

Welcome to the 24th Futures Conference

FUTURES OF NATURAL RESOURCES

4 June 2024 | Virtual Pre-Conference
13–14 June 2024 | Onsite in Turku, Finland

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BOOK OF ABSTRACTS



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Lahara Ranaweera
Riikka Saarimaa



CONFERENCE PROGRAMME

TUESDAY 4 JUNE 2024 | Virtual

- 13:00 **Opening of the Futures Conference 2024**
Dr. *Juha Kaskinen*, Finland Futures Research Centre, University of Turku
- 13:10 **Introductory Speech on the Futures of Natural Resources**
“The Futures of Natural Resources: Transdisciplinary Perspectives”
Dr. *Juha Hiedanpää*, Natural Resources Institute Finland (Luke)
- 13:30 Break
- 13:40 **Keynote Speech and Chaired Discussion**
“Food System Transformation in Times of Permacrisis”
Dr. *Gianluca Brunori*, University of Pisa, Italy
- 14:15 Break
- 14:30 **Session 1** (parallel tracks)
- 15:45 Break
- 16:00 **Session 2** (parallel tracks)
- 17.15 Break
- 17.30 **Session 3** (parallel tracks)
- 19:00 Closing of the Online Conference Day

**SCAN TO OPEN
THE CONFERENCE
PLATFORM**



THURSDAY 13 JUNE 2024 | Onsite

- 9:00 **Registration to the Conference**
Coffee and Tea
- 10:00 **Conference Opening and Welcome Remarks**
Dr. *Sari Puustinen*, Finland Futures Research Centre, University of Turku
- 10.15 **Opening Speech of the Conference**
“Cultural Pathways for Sustainable Use of Natural Resources”
Dr. *Katriina Soini*, Natural Resources Institute Finland (Luke)
- 10:45 Break
- 11:00 **Keynote Speech and Discussion**
“Unlocking a Thrivable Future for Humanity – Optimism, Sustainability, and Prosperity”
Dr. *Mariana Bozesan*, AQAL Capital GmbH & AQAL Foundation, Germany
- 12:00 Lunch
- 13:00 **Session 1** (parallel tracks)
- 14:30 Break
- 15:00 **Session 2** (parallel tracks)
- 16:30 Break
- 16:45 **Keynote Speech and Discussion**
“Futures Beyond Consumption”
Dr. *Åsa Svenfelt*, Centre for Local Government Studies (CKS), Linköping University, Sweden
- 17:45 Closing of the Conference Day 1
- 19:00 **Conference Dinner**

FRIDAY 14 JUNE 2024 | Onsite

- 8.30 Coffee and Tea
- 9:00 **Session 3** (parallel tracks)
- 10:30 Break
- 10.45 **Keynote Speech and Discussion**
“Green Horizons: Navigating Sustainable Futures with Forest-Based Bioeconomy Roadmaps”
Dr. *Rafael Popper*, Warsaw University of Technology, Poland & University of Turku, Finland
- 12:00 Lunch
- 12:45 **Session 4** (parallel tracks)
- 14:30 Break
- 14:45 **Session 5** (parallel tracks)
- 16:30-17.00 Networking and Closing of the Futures Conference 2024

SESSION PROGRAMME

TUESDAY 4 JUNE 2024 | Virtual

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16:00–17:15 Session 2	Sustainable uses of natural resources	Case studies on uses of natural resources – Food production	Workshop: Catalysing Sustainable Practices in Higher Education Through Student Leadership and Service Learning
17:30–18:50 Session 3	Futures research methodologies in managing the natural resources	Rethinking the relationship between humans and nature	

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SESSION PROGRAMME

THURSDAY 13 JUNE 2024 | Onsite

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15:00–16:30 Session 2	Book launch Special Session: Our World of Futures Studies as a Mosaic	Transitions towards circular economy and zero carbon societies	Workshop: Unlocking agency for just green transition in the use of Finnish forests	Workshop: Decentralised and detemporalised game-based construction of regional futures in fruit cultivation	Workshop: From the expected to the desired: Construct alternative futures with Japanese Foresight methods and Weak Signals	Workshop: How virtual personas can advocate for environmental considerations in strategic foresight and innovation funnels	Workshop: Impact of Mindfulness Exercise on the Futures Efficacy	

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SESSION PROGRAMME

FRIDAY 14 JUNE 2024 | Onsite

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12:45–14:30 Session 4	Climate change challenges to farming and climate change mitigation strategies - case studies	Sustainable transformations in the use and management of natural resources	Paths towards sustainable energy systems	Exploring alternative economic perspectives for sustainable futures	Policy instruments and the governance of natural resources	Futures research theory and methodology	Workshop: From forest bioeconomy to sustainable biosociety: Interactive interpretation of weak signals for anticipatory governance
14:45–16:30 Session 5	Special Session: Earth trusteeship: An ethical framework for Governance and the UN Summit of the Future 2024	Workshop: Co-create a Futures Literacy Game Concept – FuLiBRe Pilot 1	Workshop: Experiencing regeneration: Immersive AI technology for more agency in strategic foresight	Workshop: Reimagining the future: CIRAN's 2035 scenarios for alternative and sustainable CRM extraction practices	Workshop: Teamcentive – natural resources innovation game		

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KEYNOTE SPEECHES | Virtual & Onsite

Food System Transformation in Times of Permacrisis

Time: Tuesday 04 June at 13.40

Dr. **Gianluca Brunori**
University of Pisa, Italy

Cultural Pathways for Sustainable Use of Natural Resources

Time: Thursday 13 June at 10.15

Dr. **Katriina Soini**
Natural Resources Institute Finland (Luke)

For many decades already there have been attempts to find means to use, manage and govern natural resources in a 'sustainable way' to guarantee the well-being of present and future generations within the planetary boundaries. Despite scientific and technological advancements and all knowledge produced the target seems still to be far away, and the pathways towards sustainability even more complicated due to the increased uncertainty caused by the recent crises. Overall, it seems that we have been unable to sufficiently understand and deal with the underlying patterns of the society to make the desirable change, sustainable transformation, happen. These patterns are related to culture, the inner dimension of sustainability as a deep leverage point for sustainable transformation that tackle the root causes of the problems.

Culture is a term that may be defined in number of ways, but in the broadest sense it refers to meaning making. From this perspective it is essentially connected to our way of being in the world, in relation to other people and nature. A change needs to take place in these multiple connections across sectors in all scales, as people are the most powerful solutions for all the challenges we currently face. The question is how we can strengthen individual and collective capacities and capabilities for change making.

In my presentation I will provide some insights how to understand sustainable transformation in the use, management and governance of natural resources through the cultural and relational lenses, and give some examples of ongoing research and promising initiatives towards this direction.

Unlocking a Thrivable Future for Humanity - Optimism, Sustainability, and Prosperity

Time: Thursday 13 June at 11.00

Dr. **Mariana Bozesan**
AQAL Capital GmbH & AQAL Foundation, Germany

In a world facing immense challenges, the pursuit of a thrivable future is not only possible but already underway. This keynote unveils a path towards an abundant future for all by focusing on existing solutions that are addressing today humanity's grand global challenges across several foundational sectors of the economy. It busts several common societal myths about humanity's helplessness and demonstrates how a blend of deep innovations, daring entrepreneurship, smart capital, and leading-edge technologies, as well as cultural transformations paired with socio-political determination, are making the most significant sustainability transformation in human civilization possible today.

Based on her own entrepreneurial and investing experience and existing examples, the presenter is exploring the remarkable progress made in the energy, transportation, and food sectors where renewable solutions are not just a possibility but are already happening at large and small scales making net-zero emissions and beyond by 2040 feasible through the deployment of eight existing key technologies alone. These innovative technologies are proving that a sustainable future in energy, transportation, and food security, to name a few, is within our grasp and redefine our relationship with the planet.

However, time is of the essence and the price for these radical transformations is massive disruption in all areas of life. It requires humanity to brace for impact. Yet, there is hope because a new foundational mindset is also emerging. It is characterised by resilience, adaptability, and an unwavering commitment to a thriving future. This keynote will argue that the new mindset is transdisciplinary. It must and it does indeed integrate all indivisible aspects of life, called by Plato the True, the Good and the Beautiful. From biology to food, from technology to sustainability, from policy to culture, and from finance to sustainability, we are currently generating both massive abundance and the know-how necessary to make the most important transformation in the history of humanity feasible.

Futures Beyond Consumption?

Time: Thursday 13 June at 16.45

Associate Professor **Åsa Svenfelt**

Centre for Local Government Studies (CKS), Linköping University, Sweden

A just transition to sustainable or decreased consumption is urgently needed. However, change seems slow, and no substantial transition is in sight. Futures studies scholars argue that dominant narratives in the present might filter out or block alternatives that could alter our course. Without visible alternatives, there are risks that these narratives prevail and colonize future spaces. Examples of such narratives in sustainable consumption discussions include economic growth, improved efficiency, and responsible consumer behaviour. Critical futures studies approaches might challenge existing structures and dominant assumptions about the future. In this presentation, I will delve into alternative futures beyond growth and possibly beyond consumption. Moreover, I will argue that the question of 'who' deserves more attention in both futures studies and consumption. Specifically, we must consider who becomes involved and who has the power to influence which future to strive toward. In search for perspectives of those who are usually not in the room when consumption in the future is discussed, I will share narratives, ideas, and images of the future resulting from collaborative visioning and art.

Green Horizons: Navigating Sustainable Futures with Forest-Based Bioeconomy Roadmaps

Time: Friday 14 June at 10.45

Dr. **Rafael Popper**

Warsaw University of Technology, Poland & University of Turku, Finland

The keynote on '*Green Horizons: Navigating Sustainable Futures with Forest-Based Bioeconomy Roadmaps*' aligns with the overarching theme of the Futures Conference in Turku, emphasising the Future of Natural Resources. This research, conducted in collaboration with the Natural Resources Institute Finland (Luke) and VTT Technical Research Centre of Finland, was commissioned by the Government of Uruguay in order to integrate foresight methodologies with interdisciplinary approaches to Anticipate, Recommend and Transform (ART) opportunity pathways for global and national forest-based bioeconomies by 2050 (Popper et al., 2020).

The study unfolds a comprehensive perspective by not only delineating a strategic roadmap for Uruguay's forest-based bioeconomy but also by offering actionable insights applicable to a variety of stakeholders

worldwide, including Australia, Brazil, Canada, Chile, Finland, New Zealand, South Africa, and Sweden, among others. Through a participatory process involving diverse stakeholders, the research identifies key global forest-based bioeconomy areas, assesses needs and gaps across multiple countries, formulates a shared vision for Uruguay's bioeconomy, and co-creates a strategic Action Roadmap for its realisation with multi-level actions to be deployed in multiple time horizons: Now, 2030 and 2050. This roadmap encompasses concrete recommendations spanning Forest Management, Mechanical Wood Processing, Fibre-based Biomaterial Processing, Biorefining, and Bioenergy, while considering socio-technical system transitions and dimensions.

The study's implications extend to the quadruple helix of innovation actors, including governmental bodies, businesses, research institutions, and civil society organisations engaged in the bio-based bioeconomy domain. It outlines 15 future opportunity pathways namely: – Competitive wood products for international markets; Diversification of pulp mill investments; Integrated utilization of forest industry residues; Optimal use of underutilized plantations and infrastructure; Native forests for ecosystem services and products; Attractive investment environment for wood processing; Novel cellulose-based materials from eucalyptus pulps; Conversion of by-products to marketable intermediates; White and torrefied pellet production from side streams; Entrepreneurial networks and skilled labour in forest management; Proof-of-concepts for wood-based panel industries; Manufacturing paper grades with locally produced pulps; Value-added applications for wood barks from sawmills; Combined Heat and Power (CHP) plants at wood processing sites; and Advanced biofuels and synthetic fuels production – all enabling foresight-driven knowledge transfer and fostering collaboration across regions concerned with the future of the forest-based bioeconomy on a global scale (see also Tahvanainen et al., 2024).

Furthermore, ongoing evaluation with local stakeholders underscores a promising trajectory, with significant progress towards roadmap implementation. This collaborative effort reflects a shared commitment towards sustainable futures anchored in forest-based bioeconomies, while acknowledging the need for continued intervention to address existing challenges.

In essence, this keynote presentation offers a roadmap towards a sustainable and prosperous future, leveraging the potential of forest-based bioeconomies to navigate the complexities of tomorrow's world while fostering inclusive and resilient pathways for socio-economic development.

References

- Popper, R., Rilla, N., Niemelä, K., Oksanen, J., Deschryvere, M., Virkkunen, M., Loikkanen, T., 2020. *The Future of Forest-Based Bioeconomy Areas: Strategic Openings in Uruguay and the World by 2050* (VTT Technology No. 379). VTT Technology. VTT Technical Research Centre of Finland. <https://doi.org/10.32040/>.
- Tahvanainen, V., Laakkonen, A., Pesälä, O., Pittaluga, L., Hujala, T. and Pykäläinen, J., 2024. Pulp addiction? Perspectives of local regime actors on the development of the growing pulp industry in Uruguay. *Forest Policy and Economics*, 164, p.103248.

TUESDAY 4 JUNE 2024 | Virtual

VIRTUAL SESSION 1 at 14:30–15:45

Designing responsible futures – Systemic approaches in resource management

Time: Tuesday 4 June at 14:30-15:45

M-nex: A design support platform for smart management of urban food-energy-water resources

Yan, Wanglin^a & Nakayama, Shun^b

^aFaculty of Environment and Information Studies, Keio University, Japan

^bGraduate School of Media and Governance, Keio University, Japan

This presentation reports a cooperative design support platform M-NEX, for the smart management of urban food-energy-water resources. The M-NEX platform was born in the M-NEX project of the Sustainable Urbanisation Global Initiative (SUGI nexus), Belmont Forum. The platform was continuously developed through and after the project period. The platform provides the functions of 1) inventorying the urban food-energy-water (FEW) resources, 2) evaluating the gap of supply and demand for FEW at urban neighbourhood scale, 3) estimating the space use intensity and the carbon emissions of the correspondent areas, 4) proposing design scenarios for carbon neutral cities. The experimental practice of the platform acknowledges that 1) the cities exist redundant resources and the potential for improving self-sufficiency by creative design policy and technology, 2) the platform based on the nexus approach provides tools for actors, including governments, companies, and community leaders to co-design, co-produce and co-delivery towards the carbon zero and sustainable cities.

Keywords: sustainable urbanisation, food-energy-water nexus, design support platform, resource use efficiency, visualisation

Experiences with two systemic and participatory qualitative modelling methods in strategy development

Welp, Martin; Ibsch, Pierre; Spies, Michael & Finkenzeller, Julia
Eberswalde University for Sustainable Development, Germany

Natural resource governance at multiple scales can greatly benefit from participatory, system-based modelling interventions. The aim of such dialogue processes is to break down sectoral thinking and combine different ways of knowing, including scientific, local and indigenous knowledge, while structuring these processes in a way that promotes systems thinking.

The paper shows how two different qualitative modelling methods have been used in different cultural settings, from local to global, to support learning in policy making, management and higher education. The experiences are based on interventions in both the global North and the global South.

The MARISCO (Adaptive Management of vulnerability and RISk at COnservation sites) method was developed at the Centre for Economics and Ecosystem Management at the University of Eberswalde for Sustainable Development. It is an approach for systematically assessing the vulnerability of ecosystems and natural resource use systems in order to plan adaptive management strategies aimed at reducing threats to these systems. The method has been applied in protected areas, in the context of regional planning, and in

urban areas in South America, Europe and Asia. Moreover, it has provided the framework and backbone for the international Masters in Global Change Management (launched in 2006).

The second approach is based on Causal Loop Diagramming (CLD), which has been used to promote systems leadership in our projects at both local (Federal State of Brandenburg) and regional levels (e.g. Vancouver Island). It provides a low-threshold approach to modelling complex social-ecological systems and can be used in individual or group settings, or in combinations of both.

Strengths and weaknesses of both qualitative modelling approaches are discussed, including their ability to (a) visualise complexity while enabling the participation of different communities of practice, (b) depict reinforcing and balancing feedback loops, and (c) foster collaborative and systems leadership for strategy development in natural resource governance.

Keywords: Systems thinking, systems leadership, qualitative modelling, communities of practice

Shaping responsible futures: The role of design-based research in higher education

Pattermann, Juliana & Waldegger, Julia

MCI | The Entrepreneurial School®, Austria

The sustainable management of natural resources is integral to meeting the needs of the present without compromising the ability of future generations, as laid out in the Brundtland Commission's definition of sustainability. Addressing current and future environmental and social challenges requires responsible managers who are equipped with competencies for ethical, responsible, and sustainable decision-making. These competencies lie at the heart of responsible management education (RME) in higher education (HE), highlighting the intersection of sustainability and futures studies.

While there is growing research interest in the necessary competencies for making responsible futures happen, few studies focus on competency development. Course concepts aiming to foster students' futures capabilities are often developed for particular contexts, implemented, evaluated, and published on a case-by-case basis. This approach to sharing insights does not allow for generalization and development of learning theory.

The interdisciplinary nature of futures studies allows drawing from learning sciences to develop learning interventions for responsible futures. With this conceptual contribution, we advocate for design-based research (DBR) as an approach for futures research and illustrate a DBR project in HE. We argue that DBR, as an interventionist approach, allows for synergies and empirical insights in RME. While DBR aims to create innovative solutions for unsolved practical problems, it simultaneously develops theories with practical relevance. Intending to create new theories, artifacts, and interventions, DBR examines learning in naturalistic contexts. A DBR project follows iterate, documented cycles of design, testing, analysis, and re-design to generate evidence-based, contextually sensitive design principles for learning. However, the dual nature of the researcher/designer requires critical reflection in the research process. In the presentation, we will explore the research design of a DBR project that aims to foster Futures Literacy in HE in more detail. This is the basis for discussing the inclusion of DBR in the futures research methodology.

Keywords: design-based research, futures research, responsible management education, higher education, futures literacy

The governance of natural resources

Time: Tuesday 4 June at 14:30-15:45

Exploring the traditional ecological knowledge of whales and dolphins in South Africa for inclusive conservation management

Vargas-Fonseca, Alejandra^a; Zylstra, Matthew^b; Clark, Belinda^a; Strand, Mia^a; Lombard, Amanda^a & Snow, Bernadette^c

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^bCentre for Sustainability Transitions, Stellenbosch University, South Africa

^cScottish Association for Marine Science, UK

Natural resources contribute to the historical and cultural identity of communities. The ethical responsibility to safeguard these resources and make conservation more inclusive, effective, and socially just for future generations is gaining increased recognition. The Sustainable Development Goal 14, emphasizes the limitations of current marine biodiversity protection measures, urging exploration of alternative management approaches. The IUCN guidelines on the Cultural and Spiritual Significance of Nature emphasise that understanding the sacredness and spiritual significance of endangered species is a necessary step in attempts to protect wildlife.

Despite the rich marine mammal biodiversity in South Africa, the cultural significance and Traditional Ecological Knowledge (TEK) surrounding whales and dolphins remains largely unexplored. However, it is acknowledged that the ocean holds sacred importance in many South African communities' cosmologies, serving as the home or resting place of their ancestors. Indigenous and local communities possess extensive knowledge about the behaviour, migration patterns, and ecological roles of whales and dolphins. Even after historical displacements during colonization and apartheid, oral traditions related to these animals are believed to persist among community elders and those regaining access to coastal ecosystems.

The study aims to examine cultural beliefs about whales and dolphins, including community awareness, historical connections, shared values, and cultural practices (i.e., legends, myths and folklore). We will use an exploratory qualitative case study design in four coastal areas in South Africa with diverse ethnic groups. At the same time, we aim to identify current threats and pressures that could affect whales and dolphins, important habitats, patterns and shifts in recent times. The research method includes semi-structured interviews, storytelling and an extensive literature review.

Our transdisciplinary approach involves collaborating with local stakeholders, aiming to contribute to more inclusive and effective marine mammal conservation strategies. We aspire to incorporate this valuable cultural knowledge into legislative procedures, acknowledging its importance in promoting a comprehensive, culturally diverse and inclusive approach to marine conservation. The research will be part of a package of Dynamic Ocean Management tools within the MARISCO project. Integrating TEK into legislative processes stands as a pioneering effort, poised to establish an innovative and impactful tool for collaborative conservation efforts, promoting a holistic and inclusive approach to the conservation of marine mammals that encourages stewardship and respect.

Keywords: Ethical Conservation, Indigenous Knowledge, Oral Traditions, South African Cosmologies, Stewardship, Transdisciplinary

Current status of ecosystem services in RAMSAR areas in the Colombian Amazon region

Guarín, Diego Alexander

TU Dortmund University, Germany

Colombia, as one of the most biodiverse countries in the world, has regions whose Ecosystem Services (ESS) have not been adequately assessed, as established in recent environmental policies. Although various planning and policy instruments at the national level have formulated guidelines and compiled examples of ESS management strategies in the country over the last 15-20 years, there have been cases of economic or ecological valuations focused on certain regions, such as the Andes or the Caribbean. These efforts have contributed to regional socio-environmental development.

Nevertheless, there are still significant gaps in terms of ESS assessments involving biophysical and cultural aspects in some regions, such as the Amazon or the Orinoco areas. Addressing these gaps would allow for strengthening environmental management programs and policies in the country. This research aims to fill this void, focusing on some of the less-studied areas in the northern Amazon region, such as the Ramsar wetland site, the Inírida Fluvial Star (IFS). This marks the first part of an integral socioeconomic and environmental assessment of the wetland, encompassing both its urban and natural areas.

The main purpose of this research is to assess the current state of ecosystem services in this region to contribute to the development of the urban area, in conjunction with the conservation and management of the wetland. The significance of this study lies in the generation of new in-depth data for this region, which will be an asset at the scientific level and considered for further studies in the country.

Keywords: Ecosystem services, inland wetlands, northern Amazon region, risks, valuation

Responsibilisation Versus Responsiveness in Natural Resource Governance

Mustalahti, Irmeli

University of Eastern Finland, Finland

Existing research contributions on natural resources governance suggest that governance interventions, coupled with the diversity of contexts in which they occur, are associated with many different social and ecological outcomes and careful analysis is critical to attribute outcomes to various interventions. Scholars highlight a specific thematic and analytical focus – responsabilisation – being common across the diversity of multi-actor and multi-level governance arrangements. Also, responsiveness has attracted attention in other fields of governance – particularly in decentralization of natural resources governance. Broadly, the process of responsabilisation is associated with a transfer of responsibilities to administrative arrangements and agents subordinate within a decision-making hierarchy; in turn, decision units receiving new responsibilities adopt the goals of governance and carry various responsibilities as their own (Mustalahti and Agrawal 2021). How responsabilisation unfolds in different forms of natural resource governance while responsive governance supports deliberative governance. The process of responsabilisation denotes the assignment of new responsibilities and the emergence and creation of responsible subjects but often without the responsiveness between different levels of governance and decentralization of powers and resources necessary to carry out these responsibilities. Scholars argue that responsible subjects, by becoming responsible for their own actions, behaviours, and well-being, also contribute to greater societal well-being. This paper draws attention to and leads to a call for governance capacities, responsiveness and resources, as well as capabilities, for local agents in proportion to their responsibilities. Governance of natural resources requires that legal governance mandates be matched to resources and deliberative powers for lower level decision-making agents to support their mandates and capabilities.

