are grateful for the support of the Institute of Geography, Romanian Academy for the project "Geographical studies of the Romanian Carpathians and Subcarpathians in the context of climate change", planned within the Institute's yearly research framework activities.

2. *Simone Martino, Maria Nijnik, The James Hutton Institute and Simone Martino, David Miller, Katy Joyce, Sam Poskitt, Chen Wang, Margaret McKeen, The James Hutton Institute, Aberdeen, United Kingdom and Mariana Melnykovich, Bern University of Applied Sciences, Switzerland*

Innovation in natural capital valuation to improve decision-making in mountain forestry

ABSTRACT

Consequences of the changing climate and unbalancing of socio-ecological systems necessitate immediate human responses, especially in mountains. The Dasgupta Report (2021) stresses that humanity underestimates the value of nature, and there is a need to improve our understanding of the role of forests in tackling climate change and the provision of other ecosystem services, including cultural. To develop this knowledge, we must advance natural capital valuation with the integration of participatory and other innovative approaches. Our project on innovative approaches to natural capital valuation is in progress, emphasizing the role of a participatory environment, and co-constructing knowledge with stakeholders. The scientific and stakeholder labs jointly focus on knowledge gaps; the dimensions of value, which it is helpful to examine; and how these can be best captured, measured, and assessed to support relevant policies, planning and decision-making processes, and provide effective, robust and end-user friendly knowledge exchange.

This paper presents an application of a combination of participatory, quantitative, and digital (e.g. visualisation) techniques for improving current understanding of interactions between manifold socio-economic and nature protection values and activities in mountain forests (Nijnik et al., 2017;

2018). Stakeholders' values and perspectives regarding woodlands expansion, the provision of ecosystem services, as well as practical issues and benefits of multi-functional forestry and aspects of sustainable forest management were identified by using Q-methodology. The preliminary results for Scottish Highlands and Ukrainian Carpathians imply that these are strategic issues (e.g., biodiversity conservation, climate change) that matter to people, and medium- and short-term objectives concerning income generation, jobs creation, etc., and the provision of forest products and amenities for local communities. Contemporary opportunities are important in terms of the economy, environment, and livelihoods, whilst forestry performance is essential for creation of a competitive advantage given the long-term strategic objectives of sustainable development.

Keywords: ecosystem services, woodlands, participation

Acknowledgement: The project KJHI-D5-1 on natural capital valuation is supported by the Scottish Government through its Strategic Research Programme (2022-2027).

3. *Lidiia Hryniv, Ivan Franko Lviv National University and Volodymyr Hryniv (Lviv National University)*

Creation of Spatial Sustainability Management System in Carpathian: Innovative Approach

ABSTRACT:

We thus suggest that the innovative approach to spatial sustainability management of natural resources in mountain areas should be based on the transdisciplinary methodology for research of complex natural, social and economic processes occurring in the terrestrial biospheric space. Taking the physical parameters of this space into account gives the possibility of forming new evaluation systems in sustainability science and practice.

The interdisciplinary physical economic paradigm is, in our view, capable of making a significant contribution to policy design for the long-term sustainable management of natural resources and ecosystem services. The approach is based on the notion of ecologically sustainable supply function of the spatially distributed natural capital, which, in turn, sets the objective estimable boundaries for social and economic activity based on natural resource and ecosystem services use in the region. The primary living matter productivity in an ecosystem is seen as the key parameter that can be quantitatively linked to a set of innovative spatial sustainability indicators for the corresponding complex natural, social and economic system.

The ecogeographical continuity of the European Danube-Carpathian mega-region, countered by institutional discrepancies between the EU member states and Ukraine, presents a unique possibility for a cross-regional comparative sustainability assessment of institutional environments in the Austrian Alpine and Ukrainian Carpathian regions. Our proposed management model includes the development of the set of spatial sustainability indicators theoretically based on physical economic approach, and, consequently, qualitative and formal modeling analysis of institutional arrangements on various levels and their sustainability impact.

Accordingly, we propose a concept of spatial model of management for mountain areas' sustainability in complex natural, social and economic systems which include ecosystem landscapes of various hierarchical levels, in the isothermal mode of development within the biosphere, at their core.

