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The thematic assessment report of

THE UNDERLYING CAUSES OF BIODIVERSITY LOSS AND THE DETERMINANTS OF TRANSFORMATIVE CHANGE AND OPTIONS FOR ACHIEVING THE 2050 VISION FOR BIODIVERSITY

SUMMARY FOR POLICYMAKERS

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Summary for policymakers of the thematic assessment of the underlying causes of biodiversity loss and the determinants of transformative change and options for achieving the 2050 Vision for Biodiversity (transformative change assessment)

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Annex

Summary for policymakers of the thematic assessment of the underlying causes of biodiversity loss, determinants of transformative change and options for achieving the 2050 Vision for Biodiversity

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1 Preamble

2 Transformative change for a just and sustainable world is urgent, necessary and challenging but possible, to halt and reverse biodiversity loss and safeguard life on Earth[2,3] 3 . It is required to respond to global environmental challenges 4 and crises, including biodiversity loss, climate change and pollution. Biodiversity is fundamental to the systems 5 underpinning life and good quality of life and many of these systems are now at risk. Promoting and accelerating 6 transformative change is essential to meeting the 23 action-oriented global targets and four goals of the Kunming Montreal Global Biodiversity Framework of the Convention on Biological Diversity[4] 7 by 2030 and for achieving the 8 2050 Vision for Biodiversity, where "biodiversity is valued, conserved, restored and wisely used, maintaining 9 ecosystem services, sustaining a healthy planet and delivering benefits essential for all people". It is also vital for progress towards the 2030 Agenda and its Sustainable Development Goals[5] 10 , the United Nations Framework Convention on Climate Change[6] 11 and the Paris Agreement. The vision of living in harmony with nature, including 12 Mother Earth, describes a world that is just and sustainable, where all life can thrive. The links between 13 sustainability and equity have been clearly recognized and acknowledged in international agreements relevant to the 14 conservation, restoration and sustainable use of biodiversity.

15 This assessment focuses on transformative change that deliberately contributes to achieving the 2050 Vision for 16 Biodiversity and global sustainability. It builds on past IPBES contributions that recognize the importance of transformative change for fully addressing biodiversity loss and nature's decline[7,8] 17 . The IPBES Global Assessment Report on Biodiversity and Ecosystem Services[9] 18 defined transformative change as "a fundamental, system-wide 19 reorganization across technological, economic and social factors, including paradigms, goals and values". This 20 assessment builds on and further clarifies this definition, focusing on what transformative change means, how it 21 occurs and how to promote and accelerate it for a just and sustainable world.

22 Transformative change that matches the scope, scale, speed and depth necessary to maintain life on this planet calls 23 for new understandings and strategic approaches that yield positive results for biodiversity and nature. Drawing on a 24 rapidly growing body of literature and informed by evidence from diverse scientific disciplines and different 25 knowledge systems, the transformative change assessment recognizes that a simple system-wide reorganization of 26 constituent elements is not enough. To achieve the breadth, depth and dynamics of system reorganization described in the IPBES Values Assessment[4] 27 it is important to address the underlying causes of biodiversity loss and nature's 28 decline in a manner consistent with key guiding principles of transformative change.

[2] IPBES (2019a): *Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Díaz, S., Settele, J., Brondízio, E. S., Ngo, H. T., Guèze, M., Agard, J., Arneth, A., Balvanera, P., Brauman, K. A., Butchart, S. H. M., Chan, K. M. A., Garibaldi, L. A., Ichii, K., Liu, J., Subramanian, S. M., Midgley, G. F., Miloslavich, P., Molnár, Z., Obura, D., Pfaff, A., Polasky, S., Purvis, A., Razzaque, J., Reyers, B., Roy Chowdhury, R., Shin, Y. J., Visseren-Hamakers, I. J., Willis, K. J., and Zayas C.N. (eds.). IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.3553458

[3] IPCC (2022): *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.) Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., 10.1017/9781009325844

[4] Decision adpted by the Coference of the Parties to the Convention on Biological Diversity, CBD/COP/DEC/15/4

[5] Resolution adopted by the United Nations General Assembly, A/RES/70/1

[6] United Nations, Treaty Series, vol. 177, No. 30822

[7] IPBES (2022): *Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Balvanera, P., Pascual, U., Christie, M., Baptiste, B., and González-Jiménez, D. (eds.). IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.6522522

[8] IPBES (2022): *Thematic Assessment Report on the Sustainable Use of Wild Species of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Fromentin, J. M., Emery, M. R., Donaldson, J., Danner, M. C., Hallosserie, A., and Kieling, D. (eds.). IPBES secretariat, Bonn, Germany.