Keywords: natural resources governance, responsabilisation, responsiveness, resources, capabilities, power

Workshop: More than human future – Creating Non-Human Narratives

Time: Tuesday 4 June at 14:30-15:45

Facilitator: Stenros, Anne & Takala, Minna
Creative Catalyst Oy, Finland

**Note: The workshop is designed to accommodate up to 30 participants.*

In design thinking and futures thinking processes we usually create human personas representing the users of services or products, or the users and citizens in scenarios. Traditionally, these users are human-centric, sometimes even humanity-centric. They usually follow the same format, including positive and negative trends, hopes and fears, challenges and opportunities, and user needs. Recently, the user-centric viewpoint has been widened by the non-human and non-user personas representing animals, plants, environments, etc. The emerging life-centred and non-human design approaches give vulnerable humans and nature a voice. By applying this alternative thinking, non-human actors will become visible.

Based on recent studies, biodiversity is seen as a common ground of interest for a healthy society. The weakening of biodiversity erodes economic structures, threatens the functionality of the food system, weakens people's physical and psychological health, and causes social conflicts, violence, and eco-refugees. Therefore, biodiversity and its non-human actors are becoming a more and more important part of futures thinking and scenario planning. The traditional socio-economic approach to future foresight should be extended to a socio-ecological approach to cover human and non-human aspects of life. We should give voice and listen to the actual makers and doers of biodiversity and help them in rewilding.

The non-human personas are written as narratives or power stories with a philosophical input. These philosophical and metaphorical narratives activate our innate impulse to search for meaning. Stories have great power to unite because their themes are usually universal. Based on the learnings from non-human personas and their narratives, we can imagine the superpowers that help us to overcome challenges, obstacles, and even crises in life. Existing side-by-side in the scenario planning process, the humans and non-humans create the full picture of the rewilding ecosystem and its actors in the more-than-human future.

Keywords: Design thinking, Futures thinking, Alternative thinking, Personas, Life-centred design, Non-human personas, Power stories, Biodiversity, Rewilding, Socio-ecological approach

VIRTUAL SESSION 2 at 16:00–17:15**Sustainable uses of natural resources**

Time: Tuesday 4 June at 16:00-17:15

Modernisation of Nigeria’s Mining Industry: The Case for Participation and Sustainable Development of Local Communities

Ezeudu, Martin-Joe

Bora Laskin Faculty of Law, Lakehead University, Canada

To retract from its overdependence on crude oil fortunes and be a participant in the green energy economy, Nigeria has recently begun to revive and modernise its mining industry. The modernisation is driven by the Nigerian Minerals and Mining Act, 2007 (NMMA) and Regulations promulgated thereunder.

This paper examines whether and to what extent the NMMA and the Regulations provide sufficient legal architecture for local communities to meaningfully participate in mineral development decisions and processes in ways that advance the course of their sustainable development. It acknowledges that participation or meaningful consultation with local communities in regard to decisions or activities pertaining to resource development is a modern strategy for ensuring that local communities obtain the benefits of sustainable development and measure the compliance of the NMMA and its Regulations against the standard tools developed under international law.

It attributes the human and environmental sustainability crisis in the Niger Delta region to the failure of the Nigerian government to co-opt the oil host communities early on in the oil development and governance scheme and warns that Nigeria does not repeat the same error as it embarks on modernizing the solid mineral industry.

Keywords: Community Participation, Sustainable Development, Mining Industry

Visions of sustainable natural resource extraction – Talk, action, and alternative futures

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Sustainable natural resources are critical to effective responses to climate change that seek to maintain and expand access to high standards of living which many have become accustomed to or aspire to achieve. More extraction, especially of minerals and materials critical to electrification, will be required. Given the well-understood issues linked to extractive industries, we are beholden to identifying ways in which the least possible harm is caused to the planet and communities.

The mining sector as a whole recognises this responsibility. Albeit ambiguously. A number of industry initiatives exist that seem to be saying the ‘right’ things and developing the ‘right’ courses of action, for example, the ICMM, which has developed guidance for emissions target setting, water stewardship and human rights due diligence. However, the effective reach of these initiatives is limited. Likewise, the interplay of regulation, lobbying and carbon politics creates unintended consequences that can take decades to play out. Add to this, curious mining sector culture and an independency whereby many organisations “do their own thing.” Often with scant regard to verbal promises made if the engineering is easier when not avoiding indigenous cave art in an unfortunate Australian example.

As global demand growth for natural resources – especially “new energy” minerals – shows no signs of slowing, we take stock and examine the current state of talk and action. Using this baseline, we imagine alternative pathways towards more sustainable resource use. Our analysis builds on the idea that legitimate institutional change is processual and happens over time as a result of actors' agency. In other words, a sustainable future for mining needs to be built by people and organisations. What we want to do is identify what kind of actions and actors are needed where and when in order to make the change we need happen.

Keywords: sustainable natural resources, extraction, institutional complexity, alternative futures

Purchasing attitude towards electric cars in Hungary

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In the fight against climate change, the electrification of mobility is one of the strategic goals in the European Union to decrease the greenhouse gas (GHG) emissions in transportation. Cars are responsible for a significant level (13,59%) of the total GHG emissions in the EU, therefore, member countries are supported to increase the purchases of electric vehicles, especially e-cars. Hungary, which attracted several battery production companies to Europe recently, is the leader in the share of electric cars in the Eastern region, however, further incentives will be needed to catch up with the more developed Western member states. A computer-aided telephone survey and several focal group interviews were conducted to analyse the attitude and motivations of potential car buyers in Hungary. Results show that though the majority of potential buyers would be open to use e-cars because of their environmental friendliness and quiet running, price and convenience are still a priority when customers come to a decision between the conventional and alternative technologies. The findings suggest that beside any further financial aid, intense education on the not-so-obvious advantages and the proper use of electric cars, furthermore, a possibility to experience the driving and charging of e-vehicles would greatly advance potential buyers' motivation to consider e-cars as a relevant alternative.

Keywords: electric cars, electromobility, purchasing attitude

Case studies on uses of natural resources - Food production

Time: Tuesday 4 June at 16:00-17:15

The global potential for carbon removal through biochar in shifting cultivation systems

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In the Special Report on Climate Change and Land published by the IPCC (Intergovernmental Panel on Climate Change) the global potential for removal of carbon from the atmosphere by making biochar and amending to soils in shifting cultivation systems was estimated to approximately 2.1 to 3.6% of the current global emissions. Here, the basis for this estimate is reviewed, and experiences from preliminary field trials making biochar in shifting cultivation fields are shared. It is noted that there are huge uncertainties regarding many crucial parameters, such as the rate of growth of biomass in fallow forests, as well as the current and future global area under shifting cultivation. It is also noted that making biochar in long-rotation shifting cultivation requires a large input of labour for cutting and splitting the feedstock, which makes it relatively expensive. Further research on biochar in shifting cultivation systems should therefore preferably focus on systems based on relatively short fallow periods, where feedstock preparation does not require splitting the wood.

Keywords: Biochar, shifting cultivation, slash-and-char, climate change

Replacing commercial fish feed diet with on-farm inputs

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The factory produced fish feed is expensive and consists mostly of wild-caught fish. Several government-funded researchers and fish food manufacturers have been working on figuring out a recipe for fishless fish food. A current priority in the aquaculture industry is the need to partially or totally replace fishmeal with less expensive and easily available plant protein sources to reduce dependence on fish meal and soybean meal as the fundamental protein sources for aquatic animal diets without reducing the nutritional quality of feeds.

We began studying the feasibility of using on-farm inputs as fish food as opposed to commercially processed fish feed pellets at The Venus Project Integrated Aquaponics System (TVPIAS) project. Experiments are being conducted to evaluate the effect of using on-farm inputs, especially chaya mansa leaves, as a partial substitute of fish meal in fish diet on growth performance and feed utilisation of Nile tilapia (*Oreochromis niloticus*) fish. The fish were initially fed with a diet of Growell company with a minimum analysis of 32% crude protein, 3.5% crude fat, and not more than 7.0% crude fibre. Our daily feed regimen for fish now includes 30% weight of the above-mentioned diet plus on-farm inputs such as colocasia leaves, moringa leaves, banana leaves and chaya mansa leaves. These on-farm resources are cheap to produce, locally available, and are self-sustaining. We were able to cut down the pelleted fish feed to over 70% with this experiment. Results have begun to demonstrate that growth performance parameters (final body weight, weight gain, specific growth rate, and survival rate) were not affected at all with increasing the above on-farm inputs in fish diet.

Keywords: Aquaculture, Aquaponics, Organic Fish Feed, Sustainability, Sustainable Living

Charting the future: Enhancing fisheries management through co-management and future studies

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The fisheries sector grapples with multifaceted challenges such as declining output, climate change, and sustainability issues. At present, fisheries resources are managed by national governments through top-down fisheries management processes, driven by rationalized fisheries prediction models. Despite the use of such models, persistent stock declines reveal the inadequacies of this approach in comprehensively capturing socio-ecological complexities. In response, participatory co-management has emerged as a promising alternative to democratize resource management and integrate local knowledge.

However, while co-management offers a bottom-up approach that considers socio-ecological dynamics, it often lacks long-term planning capacity and struggles to adapt to socio-ecological dynamics in the ocean and fisheries sectors, especially in the context of the evolving blue economy. This gap underscores the necessity for exploring options in future studies to capacitate co-management practices and stakeholders with future studies-based methodologies to enhance participatory fisheries management's effectiveness in accommodating socio-ecological fisheries dynamics.

By capacitating co-management bodies and empowering stakeholders with tools such as scenario planning and insights from future studies, stakeholders can proactively anticipate and prepare for diverse future scenarios, navigating uncertainties and fostering resilience in fisheries socio-ecological systems. This further strengthens co-management regimes, ensuring the sustainability of fisheries and the livelihoods they support

by embracing uncertainty and promoting innovation in effectively addressing the complexities of the fisheries sector, safeguarding ecosystems and communities for generations to come.

This article explores future studies methodologies to bolster participatory fisheries management's effectiveness, focusing on resilience and adaptive planning. Incorporating scenario planning offers a proactive stance against uncertainties, enabling stakeholders to anticipate and prepare for diverse future scenarios. Additionally, insights from future studies provide valuable perspectives on emerging trends, technological advancements, and socio-economic shifts, enhancing fisheries management decision-making within co-management frameworks.

Keywords: Future studies, Fisheries co-management, Scenario planning, Future methodologies, Fisheries management

Workshop: Catalysing Sustainable Practices in Higher Education Through Student Leadership and Service Learning

Time: Tuesday 4 June at 16:00-17:15

Facilitator: Johnson, Ben
Brock University, Canada

The proposed scholarly workshop aims to harness the potential of student leaders in post-secondary institutions to address environmental sustainability issues through cognizance of the university's environmental footprint. Stemming from case study research at a university in Ontario, Canada, this workshop will particularly focus on reducing food and paper waste, promoting proper recycling, and fostering environmental consciousness where stewardship of natural resources is second nature. The workshop will facilitate a platform for student leaders to share best practices and collaboratively organise advocacy campaigns. For instance, student department representatives can analyse paper usage practices and coordinate effective strategies to minimize paper waste. Additionally, students can unite to lobby for increased availability of composting bins on campus, crucial for diverting food waste from landfills. The economic benefits of increased composting will be discussed, as access to composting not only aligns with environmental goals but also contributes to cost-effective waste management. The workshop will facilitate discussion on how these practices are situated within the universities, but transfer beyond its borders, influencing the broader community to enhance stewardship of natural resources. The integration of student leadership aligns with postsecondary pedagogical strategies, specifically service-learning and experiential learning, providing institutions with compelling reasons to adopt and incentivize this direction. Simple event details such as having a plan for food waste may not seem significant when viewed in isolation; nonetheless, universities are busy places where small details can accumulate into massive environmental footprints.

Furthermore, the advantage of championing environmental stewardship in universities is the connections with sustainability experts who can help ensure evidence-based practices transpire. Welcoming participants from diverse backgrounds, the workshop aims to stimulate global conversations on grassroots-level initiatives. Ultimately, the workshop envisions a collective effort to catalyse environmental responsibility and resource conservation through student leadership.

Keywords: student leadership, sustainability, service learning

VIRTUAL SESSION 3 at 17:30–18:50**Futures research methodologies in managing the natural resources**

Time: Tuesday 4 June at 17:30-18:50

Futures research in the US Forest Service: Foresight for a sustainable futureBengston, David^a; Westphal, Lynne^a & Floress, Kristin^b^aStrategic Foresight Group, US Forest Service, USA^bNorthern Research Station, US Forest Service, USA

Forestry professionals have a long history of looking far into the future due to the nature of forests and the long growing period of trees. The United States Forest Service, for example, has often used time horizons of 50 years or more in planning and forecasting. This forward-looking and long-term perspective is essential for sustainable management of forests and related natural resources. But Futures Research is a relatively new addition to the toolkit the US Forest Service uses to fulfil its mission. This paper reports on the establishment of the Strategic Foresight Group, the first Futures Research unit in the Research and Development branch of the US Forest Service, and outlines the program of research it has carried out over the past 15 years. A wide range of Futures Research methods have been used, including horizon scanning, scenario planning, drivers of change analysis, the futures wheel, foresight panels, serious games, and backcasting. Examples of key futures projects of the Strategic Foresight Group are summarized and the current and potential impacts of this work on the US Forest Service, the forestry profession, and diverse forestry stakeholders are discussed.

Keywords: Forestry, Futures Research, US Forest Service, Sustainability

The future of evaluating the impact of research on natural resources in Latin America: A documentary review of research evaluation reports

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Universitat Politècnica de València, España & Universidad Nacional-Costa Rica, Costa Rica

The objective of the paper aims in defining possible futures of evaluation of research in the field of natural resources at Ibero-American region, in order to provide scenarios for the development of the science, technology and innovation in this knowledge field. Currently, there are few visions of the future of research evaluation in the Ibero-American region, which poses an ontological, epistemological, methodological and practical void in the evolution of theory and practice of research evaluation, generating uncertainty, and at the same time dependence on evaluation models that doesn't realise about the contexts of the region. Methodologically, the research proposal is based on the concept of Foresight, which is a tool that explores the trends that change the future of science and technology, contributing to planning and making scientific and technological decisions (Martin, 2010). As part of the results, it is expected to determine the generations of research evaluation in the field of natural resources in the region and proposes a future hypothesis of the evolution of the evaluation of the research in the field of natural resources.

Keywords: research evaluation, foresight, science

Design for the transition towards a desirable future for traditional medicine in Mexico: The case of Psilocybin in Huautla de Jiménez, Oaxaca

Ostoa Ortega, Nohemí

Universidad Nacional Autónoma de México, Mexico

Despite it being largely underappreciated, traditional medicine continues to play a very relevant role in some indigenous communities in Mexico, where other issues, including poverty, lack of access to health services, and a shortage of educational opportunities contribute to creating a complex social situation. Moreover, recent Western research on the therapeutic applications of natural resources previously used only in traditional medicine, such as psilocybin in the treatment of different mental illnesses, pose potential challenges for indigenous communities. This research applies a Transition Design approach in order to identify the elements that form a complex bio-socio-technical system around the use of psilocybin in the mazatec community of Huautla de Jiménez, Oaxaca; and to co-design with them interventions that might direct them towards a more desirable future. It is necessary to explore the various components contributing to its complexity, including actors and their values, cultural complexities, multidimensional uses of psilocybin, sustainability and biodiversity conservation, the regulation and legality of the substance's use, as well as the economic, epistemic, and ontological extractivism that the community might be facing. Visualizing the system, registering the community's hopes for the future, and a collective activation contributes to a transition towards a desirable future for traditional medicine in Huautla de Jiménez, Mexico. This work also argues for the relevance of design in addressing social challenges, and in facilitating the creative participation of directly concerned people in the generation of alternative future scenarios.

Keywords: transition design, alternative futures, traditional medicine, indigenous communities, psilocybin, natural resources.

Regenerative forestry and agriculture practices: A response to the climate emergency and biodiversity decline in developing nations

Brown, Cleverline T.

Rivers State University, Nigeria

This study examines the critical significance of regenerative forestry and agriculture techniques as a tactical response to the growing climate emergency and biodiversity loss in developing countries. Land use changes, pollution, and habitat degradation are cited as direct consequences of agricultural operations that contribute to biodiversity loss. Climate change concurrently affects biodiversity and agricultural productivity dramatically, driven by both natural and human forces. The study explores the effects of agriculture on biodiversity, the environment, and climate, highlighting the need for a sustainable strategy and acknowledging the urgent need for nature-based solutions to climate change and biodiversity loss. Agriculture must implement mitigation techniques for climate change since it poses a global hazard to food, the environment, and human security. This study is based on research that highlights the negative impacts of climate change on the environment and human population, as well as the necessity of addressing these effects through nature-based solutions. It also examines the widespread and escalating threat that climate change poses to ecosystems and biodiversity, emphasising the pressing need for an all-encompassing solution. This study discusses the various effects of climate change on developing countries, such as reduced resources for forestry and agriculture, water scarcity, and food and people insecurity. It highlights regenerative agriculture and forestry methods as viable solutions that help restore biodiversity while simultaneously reducing the impacts of climate change and biodiversity loss. By combining knowledge from these various sources, the study seeks to offer a thorough summary of how regenerative approaches might improve sustainability and resilience in underdeveloped countries' environmental discourse.

Keywords: Regenerative forestry practices, climate change, biodiversity

Rethinking the relationship between humans and nature

Time: Tuesday 4 June at 17:30-18:50

Chair: Morgan Shaw

Re-entanglement: Away from extractivism and towards reciprocity

Jackson, Cherry

Royal Holloway, United Kingdom

The use of natural resources, from rare metals and fossil fuels to groundwater and certain landscapes, has pushed humanity to be increasingly entangled in a relationship with particular systems, and with things themselves, in a logic that has been described as extractivism. As natural resources are depleted and damaged, solutions are being sought by individuals and organisations that allow for a sustainable approach to their management. One solution proposed is the development and implementation of new technology. Yet, the drive to create and adopt the latest technological developments should give us pause. Is this a fix(ation), and a product of the prevalent short-term thinking and prioritisation of profit maximisation? What exactly do we mean by such terms as "technology," "growth" and "use" as well? And is the implicit distinction made between nature and culture useful here? In this paper, I propose that rather than focusing on the proliferation of new technologies to better manage natural resource use and the implications of its current mismanagement, we should turn our attentions to just how we are entangled. We should also take heed of the definitions given and distinctions drawn to the categories of technology, growth, and use, as well as to the binaries made between nature and culture. I then argue that rather than seeking to disentangle ourselves from things, humanity should undertake a process of re-entanglement. This should be done in a manner that eschews normative definitions and boundaries between natural resources and technology, and nature and culture, as well as in a way that proffers growth as something that does not necessitate aggrandisement and use as a series of exchanges. In that way, I argue that our current lifestyles, and thus the relationship between humanity and natural resources, will be transformed from a logic of extractivism to one of reciprocation.

Keywords: extractivism; entanglement; reciprocity; technology; natural resources

Ethics, just transformation and natural resources

MacLeod, Laura Rojo

WG USA Climate Focus group, USA

To 'be in the world means to be well in the world', Aristotle would say.

His ethics, still very much in force today, is the first that concerns human behaviour with a new vision of the real, the daily life of the individual man embedded in the social, natural and historical fabric.

Today we have run over the natural, eternal limit and the capacity of total belonging to the natural world is negligible. We live in a material world alienated in a borderline crisis of ethical values. Our overexploitation of natural resources exceeds ecosystems' capacity to provide them or to absorb our waste. Society has failed to meet clearly stated goals of the UN Framework Convention on Climate Change. The UN Stockholm Conference, 1972 was the starting point of organised efforts to deal with environmental problems and the urgent necessity of preventive global actions." Millions of individuals must adjust their personal priorities and assume a global ethic reflecting the compromise for a better environment and life as a whole".

Humanity has begun the social, economic, political and technological initiatives needed for this transformation. A just transformation focusing on environmental justice mostly in indigenous communities seriously affected by pollution of all sorts, where women and girls bear the brunt of the climate crisis, should be in place now. But the challenging, transformative actions to turn away from the ecological abyss are not technical but ethical. Top decision makers, government, corporate and political polluters permanently tread on the common dream of full global environmental ethics.

To accelerate the ethical change in decision makers and society, we forcefully recommend priority actions and resource allocation to empower women and girls in order to avert the worst of the ecocide and lead society into a future of greater wellbeing and wisdom.

Keywords: ethics, change, natural resources, actions, decision making

Contemporary art(ivism) in the mires: Environmental Values and Future Agency in the Landscapes of mining

Latvala-Harvilahti, Pauliina

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Mires are important for our future well-being as they act as an atmospheric carbon sink. Various minerals located under and next to mires are mined for contemporary technological devices, despite the knowledge that the natural areas are vulnerable to the consequences of mining. The mires are changing culturally and are used by artists to highlight new aspects in the context of eco-crisis. Mires represent not only nature or the long period of past culture, but also future values. There are a growing number of artists who have chosen the theme of the mire for their art projects, which are performed either in the mire or indoors, for example, in galleries. Art-related events in relation to mining plans near or under the mires can be regarded as a weak but intensifying signal of mire artists' future agency, through their conscious pro-environment behaviour. Mire activism combines mire art and activism. It refers to environmental artists with activist aims. For example, environmental struggles against mining are known globally, but in every struggle the meanings and emotions attached to mires apply locally in the specific environment. Art promotes discussion about the conflicted situation and provides a forum for people to show their environmental emotions. As my interviewees mentioned, participatory mire artworks have not had any difficulties finding volunteers. In the artistic process, ecological reflection can extend from the use of natural materials and local choices to the global impact of human activity and a more general critique of consumption. My research material consists of open theme interviews of environmental artists. Interviews with an opera singer, two photographers, and a lament artist show that contemporary mire art is collaborative in nature: there has been co-operation with environmentalists, environmental organisations, local communities (individuals, volunteers), and politicians who wish to strengthen the awareness of mires as carbon sinks. The paper is part of my earlier research conducted in the Mire Trend research project (2020-2022 UEF) and is based on the published findings.

Keywords: activism, mire environment, intangible heritage, mining, values, future agency

THURSDAY 13 JUNE 2024 | Onsite

SESSION 1 at 13:00–14:30

Millennium Project Special Session: Deconstructing Paradoxes of Work through CLA

Time: Thursday 13 June at 13:00-14:30

Chairs: Heinonen, Sirkka^a & Kuusi, Osmo^b

Facilitators: Knudsen, Mikkel^a; Pättikangas, Paula^a; Taylor, Amos^a; Viitamäki, Riku^a & Tähtinen, Lassi^b

^aFinland Futures Research Centre, University of Turku, Finland

^bAalto University, Finland

Keynote Speech: Glenn, Jerome

The Millennium Project, the United States of America

Work as a key sector in society is undergoing transformation, especially within the twin digital and green transition (EU strategic areas). 'Futures of work' have been extensively explored in the field of future studies. We are, however, now entering the next stage where novel drivers and new complex phenomena arise, such as a technological revolution, the effect of AI on work, as well as a sustainable and just green transition.

