Editorial

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The 6th sustainability conference at the University of Akureyri, co-hosted by the Environmental Council and the Stefansson Arctic Institute at the University of Akureyri, received more abstracts and registrations than ever. Albeit globally, public interest in the climate crisis decreased over the past year in view of the threats to democracy, violation of international law at a large scale, economic pressures, incinerated by unequal wars and genocide, climate change does not stop. By contrast, it was accelerated by the very same wars and genocide, the very same demolition of democracy, the economic crises, and the shift in attention. Scientific, physical evidence makes the dire reality of the accelerating crisis clear: 2025 has been one of the top three warmest years on record, and ocean heat content reached dangerous levels. The world is not on track to meet the 1.5°C target.

It is difficult to provide a grain of hope to those who are suffering the most from the crisis, who lost their existence to droughts, floods, storms, and who are displaced and forced migrate because their homeland has become or is on the way to becoming unlivable due to extreme heat or other extreme weather.

But there is hope. Since the adoption of the Paris Agreement ten years ago, temperature predictions have fallen from 3 to 3.5°C to 2.8°C, and full implementation of Nationally Determined Contributions would bring us down to 2.3-2.5°C. Some sources describe the situation of the world as standing on “a fragile plateau”, as emissions are still rising, but more slowly.

More than ever, science is needed to bring this curve down, to move us fast forward towards the original goal. This is the ultimate purpose of this conference: we want to provide a platform for the communication of problems arising from unsustainable practices, ideas, and solutions to these problems. We aim to create a community that, in a concerted effort, brings back attention to the pressing need to decrease our CO2 emissions, pollution, and all the other unnamed negative impacts of human existence on this planet. At the same time, we want to celebrate those who provide solutions, highlight their efforts and, in doing so, provide a grain of hope.

This year’s keynote address will be delivered by Jukka Heinonen, Professor in Engineering and Natural Sciences at the University of Iceland. As an expert in CO2 footprinting, he provides an analysis of how national emissions accounting creates a “low-carbon illusion,” making affluent Nordic countries appear as climate leaders while outsourcing much of their emissions.

Among these outsourced emissions, the negative impact of artificial intelligence (AI) is not directly discussed in any of our talks and posters – but most people are now aware that AI has an insatiable thirst for energy and water. But what if we use AI to benefit climate change? Scientists including Tom Barry and Magnús Smári Smárason utilize AI to accelerate the evaluation of biodiversity effects of climate change, ultimately providing up-to-date information to policy makers and arguments for further action. In doing so, they introduce the Arctic Tracker, an AI-assisted platform for assessing CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) effectiveness in protecting Arctic species, highlighting the need to couple trade regulation with climate adaptation and habitat protection.

While we should be interested in conservation of biodiversity, the impact of warming in the North and specifically the oceans is also an economic issue. Hreiðar Þór Valtýsson uses a

novel cod equivalents (codeqs) metric to assess changes in the relative value of northern fisheries since 1950 and examine their relationship with observed ocean warming trends.

Moving towards a considerably smaller scale of life, studying microorganisms in extreme or shifting habitats increasingly informs various fields of sustainable development, including ecosystem monitoring and climate adaption strategies. This is especially important in habitats that are vital yet severely threatened by the changing climate. Additionally, various microbes isolated from these areas prove to be especially competent and useful in valorization techniques of e.g. bioethanol and hydrogen production, underlining the importance of biotechnology in improving industrial processes, leading to a greener route towards the production of industrially important solvents. These topics are highlighted in this years' conference with a special microbiology session. Oddur Þór Vilhelmsson will unveil the green curtains of the effects climate change and habitat type have on lichen-associated microbiomes like *Peltigera* sp. (dog lichen) while Eva María Ingvadóttir and Ingunn Ósk Grétardóttir turn up the heat with the contributions that biotechnology and heat-loving microorganisms bring to greener industrial processes.

Turning towards hope, the conference features multiple case studies, among them by Belen Garcia Ovide explores community perceptions of the Mission Blue "Hope Spot" designation in 2023 for the area encompassing Skjálfandi Bay, Eyjafjörður, and Grímsey in Northeast Iceland. She presents a pilot resident survey showing strong local support for the Hope Spot and further marine protection, suggesting local readiness for sustainable, legally binding ocean management.

A series of lectures from Eimur, a local public-private partnership/cluster focused on energy, geothermal resource utilization, and innovation in North Iceland, gives further hope that solutions exist. Solutions that not only solve problems with pollution but generate economic value out of them. Presented case studies feature valorization of waste water from industries and methane from landfills. Other case studies focus on more efficient use of resources, such as options for the use of excess hot water that is discharged from geothermal sites in North Iceland.