https://doi.org/10.5281/zenodo.6448567

[9] Chan, K. M. A., Agard, J., Liu, J., Dutra De Aguiar, A. P., Armenteras Pascual, D., Boedhihartono, A. K., Cheung, W. W. L., Hashimoto, S., Hernández-Pedraza, G. C., Hickler, T., Jetzkowitz, J., Kok, M., Murray-Hudson, M., O'Farrell, P., Satterfield, T., Saysel, A. K., Seppelt, R., Strassburg, B., Xue, D., Selomane, O., Balint, L., and A. Mohamed. (2019). *Chapter 5: Pathways towards a Sustainable Future. In: GlobalAssessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform.* Brondízio, E. S., Settele, J., Díaz, S., and Ngo, H. T. (eds). IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.3832099

29 The assessment focuses on different dimensions of transformative change that contribute to the 2050 Vision for 30 Biodiversity. It also considers the challenges and barriers to realizing transformative change. To overcome these 31 challenges, the assessment emphasizes that it is not just what people do, in terms of strategies and actions, but also 32 how they do it, in terms of principles and shifts in views, structures and practices, taking into account different 33 visions, worldviews and values. Practical guidance outlines how decision-makers, business, civil society, Indigenous 34 Peoples and local communities, and all people, can use the messages and evidence in the assessment to engage with 35 transformative change for a just and sustainable world (appendix II).

KEY MESSAGES

A. Transformative change is urgent, necessary and challenging – but possible

KM1. Transformative change for a just and sustainable world is urgent and necessary to address the global interconnected crises related to biodiversity loss, nature's decline and the projected collapse of key ecosystem functions. Delaying action to achieve global sustainability is costly compared to the benefits of taking action now {A1, A2, B4}. Transformative change is urgent to address the scope and scale of current sustainability challenges, including the decline and projected collapse of key ecosystem functions and loss of biodiversity. It is necessary because

previous and current approaches have failed to halt or reverse nature's 44 decline at a global scale, which has serious repercussions for the global economy and human well-being. The 45 world is facing multiple, interacting and accelerating global crises of biodiversity loss, climate change and 46 pollution. These interacting crises increase the risk of reaching irreversible biophysical tipping points that 47 threaten fundamental ecological systems and processes that sustain life. There is increasing awareness of the 48 need for transformative change from governmental and intergovernmental bodies, private sector organizations 49 and civil society, along with a growing recognition of interlinkages among a nexus of elements that include biodiversity, climate change, water, food and health[10] 50 . Most previous and current approaches to conservation 51 aim to reform rather than transform existing systems. Efforts to conserve, restore and sustainably use 52 biodiversity are significantly under-resourced in relation to the global economic value generated by activities 53 directly dependent on nature. For example, financial flows to biodiversity conservation (US$135–156 billion 54 inflation adjusted to 2023), amount to around 0.25% of the global GDP that is moderately and highly dependent 55 on nature ($58 trillion). The costs of inaction and delayed action are high, and delaying action to halt and 56 reverse biodiversity loss globally by ten years is estimated to be twice as expensive as taking immediate action.

57 **KM2. Transformative change is defined as fundamental, system-wide shifts in views, structures and** 58 **practices. Deliberate transformative change for a just and sustainable world shifts views, structures and** 59 **practices in ways that address the underlying causes of biodiversity loss and nature's decline. At the same** 60 **time, it remains important to recognise and strengthen views, structures and practices that are aligned** 61 **with generating a just and sustainable world, such as those of many Indigenous Peoples and local** 62 **communities {A3, A4}.** Underlying causes are deeply rooted and interconnected social and cultural patterns 63 that shape, influence and reinforce all direct and indirect drivers of biodiversity loss. The three key underlying 64 causes identified in this assessment were: 1) disconnection from and domination over nature and people; 65 2) concentration of power and wealth; and 3) prioritization of short-term, individual and material gains. 66 Together they undermine the effectiveness of efforts to conserve and sustainably use biodiversity and contribute 67 to challenges and barriers to transformative change. Currently dominant configurations of views, structures and 68 practices perpetuate and reinforce these underlying causes of biodiversity loss and nature's decline. At the same 69 time, many Indigenous Peoples and local communities around the world have views, structures, and practices 70 aligned with generating a just and sustainable world. Transformative change is necessary to achieve the 2050 71 Vision for Biodiversity and related global sustainability objectives by shifting views, structures and practices in 72 ways that target and address these underlying causes. Views include ways of thinking, knowing and seeing. 73 Structures refer to ways of organizing, regulating and governing. Practices represent ways of doing, behaving 74 and relating. It is possible to promote and accelerate transformative change by selecting and advancing 75 strategies and actions for conservation, restoration and sustainable use of biodiversity and nature that integrate 76 across views, structures and practices to specifically address underlying causes.