Keywords: spatial sustainability management, natural capital, physical economic approach, indicators.

4. Karolina Taczanowska, University of Natural Resources and Life Sciences Vienna and Fruzsina Stefán, Mariusz Ciesielski, David Ganhör, Simon Trap, Helena Fornwagner, Loukas Balafoutas, David Messner, Charlotte Eggert, Kamil Choromański, Dariusz Gotlib

Mapping Cultural Ecosystem Services in Digital Society – Case Study of Nature-based Recreation in Central European Forests

ABSTRACT:

In the context of a rapidly evolving technology and society, the management of nature-based recreation destinations faces transformative challenges and opportunities. This study explores the paradigm shift in managing recreational function in Central European forests, considering growing digitalization in society. Grounded in empirical research conducted between 2023–2024 in sub-urban forests in Austria and Poland, the study investigates how digital technologies reshape visitor behaviour, site management, and policy responses. The findings underscore the increasing importance of digital representations of recreational offers, the spread of user-generated content, and the rising reliance on mobile applications for trip planning and navigation (Stefan et al 2024; Pellicer-Chenoll et al 2023). Simultaneously, our study highlights the growing use of large-scale datasets—from mobile devices, outdoor apps, and social media—as complementary data resources for systematic visitor monitoring. However, challenges such as disparities in digital literacy, limitations in data accuracy, and the fragmentation of digital content management are identified as critical constraints. Overall, this study calls for extending traditional management strategies to incorporate digital tools thoughtfully and equitably, integrating both technological innovation and social dimensions to enhance recreational experiences and ensure sustainable use in forest environments.

Keywords: cultural ecosystem services, outdoor recreation, nature-based tourism, digitalisation, forests, Central Europe

Acknowledgement: The research was carried out within the international cooperation grant (“Big Data in Forest Recreation Monitoring” - grant DOI 10.55776/I6083 the Austrian Science Fund (FWF) and “Big data in monitoring of tourist traffic and valorization of cultural ecosystem services in forest areas within the Warsaw and Vienna metropolises” - grant 2021/43/I/HS4/01451- financed by the National Science Centre in Poland under the NCN OPUS / FWF Weave programme).

5. Oleh Chaskovskyy, Ukrainian National Forestry University and Serhii Havryliuk (Ukrainian National Forestry University), Oleksiy Sinkevych (Ukrainian National Forestry University), Andriy Nechepurenko (Ukrainian National Forestry University), Oksana Pelyukh (Ukrainian National Forestry University), Mykola Rozumovskyi (Ukrainian National Forestry University)

Satellite-Based Assessment of Forest Disturbance Dynamics in Protected Ecosystems

ABSTRACT:

Forest ecosystems are increasingly vulnerable to the synergistic effects of climate change and human activities. Climate-related stresses such as drought and pest outbreaks undermine forest vitality, amplifying the effects of illegal logging and accelerating environmental degradation through reduced carbon sequestration and impaired ecological functions. Traditional forest management approaches often struggle to address these intertwined challenges effectively, highlighting the critical need for advanced monitoring systems to capture climate-related changes and human-induced disturbances.

This study investigates forest cover dynamics within a part of the protected area using satellite remote sensing data acquired during 2023–2024. The

methodology analyzes high spatial and temporal resolution Sentinel-2 multispectral image time series to detect forest cover changes. Complementary detailed elevation data from the ASTER Global Digital Elevation Map enrich the understanding of the topographic context of these changes. The study employs machine learning algorithms, specifically Random Forest classifiers, chosen for their effectiveness in processing complex and large datasets, identifying patterns, and ensuring robust and accurate forest cover analysis while mitigating overfitting.

Preliminary results indicate non-significant forest disturbance, with an approximate forest cover loss of 1.83 ha in the NNP “Skolivski Beskydy” recorded during the study period. Sentinel-2 imagery facilitated mapping deforestation patterns at medium resolution, while AI-based analysis improved land cover classification accuracy. Regions with forest cover loss were located within specific structural units of the study area, near active commercial logging areas and military forest areas.