We will readdress this topic through paradoxes in this futures clinique. Paradoxes can be used as promising tools for exploring non-explicit socio-cultural and techno-economic developments as well as for deconstructing assumptions. Paradoxes may also point to emerging disruptions that will shape the new paradigm of work. We invite the participants to delve deeper into the paradoxes and to deconstruct them utilising the CLA (Causal Layered Analysis) method in small interactive groups.

As inspiration for this foresight exercise, a keynote is given by Jerome Glenn, CEO of the Millennium Project highlighting the implications from ANI (Artificial Narrow Intelligence) evolving into AGI (Artificial General Intelligence), based on a recent MP Study, and re-thinking the meaning of work. Through futures provocation the participants are invited to ponder critically on some paradoxes representing current paradigm of work. The workshop provides participants with deeper insight of paradoxes and of CLA as a way to deconstruct background assumptions that control our understanding of work.

The participants will get a printed copy of the report on two previous Millennium Project sessions (FFRC eBook 4/2023), as well as experience a methodological experiment offered by the three-year T-winning Spaces 2035 project (<https://t-winning-spaces2035.com/>), funded by the European Union NextGenerationFund and The Research Council of Finland under grant #353326. The session is organised in co-operation with the Millennium Project, Finnish Society for Futures Studies and Aalto University.

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Keywords: work, meaning of work, paradoxes, CLA, digital and green transition, Millennium Project

Special Session: Harnessing the natural resource called human curiosity to cultivate knowledge sharing in professional networks

Time: Thursday 13 June at 13:00-14:30
Facilitators: Tuenkers, Lena^a & Balcom Raleigh, Nicolas^b
^aForesight Europe Network, Germany
^bForesight Europe Network, Finland

Humans are part of nature, and not separate from it. Therefore, human curiosity and the ability to learn from others can be considered as a natural resource. For professional networks, accessing this natural resource can enable their members to produce value. Among foresight practitioners, users, researchers and educators, the tools one most frequently uses are the most familiar, while appropriation of other or new tools can be challenging. Starting in early 2023, Foresight Europe Network launched a program called FEN Demo Hour aimed at opening opportunities for its members to be curious and learn from each other. The program was designed to be light-weight to run, completely voluntary for participants, and outcome-neutral. In this panel discussion, selected participants from past Demo Hours will share their experiences and value gained from the program. Across the course of the year's monthly Demo Hours, several categories of value emerged including increased contact between newcomers and longstanding futures community member, and opportunities to give/receive specialized feedback. Serving as a kind of Community of Practice, the Demo Hour showed how accessing a network's natural resource of human curiosity cultivates networked knowledge exchange and co-creation and helps foster a sense of professional identity. Overall, the Demo Hour organisers found that its general-level design is repeatable, low-maintenance, low-risk, and high-reward. By sharing practical experiences from one year of this program, we offer a replicable template which other professional associations and networks can apply to launch similar learning venues for their members.

Keywords: Community of Practice, Curiosity, Knowledge Sharing, Social Learning, Professional Networks

Visions for the resilient futures in urban environments

Time: Thursday 13 June at 13:00-14:30

Design options for building sustainable urban waste value chains: A case study in a municipal council in Sri Lanka

Esham, Mohamed^a; Winterford, Keren^b; Davila, Federico^b; Dominish, Elsa^b; Drechsel, Pay^c; Jayathilake, Nilanthi^c & Samarakoon, Damitha^d

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^dJanathakshan (GTE) Ltd, Sri Lanka

Addressing enablers and barriers for public and private institutions in Sri Lanka to advance sustainable value chains necessitates a multi-faceted approach. This study asked: “What are the enablers and barriers for public and private institutions in Sri Lanka to advance the implementation of sustainable and innovative value chains to improve sanitation, health and food security?” To answer this, a collaborative team investigated design options for building sustainable urban waste value chains, focusing on a case study of a local authority, the Kaduwela Municipal Council (KMC) in Sri Lanka. The study, informed by waste system assessment, social and market research on organic waste value chains, political economy analysis, and stakeholder consultations identified a range of design options categorized within practical, political, and personal spheres. Option 1 prioritises scalability in waste treatment volume for compost, while option 2 focuses on improving quality through enhanced waste collection and compost production methods. Option 3 suggests enriching compost nutrient value by adding septage. Option 4 advocates for targeted marketing of compost products, and option 5 underscores the importance of educating retailers and farmers about effective compost utilisation.

The study advocates a paradigm shift on 'waste' to foster attitudinal changes towards organic municipal waste, alterations in systems and structures, and cooperative efforts for enhancing compost quality. Value addition through co-composting provides a practical means of strengthening nutrient value but requires further research and technical guidance, while stronger coordination among the public, private sectors, and community actors is essential to enable system change. Exploring new waste management business models and employing system thinking for integrating waste streams can facilitate sustainable value chains, contributing to improved sanitation, health, and food security in urban areas of Sri Lanka. The project team is closely collaborating with KMC to incorporate end users of the research into the study.

Keywords: compost, sustainable waste value chains, organic waste, local authorities, Sri Lanka

Innovation policy roadmapping on exploring resilient urban futures via digital twins

Karayel, Tolga

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The swift expansion in digitalization has prompted the integration of Digital Twins on urban futures (Deng et al., 2021; Deren et al., 2021; Mylonas et al., 2021). Digital Twins are virtual representations of physical entities/systems/objects - (Grieves and Vickers, 2017) and presents a paradigm shift in redefining urban futures (Mohammadi and Taylor, 2017). My recent master's thesis research on “Innovation Policy Roadmapping for the Future Finnish Smart City Digital Twins” (Karayel, 2023), delved into the intricate interplay of socio-technical dynamics within the urban context, examined how Digital Twins could reshape urban landscapes and foster resilience by utilising “Innovation Policy Roadmapping (IPRM). By highlighting the convergence of Systemic Transformation Roadmap, and the Technology Roadmap via foresight methodologies (Ahlgqvist et al., 2012)., IPRM outlines a visionary course towards adaptable and forward-thinking urban futures.

In this session, the presentation introduces IPRM on exploration of Digital Twin's role in resilient urban futures, disaster mitigation, natural resource management and social/ecological well-being. It reveals;

-IPRM's pivotal role of joint vision among policymakers and sectoral stakeholders in nurturing an innovation technology ecosystem conducive to the survival against external drivers, and
 -The multifaceted capabilities of Digital Twins across various urban domains, including urban planning, scenario development, What-IF analysis, and resource management by public engagement.
 The presentation offers insights from research findings into sustainable urban transformations via facilitating the integration of futures studies methodologies and digital twins to address uncertainties and foster resilient urban futures.

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Keywords: “Digital Twins”, “Innovation Policy Roadmapping”, “Foresight Methodologies”, “Socio-Technical Urban Transformation”

Participatory foresight processes: Exploring the images of the future of communities in Indonesia’s new capital city

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The government of Indonesia is currently relocating its capital city from Jakarta to East Kalimantan, a forest nature area in the Island of Borneo. The impact of this development on the future sustainability of the region has raised serious questions concerning the environmental and societal implications on the local community. Some of the main problems including land inequities, displacement and relocation of local/indigenous communities and the tensions that can grow between local residents and the expected newcomers. There is a need to deploy strategies that promote inclusion and understanding of the contrasting expectations of those who are most impacted by the new capital city transformation. This paper explores the participatory foresight process that was conducted in East Kalimantan-Indonesia for the purpose of investigating the images of the future of local stakeholders in the new capital region. The foresight process was designed in a 3-step approach for testing a combination of foresight tools and methods: First, as part of the participatory futures praxis, the deployment of futures workshops aimed to facilitate the exploration of images of the future with a group of diverse stakeholders. Second, by using the futures wheel, a graphical visualization of direct and indirect future consequences of change was explored in the context of the new capital city. Third, by building on the notion of Greensight as a sensemaking tool, attention is placed in comparing people’s interpretations of natural and built environments. The overall results on the process are meant to underscore the contrasting perspectives, positive and negative in the different stakeholders involved during the 3-day activities. Furthermore, the theoretical, and analytical approaches on images of the future add value to the ongoing discussions on the topic of foresight and urban transformation.

Keywords: images of the future, urban change, sustainable development, transformation, foresight.

Sustainable and inclusive stakeholder engagement in long-term energy planning

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The research on the concept of stakeholders has a long and rich history, beginning its discourse in management studies. Over time, attention to the parties affected by firms or organisations in various spheres has grown and acquired multiple definitions and concepts. Studies link the definition of stakeholders to their roles, communication with each other and degrees of exposure or influence on the project/study under consideration. However, most studies do not pay sufficient attention to one of the main determinants of a stakeholder's role, namely their active actions and practices that define their relationships and connections with other stakeholders and project itself. This research proposes to examine the concept of stakeholder in terms of actions and practices as a determinant of stakeholder roles. This study also creates a concept considering stakeholder relationship as a continuous and flowing process, where the roles of stakeholders and their designations change according to the changes in their practices and interactions. Thus, the conceptualization of stakeholder based on their actions will contribute to the study of the stakeholder role especially in the field of long-term energy transition in particular, as by building an understanding of the stakeholder roles through the changing practices, that are formed by actions, and fluid systems of interaction between stakeholders it is possible to contribute to creation of a practical methodology of a long-term and successful co-operation in the multi-directional phenomenon of sustainable energy transition. This article contributes to the conference theme by expanding the notion of stakeholders within the scope of sustainable use of natural sources and the long-term energy transition, and by reviewing relevant state-of-the-art stakeholder engagement methodologies with the intention of discovering main research directions and related knowledge gaps.

Keywords: stakeholder engagement, stakeholder theory, energy transition, sustainability transition, literature review

Transformations to sustainability: Insights from the futures research

Time: Thursday 13 June at 13:00-14:30

Transformative power of culture

Siivonen, Katriina & Halme, Amanda

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Culture is a central driving force of futures and, if we so want, towards a more sustainable world. Culture is constantly recreated in interaction between matter and meaning. Nature as life and flows of changing matter and energy including bodily human beings in their everyday interaction on Earth and human made material environment forms one part of this interaction. Constantly changing flow of culturally shared worldviews, values, memories, images of futures, habits and practices forms another part of the interaction. These two streams intertwine with each other every moment in individual human actions and form the global process or river of culture. (Siivonen 2022; Barad 2003; Siivonen 2008; Hannerz 1992.)

The focus of this paper is in the voluntary, conscious cultural transformation, regarded as necessary to tackle the ecological crisis. We suggest a new form of Heritage Futures, based on Intangible Cultural Heritage, as a tool to co-create alternative, sustainable futures and accordingly actions in culture and society. In order to help us to better understand the cultural human-nature interface and to form practical solutions towards a more sustainable Globe, Heritage Futures need to include both anticipatory understanding and understanding of the interactive process of matter and meaning inside and outside of human world. (Siivonen 2020; Siivonen 2022.) Thus, Heritage Futures combines 1) transformative power of culture defined as a dynamic, interactive process

as a part of nature, 2) anticipatory understanding, and 3) cultural heritage as a tool to engage people in an inspiring, affectual, cognitive and practical way (Siivonen 2022). The model of Heritage Futures is an intentional, anticipatory, cultural tool to co-create alternative images for sustainable futures and accordingly actions in culture and society. Voluntary participation is a prerequisite of ethical implementation of cultural sustainability transformation, and thus also prerequisite of sustainability transformation (Siivonen 2022).

Keywords: Culture, nature, heritage futures, anticipation, cultural sustainability transformation, participatory methodology

Transformative skills and transition efficacy in strengthening futures agency

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In the contemporary world of complex uncertainties, unforeseen turns and systemic changes, the resilience of ecosystems, people, and communities is a key success factor. In addition to coping with changes and recovering from the shocks of the operating environment, building a sustainable society requires strengthening futures agency. In recent futures studies literature, agency is seen to stem from constructs such as futures consciousness, futures awareness, and futures literacy, which, enriched by critical transformative learning, create empowerment that unlocks social action towards a better future. In professional fields such as natural resource management, creating and enhancing futures agency is part of continuous learning in the altering working life and can be operationalized via taking up transformative skills. The present contribution provides a practical interpretation of transformative skills by Wamsler et al. (2020; <https://doi.org/10.1016/j.envsci.2020.06.005>) for the systemic transition of natural resources. Conceptually, the futures agency generation emphasizes transition efficacy, an evolvement of Bandura's concept of self-efficacy, as a crucial catalyst for people to successfully use their transformative skills and meaningfully engage in the societal transition. It is envisaged that along an increasing transition efficacy, the courage to apply transformative skills increases and thus, stronger futures agency takes place. In the natural resources related fields, such as forestry, transformative skills and transition efficacy can be enhanced through futures activities (e.g., facilitated workshops, strategy design events or innovation candidate experiments) that transcend sectoral boundaries and ways of knowing. These activities may feature human-nature interaction and activate both mind and body. Various arts-based and mediated methods that bring confidence to one's own opportunities to live in and influence the transition are recommended.

Keywords: action orientation, continuous learning, futures skills, resilience

Framing regenerative anticipatory assumptions in Futures Literacy

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“Regeneration” is a biological term which refers to the capacity of organisms and entire systems to self-reform 1. “Anticipation” originally is also a biological term, related to metabolism and wellbeing: all living systems are anticipatory systems 2. “Regenerative anticipation” involves anticipatory systems (stem cells, exaptation and autopoiesis) 2, 3, 4 and describes meaningful ways through which self-reform and repair could be understood for different systems (from cells, to cities, to planet). We speculate that regenerative anticipation, from a human perspective, might have an important role to play in planetary wellbeing – i.e., “the opportunity for both humans and nonhumans to have their needs satisfied now and in the future” 5.

We understand that Earth has been fractured, and the resulting degraded ecosystems/social inequalities are symptoms of an alienation of modern humans 6. We, as a planetary system, need regeneration. Can we regenerate these wounds and anticipate alternatives of planetary wellbeing? Can we anticipate regenerative futures?

We will explore the concept of Regenerative Anticipation within the methodology of Futures Literacy Labs (FLLs), providing inputs related to planetary wellbeing and imagination for desirable futures. A case study will be described, in which regenerative futures are incorporated into the second phase of a FLL 7. This phase provides a new scenario neither probable nor desirable based on anticipatory assumptions collected throughout previous steps. In this work, we will build scenarios based on regenerative anticipation traits - stimulating collaborative imagination focused on planetary wellbeing instead of dystopias and/or utopias. Finally, we aim to create and publish a portfolio of regenerative scenarios to be incorporated into FLLs. We expect that regenerative anticipation can be incorporated into research and Futures Literacy exercises, aiding us in the mission of healing the existing fractures between humans, and between humans and the more-than-human components of nature.

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Keywords: Futures Literacy, Regeneration, Regenerative Anticipation, Imaginary, Anticipatory Assumptions

Guardians of the earth – Exploring sustainable futures enabled by cutting-edge space technology and AI

Melvola-Georgakarakos, Kirsi; Blomqvist, Nina; Lehterä, Tiia-Lotta; Lind, Jan; Melkko, Elsa; Puttonen, Heidi; Saranen, Niina & Pura, Minna
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Sustainable management of natural resources in the future extends surface of the earth to minerals in space. European Commission encourages development of space capabilities supporting safety, resilience, and sustainability. Our gaze is therefore directed to space, imagining alternative futures in the year 2050. As Finland's vision is to become the most attractive and agile environment for space business in 2025, futures research tools offer great potential to wider societal discussion on the topic.

Our transformative scenario workshop series conducted in November 2023 resulted in four scenarios, depicting socio-economic and environmental consequences and even ideas for new innovations and deep space technology that may assist sustainable preservation and management of different natural resources, such as clean water. We applied LEGO® SERIOUS PLAY® futures workshop methodology as a facilitation technique to construct tangible stories and simulate consequences of actions. A multimedia presentation (generative AI has been used in execution thereof) lets the audience dive into the year 2050 and experience news from the future with a help of personas and stories linked to their lives.

While satellites today can provide real-time information of the state of the globe, economic growth and the use of natural resources can in the future be viewed from a totally new perspective that is accessible to all due to open data and AI. Furthermore, Earth's natural resources are diminishing, and as space exploration is expected to grow in the future, it is vital to understand what social and environmental opportunities or threats might arise and how we are able to protect the scarce natural resources and biodiversity in an effective and sustainable way.

Keywords: Sustainable natural resource management, Space exploration, Future scenarios, LEGO® SERIOUS PLAY®, Open data and AI, Social and environmental impact

Sustainability transitions of food systems

Time: Thursday 13 June at 13:00-14:30

How to build a sustainable food system: Case Finland

Pietola, Liisa; Jalava, Eero; Räsänen, Ilkka; Torniainen, Tatu; Turkki, Vilma & Valkeapää, Annukka
Finnish Innovation Fund Sitra, Finland

The paper offers proposals for contributing to the sustainable transition of the food system in Finland. The proposals create a holistic picture in which the aspects of nature, food production and nutrition are addressed together and in a way that identifies interdependencies.

As a northern agricultural country, Finland has its own particularities in terms of climate and soil conditions. With only 7% of its land area used for arable crops and a short growing season, global indicators are not relevant when assessing food sustainability issues. To emphasize security of supply, the paper places the role of primary production at the heart of the issue, alongside nutrition and social issues.

The food system faces challenges caused by climate change and nature loss. But technology, consumer knowledge and a highly competitive agricultural sector run by innovative farmers will enable the food system to change. Food produced in a sustainable food system contributes to public health. Food is produced and consumed in a way that preserves, optimizes the use of and recycles natural resources. This promotes the circular economy and creates added value and profitability for the whole food system.

The sustainability transition can be achieved by following the measures and principles set out under four objectives, which, if successful, will create the opportunity to fulfil a fifth aim.

- 1) Sustainable agriculture adapts to the limits of nature's carrying capacity
- 2) Profitable agriculture enables a sustainable food system
- 3) People in Finland eat sustainably
- 4) The food system creates local inclusion and well-being
- 5) High-quality, ecologically sound Finnish food is exported across the world.

In order to achieve the objectives, short and long-term measures are needed. Many of the actions that promote change still need further development – for example, attributing value to ecosystem services or using nutrients from municipal waste in food production.

Some measures, such as reducing the number of animals per hectare (reducing livestock density), require long-term planning and implementation in specific areas of Finland. It is therefore important to start the change immediately and simultaneously throughout the food chain. For the success of the measures, it is essential that they are perceived by society as being fair.

Keywords: agriculture ecosystem food nutrition planetary health

Sustainability transitions of food systems - stakeholder involvement and considerations of sufficiency of natural resources

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Initiatives around the world aspire to contribute to change towards more sustainable and inclusive societies. The major challenges posed by e.g., climate change and biodiversity loss have generated many initiatives that seek to implement societal change or even initiate large scale and long-term transition i.e., transformations. Societal change towards sustainability requires actions at different societal levels comprising individual, group, organisational and often different policy levels, in addition to various geographical scales.

Transition literature also investigates changes at different theoretical levels (landscape, regime, and niche) and at systems level. Action to change (e.g., social practice) plays a role for creating innovative niches, linkages between niches, regimes and systems, and by aligning them towards the same direction thereby helping induce a transition. A sustainability change can be driven or hindered by people and their actions in variety of networks, levels, and scales. However, a larger sustainability change (transition) requires interaction and collaboration between people and groups of people. Furthermore, a sustainability change often requires learning and knowledge co-production, which involves managing complex set of psychological, social, cultural, political, and even institutional interactions. However, the focus of research is often on technical or theoretical – i.e., on academically relevant entities and details.

In this paper literature of this topic is reviewed, concentrating especially on studies on participation of actors and stakeholders in connection to sustainability transitions and transformations of modern food systems at different levels (local, national, global). It is investigated what kinds of theoretical frameworks or methodological approaches are used and how the sufficiency of natural resources is considered in these studies. Furthermore, review will shed light on who, how, and to what extent stakeholders have been involved. The paper will also discuss some of the challenges and solutions brought up by reviewed papers.

Keywords: food system, transition, transformation, stakeholder, collaboration, interaction

Goat production systems in flux in Western Nepal

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Goat is a highly important livestock in Nepal. They are a vital source of food and income for rural households and are produced in both the household (up to 10 goats) and commercial (30-60 goats) farms. We conducted life cycle sustainability assessment of goat production systems in three geographic regions of Western Nepal: 1) Dhangadhi, a fertile lowland near India with international trade; 2) Bheriganga and Birendranagar, midhill region with strong pressure on cultivation land and more dependence on external feed sources; and 3) Dullu, a remote high hill region with local and self-sufficient system. In our study, we analysed the goat value chain from production to consumption, including the role of middlemen and butcheries.

We observed the roughage feed for goats was mainly tree branches, grasses, and forest pastures. The energy and protein feed included mostly maize, soybean, rice husk and mustard cake. Animals were sold as live animals mostly to middlemen, ending up directly or via other middlemen to butcheries taking the responsibility of slaughtering and selling meat. No cold chain was commonly applied after slaughtering. In Dullu, goats were mostly consumed locally whereas from other regions they were transported to bigger cities like Kathmandu and Pokhara, through middlemen.

We identified several hotspots to manage the natural resources in a sustainable way and improve the overall efficiency of the future goat value chains, including that the goat farmers need more education on feeding, breeding, and health practices. In addition, transportation and storage conditions must be improved to ensure the consumption of goat meat is efficient with minimal waste. Goat breeds vary in their resilience, health, and reproduction in Western Nepal's harsh climate. Hence, farmers need to consider the suitability of commercial breeds for their region and management system before improving their local breed or starting goat farming.

Keywords: goat, LCSA, climate change, Nepal, agriculture, value chain

Making food fossil free: Stakeholder engagement and networked business models to enable a long-term shift of the food system

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The food system is estimated to be responsible for around 25% of global emissions, and needs to transition towards reduced fossil fuel inputs into the system. Engagement from actors in the food value chain is crucial for a transition towards a fossil-free future. However, food systems actors face two critical problems. One is that no single actor has the power and influence to change the system, and that organisations must remain profitable in a transition. As such, the transition towards a fossil-free food value chain requires collaboration, long-term perspectives, investments and risk sharing across the value chain, as well as policy interventions.

In the current study, together with the Swedish government agency for economic and regional growth, we gathered actors in the food system to build a networked business model (NMB) to define common visions, value capture, and strategic initiatives to achieve a transition away from fossil inputs in the food system. An initial list of sources of fossil emissions in the food sector was used to narrow the focus to packaging and transportation, two areas where it was deemed that actors across the value chain had mandate to make changes where policy interventions might still be required. From these areas NBMs were developed, defining shared value propositions, creation, and capture to find ways in which actors could collaborate and share both profits and risk across the value chain. The NBM was subsequently used in a design space for business models to explore lock-ins in the current system – and how shared value capture and policy interventions could help with a shift towards a future sustainable food system. The way of working employed was successful in gathering stakeholders around a joint issue and working towards a collaborative long-term solution, and the process resulted in pathways towards a fossil free food system.