Amid today's precarious global challenges of climate change and social inequality, Jules Pretty contributes with reflections on the vital role of stories in helping us make sense of

crisis, highlighting how new forms of storytelling can inspire courage and guide us toward collective transformation. In a similar way, Lars Keller calls to action: scientists and teachers play a crucial role in shaping attitude and behavior of future generations. The sustainability conference at the University of Akureyri is exactly this: a platform for scientists and educators, entrepreneurs and individuals to gather and share concerns, solutions, and visions for greater sustainability.

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Keynote Address

Affluence and the climate-sustainability illusion in the Nordics

Jukka Heinonen, heinonen@hi.is

University of Iceland, Iceland

Keynote, on-site oral presentation (talk)

National climate mitigation focuses on emissions occurring inside national borders. This allows highly-developed, typically affluent and service-oriented, countries to appear as low-carbon locations in comparison to countries mainly producing for export. These countries do not produce what their societies need to operate like they do, but instead focus on using what is produced elsewhere, typically with a cost benefit compared to local production. From a climate perspective, rather than leading global climate mitigation, these countries actually 'outsource' their emissions. The Nordic countries are textbook examples of them. They are highly affluent societies focused on consumption, and particularly on consumption of imports, producing only a fraction of all the goods and services traded within their borders. Furthermore, their societies are also highly mobile, meaning that their residents actively participate in consumption outside their borders through international travel. At the same time, the Nordic countries have been relatively active participants in the global climate negotiations, and have ambitious national mitigation targets in place, which leads to an image of them as forerunners in climate change mitigation, both among their own residents and internationally. This can be called a 'low-carbon illusion' about them. Internally, it might lead to lack of will to engage in low-carbon lifestyles following from a perception that there is no need. Internationally these countries might be considered as benchmarks or examples to follow, when at the same time they place among those with the highest per capita global climate impact.

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Session 1: The Arctic, Conservation, and Climate Change

Trading for Conservation: Leveraging AI to evaluate CITES's Impact on Arctic Conservation.

Tom Barry & Magnus Smári Smárason, tom@unak.is; magnussmari@unak.is

University of Akureyri, School of Humanities and Social Sciences, Iceland

In-person on-site oral presentation (talk)

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) plays a pivotal role in regulating global wildlife trade, yet its effectiveness in the rapidly changing Arctic remains poorly understood. Using the Arctic Tracker, an integrated assessment platform combining CITES trade records, conservation status data, and catch statistics, this paper evaluates protection effectiveness for 43 Arctic species spanning five decades. This study shows that while around one-third of species display stable or improving populations under CITES protection, most continue to decline due to climate change, habitat degradation, and limited enforcement capacity. Despite overall reductions in legal trade volumes, illegal and unreported trade persists, undermining conservation gains. The Arctic Tracker designed and built by the authors enhances the transparency and reproducibility of CITES performance assessments, providing a scalable model for evaluating multilateral environmental agreements. These findings highlight the need for integrated approaches that couple trade regulation with climate adaptation and habitat protection to safeguard Arctic biodiversity.

This project employed a progression of generative AI tools to accelerate code generation, documentation, and literature synthesis—reflecting the rapid evolution of AI model capabilities during the project period. Species descriptions were generated from peer-reviewed literature using citation-aware AI systems (Scite.ai), with structured output extraction conducted by Google’s Gemini 2.5 Pro, drawing from 470 scientific sources. All AI-generated content was verified by human experts. This approach greatly reduced the time, labour, and costs associated with data discovery, harmonization, and analysis, which without AI would have taken a large development team and several months of work.

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Are subarctic nations' fisheries benefiting from climate change?

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University of Akureyri, Iceland

In-person on-site oral presentation (talk)

Assessing performance of fisheries through value of catch arguably offers deeper insight than traditional volume-based measures, which overlook large price differences among species. This study applies a novel cod equivalents (codeqs) metric to evaluate changes in the relative value of northern fisheries over since 1950 and to explore whether these shifts correspond with ocean warming trends observed. The results show that while total catch volumes have declined since the 1970s, the aggregated relative value of catches has remained stable at around five million codeqs per year. At the national level, Greenland, Norway, Russia, United States, and the Faroe Islands have experienced increased catch values, largely due to expanded groundfish and shellfish fisheries, while Denmark, Iceland, and Sweden have seen declines. Changes were insignificant for Canada and Finland. Despite localized gains, particularly in the Barents Sea and around Greenland, the analysis provides little consistent evidence that warming oceans have produced overall economic benefits for northern fisheries. Instead, factors such as improved management, changing species composition, and market dynamics appear more influential than temperature trends in shaping the long-term value of Arctic and subarctic fisheries.

