

1 **Title**

2
3 Overcoming “doom and gloom”: Envisioning desirable futures for Arctic biodiversity

4
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43
44 **Abstract**

45
46 We co-created visions of desirable futures for Arctic biodiversity during a workshop which
47 included representatives from academia, Indigenous Peoples, business and policy-making.
48 Appreciating our diverse perspectives, we identified key actions that would enable the positive
49 outcomes shared in our visions: boosting education, rethinking Arctic biodiversity governance,
50 elevating the voices of Indigenous Peoples and the voices of local communities, developing
51 scalable monitoring systems, and evaluating impacts of policies and economic activities.

52 **Main text**

53

54 The Arctic is one of the most rapidly changing regions on the planet, warming at three times
55 the globe average¹. This warming increases the accessibility to the region and accelerates
56 human activities² including industrial development³. These changes have profound impacts
57 on biodiversity and the livelihoods of people that depend on it. They endanger cold-adapted
58 species and the resilience of ecosystems, they increase the likelihood of the spread of invasive
59 alien species and pathogens, and they trigger losses in nature's contributions to people,
60 including the mitigating role of many Arctic ecosystems in global climate-feedbacks². For
61 example, warming causes range shifts in cold-adapted Arctic species, which move north until
62 they reach biophysical limits, while sub-Arctic species move in from the south, resulting in a
63 narrowing of the area occupied by Arctic species⁴. Additionally, the Arctic is experiencing rising
64 pollution levels and new contamination sources are emerging⁵. All this is happening in the
65 context of colonial histories⁶ in a populated region subject to geopolitical tensions,
66 complicating governance and policy-making⁷. Together, these changes paint a bleak picture,
67 and “doom and gloom” has become a dominant narrative about Arctic biodiversity in the
68 media⁸, funding proposals, and scientific publications. However, this narrative prevents us
69 from being proactive and taking the steps needed to create the best possible future for Arctic
70 biodiversity.

71

72 Visioning of “desirable futures” is increasingly recognised as a powerful approach to overcome
73 a “doom and gloom” mindset and facilitate the (transformative) changes needed to address
74 the challenges of the Anthropocene, including biodiversity loss⁹. Desirable futures are those
75 that improve the chances of our societies to overcome and/or adapt to current crises¹⁰ and
76 thrive in coexistence with nature. Futuring allows us to openly explore and evaluate pathways
77 for achieving more liveable futures in an uncertain world¹¹ and can inspire change and
78 innovation¹². The value of desirable futures has been recognised in the context of global
79 biodiversity loss (e.g., Nature Futures Framework^{11,13}) and in Arctic contexts (e.g., “Rights for
80 Life”¹⁴). Inspired by this, we set out to co-develop visions of desirable futures for Arctic
81 biodiversity to overcome the “doom and gloom”, stimulate change and enable backcasting¹⁵,
82 allowing us to identify actions that could make our visions reality.