The results highlight the significant potential of satellite-based methods for forest monitoring and proactive disturbance detection. Integrating remote sensing with AI-driven analysis offers a cost-effective strategy for improving forest management and combating illegal logging. This study contributes to developing an operational framework for remote sensing-based forest monitoring that may apply to other regions facing similar environmental challenges. Future research could refine the classification techniques by incorporating additional environmental datasets (e.g., meteorological data, ground truth observations) to improve detection accuracy.

Keywords: satellite images, remote sensing, forest disturbance, protected areas, Sentinel-2, machine learning, random forest

Acknowledgement: This research was carried out as part of the project “Mapping of the Forest disturbances in National Nature Park “Skole Beskids” Using Remote Sensing Satellite Data Processing Methods” that has received funding through the EURIZON project, which is funded by the European Union under grant agreement No.871072.

6. Christian Rosset, Bern University of Applied Sciences and Soshenskyi O. (National University of Life and Environmental Sciences of Ukraine (NUBiP)), Lobchenko G. (WWF Ukraine), Voloshyn N. (FORZA), Diachuk P. (Polissia National University), Kondratiuk L. (Ukrainian National Forestry University), Melnykovych M. (Bern University of Applied Sciences)

Putting together the puzzle of close-to-nature forest management

ABSTRACT:

Forests play a vital role in society, contributing to biodiversity, sustainable wood supply, climate regulation, recreation, and more. They are complex ecosystems with short, medium, and long-term dynamics, shaped by past management and natural disturbances.

Close-to-nature silviculture is a gentle management approach that leverages natural processes, such as tree regeneration, to ensure the provision of multiple forest ecosystem services. However, managing forests has become increasingly challenging due to profound changes in climate and society, particularly in Ukraine with the current war.

The practice of close-to-nature silviculture requires thorough understanding of forest ecosystems and how to influence their dynamics. Observation skills are essential, as is the ability to develop a multitemporal perception of forest dynamics to anticipate future developments and optimize the timing and cumulative effects of silvicultural interventions.

Marteloscopes, which are large observation and training plots, play a key role in the acquisition of these skills. By using several marteloscopes, organized into discovery and training itineraries, it is possible to observe and compare forest dynamics and management practices, and to move step by

step into the complexity and diversity of close-to-nature silviculture. From this perspective, marteloscopes can be seen as pieces of a puzzle that provide an ever-improving overall picture of close-to-nature silviculture.

The challenge is to determine which pieces to put together and how to prioritise them, to create or extend a marteloscope network step by step, given the great diversity of situations (tree species and their multiple mixtures, stand structure types and development phases, site conditions and forest ecosystem services).

This presentation is about a methodology on how to meet this challenge and establish such a marteloscope network in Ukraine to promote better understanding of close-to-nature silviculture and enhance practical skills, based on the Swiss experience and the martelage.sylvotheque.ch project with 250 marteloscopes available on this multilingual platform.

Keywords: adaptive and sustainable forest management, close-to-nature silviculture, marteloscope

Acknowledgement: This research is supported by the Velux Stiftung within project From crisis to resilience in Ukraine and is jointly implemented by the School of Agricultural, Forest and Food Sciences HAFL at Bern University of Applied Sciences (BFH-HAFL), the National University of Life and Environmental Sciences of Ukraine (NUBiP), and WWF Ukraine, in collaboration with the NGO FORZA, the Ukrainian National Forestry University (UNFU), and Polissia National University.

7. Taras Parpan, Ukrainian Research Institute of Mountain Forestry

Importance of the Deadwood and Innovative Practice for Sustainable Forest Management

ABSTRACT:

Forests are home to much of the world's terrestrial biodiversity, and their sustainable management is crucial to halting biodiversity loss. While scientific evidence indicates that sustainable forest management (SFM) should be assessed by monitoring the diversity of many taxonomic groups, most current SFM criteria and indicators only consider trees or look at indirect proxies for biodiversity (Burrascano, 2022, p. 110). Deadwood is an important component in forest structure and function, playing a key role in maintaining forest productivity, natural regeneration, biodiversity conservation, enhancing climate change resilience, and improving the provision of ecosystem services to local communities and society at large.