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The RECET project and its progress in NE-Iceland

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In-person on-site oral presentation (talk)

The LIFE-RECET project supports rural municipalities in Iceland to phase out fossil fuels by strengthening local capacity for accelerating the clean energy transition. While Iceland's electricity and heating are almost entirely renewable, transport on land and sea remains heavily dependent on oil, creating a significant emissions challenge. The RECET project has contributed to clean energy and climate action in at least three ways in Northern Iceland.

First, RECET participants held five co-creation workshops with ten municipalities, guiding participants through future visioning and practical action planning. This process produced the RECET Action Bank, a set of 49 realistic climate and energy measures targeted for municipalities to implement individually or in collaboration. Each action includes implementation guidance and links to Iceland's national climate plan, easing replication of actions in other municipalities.

Secondly, through the RECET project, data-driven planning was strengthened through a regional oil sales analysis, covering the years 2010–2020, and visualized in a public Fossil Fuel Dashboard. This tool provides transparent insights into fuel use by region and sector. This is the first time such data, broken down by geographical regions, has been made available to the public.

Thirdly, building on these foundations, a regional working group representing all ten municipalities completed a climate action plan for the Northeast of Iceland focused on a small set of realistic actions for the next two years.

These initiatives demonstrate that co-creation, actionable tools, and transparent data can overcome capacity barriers and accelerate the clean energy transition in rural regions.

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Session 2: Microbiology

Climate warming habitat shifts as revealed by dog lichen microbiomes in Icelandic and UK habitats

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University of Akureyri, Iceland

In-person on-site oral presentation (talk)

Dog lichens (Peltigera spp.) are characteristic of several Icelandic habitat types, including forestries, various heathlands, boreal snowbeds, and more. The ongoing rapid warming of the Arctic is likely to lead to shifts in vegetation coverage and composition, although the extent of such changes and effects on different species are yet poorly understood. As symbiotic organisms, lichens may be fairly resilient to environmental changes due to the dynamism conferred by the interactions among the various microbes making up the lichen holobiont and its associated microbiome. Nevertheless, shifts may lead to outcompetition by faster-growing bryophytes and other plants. To what extent do habitat type and climate influence the composition and activities of lichen-associated microbiomes? Are the symbiotic partners likely to temper or exacerbate these shifts? Will a warming climate lead to decreased health of lichen holobionts? Will a warming climate affect specific microbiome functionalities? Attempting to shed light on these and similar questions, we set out to investigate the metabolomes and microbiomes of several Peltigera spp. in habitats ranging from NE-Iceland tundra to temperate rainforests in Cumbria, England. We have analysed their microbiomes by amplicon-based metabarcoding, their metabolomes by LC-MS/MS, and isolated several key bacterial species with putative roles in auxiliary photosynthesis, nitrogen fixation, nutrient scavenging, and more. Preliminary results indicate a marked difference in both microbiomes and metabolomes between lichens growing in Icelandic Arctic habitats vs. those growing in the more temperate climates of Scotland and England. This difference holds true whether analysed across lichen species or for individual species such as P. membranacea or P. leucophlebia.

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Turn up the heat: the role of thermophilic microbes in sustainable development

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In-person/online oral presentation (talk)

Genus *Thermoanaerobacter* comprises bacteria isolated from hot springs around the globe including Iceland. They are efficient biofuel producers and have been observed to convert organic acids to their corresponding alcohols, although the exact underlying metabolic pathways responsible for the latter remain unknown. Recently, a number of *Thermoanaerobacter* spp. were grown in triplicate in the presence of 29 acids (C2-C7) using glucose as reducing potential. Cultures were incubated for 48 h after which reduced products were analyzed via gas chromatography and remaining glucose colorimetrically. All strains reduced butyric and isobutyric acid with each strain revealing a distinct substrate range. The effects of using mannitol, a macroalgae-sourced sugar, are currently being evaluated as it has a higher reducing potential than glucose and can be obtained from non-terrestrial biomass, including brown seaweed. Additionally, available genomes of *Thermoanaerobacter* spp. of interest have been manually searched for genes related to mannitol utilization revealing phosphoenolpyruvate (PEP): mannitol-dependent phosphotransferase systems (PTS) which should encode for the necessary enzymatic machinery needed to generate the reduction potential necessary for organic acid reduction. The end goal is to use *Thermoanaerobacter* spp. as whole-cell biocatalysts in the reduction of carboxylic acid rich anaerobic digestates prepared with aquaculture waste. This would present a promising green route towards the production of industrially important solvents and other chemical building blocks via waste stream valorization which is one of the pillars of circular economy. This talk will present results from the aforementioned organic acid reduction experiments, whole genome investigations, and broadly discuss how biotechnology plays a role in sustainable development.