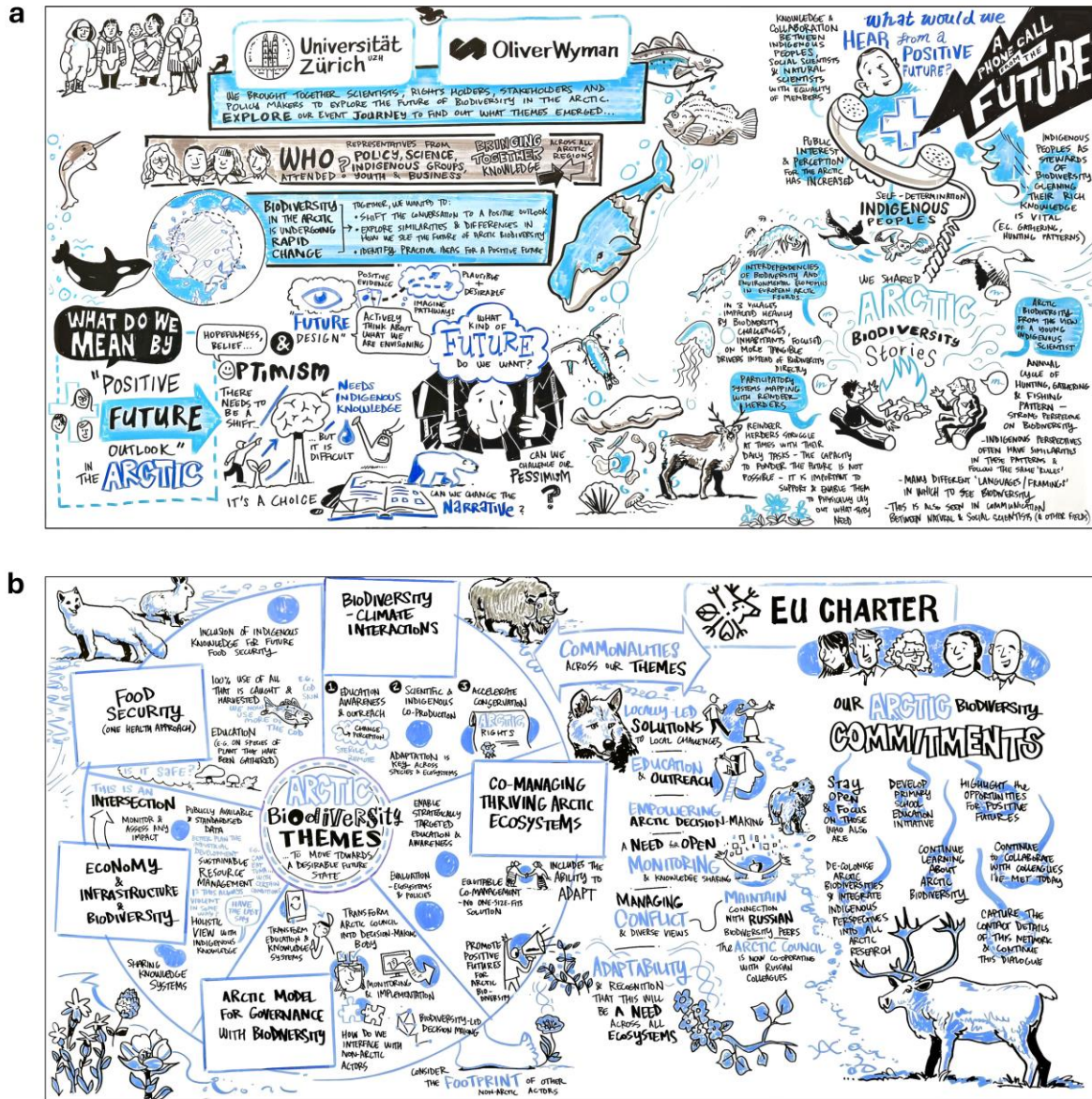
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84 To explore what desirable futures for Arctic biodiversity could look like, we organised and
85 participated in a one-day workshop including representatives from natural- and social-
86 sciences, Arctic residents (including Indigenous and non-Indigenous people), policy making
87 and business. We partnered with industry-based experts on workshop facilitation to maximise
88 the chances of success and open links to the business-sector. The workshop took place during
89 the 3rd World Biodiversity Forum (WBF2024) in Davos, Switzerland, and had three aims: 1)
90 enable participants not familiar with future visioning to actively imagine “desirable futures” in
91 the context of Arctic biodiversity; 2) co-identify shared themes in these futures and 3) sketch
92 out high level recommendations that could make them reality.