Keywords: Business models, co-creation, stakeholder engagement, fossil free, value-chain

The governance of natural resources

Time: Thursday 13 June at 13:00-14:30

Repurposing historical commons to project traditional forms of governance of natural resources in the future

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In mountain social-ecological systems, the values ascribed to both material and immaterial goods undergo evolution in response to the restructuring of relationships among humans and between humans and their habitats. However, the rules governing land and resource management at the community level remain static and resistant to change. This contribution delves into the incongruity between evolving values and the unyielding rules governing historical commons. This incongruity results in dysfunctionality of local resource governance, manifested through unsustainable resource exploitation by external interests and low community participation in collective efforts.

Abundant scholarship claims that commons serve as empowering forms of land and resource management, enhancing community well-being and preserving resource integrity. Drawing on this, this contribution explores the repurposing processes of historical commons through community-based entrepreneurship. The objective of such processes is to align values with resource uses and stimulate collective action for transforming the relationship between humanity and natural resources. We focus on a case study in the in the Northeastern Italian Alps: a community-based hospitality that aims to repurposing a community-owned mountain huts as a strategy to counteract periphery traps. The latter includes the exploitation of lands for EU Common Agricultural Policy (CAP) subsidies, and the transformation of the region into a transport corridor between prominent tourist

destinations. The initiative was included as a demonstrative case of COST Action MARGISTAR, a project assessing current problems, alternative viable future visions, and pathways to post-marginalised mountain areas.

To comprehensively study reconfiguring processes, a formative evaluation framework, based on a previous EU-funded project (SIMRA), is employed in this research. The framework identifies enabling and disabling factors in repurposing processes and assesses resulting trade-offs. The research adopts a semi-grounded approach, integrating literature on innovation processes in community-based resource management with empirical data gathered by the first author.

The article's contribution lies in empirically testing the framework through a longitudinal case study of the community-based hospitality initiative. The contribution will provide insights into observed processes, articulating a set of indicators to be used by practitioners, policymakers, and researchers to evaluate innovation processes involving commons that project such local forms of natural resource governance in the future. The findings contribute to the broader discourse on social innovation, addressing the imperative of inclusive collective action and providing practical guidance for similar initiatives that enable to project historical commons in the future as transformative practices for sustainable governance of resources to maintain a good life on earth for all.

Social confrontations, European democracy and the future of resource governance

Giesecke, Susanne

Austrian Institute of Technology, Austria

Social confrontations signify the struggle about how we want to shape our futures. Rooted in different narratives represented by different social groups they are often competing for the sovereignty of interpretation of what our future in face of climate change and the use of resources may look like and how we are to achieve it. These diverging perspectives are usually rooted in past collective experiences and value systems and their interpretations and constitute a point of reference for a personal identity that reinforces a person belonging to a certain group. Social confrontations are not a singular phenomenon; instead, we live in a world of multiple social confrontations, and they co-exist, overlap, and compete. The divides social confrontations create can go across all spheres of life: education, care, health, nutrition, energy, race, gender, political power, migration, etc.

The paper explores how these developments have been perceived in capitalist economies, science and society and how they are likely to impact the futures of democracy in Europe and the future economic system. To this end, it presents four scenarios that chart diverging pathways on how social confrontations could evolve in the next 15 years under various drivers and trends and what role they could play for the governance of resources and the democratic development in the EU. Finally, we present implications for R&I policymaking from the scenarios.

The four scenarios explore divergent possibilities and do not depict preferable futures and governance aspects. From our point of view, scenario 1 ("A Resilient and Consensual European Confederation") is the most positive one of the four and it is helpful to filter the preferable developments that can be influenced by R&I policy-making. But also, the other three, less preferable scenarios ("European Democracy defending itself against totalitarian tendencies", "The European Fortress", "Cultural Hegemony Through Global Capitalism") contribute to thinking through negative developments that could be contained or prevented by future policy-making.

The paper is the result of one of a deep dive foresight study in the project 'European R&I Foresight and Public Engagement for Horizon Europe' conducted by the Foresight on Demand' consortium for the European Commission during spring of 2023. It provides input for future EU Framework Programmes and other research and innovation policy schemes.

Keywords: Social Confrontations, European Democracy, Scenarios, Just Transition, Global South, Capitalist Economy

The impact of high Futures Consciousness in the assessment of fairness, effectiveness and acceptability of new biodiversity policies

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As the current environmental crises unfolds, a stronger governmental involvement is being called for in order to accelerate transformation towards planetary futures. Especially there is need for strategies and policies that would aim at the reduction of consumption in the name of sufficiency. The challenge is to find ways that these could be accepted by large populations in democratic systems.

Future thinking is considered as one of the factors that motivate individuals to protect the environment and promote transformation towards biodiversity respectful futures. In our currently ongoing research, we have studied the impact of Futures Consciousness (measured by the Futures Consciousness Scale) on how Finnish people assess new, more radical, biodiversity policies. The twelve policies included in the study cover a range of regulatory and fiscal measures aiming to decrease the biodiversity impact of consumption by either limiting the supply or increasing the price of products and services. The policies target especially meat consumption and flying for leisure.

The survey includes a representative population sample of Finnish people, and it is being carried out in 2024. We wish to present first results of the survey in the conference. The conducted research is part of the BIODIFUL research project funded by the Strategic Research Council of the Academy of Finland.

Keywords: policy acceptability, policies for sufficiency, governance, futures consciousness, future thinking

Forest futures in Brazil: How to combine a hotter climate, ever-growing wood and food demand with reforestation and zero deforestation goals?

Johan Slätis

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University of Turku Biology, Finland

Global demand for timber, food, and conservation areas is increasing, resulting in land use competition. Tree plantations in Brazil have grown at a yearly pace of up to 10%, reaching 100.000 km². Brazil, with a population of 200 million people, produces food for 900 million people, 11% of the world's calories. The expected annual increase in land needed for agricultural exports is 1,5 to 3%. The land use policy of the Lula 3 government is to expand crop production to degraded pasture lands and protect the Amazon from slash-and-burn practices.

Reforestation and monitored secondary forests represent each some 2% of the forest cover. Active reforestation is undertaken to increase connectivity in fragmented landscapes, reduce sedimentation and flooding damage, and improve freshwater availability. Reforestation data may include eucalyptus plantations, agroforestry, and agrosilvopastoral production systems. Reforestation needs to be increased considerably to compensate for Brazil's CO₂-emissions caused by deforestation. The capacity of tropical forests to capture CO₂ is reducing due to increased temperatures, degradation, and drought.

785 litres of water is needed to produce 1 kg of Eucalyptus wood and 1.500 litres for 1 kg of soya. Brazil's temperatures have risen since 1960. In future scenarios, most regions will face a medium or high drought risk. Will it be possible to increase production in a hotter, dryer, and more unstable climate? Despite recurrent droughts and floods, the Brazilian Agro sector will respond to the business opportunities that the increasing food and cellulose demand will bring. The environmental police force (IBAMA) protects the native forests if the government in Brasília gives funds. Global temperatures are rising, and Brazil, like the rest of the world, needs to do much more to stop global warming to mitigate the damage to agricultural production and tropical forests.

Keywords: Forestry Brazil, Water resources, Reforestation, Rainforest carbon, Climate Change

Workshop: Affects and deliberation as approaches to technological forecasting

Time: Thursday 13 June at 13:00-14:30

Facilitators: Kurki, Sofi; Halonen, Minna; Martins, Jorge & Saari, Hanna
VTT Technical Research Centre of Finland, Finland

New emerging technologies, such as advances in biotechnology, artificial intelligence, quantum computing, or novel ways to generate energy present various possibilities for future societies. In the EU funded FORGING-project we are working on creating a forum for discussing the responsible and value sensitive development and use of novel technologies. This workshop invites participants to explore the frontiers of technological forecasting. While it is well known that novel technologies have a tendency to evoke extreme emotions such as utopian hopes and dystopian fears, such emotions are rarely addressed directly in technology foresight. In addition, technological foresight typically is conducted from an expert-driven vantage point and with a deterministic technology push - approach. While assuming a co-creation process between society and technology is a mainstream starting point in social sciences, this approach rarely transpires to technologically oriented forecasts. This workshop presents viewpoints from different technology cultures as prompts for discussion on novel approaches to technology foresight. How can we make use of emotions and a deliberative approach when assessing the futures of technological development? Can we decipher novel tools for encouraging a more participatory discussion affecting technology development and use? In the workshop we form small groups for discussion, and the session ends with a facilitated and shared discussion on key insights that emerge from the discussion.

Keywords: Emotions, participatory approach, deliberation, anthropology of technology, futures studies methodology

Workshop: Cruising Off the Charts: Reimagining Futures of Sustainable Cruise Ships – A Fast Futures Literacy Laboratory

Time: Thursday 13 June at 13:00-14:30

Facilitators: Heikkilä, Katariina; Jokinen, Leena & Richards, Martyn
Finland Futures Research Centre, University of Turku, Finland

This workshop purposefully reimagines the futures of cruise ships utilising card game elements, art-based collaborative sculpture building, and the tried and tested futures literacy laboratory process. Natural marine resources and ecosystems, technical constraints, and complex human systems are discussed through themes of sustainability, business responsibility, cruise ship concept design during this participatory session.

All kinds of shipping affect the well-being of the world's marine commons, this workshop focuses on how sustainability information flows facilitate sustainable cruise ship building. In the cruise ship industry and cruise tourism, natural resources are used throughout maritime infrastructure, from dock, to port, to the world's bodies of water. Cruise ship construction, sustainment, provision, maintenance, and retirement all include choices related to natural resources. Since the years of the Covid-19 pandemic, the demand for cruises has been increasing and the industry has had a growing need for responsible and sustainable innovations for application throughout the ship life cycle.

Reframing today's futures of sustainable cruise ships and cruising opens space for diverse ways and reasons for imagining futures that support enhanced ecological and business sustainability. In this workshop, we will deploy a Fast Futures Literacy Laboratory (FLL) process, developed in the SusFlow project, and tested in the context of the cruise ship industry. This Fast FLL proceeds through Reveal, Reframe, and Reflect stages of a futures literacy laboratory in an accelerated timeframe using Food for Thought cards as prompts. The aim of the workshop is to give participants an opportunity to experience the Fast FLL method and raise discussion about the value of utilising alternative modes of imagining the future in an industry that tends to focus on the material and technical constraints of sustainability.

For participants interested in the intersection of futures literacy and game-based methods, you are warmly welcome to attend the session “Workshop: Co-creating experimental Futures Literacy Game concepts to grow capabilities for sustainability innovation and business renewal” on Friday Session 5, Track 2.

SESSION 2 at 15:00–16:30**Book Launch Special Session: Our World of Futures Studies as a Mosaic**

Time: Thursday 13 June at 15:00-16:30

Facilitators: Villman, Tero; Heinonen, Sirkka & Pouru-Mikkola, Laura
Finland Futures Research Centre, University of Turku, Finland

In this special session, we publish *Our World of Futures Studies as a Mosaic*, a new publication by the Finnish Society for Futures Studies. The publication creates a mosaic of approaches to futures studies and foresight from different parts of the globe, appreciating and learning from the different contexts. Futures studies and foresight are simultaneously global and local activities. Futures studies is conducted all over the world, and the phenomena under study are often global. On the other hand, futures studies involve local activities, where ways of thinking and operating are connected to the culture and history of a particular region. It can also discuss phenomena that touch upon local communities. In addition, research activity across borders is increasingly conducted and promoted.

First, in this interactive session, the editors and some of the authors will present their perspectives in and around the publication's theme, for example, Jerome Glenn around the Millennium Project and Manal Mouhsine about futures studies in Morocco. Then, we will facilitate a discussion with the session participants focusing on what the field of futures studies and foresight can learn from the presented approaches and the participants own experiences, how the approaches and experiences are connected to present trends, and how the participants wish the field would develop in the future.

Keywords: Futures studies, foresight, school of thought, approaches, experiences, lessons learned

Transitions towards circular economy and zero carbon societies

Time: Thursday 13 June at 15:00-16:30

Reimagining a circular building sector 2035 – Futures with zero new constructionKyrö, Riikka^a; Lundgren, Rebecka^a; Toivonen, Saija^b & Tähtinen, Lassi^b^aLund University, Sweden^bAalto University, Finland

The building sector is the single largest consumer of natural resources, accounting for a staggering half of global material use and over a third of energy use and carbon emissions. As a response, the circular transition in the building sector has been focused on strategies such as extracting material from demolished buildings, and design-for-disassembly in new construction projects. Sadly, significant resource loss occurs in these type of ineffective recycling processes. Moreover, strategies for new construction fit poorly with the urgency of the sustainability crises. More efficient use of existing buildings would result in a more immediate reduction in the net consumption of resources. Many existing buildings may be functionally or locationally obsolete but hold major potential in terms of resource efficiency. We therefore imagine a circular future for the building sector in 2035, with zero new construction. The imagined futures are, as follows: 1) rural hubs are the most common workplaces outside of homes; 2) virtual and hybrid spaces are the most common workplaces overall; 3) the remaining corporate offices are in collaborative use; 4) offices are adapted to residential use; 5) temporary creative use thrives, and 6) vertical extension, and; 7) relocation of existing buildings are the norm. Consequently, we engage in seven backcasting workshops, each with 4-5 topic experts. We make use of the PESTE framework and guide the experts to explore which political, economic, social, technological, or environmental developments took place in 2030 and 2025, respectively, for the image to realise in 2035. Our findings comprise insights into actions and actors needed to reach the seven preferable futures to sustain our

planets finite resources. We offer a novel outlook for policy makers and building industry professionals as they navigate the green and circular transition.

Keywords: adaptive reuse, collaborative spaces, virtual and hybrid spaces, rural hubs, vertical extension, relocation

Transition towards net-zero emissions in marine traffic – reflecting and enriching current visions

Lauttamäki, Ville; Ahlqvist, Toni & Stein Knudsen, Mikkel
Finland Futures Research Centre, University of Turku, Finland

Marine traffic is facing a challenge to decarbonize its operations in the coming decades. Strategy of International Maritime Organization sets a goal of net zero emissions from ships “by or around, i.e., close to, 2050” (IMO 2023).

This is a formidable challenge considering that currently shipping is very fossil-intensive sector. In 2023 93,5% of ships in the world fleet were using conventional (i.e., fossil, crude-oil-based) fuels (DNV 2023). Possible solutions proposed for decarbonizing the sector include new carbon neutral fuels such as biofuels, ammonia or methanol and use of new power technologies such as fuel cells or batteries, all of which come with sustainability challenges of their own.

Considering the magnitude of the challenge, the views on the possibility to achieve zero carbon future by 2050 presented in strategy papers appear to be rather optimistic. With considerable uncertainties on technological development of energy technologies and availability of fossil-free marine fuels, the current futures work might fall short in inspiring or guiding actors in the field. Richer and more nuanced views of the future might be needed in order to offer further insights and credible development trajectories for different stakeholders in the marine traffic sector.

This paper builds on a selection of recent strategy and vision papers of maritime sector and draws attention to some of the key assumptions and uncertainties presented in them. Building on insights from the field of sustainability transitions, ideas on if and how the future and possible development trajectories of the maritime sector might need to be reframed are discussed. Aim of the paper is to enrich the way future is perceived and how solutions to decarbonize the maritime sector are formulated.

References

- IMO (2023) 2023 IMO Strategy on Reduction of GHG Emissions from Ships
<https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/annex/MEPC%2080/Annex%2015.pdf>
- DNV (2023) Maritime Forecast to 2050 – A deep dive into shipping’s decarbonization journey
<https://www.dnv.com/maritime/publications/maritime-forecast-2023>

Keywords: Marine traffic, future, scenarios, decarbonization, transition, alternative fuels

Towards the circular car: Possible future states for Sweden's car fleet in 2045

Matteoni, Marina & Enebog, Emma

RISE Research Institutes of Sweden, Sweden

Transportation accounts for almost one third of Sweden's greenhouse gas emissions, of which passenger cars account for 61% (Fossil Free Sweden, 2020). However, the shift towards more sustainable mobility has accelerated in recent years, and Swedish car manufacturers have set ambitious targets for reduction. This shift is promising but implies great system-wide change including the development of new (or reformed) circular business ecosystems and business models to maximize resource effectiveness of the passenger car fleet over the whole product life cycle.

To activate and coordinate this circular transformation of the car fleet, many aspects need to be considered in parallel with a systemic approach throughout the value chain. In a current project we aim to support new and established actors across the value chain to enable the development of a circular car towards 2045 through a systems perspective. The project, funded by Sweden's Innovation Agency Vinnova with support from FFI (Strategic Vehicle Research and Innovation), a collaborative program between the Swedish state and the automotive industry, involves nearly 20 partners from various stages of the car value chain.

Building upon systems and trend analyses carried out in a 2023 pre-study, project partners have been engaged in a foresight process during the spring of 2024 to develop scenarios that describe different possible future states for Sweden's car fleet in 2045. Serving as input to subsequent work within the project (e.g., life cycle assessments and setting action plans), the scenarios will support the industry's transformation and help anticipate the needs for further collaboration across the value chain. The scenarios will guide and inform stakeholders of possible future threats and opportunities to better plan and make strategic priorities towards the future, allowing for the transition to a car fleet adapted for circularity.

Keywords: scenarios, car, mobility, futures, transformation, foresight

The circular economy potential of critical raw materials from e-scooters: A Finnish case study

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^aFinnish Environment Institute (Syke), Finland

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Electric micromobility involves e-scooters and e-bikes and may offer an alternative to the use of private cars. These micromobility vehicles, while lighter and less resource-intensive than cars, still require different metals and minerals. In this paper, we build a dynamic material flow model for shared e-scooters in Finland, with a special emphasis on their batteries, as these contain many critical raw materials, such as Co, Li, Ni and Mn, and thus have a recovery potential. Our aim is to quantify the future resource needs and the related urban mining potential as micromobility continues to develop. We combine a fleet model with data on current e-scooter fleet size and Weibull distributions for battery and e-scooter lifetimes to build scenarios for the future evolution of the shared e-scooter fleet in Finland. In our business-as-usual scenario, the outflow of used e-scooter batteries will be approximately 25,400 units annually, and the main drivers of uncertainty are the battery lifetime and the desired e-scooter fleet size. More research is needed, and we are looking forward to applying the model on e-bikes which have a larger sales volume.

Keywords: Micromobility, e-scooters, fleet modelling, dynamic material flow analysis, critical raw materials

Workshop: Unlocking agency for just green transition in the use of Finnish forests

Time: Thursday 13 June at 15:00-16:30

Facilitators: Hujala, Teppo^a; Takala, Tuomo^a; Yletyinen Johanna^b; Raatikainen Kaisa J.^c & Ollila Johanna^d

^aUniversity of Eastern Finland, Finland

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The societal discussion on the just and green transition in the European and Finnish forest use features new public policy instruments and innovative market-based mechanisms, pursuing a change towards stronger sustainability. However, literature reveals that long-evolved existing structures and practices create institutional stickiness, halting or slowing down the systemic transition, and the forestry system is no exception. To initiate and upscale transition pathways, various change management means will be needed, but at the grassroots level, an anticipatory behavioural change of individuals is key in leveraging systemic transformation. This workshop focuses on futures agency, defined here as an empowered capability and motivation to act towards a better future. The aim is to collaboratively identify agency deficiencies and discuss how different futures literacy aspects or futures consciousness dimensions could be trained with the actors to foster resilience to yet unknown futures. The workshop uses topical examples of three types of policy instruments aiming at sustainability transition in Finnish forests: a financial subsidy to increase carbon storage, a voluntary biodiversity values market, and a nature-values oriented forestry service model. Each instrument targets a different leverage point with potential to impact the functioning of the forest-use system. We apply a world café type group discussion setting. After an introduction to the topic and the objectives, we divide the participants to café tables. The first phase will deal with identifying reasons behind weak agency; the second phase will contain suggesting futures skills that would unlock the agency; and the third phase will focus on outlining transition training for forestry actors. In the second phase, some summary material from futures literacy, futures consciousness, and futures awareness concepts will be delivered to provide participants options to choose from. The summarising plenary discussion will highlight the similarities and differences found in the café tables.

Keywords: critical futures learning, futures skills, governance, leverage points, resilience, systemic change

Workshop: Decentralised and detemporalised game-based construction of regional futures in fruit cultivation

Time: Thursday 13 June at 15:00-16:30

Facilitator: Knitsch, Valentin & Baier, Ina

Fraunhofer Centre for International Management and Knowledge Economy, Germany

Modern technologies are believed to support the transition to sustainable futures, particularly in agriculture. However, facilitating these futures remains largely an elitist project. The production of future images is often dominated by entities with significant time, cognitive, and financial resources. To address this issue, a game-like Futuring Tool is currently being developed and tested. This game serves two purposes: it stimulates players to explore and construct regional futures, while also surveying these perspectives to facilitate the creation of diverse images of the future. The game is designed to encourage physical, hands-on interaction, with short play durations (10 minutes), intuitive gameplay, low complexity, and extensive repetition with multiple stakeholders. It stimulates future thinking and dialogue by confronting players with specific and sometimes provocative "future impulses". Through different game modes and stages, players explore and engage with up to ten out of twenty impulses. Additionally, as a mobile survey instrument, the game documents perspectives on modern fruit cultivation in East Germany with each game round. This research is part of the publicly funded MIRO project (Mid-German Innovation Region for professional fruit growing, <https://obstbau-digital.de/>) and aims to support regional players in their digital transformation, including fostering dialogue on fruit cultivation in the region. Ultimately, the surveyed future perspectives of various stakeholders in the region will serve as the foundation for futuring workshops with proactive players with limited resources. I will present the game, its

design process, theoretical background and pitfalls, methodological limitations, and practical considerations for development and use. As the survey period extends until April 2025, only preliminary results and thoughts will be presented.

Keywords: horticulture; game; integrative futuring; agrotechnical futures

Workshop: From the expected to the desired: Construct alternative futures with Japanese Foresight methods and Weak Signals

Time: Thursday 13 June at 15:00-16:30

Facilitators: Kobayashi, Motoki^a; Yahata, Akihisa^a; Kitta, Naoaki^a & Konrad, Jens^b

^aThe Japan Research Institute Limited, Japan

^b4strat GmbH, Germany

Exploring uncertainties and the unknown is key to construct new narratives around alternative futures. However, this often creates a challenge as imaginary scenarios lack connection with historical and current changes.

In this workshop, participants will explore an innovative Foresight approach from Japan that lays out new pathways by combining linear and non-linear thinking models. We will work with thought-provoking Weak Signals which stem from projects in Japan and Europe. By exploring both Japanese as well as European approaches to applying Foresight thinking and methods, the workshop offers new perspectives to the futures of natural resources in Europe. All insights and results are shared with the participants in the end.