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Session 3: Pollution

The Global Critical Minerals Rush and Its Developmental Implications for Resource-Rich Countries in the Global South: A Case Study of Lithium Extraction in Zimbabwe.

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Stellenbosch University, South Africa; University of Akureyri

In-person on-site oral presentation (talk)

The growing global demand for critical minerals, particularly lithium, has triggered a resource rush with profound implications for the Global South. Lithium, a key component in energy storage technologies and electric vehicle batteries, is central to the global transition toward green energy. Zimbabwe, endowed with significant lithium reserves, has emerged as a strategic player in this evolving geopolitical and economic landscape. This paper examines the dynamics of the global critical minerals rush and its socio-economic, environmental, and governance implications for resource-rich developing countries, using Zimbabwe as a case study. It explores how global supply chain pressures, foreign direct investment, and extractive industry policies intersect with local development priorities, raising questions about resource sovereignty, equitable benefit-sharing, and sustainable development. The analysis highlights the risks of neo-extractive dependency, environmental degradation, and community displacement, while considering opportunities for industrialization and value addition. Ultimately, the study argues that without robust governance frameworks and inclusive policy approaches, the critical minerals boom may reproduce historical patterns of exploitation, undermining the developmental aspirations of the Global South.

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ICEWATER: Valorising wastewater

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In-person on-site oral presentation (talk)

LIFE-ICEWATER is Iceland's largest EU LIFE-funded project, focused on improving water management and wastewater treatment across Iceland. The project involves 22 Icelandic partners, including municipalities, research institutions and utilities, working on seven interconnected subprojects to monitor water use and quality, enhancing purification methods, and promoting coordinated water management.

One of those subprojects focusses on the treatment of slaughterhouse wastewater from the Kjarnafæði Norðlenska's slaughterhouse in Húsavík. This water is rich in fats, oils, grease (FOG), proteins, and organic matter and flows untreated through municipal sewer systems into coastal environments. This situation is common across Iceland as industries typically do not treat their wastewater before discharging into municipal systems.

ICEWATER turns this challenge into an opportunity with a mobile, containerized pretreatment plant to be installed at the slaughterhouse in Húsavík. The plant will treat the effluent on-site, extracting high-value FOG, capturing organic matter, with the aim of converting recovered materials into energy, e.g. through collaboration with Gefn, a green chemistry innovation company. The pretreatment plant demonstrates how industrial "waste" can be valorised, lowering disposal costs and relieving strain on municipal wastewater systems and water bodies.

Overall, this demonstration highlights the potential of circular and sustainable practices within Iceland's food industry, supporting innovation, meeting stricter environmental standards, and providing a scalable model for industrial wastewater management. LIFE-ICEWATER shows how innovation, collaboration, and resource recovery can turn industrial effluent into environmental and economic value.

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Session 4: *Story* and Vision for Climate Change

Story for Climate and Nature Recovery

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On-line oral presentation (talk)

Story's both new and ancient. It's a device common to every human culture. It has fifty thousand years of hi-*story* yet is often misunderstood. Put simply, the patterns of good *story* match the shapes of people's lives.

When stories are heard, we learn something true about the world, about our inner selves too. Through *story*, we practice life itself. Yet the rolling news is bad. Crises of climate, nature, social inequality. Now all over. And causing great anxiety.

These days, we find ourselves in the midst of world-spanning crises of climate, nature and social inequality. All three have the same proximate causes: a type of economy that promotes too much material consumption and a dangerous reliance on fossil fuels. Something is about to change. Yet we have never been here before. We are in the dark forest, at our darkest hour, and there doesn't even seem to be a path.

Berthold Brecht wrote in 1939: “In the dark times, will there also be singing? Yes, there will also be singing, about the dark times.”

These crises signal a need for new forms of *story*-telling, combined with a language of kindness and generosity. Kindness is both a common human state and a fine response to threat. It is selfishness that is the outlier.

You hear that? A pebble strikes your bedroom window at midnight. What now!

Could it be a positive tipping point? When will whole systems change?

Story says whole systems can be transformed. But it’s hard to take the first step. Good *story* provides guidance and architecture, moral content, emotional connection. It creates energy and leadership. It invites wonder.