93

94 The workshop consisted of individual and group activities with a focus on co-creation (Fig. 1,
95 Methods and Supp. Methods). We started with a primer on “desirable futures” and three “Arctic
96 biodiversity stories” to set the scene. These stories illustrated marine biodiversity in fishing
97 villages, the annual cycle of subsistence living in a Greenlandic community, and challenges
98 faced by reindeer herders in Europe. Next, each participant developed their own vision of a
99 desirable future using an imaginative phone call made 10 years from now. We shared these

100 visions in small groups and identified common themes. We then built out each theme in small
 101 groups and identified actions that could make our visions reality. We finished with a recap in
 102 the plenary and participants made individual commitments. Thus, the workshop allowed us to
 103 capture differences and commonalities in our visions of desirable futures for Arctic biodiversity,
 104 deepen our understanding of shared themes and identify actions that could enable them.
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106
 107 **Fig. 1: Workshop workflow and outcomes. a)** After introducing the motivation for envisioning desirable
 108 futures for Arctic biodiversity (left), we set the scene with three “biodiversity stories” (bottom-right) and
 109 used an imaginary phone call made in the future to develop our individual visions (top-right). **b)** We then
 110 identified five themes common to our visions (left) and defined actions that could help make our visions
 111 reality (centre). Inspired by the day, many of us made personal commitments (right). Artwork by Oliver
 112 Prothero.

113
 114 We identified five themes that were common to many of our individual visions (Fig. 1b, Table
 115 S2-S7): 1) governance of Arctic biodiversity; 2) understanding of biodiversity-climate
 116 interactions in the Arctic; 3) co-management to enable thriving ecosystems in the Arctic, 4)
 117 economy, infrastructure and Arctic biodiversity; and 5) food security and One Health in the

118 Arctic. Most of these themes are already recognised as important issues in individual
119 disciplines (for example^{3,16–19}), but addressing the associated challenges often requires cross-
120 disciplinary and cross-societal approaches. While working across disciplines may seem
121 daunting, there is strong potential for synergistic effects and co-benefits in the long-term (e.g.,
122 Two-Eyed Seeing). We also recognized the role of Indigenous knowledge for shaping resilient
123 and inclusive strategies for Arctic biodiversity conservation (for example^{20,21}).

124
125 Despite the commonalities we also observed differences in our visions, often reflecting
126 regional or disciplinary backgrounds (also Box 1). For example, some participant focussed on
127 concrete and localised issues (“reindeer are thriving as traditional herding systems are
128 maintained” and “lichen diversity is protected due to co-management of fires”), others on
129 circum-Arctic and global aspects (“regions generating the majority of greenhouse gas
130 emissions take responsibility for the damage they cause in the Arctic” and “the Arctic has
131 become an important contribution for meeting global biodiversity targets”). These differences
132 highlighted that pathways and solutions might not work everywhere or at all levels (one size
133 does *not* fit all) and that it is important to coordinate across geographic regions and at - and
134 across - all levels of societal organisation. We also observed a desire amongst participants to
135 co-create pathways towards desirable futures with representatives across disciplines (social
136 sciences, natural sciences) and knowledge systems (academic, Indigenous). Our workshop,
137 therefore, underlined the importance of recognizing the plurality of perspectives when it comes
138 to the future of Arctic biodiversity, only by doing so can we find actionable solutions that have
139 broad support from all rights- and stakeholders.

140
141 **Box 1: Despite commonalities amongst our visions, our perspectives on individual issues were diverse.**
142 **Appreciating this plurality of perspectives will be critical when further developing visions and policies on**
143 **Arctic biodiversity. In this box, participants volunteered to share personal statements about their visions.**
144

Recognizing the dual pressures of direct climate change impacts and the unintended consequences of mitigation efforts for Arctic Indigenous peoples such as the Sámi calls for an approach sometimes called knowledge coevolution. This involves creating adaptive, community-driven policies that not only preserve biodiversity but also strengthen Indigenous knowledge and self-determination. By foregrounding Indigenous knowledge, fostering collaborative governance, and prioritizing localized, flexible solutions, these strategies can address both the ecological and socio-cultural challenges of a changing Arctic while ensuring the sustainability of Indigenous livelihoods.

Rauna Kuokkanen

80% of the world's biodiversity is found on Indigenous lands. Indigenous Peoples have been for millennia stewarding their lands and they are considered as the most effective stewards of biodiversity. Therefore, it is important to include Indigenous Knowledge in conservation efforts and policy-making processes.