The joint Ukrainian-Romanian study comprehensively addresses these issues for standing and lying dead wood samples in managed and unmanaged forests. We believe that this can contribute to more effective monitoring of biodiversity in response to forest management. The established indicators of dead wood availability and stocks contributed to the development of the guideline "The role of deadwood and innovative measures for its management" (Parpan, 2021, p. 9). Thus, proper management of deadwood is an important contribution to sustainable forest management and certainly contributes to mitigating some of the effects of climate change (Vlad, 2022, p. 47). Key innovative solutions for best forestry practices include the following: 1) Leaving "trees for biodiversity", in particular veteran trees, as well as regeneration treatments / preservation cuttings; 2) Leaving and introducing criteria for standing deadwood selection; 3) Leaving and introducing criteria for lying deadwood selection; 4) Introducing "Aging Islands" and designing them "in the form of networks" in the forest landscape.

Keywords: deadwood, innovative practice, sustainable forest management

8. *Bogdan Andrei Mihai, University of Bucharest and Marian Puie, University of Bucharest*

Combining Remote Sensing, GIS, and AI for the Monitoring of Natural Hazards In The Romanian Carpathians: A Case Study On Jiu River Gorge, Southern Carpathians

ABSTRACT:

The Carpathian region increasingly faces significant risks from natural hazards such as floods, landslides, and rockfalls, which pose serious threats to transport infrastructure and the well-being of local communities. Within this context, the Jiului Gorge area in Romania, between Iscroni and Sadu, has been particularly affected by recurrent flash flooding episodes interrupting the rail and road traffic between Oltenia and Transylvania regions. Major events on June 26, 2020, and September 2024 caused substantial damages, driven by the intense rainfall episodes as documented by the National Institute of Hidrology INHGA on the inundatii.ro website.

This research outlines an advanced methodology that integrates Sentinel-1 SAR data with Sentinel-2 or PlanetScope optical imagery, leveraging spatial analyses in GIS platforms alongside cutting-edge artificial intelligence techniques for flood detection. The YOLO (You Only Look Once) family of models, ranging from YOLOv8 to YOLOv12, is employed for an early detection and a detailed mapping of flood events. By correlating AI-derived insights with hydrological parameters and media reports, the current study enhances situational awareness and response effectiveness.

The innovative approach fosters an interdisciplinary collaboration formual and contributes to the real-time decision-making process. The findings demonstrate the potential of the AI-driven remote sensing for continuous monitoring, prompt alerts, and effective risk reduction strategies in flood-prone mountain narrow valley regions. Additionally, this study supplements advancements in hazard mapping and early warning systems by applying machine learning techniques and satellite data, as highlighted in recent works (Cîmpianu et al., 2021; Diaconu et al., 2024; Puie & Mihai, 2024; John et al., 2024; Toma, Șandric, & Mihai, 2024).

Keywords: natural hazards; Carpathians; flash floods; remote sensing; GIS; artificial intelligence; YOLO; Iscroni; Sadu; Jiului Gorge; transport infrastructure, risk

Acknowledgement: Not specified

9. *Giorgi Mindiashvili, Ivane Javakhishvili Tbilisi State University*

Advancing Landslide Detection and Geological Mapping with Machine Learning: Methods and Case Study from the Republic of Georgia

ABSTRACT:

This poster theme explores innovative machine-learning techniques applied to enhance landslide detection and geological mapping in the Republic of Georgia. The study employs advanced algorithms to analyze geographic and environmental data, contributing to more accurate and efficient mapping practices which are crucial for natural hazard assessment and management in the region.

I will present the primary research findings, focusing on the development and implementation of machine learning models tailored to the geological characteristics of Georgia. The poster will detail the methodology, data analysis, and key outcomes of the study, providing insights into how these techniques can be applied in other regions with similar geographical challenges.

Editors

Jakub Csabay, Andrea Figulová, Kristína Grejtáková, Rudolf Škovira

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