Today, ice turns to water, summers to fire, gentle rain to storm, the healed to broken. How about too, passivity to hope, bitter to sweet, fear to courage?

Story tells us all about these things. It contains moral guidance; it sets out the differences between right and wrong. It could change everything.

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Transforming Education and Science for a Climate-Friendly Future

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In-person on-site oral presentation (talk)

Education and science play central yet still underutilized roles in enabling the societal transformation required to address the climate crisis. Together with science, education

shapes how societies understand, respond to, and act upon climate change. Yet in their current structures, goals, and incentive systems, education and science often contribute indirectly to the stabilization of unsustainable development pathways.

Through disciplinary fragmentation, growth-oriented logics, competitive performance metrics, and a strong focus on knowledge reproduction, both systems tend to reinforce existing societal patterns rather than fostering the competencies, values, and agency needed for climate-friendly and sustainable ways of living.

As key societal institutions, education and science carry a shared responsibility to contribute actively to sustainable development and climate action. Insights from the chapter *Education and Science for a Climate-Friendly Life* (Austrian Panel on Climate Change Special Report 2023) show that sustainability and climate goals remain insufficiently embedded in educational curricula, teacher education, research agendas, and institutional governance. Inter- and transdisciplinary collaboration is structurally disadvantaged, while transformative learning and research approaches remain marginal. A paradigm shift toward holistic, responsibility-driven, and transformative education and science is therefore essential, integrating system, target, and transformation knowledge.

Addressing complex socio-ecological challenges such as climate change requires strengthened inter- and transdisciplinary collaboration between education, science, and societal actors. Science plays a crucial role in generating robust knowledge and opening reflexive spaces, while education translates this knowledge into competencies, self-efficacy, and action. Practical examples from k.i.d.Z.21 — one of Europe's longest-running climate change research–education cooperation — and related initiatives illustrate how adolescents engage in real-world climate projects that foster critical thinking, empowerment, and active participation in local transformation processes.

Meaningful contributions to a peaceful and climate-friendly future depend on the fundamental reorientation of education and science toward institutions that assume societal responsibility and actively co-shape transformative processes.

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Session 5: Icelandic Case studies

Barriers to changing travel modes in Reykjavik, Iceland

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In-person on-site oral presentation (talk)

Transportation is one of the biggest contributors to urban GHG emissions, and rapid changes are needed to curb the climate impact of urban living. In Reykjavik, Iceland, car-oriented lifestyles dominate, driven by the city's car-centric design. However, the city wants to shift to more sustainable transport modes and lifestyles. A softGIS survey was conducted in early 2025 on the transportation habits and barriers of 1801 residents of the Reykjavik Capital Area. The results indicate that mobility in Reykjavik remains car-dominated, with even regular public and active mode users owning a car for running errands. However, a third of regular car commuters exhibit willingness to change modes. The main barriers for switching to public or active modes include long travel distances and travel time, unreliable bus system, poor connectivity, costly bus fares, and difficulties running errands. We also noted potential differences between native and non-native residents, and between male and female respondents. Respondents with a stronger belief in individual actions impacting the climate were more likely to choose sustainable travel modes and report less barriers to modal change. Climate awareness and education can thus be a strong tool in guiding modal change in transport in Iceland, although convenience and cost remain as main guiding forces behind modal choice. The project is a collaboration between the City and the University, with results feeding into the City's climate actions and policies on reducing transport emissions and moving towards more sustainable urban living.

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Climate Extremes, Infrastructure Risk, and Local Adaptation in Hornafjörður, Iceland

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Colorado School of Mines, United States of America

In-person on-site oral presentation (talk)

Climate-driven hazards are becoming increasingly localized across Iceland, creating growing challenges for infrastructure safety, emergency response, and sustainable development in glacier-influenced regions. In southeast Iceland, the Hornafjörður municipality is experiencing heightened exposure to extreme precipitation and wind events, pro-glacial lake flooding, and landscape instability associated with the rapid retreat of the Vatnajökull Ice Cap. These evolving hazards pose risks not only to critical infrastructure and tourism-dependent livelihoods, but also to human safety, affecting both residents and visitors during extreme weather events. This paper presents a place-based case study that examines how diverse environmental data can be translated into decision-relevant risk information at the municipal scale. Using geospatial analysis and machine learning, the study integrates long-term meteorological records, glacier and hydrological datasets, satellite imagery, and locally informed observations to identify vulnerable locations and emerging hazard patterns. This work is informed by ongoing collaboration with Vegagerðin and Hornafjordur stakeholders, ensuring relevance to operational and planning contexts. The analysis prioritizes transportation corridors, access routes, and locations where climate extremes coincide with infrastructure and population exposure. Initial results illustrate how localized climate signals, such as compound wind and precipitation events, can be linked to practical risk considerations for infrastructure planning and emergency preparedness. By grounding climate analysis in a specific regional context, the study highlights the value of applied, data-driven approaches that align scientific insight with real-world decision-making needs. The Hornafjörður case demonstrates how municipal-scale climate risk analysis can support sustainable infrastructure planning and climate adaptation in Arctic communities, offering insights transferable to other glacier-affected regions facing increasingly complex and localized climate extremes.