Stanislav Ksenofontov

The Arctic is unique. It is full of vibrant, resilient life that is found nowhere else in the world. Many specialized species live here and we have a responsibility for their continued existence, which—in addition to intrinsic value—offer benefit, well-being and livelihood for those living in the Arctic. The Conservation of Arctic Flora and Fauna play an important role to address the conservation of Arctic biodiversity, and to communicate its findings to the governments and residents of the Arctic.

Inge Thaulow

The private sector has an important role to play in ensuring a healthy biodiversity in the Arctic. It matters to us all and will impact people and business if the biodiversity collapses.

Mads Qvist Frederiksen

New tools for monitoring of critical Arctic biodiversity are urgently needed as a fundamental tool in conservation. However, observation is no longer enough, given that there already is enough evidence for the identification of the underlying problem. The global society will need to reduce its environmental footprints; early education is (maybe the only) key to achieve understanding of this.

Kai Bischof

Working towards desirable futures at a systemic level requires that interdisciplinary work be a rigorous, primary directive rather than a nice-to-have supplement. The interstitial role of generalists and strategic translators can be built into longterm efforts, ensuring that insights (from workshops like this one!) are consistently woven back into ongoing workstreams or catalyse parallel, transformative interventions.

Irina Wang

Half of the terrestrial Arctic lies in Russia. The Russian invasion of Ukraine and its consequences has created a devastating gap in region-specific knowledge generation and transfer. Collaboration between Western and Russian researchers has almost collapsed and many Russian researchers opposing the war left Russia. I encourage studying the Russian Arctic by collaborating with researchers not supporting the invasion & using data and literature already available in Russian and other languages.

Vitalii Zemlianskii

Protecting Arctic Biodiversity, in all its complexity, means that we should not focus only on charismatic species, but on the entire tree of life. Aquatic fungi are pivotal for healthy aquatic ecosystems, but unfortunately highly overlooked. How many species of aquatic fungi are there in the Arctic? How many of them are threatened? All Biodiversity needs to be known, monitored and protected in desirable futures for the Arctic.

Isabel Fernandes

Solution-oriented research and policy decisions are pivotal to overcome the biodiversity and climate crisis, not only in relation to the Arctic. I believe that people need to be given hope that there is a solution, which only works if media and NGOs are not only showcasing the disasters and crises but also elaborate on the many good examples of possible solutions. Therefore, constructive reporting in the media and the solution-oriented work of NGOs is important to convince everybody to move into the environmentally positive direction.

Simon Jungblut

145

146 We determined three overarching actions that would enable our desirable futures for Arctic
147 biodiversity centred around the themes of education, decolonisation and governance (Fig. 1b,
148 Tables S8-S11, no particular order): First, elevating the public perception of and fostering
149 education efforts on Arctic biodiversity to raise awareness on its uniqueness and linkages to
150 the global system (including feedbacks, long-distance impacts of consumption etc.). Second,
151 recognising and amplifying voices of Indigenous rightsholders, as well as non-Indigenous
152 Arctic residents, in all processes concerning the (co-)management of Arctic biodiversity - right
153 from the beginning and across all organisational levels, to include knowledge and perspectives
154 of all rights- and stakeholders. Third, rethinking the governance of Arctic biodiversity
155 (structures, inclusivity, cross-disciplinarity) to recognise the importance of localised solutions
156 for a problem of global importance and responsibility. Enabling these actions will particularly
157 benefit from input from educators, social sciences, rights- and stakeholders, policy-makers
158 and governance experts.

159

160 We identified two overarching actions that would enable our desirable futures for Arctic
161 biodiversity relating to the monitoring and understanding of ecosystems (Fig. 1b, Tables S8-
162 S11): First, the continued development of a scalable and comparable biodiversity monitoring
163 programme across the Arctic to improve our ability to assess change and fill-in missing
164 baselines. The Circumpolar Biodiversity Monitoring Programme (<http://www.cbmp.is/>) is well-
165 established, but requires continued engagement and support from all parties involved,
166 including funding commitments from nation states. Second, the structured assessment and
167 re-evaluation of the effect and impact of policies, infrastructure development, and economic
168 activities on Arctic biodiversity and livelihoods. Here, we suggest creating internationally
169 comparable reporting and evaluation standards to enable better decision making for all
170 activities with impact on Arctic biodiversity. These actions will especially benefit from input
171 from natural sciences, Indigenous Peoples, non-Indigenous Arctic residents, policy-makers
172 and business representatives.