Workshop structure (It is subject to change)

The 1st step is similar to the environmental scanning method. Due to time constraints, we prepare, in advance, some expected scenarios in the field of economic growth and the use of natural resources.

The 2nd step is based on the horizon scanning method. We collect weak signals regularly. In this workshop, we will share some of them related to social change with participants and facilitate a method to construct unexpected scenarios of social change.

The 3rd step is called “forced ideation” through the Foresight Matrix. We position the expected scenarios as a row of the matrix and the unexpected scenarios as a column of the matrix. Then, participants imagine what would happen when the expected and the unexpected scenarios occur simultaneously at a crossing cell. With this, participants are challenged to question current developments but also reflect on barriers to achieve preferred futures.

Keywords: Expected Scenario, Unexpected Scenario, Weak Signal, Foresight Matrix, Foresight Strategy Cockpit, and Japan-Europe cooperation

Workshop: How virtual personas can advocate for environmental considerations in strategic foresight and innovation funnels

Time: Thursday 13 June at 15:00-16:30

Facilitators: Winzer, André^a; Buchauer, Lucas^b & Ahmadi, Nilofar^c

^aSchaltzeit GmbH

^bFreie University of Berlin, Germany

^cHTW Berlin, Germany

This study probes why environmental considerations are frequently sidelined in strategic foresight and innovation processes, often viewed merely as cost factors rather than opportunities. It explores the potential of virtual personas in reshaping this narrative, advocating for the environment by highlighting its long-term benefits over short-term gains.

We ask: "Can virtual personas effectively advocate for the environment in innovation processes, altering the perception of environmental considerations from cost factors to opportunities?" Objectives include understanding how virtual personas can influence the inclusion of environmental factors and develop KPIs that prioritise long-term ecological benefits when assessing ideas or weak signals.

Current literature largely reflects a bias toward short-term economic gains, overlooking environmental impacts in innovation and strategic foresight. This research challenges this myopic view by integrating studies on sustainable innovation, AI advocacy, and long-term ecological thinking. It aims to redefine the normative frameworks within which environmental considerations are evaluated in business strategies.

Utilising a qualitative approach, the study will showcase how virtual personas acting as AI characters can be technically deployed for environmental advocacy in innovation processes via LLMs. Through experiments with industry experts and AI developers, it aims to uncover how these personas can recalibrate the prevalent short-term focus towards more sustainable, long-term environmental outcomes.

Anticipated results include a set of use case scenarios for integrating virtual personas into innovation processes to advocate for environmental considerations, demonstrating their potential in transforming traditionally held perceptions.

This research is pivotal in realigning innovation strategies with environmental sustainability, offering a novel perspective on AI's role in promoting long-term ecological benefits. It sets the stage for further exploration into sustainable practices in AI and strategic decision-making.

This study seeks to integrate environmental considerations in innovation funnels, positioning virtual personas as AI expert catalysts for a paradigm shift. Once implemented within Strategic Foresight and Ideation Software Suites, they empower the paradigm shift from cost-centric to sustainability-driven without compromising the business strategies.

Keywords: Virtual Personas; Environmental Considerations; Strategic Foresight; Sustainable Innovation; AI Advocacy; Strategic Decision-Making

Workshop: Impact of Mindfulness Exercise on the Futures Efficacy

Time: Thursday 13 June at 15:00-16:30

Facilitator: Huttunen, Silja

Toimisto2030 Oy & University of Eastern Finland, Finland

**Note: This workshop is an intensive session with 6-8 participants. It will be recorded and the anonymous discussions will be analysed for sustainability transition research in the University of Eastern Finland.*

There is research evidence that mindfulness exercises increase prosocial behaviour and empathy, which are crucial factors in the fight against climate crisis. As connectedness to nature is crucial factor as well, it also increases the climate anxiety, which hinders the ability to work collectively for the desired future. We consider futures efficacy (Huttunen, 2024) as capability to take action in the commonly desired future.

As it has been previously shown in research that the mindfulness exercise helps to regulate feelings and to ease imagination, it is likely that it mediates the futures efficacy by lowering climate anxiety and fostering desired collective action.

This multidisciplinary research combines methodologies from social psychology, planetary social pedagogy as well as futures studies. We value the systemic approach that acquires the understanding of interconnectedness of persons and nature. Such perspective can be enriched through participatory and multidisciplinary workshop methods.

This paper is part of a series of workshops that collect data in order to add understanding of methods and contents to be included in the futures efficacy workshops for the optimal impact. In further research the data will be analysed for understanding both the mediating role of mindfulness exercises and also the content of futures efficacy.

Keywords: sustainability transition, futures efficacy, mindfulness, collective action, workshop

FRIDAY 14 JUNE 2024 | Onsite

SESSION 3 at 9:00-10:30

Special Session: Biodiversity Respectful Futures

Time: Friday 14 June at 9:00-10:30

Chairs: Mäkelä, Marileena^a; Ahvenharju, Sanna^b & Onkila, Tiina^a

^aUniversity of Jyväskylä, Finland

^bUniversity of Turku, Finland Futures Research Centre, Finland

Introduction to Biodiversity Respectful Futures

Mäkelä, Marileena

University of Jyväskylä, Finland

Within biodiversity research there is already a lot of knowledge about the impacts and sources of the biodiversity loss. However, what we seem to be lacking are alternative visions of how the losses could be turned into gains for biodiversity and our planet. In treating the nature as a mere source of resources, we, as humans, have unwittingly eroded the whole biosphere. Within leadership research the focus has for long been on the realisation of collective aims, on driving transformation to achieve human wellbeing in material terms. How could pursuing human wellbeing be done with respect for the planet and biodiversity? Futures research seeks to unravel the multiple alternative futures that lie ahead of us. It is our visions of the future that guide our actions today, and vice versa, our actions today will shape the future to come.

This session focuses on biodiversity respectful futures. The interdisciplinary effort of bringing together the insights from natural and social sciences aims at creating a new paradigm of biodiversity respectful futures. We already know the root causes of the biodiversity loss, but what we urgently need today, are the actions, decisions, and future visions towards more biodiversity rich futures.

Keywords: biodiversity; alternative futures; futures images: loss of biodiversity; social sciences; natural sciences

Alternative images of biodiversity respectful futures - Role of policy instruments

Ahvenharju, Sanna; Lauttamäki, Ville; Lappalainen, Otto; Seiro, Milla & Puustinen, Sari

Finland Futures Research Centre, University of Turku, Finland

Reversing the decline of biodiversity and restoring the health of the planet requires fundamental changes in our current ways of life and in the way our societies are organised. Setting forward such a transformation challenges the state: with new policies it would be possible to set in motion new societal innovations and new ways of organisation, but how should this be done and what are the most essential aspects to push forward?

This presentation explores alternative future images regarding the extent and role of policy instruments in promoting biodiversity respectful futures. The alternative future images are based on mixing together nineteen policies that were originally identified based on existing literature and further evaluated by a group of 49 experts in a Delphi-style survey. The experts evaluated especially their acceptability, which was then taken as the basis of the different future images.

The conducted research is part of the BIODIFUL research project funded by the Strategic Research Council of the Academy of Finland.

Clash between values and food system structures: Agency of biodiversity friendly farmers

Kortelainen, Sirpa & Kuhmonen, Irene

School of Business and Economics, University of Jyväskylä, Finland

The food system is a major contributor to the loss of biodiversity through e.g., intensive and degrading land use, centralisation, use of pesticides and herbicides and monocultural practices. On a system level there are various dispositions such as political and economic norms restricting primary productions full potential for biodiversity supportive or regenerative farming practices. This paper focuses on the social cognitive processes of Finnish farmers who actively engage in biodiversity supportive farming by investigating their values, feelings, motivations, and future images in comparison to the priorities, values, and norms of the system. Our analysis of interviews of 19 farmers signals that farmers' agency for supporting and enhancing agricultural biodiversity is driven by universalism manifested by their ecological values and understanding the interconnections between humans and nature (understanding humans as part of nature). The results also indicate the dialog is in flux yet characterised by a paradox between the aspiration of the farmers and the structures norms and aims. Based on this analysis, we discuss the possible future images of sustainable food system constructed by the farmers.

Responsibilisation of transformative agency for biodiversity conservation in the food systemKuhmonen, Irene & [Onkila, Tiina](#)

School of Business and Economics, University of Jyväskylä, Finland

Counteracting biodiversity loss in the food system context requires fundamental changes especially in agriculture, which is responsible for much of the biodiversity impacts. At the same time, the ability of farmers to act on this challenge is arguably weak due to power imbalances in the food value chains. This leads us to ask, who, then, has the responsibility of the transformative change within food systems. In this research, we explore the phenomenon of responsabilisation for biodiversity conservation in the food systems. Our empirical context is Finland, which is characterised by a strong tendency for centralisation and specialisation throughout the food system. Drawing from a set of 37 interviews with representatives from businesses operating in various parts of the food value chain, we ask, whom do these actors responsabilise to act to solve the challenge of declining biodiversity. Previous literature has shown that responsabilisation may be used as a strategy by powerful actors to shift the responsibility of necessary changes to groups and actors with less power. Our findings indicate that despite the declining trend of biodiversity, the majority of companies operating in the food value chain feel that they are already doing the right things and going into the right direction in terms of promoting biodiversity. Most of the interviewees shifted the burden of realising the necessary change to other actors in the food chain: to agricultural policies, food processing and consumer involvement, farmers, large companies and the system as a whole. The act of responsabilisation can be seen to indicate a lock-in situation within the contemporary food regime, wherein it is difficult to find a leverage to build a future food system that nurtures biodiversity.

Special Session: The Future of Food: Dynamics of food system transformation in agricultural production and food consumption

Time: Friday 14 June at 9:00-10:30
Chairs: Mäkelä, Johanna & Silfver, Mia
University of Helsinki, Finland

Promoting sustainable food production and consumption requires action at a systemic level and by all actors from agricultural producers to consumers and policymakers. A better understanding is needed of how different actors' expectations and capacity for change meet, how cooperation and interaction can be promoted. This session examines agricultural entrepreneurs' and consumers' expectations for the sustainability of the food system. The session will provide extensive future-oriented information for food system actors on the ongoing and expected developments as well as on opportunities and tensions in the production and consumption of food.

Keywords: Agriculture, food production, food, consumption, future, transformation

Introduction to the 'Food futures: Prospects and actions in food systems transformations and agricultural policies' project

Niva, Mari
University of Helsinki, Finland

Transformation of the agricultural system: Exploring farmers' expectations and future avenues

Latvala, Terhi & Karhula, Timo
Natural Resources Institute Finland (Luke), Finland

Changes in agriculture affect the well-being of nature and society. Maintaining the functional capacity of agriculture requires a broad understanding about the interrelationships between ecosystems, production systems, politics and wider society. Flexibility of change for farmers towards the diversification and renewal of primary production to enable a sustainable change is explored. In particular, we explore farmers' own expectations for the future and the expectations placed on them with regard to the sustainability transition. The survey data was collected in January 2024.

Citizen support for policy measures for sustainable food futures

Salmivaara, Laura; Silfver, Mia; Mäkelä Johanna & Niva, Mari
University of Helsinki, Finland

Sustainability of food is prominently on the public agenda. It is evident, however, that practices of consumption do not easily change towards sustainability without political measures supporting such a transformation. This study looks into citizens' support for policy measures to advance ecologically sustainable food consumption. The study is based on data from a quantitative survey representative of the Finnish population to be collected in February 2024. We analyse 1) to what extent citizens support regulatory, economic and information-based measures advancing the ecological sustainability of food consumption and 2) socioeconomic and food practice related differences in policy support.

Orienteering towards sustainable food futures

Kirveenummi, Anna & Saarimaa, Riikka
Finland Futures Research Centre, University of Turku

All presentations in this special session will provide extensive future-oriented information for food system actors on the ongoing and expected developments as well as on opportunities and tensions in the production and consumption of food. Futures workshops work as a medium to discuss the extensive future-oriented information (research results) between the food system actors. The aim of our project has also been to develop a simple interaction space – a workshop agenda - for food system actors, especially farming advisors and experts. It is aimed to work as a tool for orienteering in uncertain food futures and for discussing the new information available. Here we analyse our first efforts to create a discussion based on the research results and observations of the ongoing change.

Regenerative futures – Sustainable use of natural resources and watershed management

Time: Friday 14 June at 9:00-10:30

Value chain approach to framing social responsibility in small scale fisheries: A case of Sri Lanka

De Silva, Achini & Senevirathna, Sulochana
Sabaragamuwa University, Sri Lanka

Small scale fisheries of Sri Lanka, a multifaceted sub sector identified as principal employment supplier for fishing communities directly and indirectly while contributing to ensuring fish security, a main protein supplement to country's diet. Over exploitation, illegal, unreported, unregulated fishing, climate change, extreme weather events, land grabbing, population pressure and habitat destruction crippled the sub sector. Study aimed to explore the connection between social responsibility and small-scale fisheries and to propose strategic management framework for capacity building of the small-scale fishery value chains. Social responsibility of small-scale fishery value chains encompasses respecting access to fishing grounds, protecting dignity and human rights, ensuring equality and equitable opportunities to benefit and improving food and livelihood security. Study adopts case study approach and qualitative tools, resource mapping, storytelling and focus group discussions were instrumental in data collection in 3 case studies of South-West, South and West coast of Sri Lanka. Social responsibilities of the upstream of the small-scale fishery value chain central to the access to fishing grounds, responsible fishing and co-manage the resource base while eliminating illegal, unreported and unregulated fishing and by catch. Responsible marketing efforts on diversified catch to multiple markets catering to varied customer segments were key interventions of downstream actors. Small scale fishery value chain actors as well as its institutional environment ignored the connection between social dimensions and environmental issues. Social issues are directly link with core value chain operations and incorporating into strategy formulation will enable to earn the benefits of social responsibility.

Keywords: Small-scale fisheries, social responsibility, Sri Lanka, Value chain

Marine resources as main ingredients for biomaterials: Obtaining and characterisation

Coman, Alina Elena^a; Albu Kaya, Mădălina Georgiana^a; Dănilă, Elena^a & Marin, Minodora^b

^aNational Research and Development Institute for Textiles and Leather (INCDTP), The Leather and Footwear Research Institute (ICPI) Division, Bucharest, Romania

^bUniversity Politehnica of Bucharest, Romania

The objective of this paper is the development of biocompatible materials for regenerative medicine starting from hydrogels/gelatine using natural resources such as fish skin and other animal by-products.

Instead of mammalian collagen, more sustainable and efficient sources should be exploited to recover as much collagen as possible to meet market demand. Globally, approximately 20 million tons of aquaculture waste and nearly 25% fish waste are generated each year, which represent one of the richest potential sources of high-quality collagen.

Fish waste (skin, scales, viscera, ligaments, fins and bones) is generated in large quantities worldwide during fish processing, constituting about 75% of a fish's weight. Therefore, the utilisation of fish processing by-products as potential sources of collagen makes collagen derived from fish waste environmentally friendly, sustainable and particularly attractive in terms of profitability. In addition, collagen derived from marine animals is considered religiously acceptable by various socio-political groups and is therefore more valuable in all production sectors. Simultaneously, the processing of collagen from fish waste also reduces the amount of biohazardous waste re-introduced into the environment. Fish skin, consisting of beneficial components, such as vitamins, minerals and several types of proteins, including collagen, has recently attracted increased attention from biomedical researchers due to its improved physicochemical properties, superior biocompatibility, low immunogenicity, biodegradability, easy processing, high porosity, inherent ability to combine with synthetic and natural materials, lack or minimal religious concerns and large-scale production potential.

This research focuses on collagen extracted from perch (*P. fluviatilis*) in the form of gel. The gel was analysed by proximate analysis (moisture, fat and ash content, total nitrogen, protein, collagen yield, pH), by sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDSPAGE), by UV-VIS and FT-IR spectroscopy and by circular dichroism (CD). The rheological behaviour of the collagen gel was determined at different concentration and temperatures.

The optimal gel was then freeze-dried to obtain spongy materials. The obtained collagen biomaterials were characterised from a structural and morphological point of view using modern methods and the results showed a new opportunity to develop biomaterials such as wound dressings from collagen of marine origin.

Keywords: fish wastes, marine collagen, biomaterials

Watershed management prioritisation of Amban Ganga sub-basin of Mahaweli River Basin, Sri Lanka

Withanage, Nisansala^a; Ekanayake, Shashiprabha^a; Abeysekara, Janaki^b; Madhushan, Danushka^a & Ravisanka, Lahiru^a

^aUva Wellassa University of Sri Lanka, Sri Lanka

^bAsian Institute of Technology, Thailand

Amban Ganga, is a main tributary of the longest Mahaweli River of Sri Lanka. The study focused on watershed prioritisation for watershed management of Amban Ganga, using spatial data gathered under GIS environment. The spatial data derived from Digital Elevation Model (DEM) using 20 m contour intervals were utilised to assess the hydrological characteristics and soil erosion potential by analysing the morphometric parameters of this basin. 18 micro-watersheds were obtained within this sub-basin using the hydrology toolset of ArcGIS 10.8 software. Linear, areal, and relief aspects of various morphometric parameters of the 18 micro-watersheds were studied based on the methods explained in the scientific literature. Micro-watershed prioritisation for soil and water conservation was performed using the results obtained by the morphometric

analysis. The results revealed that the stream network showing a dendritic drainage pattern, extending up to Strahler's 7th order. The sub-basin has 8581 streams spreading over 1555.98 km². The findings of linear aspects indicated that this area has permeable sub-soil and dense vegetation, thus, it would produce a smoother peak runoff, decreasing the likelihood of flooding. The analysis of the areal aspects showed that the basin is elongated, which also contributes to a gentler peak flow generation that makes the sub-basin less prone to flooding and soil erosion. The relief aspects demonstrated that the entire sub-basin has a gradual slope, further lowering the flood risk. When considering the priority for soil and water conservation, 4 high-priority, 6 medium-priority and 8 low-priority micro-watersheds could be identified within this sub-basin. Hence, the results of this study provide valuable information about the hydrological characteristics and the soil erosion potential of this sub-basin and such details are crucial in decision-making on sustainable water resource management and protection within the studied Amban Ganga Sub-basin of Mahaweli River Basin of Sri Lanka.

Keywords: DEM, GIS, Hydrological characteristics, Micro-watershed prioritisation, Morphometric analysis

Participatory methodology in the management of natural resources

Time: Friday 14 June at 9:00-10:30

Pasts and futures of the seas and coasts: An art-based educational intervention

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Increased urbanization and migration to coastal areas intensify human interactions with the sea, impacting lives in subtle yet profound ways. Despite declining numbers of traditional fishers in many countries, activities like fisheries, aquaculture, and technological uses of marine resources are on the rise [1]. The sea serves as both a unifying force and a barrier, shaping human life and civilization, and presenting complex challenges.

A collaborative initiative between a maritime museum and a futures studies research group led to an educational intervention implemented as an exhibition, which was displayed in outdoor galleries in Portugal and Norway, and later made accessible online globally. Comprising 20+ large canvases featuring artwork and supplemented with thought-provoking questions or comments, each piece formed an educational unit aimed at various learning objectives. The exhibition sought to offer aesthetic appeal to passers-by while engaging active onlookers to reflect on their values and behaviours concerning the sea and world. It aimed to highlight individuals' direct and indirect connections to marine resources and create awareness, especially among young adults, regarding the diversity of professional opportunities beyond leisure activities in coastal regions. Starting from the science [2] and art [3] of human-nature connectedness, the exhibited works were categorized into five themes: Mythology, Challenges, Technology, Food, and Life Relations. Selection of artwork and questions underwent interdisciplinary discussions, ensuring universality, public acceptability, and demographic balance, while considering cost and availability. The effectiveness of the intervention was evaluated through on-site research, particularly focusing on its impact on generating awareness and dialogue. This process exemplified an educational sound approach for both makers and viewers, emphasizing collaboration and critical reflection.

In summary, this collaborative educational intervention that connects science and art facilitated a thought-provoking exploration of humanity's past and future relationship with the sea, encouraging awareness and reflection among the viewers, particularly the younger generation.

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Keywords: exhibition, futures studies, interdisciplinarity, marine areas, museum, reflection

Playing with dreams: Workshop tool to support future-oriented work in communities and livelihoods

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Pressing sustainability challenges require solutions; for research methodologies this means co-producing transformative knowledge. This is needed also in the governance related to natural resources. We describe a participatory workshop method called “Dreams and surprises”. It utilises the benefits of systems knowledge and normative knowledge, needed for transformative knowledge that can contribute to actual changes. We provide an overview of the process and practical application of the method. As an illustrative case, we examine the current state and future developments around reindeer husbandry, and give examples from recent workshops carried out with actors in reindeer husbandry in Finland. In workshops, cognitive maps of the operational environment of reindeer husbandry were build using the pre-prepared deck of cards. Then, participants considered the impacts of global developments and other “surprises” (for example climate change, or green transition). Groups engaged in discussions on factors contributing to coping capacity and resilience, and what types of tools and knowledge would allow for an effective response. Lastly, participants reflected on their aims and dreams related to the livelihood. These were many, but could be grouped into broad categories: continuation of the livelihood and maintaining the culture and traditions; better pastures; better governance; increased resilience towards extreme weather events; more team spirit within the livelihood; better relations with other livelihoods and land-users of the region. Various elements of the operational environment were considered important for the livelihood-related dreams to come true and goals to be reached; the most critical element appeared to be land-use planning. These findings are relevant when developing the future governance of natural resources and nature-based livelihoods of the North; they also make tensions between national and local level aims visible. The method can be applied in various situations, characterised by needs to understand complex systems, contested future aspirations, and a need for a change.

Keywords: Collaborative research; Futures research; Learning games; Participatory workshops; Reindeer husbandry; Transformative knowledge

Futures of everyday life during environmental crisis: A qualitative content analysis of future persona scenarios

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How can anthropological research examine depictions of everyday life in the future? Scenario reports emerge as potential empirical documents for inquiry. These reports, holding a long-standing tradition in the field of foresight and futures studies, act as a primary document for organisations to prepare for possible and plausible alternative futures. However, despite the extensive history of scenario planning literature, a closer content analysis of scenario narratives appears as a research gap.

Focusing on descriptions of everyday life, we examined a selection of six publications comprising 29 future persona scenario narratives, produced by diverse economic, public, and non-governmental actors through inductive and deductive qualitative content analysis. We aimed to address how everyday life is represented

and 'future-made' in these narratives. The content of the narratives is interpreted through concepts, cultural frames, and analytical categories derived from cultural anthropology.

The dramatic outcomes of climate change, environmental degradation, and biodiversity loss were one of the main thematic dimensions in the data. Our findings suggest that scenario reports, in addition to anticipating possible futures, construct certain futures based on a systematic analysis of empirical data but also speculative interpretation. The results of these interpretative acts often appear elitist, stereotypical, and technocratic, replicating dominant societal discourses instead of effecting substantial change in ideas about the future.