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Hot Water Bleeds in Northern Iceland: Mapping Lost Energy for Local Reuse and Innovation

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In-person on-site oral presentation (talk)

Iceland’s abundant geothermal resources support near carbon-neutral district heating, but population growth and rising energy demand are straining existing infrastructure. Long-term sustainability, therefore, requires not only new renewable sources but also reduced system inefficiencies. One such inefficiency is hot water bleeding, which is the intentional discharge of heated water to maintain network stability and temperatures, particularly in rural areas. While this is necessary, it results in the continuous loss of largely unquantified and unused thermal energy.

We investigated whether hot water bleedings constitute a viable and stable source of recoverable thermal energy and explored ways of harnessing this underutilized resource. We systematically mapped and characterized bleeding locations in district heating networks in Eyjafjörður and Skagafjörður, combining operational system data, thermal analysis, and spatial mapping. Our findings identify multiple locations where sufficient unused thermal energy is available for low-temperature applications. Potential applications include heat pump integration, direct local reuse, and coupling with nearby buildings and infrastructure.

One proposed application is a pilot project using waste heat to cultivate snails. Snails thrive in the warm, humid conditions provided by hot water bleeds, making them an ideal low-temperature agricultural use of otherwise lost energy. They are an excellent source of protein, and their by-products are valued in the beauty industry, making cultivation attractive for small-scale local farmers. In our ongoing pilot, local farmers are being trained in snail husbandry. By aligning waste heat recovery with agriculture, this approach

illustrates how overlooked energy losses can be transformed into tangible social, economic, and environmental benefits. Therefore, recognizing and utilizing hot water bleeds can improve resource efficiency, reduce environmental impact, and support resilient, low-carbon energy transitions.

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Shaping the future: Community perceptions of the Northeast Iceland Hope Spot and marine management

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Ocean Missions, Iceland

In-person on-site oral presentation (talk)

The Northeast Iceland area encompassing Skjálfandi Bay, Eyjafjörður, and Grímsey was declared a Mission Blue “Hope Spot” in 2023 based on its unique ecological features and importance to both marine wildlife and local communities. Since then, Ocean Missions NGO, together with other stakeholder groups, has been exploring pathways toward formal, legal marine protection in the region. To assess public perceptions of marine protection, a pilot survey was conducted between October 2023 and July 2024 using a mixed-methods distribution approach, combining online and in-person data collection. The survey was available in both English and Icelandic and targeted residents aged 18 and older living in Northeast Iceland (population: 31,574). A total of 106 participants responded, primarily from Akureyri, Húsavík, and Dalvík. Online responses were collected via SurveyMonkey, and survey data were analysed quantitatively, with results presented as percentages.

Results highlighted key local concerns, including plastic pollution (68%) and the lack of marine protection (52%). Overall, respondents expressed strong support for the Hope Spot designation, with 86% viewing it positively, and 78% indicating support for further marine protection measures. Additionally, 80% of participants felt that large-scale marine industries—such as kelp farming, fish farming, and cruise ship tourism—require stronger

management to safeguard Iceland's marine environment. While broader survey distribution would be beneficial to ensure full demographic representation, these findings provide preliminary insight into community perspectives. The results suggest that communities within the Northeast Iceland Hope Spot are prepared to support legally binding, sustainable marine management that balances conservation objectives with economic activities. Continued community engagement will be essential as the Icelandic government works toward its commitment to protect 30% of Iceland's ocean by 2030.

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Session 6: Posters

Geopolitical Dimensions of Climate Change: Displacement and Migration Flows into the EU.

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University of the Aegean, Greece

On-line poster presentation

Climate change is increasingly seen as a "threat multiplier," exacerbating resource scarcity and destabilizing vulnerable regions, thereby altering global migration patterns. This analysis delves into the geopolitical dimensions of climate-induced displacement, particularly its impact on the European Union (EU). It presents a comprehensive geographical analysis of how environmental degradation in the Global South interacts with existing political frameworks to spur migration towards Europe.