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Every small step counts on the path towards realising a desirable future for Arctic biodiversity. Many of the themes and actions that we identified are not new, but our workshop underlined the need to increase their profile and couple them with transformative visions. By doing so, we will set the seeds needed to create those opportunities that will make desirable futures reality. While the majority of participants felt pessimistic at the start of the workshop, many reported a change in attitude and felt empowered to make a personal commitment for positive action at the end of the day (Fig. 1b). Co-creating visions for desirable futures as a group was perceived as particularly powerful and inspiring. Running similar workshops in a variety of contexts and with people not already involved in the Arctic biodiversity discourse will broaden participation and increase the impact beyond the predominantly academic participants at the WBF2024 (Table S12), which may create biases towards abstract conceptualisation of the future. Future workshops would also benefit from including representatives from all backgrounds early in workshop design. By sharing the outcomes from our workshop, we hope to inspire action and encourage people from all backgrounds, including the sciences, Indigenous Peoples, non-Indigenous Arctic residents, business and policy-making to come together, collaborate and co-create a positive future for Arctic biodiversity.

Methods

Motivation, planning and background

The idea for the workshop originated in a team of natural scientists from the University of Zurich, Switzerland, within the context of the EU project CHARTER (<https://www.charter-arctic.org>) and evolved as a cross-sector collaboration with design thinking experts from Oliver Wyman (London, UK). Inspired by the development of the Nature Futures Framework¹¹, we were curious about the potential of desirable futures to stimulate positive change for Arctic biodiversity. We identified the World Biodiversity Forum 2024 as a venue for the workshop and, given limited time and resources, decided on a single day format. The workshop was run on 16 June 2024 under the title “WS-15 (Workshop): Building pathways towards desirable futures for Arctic biodiversity – a design thinking workshop”.

We set three objectives for the workshop: 1) enable participants to actively imagine desirable visions of the future, 2) co-identify important themes for developing nature-positive scenarios for Arctic biodiversity, and 3) sketch out high-level actions that could enable these. We announced the workshop on the conference website in November 2023, open for registration to everyone. In addition, we reached out through our networks, inviting representatives of various groups for registration and participation by email.

Workshop structure

The workshop ran over 8 hours, which we split into four sections with twelve sub-modules (Table S1). We designed the first section (30 min) to establish a welcoming atmosphere and a safe space, including an icebreaker and a short presentation on housekeeping. Here, we also agreed on a code of conduct. We designed the second section (60 min) to provide participants with the context for the day. We started this section with a panel discussion introducing the theory and motivation behind desirable futures and concluded with a set of three “Arctic biodiversity” stories told by pre-briefed participants. We reserved the bulk of the

221 day for the third section (5.5 hours), which we designed to achieve the core objectives of the
222 workshop, including an individual exercise to develop personal visions (phone call from future)
223 and two sets of group work (groups self-assigned) to identify common themes and potential
224 actions (details, prompts, examples in Supp. Methods). Finally, we closed the day with a recap
225 in the plenary and asked each participant to fill out a feedback survey and make a voluntary
226 personal commitment for Arctic biodiversity. An experienced facilitator guided the participants
227 through all activities and moderated discussions.

228

229 *Capture and synthesis of information*

230

231 We captured the content generated by all participants in writing and with photographs, and
232 synthesised the outcomes for this manuscript. Plenary discussions were recorded by a note
233 taker and content from other activities were recorded in writing by participants and then
234 photographed by the facilitation team. In addition, artist Oliver Prothero captured the activities
235 and outputs in the form of live-drawn scribe panels (Fig. 1). The workshop organisers and
236 facilitation team summarised the content and synthesised the key messages, which we all
237 reviewed and edited during the write up of this manuscript.