The results indicate a need for more polyphonic futures and foresight work that can produce more discontinuous and transformative images of the future. As an avenue of methodological development, we propose a more nuanced and comprehensive perception of transcultural flows and social structures in scenario narrative writing. In addition, ethnographic methods could increase our understanding of how futures are collaboratively constructed and produced by different actors and their respective backgrounds, experiences, and knowledge within scenario processes. Consequently, culturally sensitive scenario writing could increase the impact of scenarios on societal discussion as the narratives become closer to the everyday life of not only a chosen few but a vast majority of people.

Keywords: future personas, scenario planning, anthropology, future-making, content analysis, futures studies

Assessment of soil erosion and carbon stock in tropical agricultural soils: A case study in Sri Lanka

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Soil erosion is one of the major environmental issues that contributes to land degradation, which has a negative impact on crop production. Soil erosion badly affects plantation agriculture in Sri Lanka. Assessment of soil erosion for both the current climate and the future climate is essential in implementing soil and water conservation measures to increase the productivity of the plantation land. Therefore, soil erosion and carbon stock in plantation land with different land use types in the wet zone of Sri Lanka were assessed in this study using a modelling approach. The Integrated Valuation of Ecosystem Services and Tradeoffs Sediment Delivery Ratio model and the Carbon Storage and Sequestration model were used to simulate soil erosion and carbon stocks. The future climate data were obtained from 3 General Circulation Models (GFDL-ESM2M, MIROC5 and MPI-ESM-MR) under RCP 8.5 scenario for two periods; mid-century (2040-2069), and end-century climate (2070-2099). The simulated mean soil loss rate (MSLR) of the study area for the current (2016-2020), mid-century, and end-century climate were 106, 75 and 86 t ha year⁻¹ respectively. The MSLR under the current climate was the highest whereas the value of the mid-century was comparatively lower than that of the end-century climate, mainly due to the low intensity of rainfall estimated in the future in the study site. Total soil loss values ranged from 0 to 6833.64 t ha year⁻¹ under the current climate. The simulated mean carbon stock of the study area was 210 t ha⁻¹ where the value was high in most of the land due to the healthy forest cover and the addition of organic manure to the fields. The findings of the study are vital for making management decisions on conservation measures in tropical plantation fields under both current and future climates.

Keywords: Agri-environmental modelling, Carbon storage, Climate change, GIS, InVEST SDR

Reflections of experiential and action-based futures research case studies

Time: Friday 14 June at 9:00-10:30

Practical and theoretical reflections on experiential foresight

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Experiential foresight has achieved quite a lot of theoretical attention, however practical examples of this methodological sphere appear to be fewer. In this abstract we present a case study on the topic of exploring the futures of food production, arranged as an experiential futures space and a workshop. The case was conducted as a part of iBEX Innovation Programme of VTT Technical Research Centre of Finland Ltd. The case consisted of five workshops, taking place in the food court of a future shopping mall, where variety of stakeholders came to taste future food and to discuss given topics related to food system changes. The future was created 'real' by using different tangible and fictional elements, including visualizations and dramatized narratives. In frames of experiential foresight, our study contributes to futures ladder (Candy & Dunagan 2016) modelling. We observe these ladders from the viewpoint of executed future eating experience that took the real-life form in accessible space, artefacts and activities. Besides using experiential foresight as a primary reflection base, we consider experiential futuring as an aesthetic experience. There, we extend our theoretical reflection towards John Dewey's thoughts, where experience is formed as a part of natural processes to which the human being is fundamentally tied. As an outcome we observe possibilities and extensions that our case study reveals for the further development of experiential foresight.

Keywords: Experiential foresight, futures of food and food production systems

Tasting Tomorrow - Experiences of action laboratories at a university restaurant in Mexico City

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The UNESCO Chair in Future Studies at Universidad Autónoma Metropolitana (campus Cuajimalpa) in collaboration with the Urban Transition Laboratory-LabCit is organising futures literacy experiments using the original initiative of Jonathon Keats and his platform Tasting Tomorrow (www.tastingtomorrow.org), which presents climate analogues within a 50-year future. In the case of Mexico City, the analog corresponds to Asunción Cuyotepeji, Oaxaca. The objective of the project, initiated in mid2023, is to implement food transitions through culinary experimentation with alternative ingredients from Oaxaca, a possible climate scenario for Mexico City, with the purpose of anticipating changes that allow initiating the dialogue for major transitions of urban food systems in the university community. The methods employed have been: participatory action research, futures literacy laboratories using exercises, review of sources, surveys, participant observation. In many occasions negative or dystopian narratives of the future that predict a collapse of the economy and food systems in the medium term prevail, therefore, from the perspective of future studies we propose a critical review of these narratives, to better understand the role that images of the future play in our decision making. We seek to empower imagination of desirable futures based on existing knowledge and cultural norms in the preservation and reinvention of Mexican recipes. The Tasting Tomorrow project is still in development, however, the current findings results we want to present at the conference have demonstrated several key results about the challenges in building collective anticipatory capacities in the university community at different levels (students, administrators, cooks).

Keywords: futures of urban food systems, action laboratories, futures literacy, climate change

Co-designing with the Futures cone

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The aim of futures studies is concerned with comprehending and investigating the opportunities of different futures. It entails identifying and assessing many possible alternative futures to better prepare for what lies ahead. Roy Amara's three guiding principles for futures studies as well as the idea of the futures cone of Voros will be covered in detail in the article. This article illustrates the use of the futures cone as a co-design tool in the Colour4CRAFTS (C4C) project. The C4C project is a three-year EU-funded research project on bio-dyes, where the research groups from different disciplines produce new information on the use of natural dyes both in historical times and new high-tech applications of bio-based dyes. The futures cone workshop will be organised five times during the project. This article discusses the results of the first workshop with sixteen (n=16) participants. The results were thematically analysed and five possible futures were outlined: the projected futures, probable futures, plausible futures, possible futures, and preposterous futures. Environmental issues became the most important theme. Sustainability issues are increasingly important, and they are one driving force in relation to the use of natural colours. The development of technology and its possible use in dyeing was another emerging theme. The different development areas in technology offer opportunities for innovative cooperation networks, when new industrial applications are being sought for the wider utilisation of natural colours.

Keywords: futures cone, natural dyes, co-design, sustainability

Exploring regenerative futures with co-creative methods: A case study in the Italian North-Eastern Alps

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There is great potential to enhance future literacy skills by means of participatory action-research. At the same time, future literacy can make change agents more conscious and effective in their actions. This research focuses on local actors (citizens, small entrepreneurs, farmers, activists, etc.) committed to bio-cultural diversity, namely the “dynamic, place-based, aspect of nature arising from links and feedback between human-cultural diversity and biological diversity” (ref: Bridgewater and Rotherham 2018).

The presentation will present the theoretical rationale, methodological approach, and empirical findings related to VERVE's “Co-creative Visioning Labs”. VERVE (2022-2025) is an EU-funded participatory action-research project, focusing on a single case study in a rural-mountain area in the Italian North-Eastern Alps. In the spring 2024, a few Labs will be carried out for the final phase of the projects' data collection process. The aim is to engage local groups committed to promoting bio-cultural diversity, in thinking about the future in regenerative and transformative ways, and in planning possible ways forward.

The Labs are informed by several research questions, including: 1) How can we think about the future in regenerative ways, valuing and promoting the wellbeing of both humans and non-humans? 2) How will natural resources management look like if we put bio-cultural diversity at the core of our visions? 3) How can we combine analytical future thinking methods with creative and arts-based techniques? 4) How can co-creative visioning strengthen community-building and resilience? 5) How do we build concrete pathways to realise our visions?

Following a recent trend in sustainability science, the Labs aim to stimulate imagination to produce a plurality of options, valuing intragenerational justice and inclusion of silent voices (e.g., those of non-humans). The Lab's foundations build on Theory U and Appreciative Inquiry, while the specific methods range from popular future thinking techniques (e.g., backcasting and 3Horizons), to arts-based, storytelling and creative methods.

Keywords: biocultural diversity, future literacy, creative methods, participatory action-research, rural-mountain communities

Novel methods of analysing data and creating scenarios – Case studies

Time: Friday 14 June at 9:00-10:30

Spatial-based design scenarios: Analysing spatial complexity combining experts' judgments and AI models

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Spatial complexity refers to the intricate and diverse physical elements part of a defined territorial area. It plays a crucial role in understanding the dynamics of our changing environment, where the escalating threats, including climate change, have significantly heightened this complexity. In the Futures Studies (FS) context, scenarios development serves as a valuable tool for anticipating future events, proposing immediate actions to avert potential dystopian scenarios. This contribution, explores the evolution of scenario development methods, focusing on the Real-Time Spatial Delphi, as an innovative adaption of the traditional Delphi method. The Real-Time Spatial Delphi, is integrated in a virtual interactive environment, enabling experts' cooperation through the administration of spatial questionnaires in real-time with supported advanced analysis. The method's aim is to facilitate a spatial consensus among privileged witnesses developing spatial scenarios with the identification of portion of the territory. However, since there are different forms of scenarios, current Real-Time Spatial Delphi outputs primarily represents exploratory scenarios, lacking consideration for normative scenarios and the narrative aspect of future events. To address this limitation, we propose a novel approach known as "spatial-based design scenario". This innovative method, incorporates experts' judgments outputs in the form of spatial elements and others' consensus outputs, leveraging artificial intelligence tools such as generative pre-trained transformers and text-to-image models resulting in an overall visualisation of the scenarios. To demonstrate the applicability of this approach, we present a case study in the climate change planning context for the city of Dublin. By integrating spatial-based design scenarios and artificial intelligence, our method aims to enrich scenario outputs with a more comprehensive representation of diverse future scenarios, supporting decision-makers in the process, and fostering a more nuanced understanding of complex spatial dynamics in the face of environmental challenges.

Keywords: Spatial-based design scenarios, Spatial scenarios, Real-Time Spatial Delphi, Artificial Intelligence

Scenarios for the Lower Rio Negro, Brazilian Amazonia, 2040

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University of Turku, Finland

We will present scenarios co-created by leaders of 12 conservation units, which are part of the Mosaic of Conservation Units of the Lower Rio Negro (Amazonas, Brazil). We also contextualize the scenarios in its current socio-political context, and what role these scenarios will now take place in the Council of Leaders of the Mosaic.

The scenarios to be presented are part of Ferreira-Aulu's doctoral research entitled "Amazonia 2040: Images of the Future for Empowering Sustainability", which is planned to be completed by the end of 2026.

The workshop approach used for the scenario co-creation is a novel approach to participatory futures research called spatial-explicit scenario workshop currently being developed with this study. The aim of this workshop approach is to enable participants to negotiate desirable futures of specific locations.

Spatial-explicit scenario workshop combines elements from Futures Literacy Laboratory - FLL (Riel Miller), a re-designed framework based in the Causal Layered Analysis - CLA (Sohail Inayatullah), and practices of Participatory Geographical Information System – PGIS (Robert Chambers).

The approach was piloted in May 2023 at the University of Turku, and was applied in practice in July 2023 in Amazonas, Brazil. Here we present the first scenarios produced using spatial-explicit scenario workshops in the context of the Council of Leaders of the Mosaic of Conservation Units in the Lower Rio Negro. Fieldwork was organised in cooperation with the Federal University of Amazonas (UFAM) and with the NGO Fundação Vitória Amazônica (FVA).

We believe this workshop approach has great potential to expand and develop further once it is experimented in other contexts beyond this study.

Keywords: Scenarios, Amazonia, Conservation Unit, Leadership, local governance, social resistance.

Co-producing SSP-based socioeconomic extensions to inform planning for regional climate change in Finland: a systems-based approach to SSP-based narrative construction

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Human exposure and vulnerability to climate change will be determined, in large part, by future patterns and trends of socioeconomic development. We cannot predict these developments with any confidence, but we can still explore plausible outcomes through scenarios.

Here, we present a method and process for co-producing integrated scenarios for climate change analysis for two Finnish regions, North Karelia and three contiguous Ostrobothnian counties, based on the global shared socioeconomic pathways (SSPs) scenarios framework. The SSPs describe five alternative future pathways for global socioeconomic development and comprise both quantitative and qualitative elements. They differ in the extent of societal challenges to mitigation on the one hand, and adaptation on the other. Though global in scope, the SSP framework is designed to be elaborated to finer spatial scales and/or for specific sectors as SSP extensions.

Co-production is an integral part of the study, with researchers working closely with regional stakeholders. This utilises a hybrid-approach to scenario development including both top-down and bottom-up elements. We also apply a novel, system-based approach to developing SSP extensions, in which three locally relevant systems were identified by stakeholders in the study regions. Four of the five SSPs were selected for analysis, omitting the intermediate case (SSP2).

Stakeholder participation was centred around two workshops organised in each region during 2022 and 2023. Workshops included discussions on key drivers of socioeconomic development in the regions, and likely development paths out to the 2050s for each SSP. The first workshop resulted in three system narratives for the four SSPs in each region. The second sought to combine these system narratives into final regional narratives. Alongside projections of regional climate also being developed, these exploratory SSP based extensions can be utilised to support a more holistic approach to both climate change analysis and adaptation planning at a regional scale.

Keywords: climate change analysis, adaptation, scenarios, shared socioeconomic pathways (SSPs), co-production

AI assisted profiling based on future oriented action intentions

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Current sustainability challenges are putting enormous pressure on our food consumption behaviour to change. We invited European high school students to participate in workshops, in which they were first given a lecture of the future of food, followed by a group work with scenarios of how food might be produced in 2100. After that, the students wrote short essays of their own role in affecting the future of food. The effectiveness of AI-assisted topical analysis was investigated in evaluating the essays. The aim was to identify key themes aligned with Archer's theoretical framework, including e.g., Future Awareness and Future-oriented Action, and test whether different student profiles could be found based on the data. Advanced artificial intelligence technologies, large language model (ChatGPT4) and K-means clustering, were used to systematically explore and categorize the essays. An unsupervised examination of the essays to identify primary themes and categories was carried out with ChatGPT4. AI-extracted text snippets were verified for consistency with theoretical dimensions and compared against manually coded topics in NVivo to ensure the coherence of the AI-identified topics. The final analysis uncovered several key themes, including differing perspectives on sustainable food systems, the balance between personal and collective actions, opinions on technological advancements such as cellular agriculture, future concerns and hopes, and the impact of personal dietary choices on the future of food. As a result, five distinct student profiles were extracted from the data. The incorporation of AI-assisted methods enabled an efficient analysis of a large volume of text, providing a detailed understanding of the students' future perspectives. By combining AI tools with traditional qualitative research methods, researchers could potentially enhance the accuracy and depth of their findings. This approach allows for a rigorous validation process by triangulating AI-extracted topics with manually coded topics to ensure consistency and reliability.

Keywords: Future of food; AI; Future awareness; Future oriented action; Profiling

Sustainable land-use and city planning

Time: Friday 14 June at 9:00-10:30

Smart city wheel: A holistic analytical framework on exploring urban futures

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With over half of the global population residing in urban areas, a figure set to rise by 68% by 2050 (UNHABITAT, 2022), and cities consuming a disproportionate amount of the world's material resources despite occupying just 2% of the Earth's land surface. As urbanization accelerates globally, this disproportionate material consumption (e.g., steel, cement, sand etc.) is estimated about 90 billion tonnes by 2050 (UN-IPR, 2018), it becomes increasingly urgent to introduce high-level approaches to design resilient and resource-efficient future cities. Cities will play a central role in the future of global sustainability policy and strategy process. Thus, we introduce the "Smart City Wheel" (Cohen, 2013) as an analytical framework aimed at envisioning and planning for the sustainable urban futures demanded by the 21st century.

The Smart City Wheel was originally designed and utilised as a benchmarking tool to assess worldwide smart cities (Cohen, 2013, 2014), it also offers a comprehensive foresight framework allocating resilient urban developments on six smart city dimensions: mobility, environment, economy as hard domains, governance, living and people as soft domains (Neirotti et al. 2014, 27; Cohen, 2013; Albino et al., 2015; Giffinger et al., 2007). Both hard and soft domains are relevant and important for the sustainability planning of cities. The Smart City Wheel methodology has a lot of potential in sustainable urban planning. In the article, we shall tell you about how this planning tool can be used to plan and design better urban sustainability.

In this session, we present how the Smart City Wheel was adapted as a base for the foresight workshops in the Smart City Digital Twins Project and used in partners cities in Poland, Lithuania and Turku, Finland. While we present the empirical results gained from the foresight workshops, we also provide insights into the further utilisation and development of Smart City Wheel towards National Smart City Digital Twin Program in the Finnish context since it was realised that currently, Finland has a feasible ground to develop a national DTs program aligning with - Finland's Digital Compass, Ecosystem Agreements, National AI Program, Metaverse Strategy. We assert that Smart City Wheel could be the first holistic framework combining all these dispersed strategies for Finland's National SCDTs program.

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Keywords: "Smart City Wheel", "Resource-efficient Urban Futures", "Resilient Urban Development", "Digital Twins", "City planning", "Sustainable development"

Gaining time in nature: recognising nature's contributions to human sense of time

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There is growing evidence that interacting and connecting with nature are essential to maintain human health and well-being. The various benefits of nature experiences are increasingly being recognised, many others remain to be discovered and explored. I propose there is a need to better explore the pivotal role of nature experiences in shaping human time perception – our sense of time. Human time perception is complex and involves at least three key dimensions related to temporal succession, temporal duration, and temporal perspective. Yet, it is also subjective and shaped by various contextual factors, including the contents of the time period and the cognitive, emotional and bodily characteristics of the experiencer. I draw from a growing body of evidence that nature experiences can influence human sense of time to suggest they can contribute to extend human perception of temporal duration and shift time perspectives towards a more positive outlook of the past, present, and future with less focus on a single time perspective. In a context of increasing time scarcity in modern urban societies with dire consequences for human health and well-being, I argue that nature recovery can have a positive effect on human temporal well-being. To realise this potential, we need a better understanding of how nature experiences shape our sense of time suggest to generate actionable insights that can help to restore a healthier and more balanced relationship with time and nature.

Keywords: Sense of time; Ecosystem services; Time perspective; Nature experiences; Nature recovery; Well-being

Systemic transformation challenging time concepts of strategic land-use planning: breaking the pattern through exploring different approaches

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Land-use planning has a pivotal role in guiding our futures, as its direct and indirect impacts on society and natural resources are far-reaching in time and space. Further, land-use planning plays a crucial part in solving wicked problems that need systemic, open-minded, and sometimes unconventional approaches. This applies topically to e.g., food systems as studies suggest complementing them with local and decentralised solutions to add resilience – which is posing pressure on the built environment to adapt. The capability of land-use plans to recognise alternative futures and to respond to systemic transformation seems crucial yet insufficient.

We approach this issue through looking at time concepts used in Finnish regional and master plans. It appears that land-use planning lacks different views of time. Many Finnish strategic land-use plans examine the future in a rather short time span considering their impacts, and the conception of time in these plans is predominantly linear. Most pressingly, we see plans where the solution is a locked vision based commonly on a continuation of the current trend, whereas there may be more prosperous futures to consider. If land-use planning does limit its view of futures, as a fundamental part of building the future of society, land-use planning can be seen as a bottleneck that prevents searching for alternatives to current systems and to the use of natural resources. However, some alternative approaches to time known in Finnish land-use planning imply potential of exploring futures more open-mindedly. Through analysing these cases and further time concepts from futures research, we argue that land-use planning could benefit from challenging its conventional time concepts, to allow further exploration and to better respond to systemic transformation. Furthermore, we see that futures research could benefit from examining time in land-use planning.

Keywords: land-use planning, time, systemic transformation, food systems

Beyond the cubicle: A glimpse into the future landscape of sustainable workspaces

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The ongoing technological advancements, coupled with the effects of digitalization and the ascent of knowledge-based work, have promoted the integration of remote and flexible work solutions. Simultaneously, myriad forces, ranging from megatrends like urbanization to wild cards such as the profound global impact of COVID-19, have accelerated shifts in lifestyles and work practices. Thus, hybrid work has emerged as a dominating way of work among knowledge workers.

This transition entails significant environmental, social, and societal consequences, ranging from a lack of social connectedness, ergonomic issues, decreased work-life balance, and increased commercial real estate vacancies to potential reductions in greenhouse gas emissions. New office buildings are being constantly built even though demand for office space in the future grows more uncertain. Despite acknowledging these issues, a deeper understanding of hybrid work's effects on spatial settings is needed. One recognised solution to add flexibility in corporate space usage, address remote work impacts, and increase space occupancy for reaching strategic goals, such as environmental targets, is the concept of coworking.

The aim of our study is to cultivate an understanding of the future potential of coworking spaces in hybrid work. We showcase seven coworking spaces in Australia, which can be seen as one of the pioneering contexts due to the autonomy and power that employees hold in the knowledge work job market. We focus on various tangible and intangible aspects, such as location and space characteristics, on-site services, user preferences, and emerging trends. Our results aim to provide insights for academic discussion of work futures and to assist workplace managers in reevaluating traditional workplace strategies to effectively harness the role of physical

spaces and their capabilities in this shift to foster an environmentally and socially sustainable transformation towards the future landscape of work.

Keywords: future of work; hybrid work; coworking; workplace management; social sustainability; green transition

SESSION 4 at 12:45-14:30**Climate change challenges to farming and climate change mitigation strategies - case studies**

Time: Friday 14 June at 12:45-14:30

Futures research and climate science for sustainable agriculture in Sri LankaHaapasaari, Osku^a; Alahakoon Arachchige, Kalpani Pavithra^a; Korkeakoski, Mika^a; Kaliyadasa, Ewon^b & Esham, Mohamed^c^aFinland Futures Research Centre, University of Turku, Finland^bUva Wellassa University, Sri Lanka^cSabaragamuwa University of Sri Lanka, Sri Lanka

Sri Lanka ranked 6th in the world when it comes to climate risk in 2018 (Germanwatch 2020). Even though the situation has improved since then, the country remains highly vulnerable to effects of climate change, especially when it comes to water resources. With over 25 percent of the population employed by the agricultural sector, many Sri Lankan universities have developed expertise in sustainable agriculture and are striving to equip graduates with the expertise to deal with the impacts of climate change.

However, there is a research gap focusing on the current level of university students' awareness and knowledge of climate change. While there are some analyses that investigate the level of environmental literacy and climate change awareness among Sri Lankan university students (Withana & Sandika 2009, Kurupparachichi et al. 2021), analyses focused specifically in the field of agriculture are lacking. In addition to expanding the studied population to students of agriculture and natural sciences management, the study also looks at universities located in the Sabaragamuwa province, in more geographically rural locations.

The study analyses student perceptions and conceptions related to climate change based on survey data collected in 2024. Drawing on the results of the questionnaire, it recommends concrete actions that promote climate change awareness and level of climate change knowledge among future agriculture professionals graduating from Sri Lankan universities.

The paper is based on findings of the Erasmus+ SUCCESSFUL project and is presented in collaboration between University of Turku, Finland, Wageningen University, The Netherlands, Uva Wellassa University and Sabaragamuwa University of Sri Lanka.