The research critically evaluates the current EU policy landscape, focusing on the interplay between the European Green Deal and the New Pact on Migration and Asylum. A key issue identified is the existing legal gaps surrounding the definitions and protections of "climate

refugees," who often do not align with traditional asylum frameworks. Additionally, the study explores the spatial dimensions of migration flows and the strategic challenges these pose for EU border management and social cohesion.

The authors argue for a transformative approach to both EU foreign and domestic policies in light of climate change adaptation, proposing a shift from reactive crisis management to a proactive integration of climate security into migration policies. The findings emphasize the urgent need for actionable policy recommendations that seamlessly link environmental science with geopolitical strategy, addressing the complexities of migration in the context of climate change.

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Methane Emission Reduction at a Landfill in Northwest Iceland

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In-person on-site oral presentation (talk)

This presentation outlines the Stekkjarvík landfill gas project as a case study demonstrating quick and measurable methane emission reductions through surface covering of an active landfill site. Based on recent studies, the Stekkjarvík site currently produces stable but only partially captured landfill gas flow. Although flaring has been in operation since 2018 and has significantly reduced emissions, analyses suggest that a substantial portion of methane continues to diffuse from the landfill's surface.

The work builds upon a standard IPCC FOD model of landfill gas generation at Stekkjarvík, combining measured gas flows, and site-specific operational data. This work highlights three key points. First, it examines several ways of utilising landfill gas, and the challenges linked to that. Secondly, it highlights the significance of surface-covering as a climate action, independent of downstream energy use, and explains why its benefits cannot be

measured solely by heat or power revenue. Thirdly, it discusses policy and financial considerations, including the gap between the high societal value of methane reduction and the limited private-sector incentive when accounting only for energy sales.

The primary opportunity discussed in this presentation is the installation of a geomembrane cover over an existing landfill cell of approximately two hectares. Such an action has the potential to drastically increase gas capture, converting diffuse emissions into a controlled flow. In climate terms, this could prevent emissions amounting to hundreds of thousands of tonnes of CO_2-eq over the site's remaining lifetime, comparable to the annual emissions of several large fishing vessels. As a result, it can be among the most cost-effective climate measures available to authorities. This presentation is designed for anyone interested in scalable, practical mitigation strategies based on real-world operations.

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Applied Education in Oils and Biodiesel through Laboratory Skill Development Using Cod Liver Oil from an Icelandic Industry

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Federal University of Grande Dourados, Brazil

On-line oral presentation (talk)

The valorization of cod liver, commonly treated as a low-value by-product of the fish-processing industry, represents a strategic opportunity for strengthening the blue bioeconomy and advancing circular economy principles. This study presents the implementation and evaluation of a pilot, practice-based course on oils and biodiesel delivered to undergraduate students at the University of Akureyri. The course was structured as a 40-hour program, comprising 10h of theoretical instruction and 30h of supervised laboratory practice. The small-group, intensive format was designed to promote progressive learning across multiple cognitive levels of Bloom's taxonomy. At foundational

levels, students acquired and consolidated core concepts related to oils, fats, biodiesel production, and sustainability through concise lectures and deep discussions. At higher cognitive levels, the laboratory component enabled students to apply standardized analytical methods, analyze experimental data, and evaluate oil and biodiesel quality parameters in real-world contexts. Practical activities also enhanced technical proficiency through the use of diverse laboratory equipment, including centrifuges, spectrophotometers, iodine chambers, and titration systems. Results show that students successfully carried out the complete oil and biodiesel production chain through hands-on activities under instructor supervision. This included oil extraction, biodiesel synthesis, comparing biodiesel produced from extracted fish oil, vegetable oil, and used frying oil, and comprehensive quality analyses. Parameters evaluated included yield and productivity, visual appearance, acidity, density, water content, sediment presence, viscosity, and transesterification reaction status. The fish oil produced during the course exhibited high quality, obtained through slow cooking at low temperatures, which minimized thermal degradation and preserved desirable physicochemical properties. Biodiesel production was evaluated at three reaction temperatures (60, 100, and 150°C) with a reaction time of two hours. Comparative analysis indicated that the reaction conducted at 60°C achieved the highest yield and best overall quality, meeting key parameters established by European biodiesel legislation. These outcomes demonstrate that students developed laboratory competence, analytical and decision-making skills, and autonomy, effectively integrating theoretical knowledge with applied practice.