238

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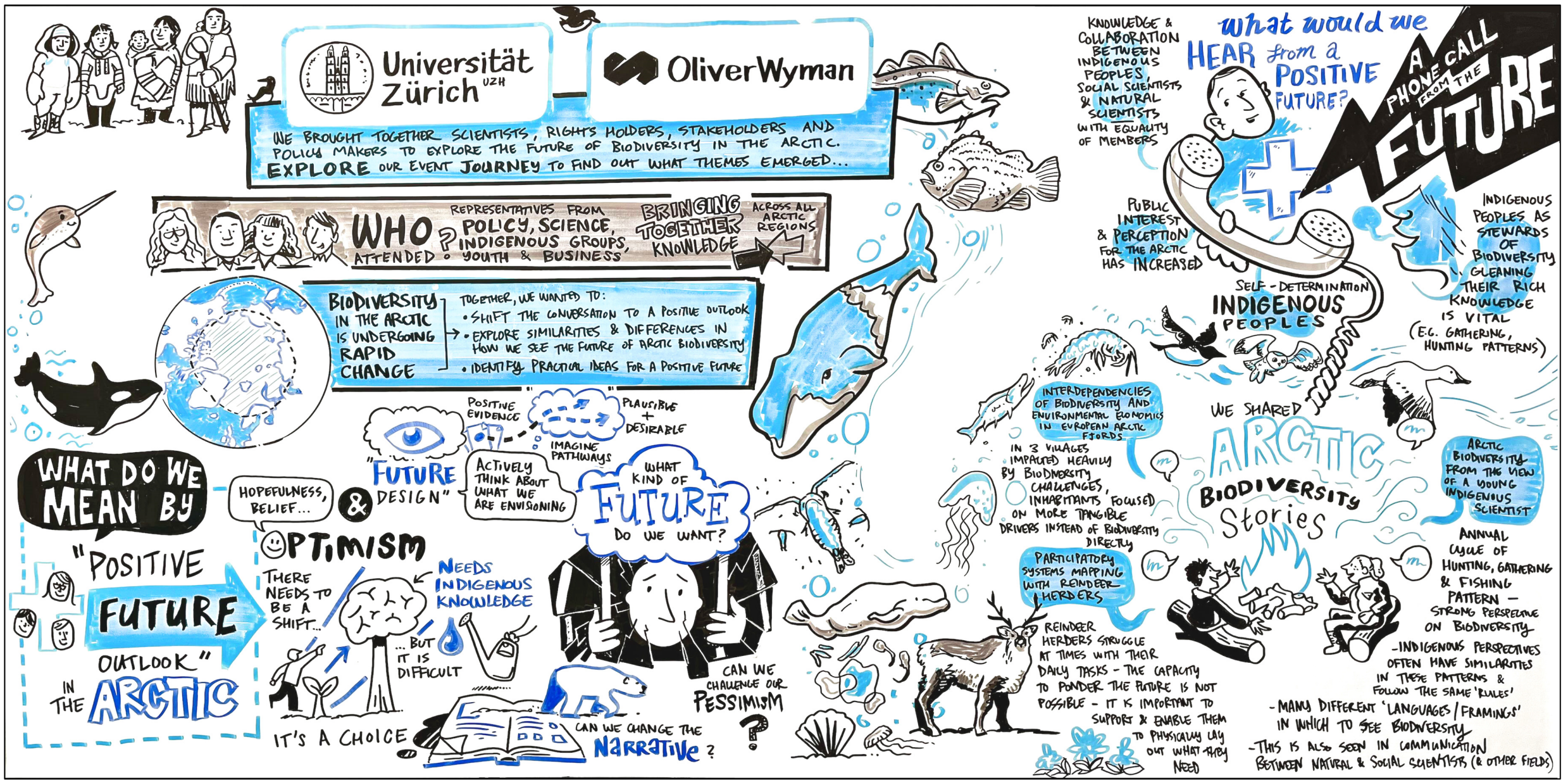
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