Keywords: Climate change, agriculture, higher education, university student

Impact of climate change on tea smallholder production – A case study in Sri LankaFernando, Hasantha^a; Rosairo, Rohitha^a; Wickramawardhana, Rohan^b & Esham, Mohamed^a^aSabaragamuwa University of Sri Lanka, Sri Lanka^bNational Planning Department, Ministry of Finance, Economic Stabilization and National Policies, Sri Lanka

Sri Lanka's economy has benefited from the tea smallholding sector by providing jobs and foreign exchange. Tea is a rain-dependent perennial crop. Tea smallholders are crucial to Sri Lanka's economy but vulnerable to the implications of climate change. The study was conducted to assess the impact of climate change on tea smallholder production in two major tea-producing districts in Sri Lanka: Badulla and Matara, to understand tea smallholders' perception of climate change, to identify how they adapt to climate change impacts using different adaptation measures leveraging on their farming experience and support from the government. The study was done using a descriptive research design with a survey. A stratified random sample of 200 smallholders who owned between 0.125 and 10 acres of lands was selected. Data were gathered through a

structured questionnaire. Ten years of temperature and rainfall, and production data were collected from the Department of Meteorology and Sri Lanka Tea Board. Correlation analysis shows a negative relationship between the temperature and the production and a positive relationship between the average rainfall and the production in Badulla district. In Matara district, there were negative relationships between the temperature and rainfall, and the production. Tea smallholders perceived that temperature increased while rainfall decreased but the one-day heavy rainfall has increased. Tea smallholders with farming experience have adapted irrigation systems and extension services while shade trees and soil conservation have relatively high adoption rates across all experience levels. Smallholders expect government subsidies to face climate change implications.

Keywords: Tea, Climate Change, Tea Smallholders, adaptation measures

Assessment of yield losses of rice in Sri Lanka due to historical and future global warming using three crop models: DSSAT, APSIM, CYGMA

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Climate change is a major constraint to agriculture in many parts of the world including Sri Lanka. The country's mean surface temperature increased at a rate of 0.2 °C per decade for the 1951-2006 and 0.3 °C per decade for the 1981-2006 periods. Rice is the second major food crop in the world and the staple food in Sri Lanka. Rice production in Sri Lanka is greatly affected due to climate variability. These issues are addressed by generating future climate projections and using them to drive crop models that feed into integrated climate–crop–economic models to quantify climate impacts on livelihoods. This study aims to estimate the yield impacts in the recent past as well as in the mid-century, associated with human-induced climate change, using three crop models; DSSAT, APSIM, CYGMA. Further, the yield simulations are compared with a more realistic climate simulation including both natural forcing and human activities. Three locations of the largest rice growing district which is Kurunegala; Rajanganaya (8.18° N, 80.17° E), Nikaweratiya (7.73° N, 80.13° E) and Batalagoda (7.53° N, 80.43° E) were selected for the study. The nearest meteorological stations for these three locations are denoted as MIFCRI, NWMAHO and BGRRIC respectively. The bias-corrected 0.5° daily factual and non-warming counterfactual ensemble simulations of a global atmospheric model (each 100 members) were analysed for the three locations from the 1980 to 2020 period. Future climates were downscaled for the study sites using selected GCMs for SSP126 and SSP585. The factual simulations revealed that both minimum and maximum temperatures have increased for the considered period due to human impacts compared to counterfactual ensembles. The yield predictions using three crop models explained that there was a declining trend in the historical period compared to the pre-industrial period indicating warming trend of factual climates in historical period has reduced the yield. Further, the predictions of future rice yields reported declining trend across the tested models for all the tested GCMs during the 2040–2069 period in different magnitudes. Increment of temperature negatively affects the growth, development and phenology of rice. Increment of maximum temperatures above the threshold values during anthesis (36.9 °C to 37.7 °C) and grain filling (29.8 °C to 31.3 °C) have severe impacts on the yield. Shortening of the growing season due to increased temperature also suggested as one of the reasons for yield reduction under climate change.

Keywords: crop models, yield, rice, climate change

Bush fires and vulnerability of rural infrastructure: A case study on central highlands of Sri Lanka

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Bushfires are responsible for 1.2% tree cover loss in Sri Lanka. Crucial bushfire management elements in Sri Lanka; coordination among institutions, contribution of people, research and management are regrettably ignored. Peak bushfire season annually begins in mid-July with the commencement of dry and windy season. There is greater chance of encountering weather that could support a significant bushfire likely to result in both life and property loss. Our approach aimed to investigate the bush fire vulnerability of the rural communities and infrastructure of the selected divisional secretariat divisions of central highlands of Sri Lanka and to find out the perceived preparedness of the various groups. Mixed method approach was instrumental in data collection. Participatory data collection tools; field observations, root cause analysis, resource maps, storytelling, in-depth interviews with key informants (43) and focus group discussions (11) were used to investigate the situation. Rural farmers (43%), tea small holders (12%), estate workers (5%), SMEs (11%), eco-tourist hoteliers (8%), and government workers (21%) were main community groups. Houses of farmers and estate workers, business places, tourist hotels, schools, hospitals, tea factories, religious places, roads, irrigation channels, telecommunication and electricity infrastructures. Both community livelihoods, mainly crops and business and rural infrastructure were vulnerable to bushfires and the level varied with the distance to fire centre. Cluster approach was used to identify the level of preparedness among various groups. Early warning system, weaknesses in preparation plans including safety, evacuation, emergency communication and community level engagement were appealing integrated bushfire mechanism.

Keywords: Bushfire, Central highlands, Perceived preparedness, Rural infrastructure, Sri Lanka

Distribution of carbon in physicochemically defined soil organic carbon pools in tropical lowland rainforests and montane forests of Sri Lanka along an altitudinal gradient

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The objective of this study was to investigate the distribution of carbon in physicochemically defined soil organic carbon (SOC) pools in tropical lowland rainforests (TLRFs) and tropical montane forests (TMFs) of Sri Lanka. Soil samples were collected up to 25 cm depth from eight permanent sampling plots, 4 from each forest type, established along an altitudinal gradient: 117 (Kanneliya-1), 174 (Kanneliya-2), 509 (Pitadeniya-1), 618 (Pitadeniya-2), 1,042 (Sinharaja-Enasalwatte-1), 1,065 (Sinharaja-Enasalwatte-2), 2,080 (Pidurutalagala) and 2,132 m asl (Horton Plains). Soils were fractionated into coarse free particulate organic matter (fPOM), fine fPOM, intra POM (iPOM) and silt+clay. The latter fractions were further acid-hydrolysed. Basic physico-chemical properties and $\delta^{13}\text{C}$ signature were also determined. According to the analysis of variance followed by Tukey test, there was a significant ($P < 0.05$) effect of elevation on the distribution of dry matter percentage of coarse sand+fPOM, fine fPOM, and silt+clay fractions (wet sieving). The elevation also significantly ($P < 0.05$) affected on the amount of organic carbon (g C kg⁻¹ soil) in coarse fPOM, fine fPOM, iPOM, silt+clay fractions, and also the unprotected, chemically protected and biochemically protected SOC pools. However, the effect was not significant ($P > 0.05$) in the physically protected pool. The highest totally protected (32.90 g C kg⁻¹ soil) and totally unprotected (24.38 g C kg⁻¹ soil) SOC amounts were observed in Pidurutalagala whereas the

highest and the lowest stabilized C percentages were observed in Pitadeniya-2 (82.4%) and Pitadeniya-1 (52.0%), respectively. Overall, the effect of elevation on SOC protection mechanisms was not consistent. Soil C sequestration in TLRFs and TMFs in Sri Lanka, as a climate change mitigation strategy, seems not only determined by the elevation gradient but also by some other factors as well. Further studies are needed to investigate these factors and their level of influence on soil C sequestration in TLRFs and TMFs in Sri Lanka.

Keywords: Climate change, tropical forests, carbon sequestration, soil organic carbon (SOC) pools, fractionation

Sustainable transformations in the use and management of natural resources

Time: Friday 14 June at 12:45-14:30

Fostering sustainable water resource policies in complex and uncertain futures with qualitative systems analysis and serious games

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Sustainable resource use is a complex challenge for policy-makers and users alike. In Germany, technical efficiency significantly reduced water use over the past decades, especially in industry. Other sectors, however, will rather need more water due to future developments, i.e., urban and agricultural irrigation in increasing drought periods. Climate and water use developments are both locally distinct, which demands resource sustainability policies to be anchored on the spot and in close consultation with stakeholders. A shift from resource management through central authorities to tailored (?) resource governance is crucial to address these issues.

Cross-impact balance (CIB) analysis allows to combine potential future context developments (such as climate, economy, politics, etc.) and stakeholders' policy mixes. Thereby, the complexity of interrelations, the uncertainty of potential developments, and the effect of one's own and others' policies on each other can be shown, improving the base for understanding and decision-making in the field of water use. Complementary to the most synergetic mixes identified by CIB, the underlying CIB matrix serves as a base for serious gaming (SG) with stakeholders to pay respect not only to scientifically robust scenarios but also to social relations in the realm of resource use and distribution. Building on a case study on irrigation in South Germany, it is shown how computed (CIB) and social (SG) solutions differ and what we can learn for successful future resource policies within a broad sustainability understanding (social, economic, and ecologic).

Keywords: Water, future, serious games, cross-impact, policy, governance

Can we achieve sustainable responsibility in corporations and SMEs? Reviewing interconnections across research themes of corporate sustainability, corporate social responsibility, and environmental management

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There has recently been much and rapid progress in three key streams and themes of research: (1) environmental management, (2) "CSR" (i.e., corporate social responsibility), and (3) corporate sustainability. In this conference article, we discuss interconnections across these three research streams and themes. We review shortly works in and across each stream of this three-fold research literature. We find gaps in this research literature. We point towards a need for more research on what we call sustainable responsibility research.

The three research streams that are the starting points of our paper are interconnected in more ways than one (Small et al. 2022; Camillieri, 2017). This said, much of the research conducted in any one of these streams has been within only that stream and not in others (see Dal Baldo, 2012; Landrum, 2018)., leading to more conceptual chaos and compromise across the streams than accumulation of research knowledge in a uniform direction (see e.g., Chang & Cheng, 2019; Zou et al. 2006). The lack of interconnections across these three research streams not been only a scholarly affair: practice and policy have often failed to meet (see Vallance, Perkins & Dixon, 2011).

On the other hand, at the interconnections of the three foci, exciting new research findings have begun to seminally emerge. There is now research on managerial strategies quantifying and monitoring corporation's "ESG" or environmental, social and governance (Sun & Saat, Maneepop et al., 2023). In turn, the above kind of monitoring-and-improvement research has spawned research critical cautioning against any very narrow base of understanding or monitoring a given phenomenon of interest (e.g., Landrum, 2018; Ainamo, Bakkar & Mäkinen, 2023). There is empirical research arguing that investors, managers or other agents have in their practice or policy engaged in what Holmström (2016) has called "moral hazard" or deleterious behaviour. Thus, many scholars have begun to argue for the benefits of qualified and more refined methodologies than quantification and economic analysis of investments as the most appropriate kind of monitoring (Waxin, Bartholomew, Zhao & Siddiqio, Dimitropoulos, Koronios & Sakka, 2023). The latter group of scholars have argued for research taking on viewpoints of citizens, their communities, and society at large (se e.g., Morales-Parragué, Varela-Laso & Araya-Castillo, Zhang, Wan & Jim 2023).

Besides above kind of literature review, we have also analysed Google Trends big data as to dynamics of popular interest in one or the other of the three research streams and themes, a new kind of research stream that we identify as having begun to emerge. What we call sustainable responsibility is constructively critical research focusing on ecological, social, economic, and cultural ills that exist and characterise our contemporary "broader environment" (Jie et al., 2023). We believe that this new research stream will benefit from managerial cognition in a key role in improving upon the sustainability of both traditional ways and modern intra-organisationally networked innovation (Jiang et al. 2023; see also Tuomi, 2002). We find that the impacts of this new stream on the broader environment would appear to strive for higher purposes such as changing the world for the better (Plessis & Cole, 2011) and "SDGs" or the sustainable development goals of the United Nations (World Commission on Environment and Development, WCED, 1987).

Finally, at the end of our paper, we provide implications for practice, policy, and how to have them meet better than in the past or present.

Keywords: Corporate Sustainability, Corporate Social Responsibility, Environmental Management, Sustainable Development, Business Ethics, Moral Hazards

Corporate scenario planning for a sustainable future: Journey of a Japanese company

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As a corporate futurist, I am excited to share insights and case studies from my work at Mitsui & Co. Global Strategic Studies Institute, a research division of Mitsui & Co., Ltd.

Mitsui & Co. is one of the world's most diversified trading, investment, and services enterprises, with a focus on sustainable and responsible practices. Mitsui & Co. handles a wide range of products, from iron ore to farmed shrimp.

In today's world, businesses face unprecedented challenges related to climate change, resource depletion, and sustainability. At Mitsui & Co., we recognise the importance of anticipating and adapting to future trends.

That's why we have been trying to establish a robust framework for future thinking that integrates multidisciplinary approaches.

One of our recent initiatives is a series of workshops on aluminium. These workshops aim to explore various scenarios and develop strategies to enhance our resilience and sustainability. Through these exercises, we visualize different future scenarios and identify opportunities for growth and development.

During my presentation, I will provide a practical example of scenario planning exercises and discuss the strategies we have developed to ensure a sustainable and peaceful future. These exercises help us understand the potential risks and challenges we may face and enable us to make informed decisions. Additionally, I will emphasize the importance of fostering a corporate culture that values sustainable development. As a profit-driven organisation, we understand the need to strike a balance between cost-effectiveness and responsible practices. We actively promote a forward-thinking culture that empowers employees to turn challenges into opportunities through our workshops.

I will share the experiences we have gained in proactively managing risks and making strategic decisions using foresight methodologies. By sharing our experiences and outcomes, my goal is to inspire attendees to embrace forward-looking thinking and implement proactive strategies within their organisations.

Keywords: scenario planning; technology; geopolitical risk; strategic resilience

Paths towards sustainable energy systems

Time: Friday 14 June at 12:45-14:30

100% renewables with more circularity and less demand – a Paris Agreement compatible scenario for Europe until 2040

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Paris Agreement Compatible (PAC) scenarios for energy infrastructure aim to develop a future energy scenario for Europe, which is compatible with the Paris Agreement target to keep global society within +1.5 C degrees temperature, compared to pre-industrial levels. The scenario, under development by civil society organisations, aspires to guide European energy infrastructure planning holistically to ensure that we are planning and building the infrastructure necessary for a fully renewables-based energy system. This is the first time a large group of civil society organisations aims to form a joint vision of a desirable energy future for Europe, and to disaggregate it to the country level. A European-wide energy scenario embodies the policy demands of civil society, and is guided by three goals: a) a 65% reduction in greenhouse gas emissions by 2030, b) a net-zero target for greenhouse gas emissions by 2040, as well as c) an aim to supply power with 100% renewables in Europe by 2040 in all sectors.

Articulating civil society demands, the scenario process couples energy modelling with a bottom-up, participatory process to shape eventual national and European scenarios for the EU27 member-states. As scenarios have to be modelled to inform about infrastructure needs, and the majority of existing energy system planning models in Europe currently do not adequately describe the renewables-based energy system that will be needed, the project aims to model energy demand (buildings, industry, transport and lifestyle) and supply using specialised, open software (Pathways Explorer, PyPSA), while calculating the co-benefits of the renewables-based energy transition. To stimulate European debates, it also assists energy modellers and other stakeholders exchange on existing and new modelling approaches to improve representations of the complex interrelations of a future energy system.

Further discussion will be needed on how transition pathways can be framed as opportunities to improve well-being – for asking what could be. Transitions are socio-technical, as well as cultural affairs, so even higher ambition levels may need to be considered than by recent assessments, such as those from the European Scientific Advisory Board for Climate Change (ESABCC) on net emissions reductions in Europe by -90-95% by 2040. While the focus of the PAC project is in Europe, the underlying challenges are global. Further insights need to be developed on the importance of transmission and distribution grids, energy demand reduction and the aspects on resource-use, social acceptance and spatial requirements. Alongside projecting for a desirable future, collaborative scenario development for alternative pathways may assist decision-makers to see a wider set of policy choices from which to choose from.

Keywords: demand reduction; circularity; infrastructure; energy transition; resource efficiency

Managing discontinuities in the foresight for a resilient energy system

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Research on sustainability transformations suggest that a fundamental shift in the core structures, practices and beliefs of our societies is needed. Although identifying and anticipating discontinuities to build adaptive capacity is crucial for a resilient society, discontinuities are largely ignored in energy foresight processes.

The theoretical background is based on four resilience capacities – absorptive, adaptive, anticipatory and transformative. Absorptive capacity is needed for creating stability when facing discontinuities. Adaptive capacity is needed for being able to react to discontinuities. Anticipatory capacity is called for in the foresight of discontinuities. Transformative capacity is needed to create a discontinuity of harmful practices and trends.

The four forms of resilience capacities are combined with alternative generic approaches in foresight – passive, reactive, pre-active and proactive. In our ongoing work, the working hypothesis is that current energy foresight processes use mainly the absorptive and adaptive resilience capacities in a reactive manner, but developing a truly sustainable energy system would require the proactive usage of the anticipatory and transformative capacities.

Continuing from this overall standpoint we generate a typology of discontinuities including temporal and spatial scope of the discontinuities, observable characteristics of the discontinuities, drivers of discontinuities, tipping points generating a discontinuity, the foresight approach taken and the resilience capacity used in the detection and management of discontinuities.

We contribute to sustainability studies with a systemic inquiry of potential discontinuities applied to the energy sector, develop methods of foresight work to uncover and manage discontinuities, and advance the societal capacities to respond to knowledge of discontinuities of alternative futures.

Keywords: Foresight, Discontinuity, Resilience, Energy, Management

Role of 'Green Energy' in reducing the use of natural resources

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"Green technologies" open new horizons in environmental protection and can become new drivers of economic development. The main contribution of green energy is to reduce pressure on natural resources.

The transition from hydrocarbon energy sources to renewable ones allows us to minimize the exploitation of oil, coal and gas, which in turn reduces the negative impact on the environment. Green energy production stimulates the development of energy efficient technologies. Solar panels, wind turbines and hydroelectric

power provide the opportunity to create more efficient energy sources, ultimately reducing the need to use natural resources.

Azerbaijan is known in the world as a country possessing and exporting hydrocarbons. However, understanding the importance of careful use of natural resources, Azerbaijan is now implementing a new energy policy based on renewable energy sources. In the "National Priorities of Socio-Economic Development: Azerbaijan 2030," the "green economy" is defined as one of the five important development directions for the country. Investing in "useful" activities allows to invest in areas of the green economy that attract investors, demand for environmental and climate protection technologies, as well as products that are environmentally friendly and resource-efficient, is growing.

Hosting the 2024 UN Climate Change Conference (UNFCCC COP 29) in November 2024 by Azerbaijan will give even a greater impulse to the sustainable development of the "Green Technologies" in the country. The transition to green energy is driving innovation in a variety of areas. This includes developing new technologies for energy storage, improving transmission systems and expanding opportunities to use renewable sources. Green energy also provides economic benefits. The development of the renewable energy industry creates new jobs, supports economic growth and helps reduce dependence on traditional energy sources. It is important to continue to invest in research and development, promoting the effective implementation of technological innovation to address our environmental challenges.

Striving for a sustainable future through green energy is the path we must choose today to leave our planet to future generations in a better condition than we find today.

Keywords: green energy, natural resources

Future sustainability transitions of Finnish district heating

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The quest for sustainability transitions calls for a critical re-evaluation of the energy sector's reliance on natural resources. This paper explores possible futures and sustainability transitions within the context of Finnish district heating with a specific focus on the utilisation of natural resources. Drawing on qualitative expert interviews with industry experts in Finland, the study creates five distinct transition scenarios for district heating in the country. These scenarios, which outline possible paths for the sector's development, are evaluated based on their anticipated impact on natural resources. Scenarios include a transformation, two technological substitutions based on hydrogen and small nuclear reactors, a reconfiguration, and a dealignment and realignment.

Keywords: scenarios, district heating, sustainability, transition pathways

Exploring alternative economic perspectives for sustainable futures

Time: Friday 14 June at 12:45-14:30

The Wealth of Natures – Discovering alternative economic narratives for a livable future

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We present in this paper some elements for new economic theories and practices based on inevitable contemporary ecological and social realities, applying innovative forms to imagine alternative futures. By integrating elements of economy and ecology based on natural capital, we look for options to restart the history of economic thought from its origins, following the exercises by Greer and others, with a special attention to a

(uchronian) history of the future. Central elements are also ideas about more-than-human interaction, cooperation, law and ethics and alternative forms of value creation and conceptions of money. These conceptual explorations are linked to different formats of futures literacy and thought experiments.

Keywords: Economic theory, more-than-human ethics, natural capital, futures literacy, thought experiments

The limits to degrowth: Exploring a critical rationalist perspective

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The term "limits to growth" refers to the limits of the ecosystem's ability to absorb waste and replenish raw materials to sustain the economy. The concept implies that, left unchecked, resource depletion will lead to a collapse in the human population. The notion of a limit to growth has been a cornerstone of futures studies thinking on sustainability since the early 1970s. Despite the vast utility of degrowth thinking, this presentation explores the counterintuitive notion, based on a critical rationalist perspective, that the "limits to growth" approach to sustainability may inadvertently limit the growth of knowledge about sustainability problems and, thus, our collective ability to solve problems sustainably. This thought experiment is explored based on insights from Karl Popper's notion of an "open society" as applied to contemporary thinking about degrowth as a viable strategy for human sustainability on a global scale. Somewhat ironically, thinking about problems in the limits of growth intellectual space, which is fertile ground for degrowth solutions, unintentionally limits the range of future problems under consideration and also raises questions about the utility of developing solutions not based on the principles of degrowth.

Keywords: Foresight; Theory of Knowledge; Limits to Growth; Degrowth

Financial instruments as a promising tool for disaster risk reduction and climate change adaptation for female fish processors in Sri Lanka

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The small-scale fisheries communities in Sri Lanka confront escalating vulnerability mainly resulted from climate change impacts, extreme weather events, natural disasters, and economic crises. Women are pivotal in fish processing activities. Hence, identifying gender-specific impacts of climate change on fish processing and implementing measures through financial instruments to protect vulnerable groups, particularly women, is crucial. Hence the present study aimed to test the inclusion of financial instruments and services as a risk reduction and climate change adaptation strategy for female fish processors in Sri Lanka. Mixed method approach instrumental in primary data collection. Respondents were small scale female fish processors of Tangalle, Amabalangoda and Negombo. The study used both quantitative and qualitative measures to achieve objectives of the study.