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Grænn Iðngarður á Bakka: Pioneering Eco Industrial Parks in Iceland

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In-person on-site oral presentation (talk)

Bakki, a 200-hectare industrial site near Húsavík, benefits from Iceland’s renewable energy

infrastructure, including geothermal electricity from Þeistareykjavirkjun (30 km away), local natural and industrial heat sources as well as direct port access. These features offer significant potential for circular and energy-intensive industries.

Between 2023 and 2025, a development project managed by Eimur and funded by Norðurþing municipality and the Ministry of Environment, Energy and Climate, transformed Bakki from a loosely defined industrial area into a structured eco-industrial park. The project focused on stakeholder coordination and resulted in the establishment of a dedicated development company, enabling a "one-stop-shop" approach for potential investors. Key activities included systematically mapping available resources and developing communication and marketing tools that highlight circular synergies.

The Bakki model can be applied in other parts of Iceland where municipalities will benefit from long-term planning strategies, simplified processes for attracting investors, and clearly outlined sustainability pillars related to resources, circularity, infrastructure, environmental performance, community, and governance.

Early interest from potential tenants shows strong regional momentum, as coordinated planning reduces investment uncertainty and accelerates industrial growth. This proactive strategy is especially vital for rural Iceland, where prepared municipalities can attract jobs, foster innovation, and support resilient local economies aligned with national climate and sustainability goals. Bakki illustrates how integrated planning and stakeholder involvement can transform brownfield industrial sites into sites minimizing environmental impact through co-location and resource sharing.

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The Hidden Cost of Concrete: How Sand and Gravel Mining Threatens Global Water Bodies and Why Recycling is the Answer?

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On-line poster presentation

Global concrete production consumes an estimated 50 billion metric tons of sand annually, according to United Nations reports, causing major geomorphological changes and ecological damage in riverbeds, deltas, and coastal systems worldwide. This intensive, often unregulated extraction is a critical yet underrecognized human pressure on freshwater and marine environments, significantly affecting hydrological regimes, sediment transport, and aquatic biodiversity.

A multi-criteria assessment compared the environmental footprint of natural sand and gravel with recycled alternatives across three main dimensions: resource availability, environmental impact, and material performance. Drawing on recent literature and international datasets, the study evaluates the scale of the resource and environmental challenge and the current state of recycling technologies and materials. Its main objective is to determine how far high-quality recycled aggregates can be produced in compliance with established construction standards.

The analysis shows that unregulated sand dredging causes largely irreversible environmental and hydrogeological damage, including lower groundwater levels, saline intrusion into deltas, and severe degradation of aquatic and riparian habitats.

The review shows that partially or fully replacing natural sand with recycled aggregates and industrial by-products is technically feasible, significantly reduces environmental impacts, and causes no or only minor adverse effects on durability and mechanical performance. Since aggregates make up about 70% of concrete volume (around 40% sand and 60% gravel), substituting river sand or gravel with recycled materials can greatly reduce extraction pressure on aquatic ecosystems.

The shift to a circular economy is not just about resource management; it is also vital for marine conservation. Rapid implementation and enforcement of strong certification schemes and comprehensive regulations are essential to protect global aquatic ecosystems

and prevent further loss of marine resources.

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Eimur: Improved utilisation of resources in North Iceland

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In-person on-site poster presentation

Eimur is a partnership between Landsvirkjun, the Association of Local Authorities and Business Development in Northeast Iceland, the Association of Municipalities in Northwest Iceland, Norðurorka, Orkuveita Húsavíkur and Ministry of Environment, Energy and Climate. Our goal is to improve the utilisation of resources in North Iceland guided by the principles of value creation, sustainability and innovation.

Promoting sustainable use of energy and resources is key to enabling the energy transition and for supporting long-term societal resilience. This involves enhancing the efficient use of heat and electricity and maximising industrial and community side streams. It also includes strengthening collaboration among municipalities, businesses, and other stakeholders. Economic value is reinforced through applied research, entrepreneurship, and innovation within existing companies. These efforts are supported by proactive communication of

opportunities to investors, public authorities, schools, and researchers.

Eimur brings together people and organisations to collaborate on experiments, research and development projects in the fields of energy, natural resources and climate, encouraging international collaboration. Each year, national and international students are welcomed to work on ongoing projects, gaining valuable hands-on experience in the applied sustainability sector, learning new techniques, and building strong professional networks.

We are continuously seeking motivated national and international students to participate in future projects. Students will have the opportunity to work closely with industry partners and researchers on real-world challenges, developing practical skills and experience that support careers in sustainability, energy, and climate innovation.

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