The women fish processors were mainly engaged in production of dry fish and steamed dry for local market using seasonal fish species as raw material. Community level fish processing heavily depends on availability of fish catch and suitable weather conditions; especially the process totally depends on traditional know-how and availability of sunlight. Hence the study revealed high climate change and disaster vulnerability among fish processors with weak resilience-building mechanisms. The vulnerability is mainly resulted due to the lack of adaptive capacity, resulted from lack of finance with limited avenues for savings and access to credit. Banking loans, with lengthy procedures and collateral requirements, remain impractical for many. Pawning gold emerges as a prevalent method for accessing funds, though with associated risks. In managing household finances, these female fish processors play a pivotal role, yet many of their husbands' substance abuse issues with drugs and alcohol significantly affect their financial management skills. The study recognises enhancing

financial literacy among women and diversifying livelihoods beyond fisheries income are crucial for reducing vulnerability in female fish processors emphasizing empowerment and access to affordable credit.

Keywords: Climate change, Female fish processors, Financial Instruments, Sri Lanka

Policy instruments and the governance of natural resources

Time: Friday 14 June at 12:45-14:30

Strategic Foresight for the United Nations: Methodological reflections from implementing a 'foresight trajectory' at UN Environment Programme

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Volatility, complexity, and uncertainty characterise our world and pose specific challenges for United Nations agencies. Motivated to update the UN and the multilateral system to be better prepared and more proactive, strategic foresight is one of five critical reforms of the UN Secretary-General's 'Our Common Agenda' (UN 2021). There is a growing interest and demand across the UN for practical knowledge about how to navigate uncertainty, apply foresight for strategic planning, chart paths forward, and take actions today for better futures. This paper presents methodological reflections from an 18-month foresight process at UN Environment Programme (UNEP) led by its Office of the Chief Scientist (OCS). This large-scale endeavour aims towards the establishment of an organisation-wide approach to foresight which contributes to knowledge production, (re)assessment of priorities, anticipatory action, and collaborations with other parts of the UN. The UNEP OCS implemented a rigorous, participatory and multi-method foresight process which included stakeholder surveys, Delphi questionnaire and interviews, sensemaking workshops, scenario-building, and six regional scenario exploration workshops. Throughout, attention was paid to involving diverse perspectives and engaging key stakeholders. Based on a foresight implementers' perspective, this paper investigates a selection of key choices and emerging challenges encountered in this foresight process which are analysed in terms of contextual issues, relevancy factors for diverse participant groups, and links to larger theoretical discussions in futures studies. The initial findings are formulated into a proposed set of principles for using foresight for strategic planning in the UN system. They are offered as a starting point and guide for applying foresight to chart new paths and act for better futures. Altogether, this methodological reflection invites further experimentation aimed at integrating foresight into organisational planning. It contributes practical ways for foresight implementers to foster the perceptions of legitimacy and relevance of 'doing foresight' among key stakeholders and beneficiaries.

Keywords: United Nations, Environment, Organisational Foresight, Principles

Promoting sustainability transformation through biodiversity respectful governance – Evaluating policy proposals for agricultural and forestry sectors in Finland

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The need for a comprehensive change in the entire society is increasingly recognised in the public discussion about the policy tools and measures required to halt the loss of biodiversity. Despite several decades worth of political efforts, the deterioration of biodiversity is still accelerating. The policymakers have so far not succeeded in transferring the level of ambition from international political agreements to policy implementation.

More than ever, governance needs to take a more central role as a driver for the transformation of the economic-political system through national-level policies.

Since the required actions affect the entire society, its central values, the foundations of business operations, and the everyday life of individuals, the acceptability of the policy measures that promote a breakthrough towards a biodiversity-respectful society thus play a central role. The realisation of ambitious goals sometimes requires leadership from the political leaders to act against public opinion. Various studies on environmental policies have shown that voluntary, market-based measures are typically more accepted than coercive measures, while the latter are usually considered more effective.

This paper presents the results of a study that identified possible policy tools to halt the loss of biodiversity in Finland and examined their effectiveness and acceptability from the perspective of experts in the field. Nineteen policy tools focusing on agriculture and forestry based on the existing literature and interviews were identified. They were then evaluated by a group of experts in a Delphi-style survey. From the results, we will develop further understanding on the challenges and pitfalls related to the effectiveness and acceptability of the chosen policies.

This study is part of the BIODIFUL research project funded by the Strategic Research Council of the Academy of Finland.

Keywords: sustainability transformation, policy instruments, agricultural policy, forestry policy, acceptability of policies

Natural resources in analyses of the strategic environment

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Textbooks in strategic management often have a section on analyses of organisations' strategic or macro environment. The textbooks often present a classification of forces in the strategic environment (e.g., political, economic, technological, social, legal, values, demographical and so on, leading to acronyms like PEST, STEP, PESTEL, PESTLED, STEEP, STEEPV, STEEPVL, and STEEPLE. PEST analyses – and their deviates - are often used as input to - or as a part of – foresight and futures research methodology, e.g., scenario planning, megatrend analyses, horizon scanning, and SWOT analyses.

Literature gives no clear answer on when or why to select which acronym. However, it seems plausible that new letters are added as new factors in organisations' strategic environment have become essential. Recently, the availability of natural resources has become of paramount importance. However, in most textbooks and guidelines, the availability of natural resources themselves is not included directly but only in affiliation with other factors such as technologies, advocacy groups, waste reduction and environmental risks.

Within strategic management, analyses of organisations' strategic environment depend on a particular view on strategy often associated with what Henry Mintzberg and colleagues in their seminal book *Strategy Safari* label the 'Environmental School' and the 'Configuration School'. In addition, other critiques have been raised concerning PEST analyses, such as inconsistencies in classifying factors and simplifying complexities in the strategic environment. Besides their use in the strategic management of organisations, PEST analyses, somewhat uncritically, seem to have diffused into other fields, particularly practice-oriented public policy areas such as energy, sustainability, agriculture, forestry, water management, and urban development.

This leads to the overall question of this paper: What insights can be gained regarding the transfer and adaptation of PEST analyses – and their deviates - from the field of strategic management to other fields? More specifically, through a systematic literature review, this paper will answer the following sub-questions:

- What are the patterns in the conceptual foundation and practical use of analyses of the strategic environment, incl. the different acronyms?

- Is the critique raised towards PEST analyses in strategic management literature disseminated to other areas? And how?
- What are best practices in including natural resources in analyses of the strategic environment?

Keywords: Strategic and macro environment, PEST analyses, natural resources, public policy

Futures research theory and methodology

Time: Friday 14 June at 12:45-14:30

Methodological innovations in addressing online misogyny: A Delphi-based scenario approach

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The escalating prevalence of misogyny and online hate speech, exacerbated by rapid technological advancements, presents a big challenge. Social media's evolution has transformed individuals into prosumers – producers and consumers – of content, facilitating the dissemination of hateful material. Despite intervention efforts and research, online gender-based harassment continues to escalate, posing threats to women's well-being. Urgent comprehensive and long-term strategies are needed to both combat and prevent online misogyny, as existing measures inadequately address its complexity. Therefore, a proactive approach to tackling online hate content is crucial. The Delphi and the scenario method are used to assess current countermeasures, evaluate future strategies, and anticipate changes until 2040. Through a Delphi-based scenario approach, and using different variables, three clusters of future projections were identified, laying the foundation for future scenarios development. The resulting future scenarios range from dystopian outcomes to hopeful ones driven by education, advocacy, and technological innovation, underscoring the need for proactive, collaborative efforts.

The research underscores the complexity of combating online misogyny, advocating for comprehensive planning and innovative solutions. By employing multiple strategies and fostering collaboration, online misogyny can be confronted, creating inclusive digital spaces devoid of discrimination or harassment. For policymakers, targeted investments in effective preventive and countermeasures are recommended to address this complex issue's future implications.

The methodological innovations proposed in this study are: 1). Panel selection through bibliometric research; 2) A Delphi approach for a complex evaluation of current and future countermeasures against online misogyny. 3). Integrating advanced statistical methodologies to analyse Delphi results and generate fuzzy clusters. 4). Developing three future scenarios starting from the fuzzy clusters. 5). Visualising Delphi results and fuzzy clusters using ternary plots and box-plots. 6). Using generative AI tools to expedite and objectify scenario writing and to draft the relative policies.

Keywords: Future Scenarios, Online hate speech, Delphi method, Artificial Intelligence

The Future of English as a Foreign Language (EFL) in Nordic Countries: A Critical Futures Research

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This study employs the Six Pillars methodology within Futures Studies, developed by Sohail Inayatullah (2008), to critically analyse the landscape of English as a Foreign Language (EFL) in Nordic countries. The Six Pillars framework provides a structured approach to understanding and shaping future scenarios, guided by concepts of Mapping, Anticipating, Timing, Deepening, Creating Alternatives, and Transforming the future.

This research engages English language practitioners from the five major sovereign states in the Nordic region—Finland, Denmark, Iceland, Norway, and Sweden—through in-depth interviews and collaborative workshops. These practitioners, selected for their expertise and diverse viewpoints, offer valuable insights into current challenges in the EFL landscape. The workshops foster rich exchanges of ideas and complement qualitative data from interviews, supported by a comprehensive review of scholarly literature.

The study emphasizes the importance of a future-oriented and holistic approach to the English language situation by examining the historical evolution and current status of EFL, considering the dynamics of multilingualism and intercultural understanding in response to technological advancements and global changes in Nordic countries. By utilising the Six Pillars methodology, this research deconstructs existing narratives about the future of EFL, broadens the range of plausible futures, and enriches public discourse with alternative narratives. It aims to provide actionable insights for EFL practitioners and stakeholders, promoting a more adaptive and dynamic approach to the English language amidst the evolving global context.

Keywords: English as a Lingua Franca, ELF, Nordic countries, Futures Studies, Six Pillars methodology, Future scenarios

Images of the "sustainable" future in the history of car design

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Over the past decades unsustainable industrial production – in which design has played an active part – has rapidly and on a large scale eroded our potential futures by degrading the life-supporting conditions of our biosphere. Products and things have generated severe environmental problems as themselves, not to mention the emissions or the other effects misdeemed as “external”. Design theorist Tony Fry names this tendency “defuturing”. Simultaneously, and rather paradoxically, design has been – and still is – one of the most effective ways to plan and to implement more sustainable societies.

When considering variable future expectations (Koselleck) industrial design had carried within during the past century, car design holds essential importance. Depending on the circumstances, the future of the car has been perceived as an attainable utopia or as an accelerating crisis. What is more, the future of the car has also influenced extensively on more general future expectations within the society. Concept cars that were developed during the postwar period in the United States are the most well-recognised and tangible example of this future orientation within the car design. These vehicles were the car industry’s primal apparatuses for envisioning and manipulating the future.

This paper concentrates on the “images of the future” that concept cars represented at the turn of the 1970s. During this unstable period, the car industries were forced to confront numerous issues that were related to sustainability – and as a result – the images of the future of the car were permanently altered. By presenting different images of the future, the car industries were seeking to reconcile the “limits of growth” and the dreams of ever-more prosperous future. Toyota EX-III (1969) envisioned a future with inter-city “super-highways”, while a few years later, Daihatsu BCX-II (1972) was presented as a car of the future which would have been fully electronic with top speed of 20 km/h.

Keywords: design; industrial design; car design; future; concept car; history

Grand Theory of Sustainable Development with a case study illustration

Luukkanen, Jyrki; Vehmas, Kaivo-oja, Jari; O'Mahony, Tadhg & Saunders, Anaely

Finland Futures Research Centre, University of Turku, Finland

One crucial topic in the sustainable development discussion has been the interconnections between environmental, social and economic development. The role of economic growth has caused debate about whether it is needed for social sustainability or whether degrowth is required for environmental sustainability. This presentation uses the Sustainability Window (SuWi) approach as a theoretical basis for the analysis. The SuWi approach combines the three dimensions of sustainability in a coherent framework and makes it possible to determine the maximum economic output (GDP) to remain within the ecological boundaries and, at the same time, the minimum economic output to secure social sustainability. We have analysed all possible 32 combinations of theoretical development paths related to environmental, social and economic development and the changes in environmental and social productivities of GDP. Only four out of these 32 theoretical development paths are sustainable and the interesting result is that two of these sustainable paths are related to economic growth and two are related to economic degrowth. The presentation provides mathematical equations for determining the minimum and maximum levels of GDP for determining sustainability. The use of the SuWi approach is illustrated with a case study using different indicators for social and environmental development.

Keywords: Sustainable development, gross domestic growth (GDP), economic growth, environmental pressure, nature, social development, sustainability scenarios, Finland, Sustainability Window method, case study

Workshop: From forest bioeconomy to sustainable biosociety: Interactive interpretation of weak signals for anticipatory governance

Time: Friday 14 June at 12:45-14:30

Facilitators: Mauno, Tuomas^a; Hujala, Teppo^a & Pelli, Päivi^b

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Forest bioeconomy can be defined in several ways, and the sustainability of using natural resources is understood ambiguously. Current production-based forest bioeconomy is envisioned to transform into a sustainable biosociety that combines well-being of society and the environment. To achieve this vision, narrative capacity, collective intelligence, and skills to reframe the future are needed. Horizon scanning, to identify and interpret weak signals of change also outside the current operating environment of forest bioeconomy, is challenging for the professionals and organisations of present forest-based sector, because we usually only recognise signals that fit our current worldview. Interactive methods for interpretation and sensemaking can widen up filtering of signals, and help discovering the opening opportunities and hiding threats of a sustainable biosociety. In this session, we will utilise signals of change collected in a previously organised horizon scanning exercise and scrutinise them for the assessment of anticipatory governance of natural resources. After an introductory presentation, the workshop participants will practice interpretation with selected signals focusing on questions related to anticipatory governance e.g., how is the future conceptualized, what kind of present-day actions for weak signals can be created, and what could be their implications. The aim of this session is to extend the use of horizon scanning for anticipatory governance of natural resources to process the collected signals of change of forest bioeconomy more effectively. We consider how horizon scanning may contribute to both probable, plausible, pluralistic, and performative conceptualizations of future in natural resource use, thus, extending the filters for signals to enable innovative and transformative use of future.

Keywords: Forest bioeconomy, Biosociety, Weak signals, Interpretation, Filtering, Anticipatory governance

SESSION 5 at 14:45-16:30**Special Session: Earth trusteeship: An ethical framework for Governance and the UN Summit of the Future 2024**

Time: Friday 14 June at 14:45-16:30
 Facilitator: Gunasekera, Neshan
 Raoul Wallenberg Institute, Sweden

This paper aims to provide an overview of principles of Earth trusteeship, adopted in 2018, as an ethical framework for governance, including natural resources, at the local and global levels. It will elaborate on its relevance to decision making processes concerning the future, including at the much-anticipated UN Summit of the Future 2024.

It will highlight some key developments since Stockholm 1972 through collective efforts such as the Earth Charter agreed in 2000, to the Maastricht Principles on the Human Rights of Future Generations and findings of the Global Climate Commission Report last year.

These efforts attempt to encapsulate the wisdom within principles of Indigenous Peoples systems, that demands an inter and intragenerational (justice/equity) orientation in any meaningful decision making (natural governance) regarding the future.

The United Nations (UN) Summit of the Future 2024 offers another opportunity to revisit these ethical considerations for achieving just transformations, despite the many nuanced challenges facing the multilateral system and our planet. Whilst several processes are ongoing with its preparations, including the wider UN reforms agenda or UN 2.0 and an outcome referred to as a Pact for the Future, including a Declaration on Future Generations. It is important to bring into these processes these normative aspects through a practical lens and applied meaningfully. The paper will also discuss the proposal to establish a UN Special Envoy on Future Generations, which has gained acceptance through the efforts of several organisations and networks, and other developments surrounding governing the global commons such as litigation ongoing at the international level.

Keywords: Earth trusteeship, intergenerational equity, Future Generations

Workshop: Co-create a Futures Literacy Game Concept – FuLiBRe Pilot 1

Time: Friday 14 June at 14:45-16:30
 Facilitators: Balcom Raleigh, Nicolas; Richards, Martyn & Jokinen, Leena
 Finland Futures Research Centre, University of Turku, Finland

Co-create an experimental Futures Literacy game concept aimed at growing capabilities for sustainability innovation and business renewal. Reconfiguring how humans consume or utilise natural resources, produce or reuse waste, shape and co-inhabit ecosystems, will require new capabilities across our societies and in our businesses. Purposeful games and meaningful play allow experimentation with new ways of doing and being in a low-risk, high-accessibility format.

Futures Literacy (FL) – a capability to diversify, expand, and vary how and why models, scenarios, or images of the future are generated and used (cf. ‘futures literacy’ as proposed by Riel Miller) – holds potential to enable businesses to renew their priorities, models, and functions in relation to their use of natural resources, and to address climate change. Games of many kinds are used in futures and foresight work to elicit heightened engagement, reduce barriers to creativity, create memorable experiences, and deepen reflection, holding the potential to drive social learning.

In this workshop, participants test a first iteration of a futures literacy game-concept creation workshop designed by the Futures Literacy for Business Renewal (FuLiBRe) project, which conducts interventionist research to co-create and test games with sustainability innovators which support futures literacy development. It will start with a briefing about sustainability issues, business renewal, futures literacy concepts, and the key characteristics of games. Participants will then work in small groups to invent FL game concepts which could help people practice remixing their modes of anticipation in support of business renewal to address issues of sustainability.

The workshop is designed to be mutually beneficial to organisers and participants. The workshop proceedings will inform the FuLiBRe team's next version of this FL game-concept generating workshop design. Participants will have an opportunity to gain new ideas about applying purposeful games, collaborate with FL and natural resource experts, and invent FL game concepts in an encouraging and supportive atmosphere. The games prototypes produced are a common resource that we encourage participants to experiment with throughout the conference – e.g., by inviting others to play at conference coffee breaks, meals, or after-hours activities. Attendees of this co-learning event will co-inquire into the question: What kind of games can we play to grow our futures literacy? How can futures literacy drive business renewal so societies use natural resources more sustainably?

Keywords: Business Renewal, Futures Literacy, Purposeful Games, Sustainability Innovation

Workshop: Experiencing regeneration: Immersive AI technology for more agency in strategic foresight

Time: Friday 14 June at 14:45-16:30

Facilitators: Lampert, Julia; Stock, Karen; Berndt, Rosa & Burghardt, Jochen
2bAhead Germany

The 21st century confronts humanity with urgent challenges - unsustainable resource consumption, ecological degradation, and climate change. To address these interconnected crises, we need radical transformations in our relationship with nature. This session explores the potential of immersive Artificial Intelligence (AI) technology to facilitate such transformations as a future tool for Strategic Foresight and Future Science.

We propose that immersive AI experiences can foster agency, the capacity to act effectively in the world. By stepping into simulated environments designed to mirror the intricate dynamics of natural systems in long term futures, individuals and communities can experiment with diverse regenerative practices on a virtual landscape. Immersive AI and procedurally generated environments tailored to the individual user can not just amplify a sensory experience of future but foster a deeper connection with the ecological world and possible as well as likely scenarios. This is crucial for motivating pro-environmental actions, fostering the implementation and action in future-oriented regenerative practices.

This presentation will introduce a fictional Experiencing Regeneration Project, which leverages current technological tools in order to create an emotional connection of regenerative landscapes. We will also discuss the potential revolution of spatial computing showcasing a prototype design of the apple vision pro.

The themes are:

Empower stakeholders to visualize and co-design regenerative landscapes.

Educate communities about the future impact (positive and negative) of human actions and ecological outcomes.

Inspire individual and collective action towards sustainable futures, by instilling a feeling of agency over the future.

Drawing on insights from future human-computer interaction, environmental psychology, and futures studies, we will also discuss the ethical considerations and potential pitfalls of using immersive AI for environmental education and engagement.

Ultimately, we argue that truly Experiencing Regeneration offers a promising avenue for Foresight & Future Studies in the Realm of Natural Resources, fostering ecological agency and accelerating the transition towards a more sustainable future.

Keywords: Immersive AI, Virtual Reality, Agency, Regeneration, Environmental Education, Sustainable Futures

Workshop: Reimagining the future: CIRAN's 2035 scenarios for alternative and sustainable CRM extraction practices

Time: Friday 14 June at 14:45-16:30

Facilitators: Robert i Campos, Helena^a; Vigna, Anna Chiara^b; Correia, Vitor^c; Lopes, Luis^d & Konrat, Marco^e

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The EU-funded CIRAN project (GA n.101091483) seeks to reconcile two societal objectives: the safeguarding of environmentally protected areas and the enhancement of socio-economic resilience. It works to collectively develop policy frameworks for the sustainable and socially responsible extraction of Critical Raw Materials (CRMs) in protected areas, by bringing together a multi-stakeholder network of governmental, research, industry, and societal actors. Such frameworks demand 'social contract' models encompassing the dynamics, linkages, and complexities of coupled socio-ecological systems in a rapidly-changing human, natural, technological, and economic environment, with the growing need for CRMs and the will to boost EU CRMs' autonomy.

CIRAN's approach and methodology develops diverse 2035 scenarios to assess the possibilities for alternative futures connected to the (ab)use of and dependency on natural resources for societal subsistence. The workshop at the 'Futures Conference 2024' will broaden the spectrum of perspectives collected until the date, hence serving as a tool to test, validate, and possibly reconfigure the formulated hypothesis in the form of future scenarios. CIRAN actively combines expertise on CRMs and extractive industries with socio-environmental sciences, working on the interplay between drivers of change and their potential impacts on the human and non-human environment in the construction of possible futures for CRMs throughout their value chain. Through a foresight-oriented research methodology, combining horizon scanning, Delphi surveys, and expert workshops, CIRAN will expose gaps and vulnerabilities related to the critical need for natural resources, while pinpointing the consequences of policy decisions that nevertheless exclude societal views and local community narratives; hence, failing to undertake a systematic and contextualised assessment including key dependencies and sensitivities.

Overall, the proposed workshop to be held at the 'Futures Conference 2024' in Turku will be practical-oriented, highly motivating participants' engagement by facilitating a safe space for dialogue and knowledge-sharing, while also encouraging philosophical discussions and forward thinking.

Keywords: Critical Raw Materials, Sustainable Extraction, Community Engagement, Circular Economy, Environmentally-protected areas, Scenario building

Workshop: Teamcentive – natural resources innovation game

Time: Friday 14 June at 14:45-16:30

Facilitator: Pitkänen, Mikko
Propellerhat Management Oy, Finland

Teamcentive is an evidence-based learning game, built by some of the leading software developers and researchers working on the psychology behavioural learning and educational games. It is optimal solution for learning and tackling issues related to teamwork when working with new innovations related to natural resources. It is based on ecosystem level behavioural science of innovation: how teams and groups of individuals interact and how they are incentivised when solving problems?

Methodology is an online mobile learning game that is played on individual mobile devices web browser. The game has optional difficulty levels, and number of players is typically ranging from 10-40 per session. The best outcomes are expected when a 2h workshop is held with 10-40 persons and 4-8 subsequent gaming sessions are played with the same group of people at the same time. The host of the session produces a narrative of what is happening followed by a dialogue of the participants. The result of the teamcentive session is a dialogue of innovation management, teamwork and incentives on collaborative problem solving.

Outcomes and data can be documented in the conference proceedings after the live session has taken place.

Keywords: Innovation, teamwork, incentives, natural resources

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