[10] IPBES (2024). Summary for Policymakers of the Thematic Assessment Report on the Interlinkages among Biodiversity, Water, Food and Health of the *Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.* McElwee, P. D., Harrison, P. A., van Huysen, T. L., Alonso Roldán, V., Barrios, E., Dasgupta, P., DeClerck, F., Harmáčková, Z. V., Hayman, D. T. S., Herrero, M., Kumar, R., Ley, D., Mangalagiu, D., McFarlane, R. A., Paukert, C., Pengue, W. A., Prist, P. R., Ricketts, T. H., Rounsevell, M. D. A., Saito, O., Selomane, O., Seppelt, R., Singh, P. K., Sitas, N., Smith, P., Vause, J., Molua, E. L., Zambrana-Torrelio, C., and Obura, D. (eds.). IPBES secretariat, Bonn, Germany. DOI: https://doi.org/10.5281/zenodo.13850289

KM3. Four key principles[11] 77 **are responsive to and address the underlying causes of biodiversity loss and** 78 **nature's decline and guide the process of deliberate transformative change. These principles are equity** 79 **and justice; pluralism and inclusion; respectful and reciprocal human-nature relationships; and adaptive** 80 **learning and action {A5, A6, B7}.** The values and visions that guide decisions affecting nature and its contributions to people matter greatly (see IPBES Values Assessment[12] 81). Given the breadth, depth and 82 dynamics of the transformative change processes, it is not only what is done that is important, but also how it is 83 done. The key principles identified by this assessment are important for directly countering the underlying 84 causes of biodiversity loss and nature's decline. They are also essential for guiding the process of change in 85 ways that are attentive and responsive to unexpected or negative impacts. Transformative change is a process 86 that affects multiple aspects of a system, often in unpredictable ways. Feedback across different levels and 87 scales may result in unexpected and unintended outcomes. Transformative change also entails shifts in the 88 status quo, which means that not everyone will benefit in the short-term from the process

of change. Even when 89 the aim is a just and sustainable world with flourishing futures for all, the complex dynamics of deep change on 90 a global scale mean that winners and losers (among both humans and non-humans) will arise and change as the 91 process continues to unfold across different contexts. This can lead to tensions arising between those who gain 92 and those who bear the costs of change. The process-oriented principle of adaptive learning and action is vital 93 for being able to see and respond to unintended consequences, emerging impacts, and tensions. Normative 94 principles that guide decisions and behaviours help ensure that the process of transformative change actively 95 considers and responds to such dynamics, and that the process remains oriented towards outcomes that are just 96 and sustainable.

97 **KM4. Transformative change for a just and sustainable world faces challenges that are systemic,** 98 **persistent and pervasive. Systemic challenges manifest as barriers that impede or prevent transformative** 99 **change and reinforce the status quo {A6, A7}.** Challenges to transformative change influence all aspects of 100 the relationships between humans and nature. Five overarching challenges were identified: 1) relations of 101 domination over nature and people, especially those that emerged and were propagated in colonial eras and that 102 persist over time; 2) economic and political inequalities; 3) inadequate policies and unfit institutions; 103 4) unsustainable consumption and production patterns including individual habits and practices; and 5) limited 104 access to clean technologies and uncoordinated knowledge and innovation systems. These challenges operate at 105 multiple scales and reflect views, structures and practices that are complex and power-laden. The challenges 106 manifest as barriers that block transformative change across diverse contexts. The impacts of actions and 107 resources devoted to blocking transformative change, for example through lobbying by vested interest groups or 108 corruption, overshadow those devoted to the conservation and sustainable use of biodiversity. Yet coalitions of 109 actors have strategies and options for overcoming barriers and challenges and are taking actions with 110 transformative potential towards a just and sustainable world.

111 **KM5. Weaving together insights from diverse approaches and knowledge systems, including Indigenous** 112 **and local knowledge, enhances strategies and actions for transformative change {A9, B10}.** 113 Transformative change involves mutually reinforcing shifts across views, structures and practices enacted in 114 ways that address the underlying causes of biodiversity loss and nature's decline. Given the breadth and depth 115 of change involved, no single theory or approach provides a complete understanding of the complexity of 116 transformative change and how to achieve it across the necessary range of diverse contexts and scales. Different 117 approaches provide complementary insights into how transformative change occurs and how to promote, 118 accelerate and navigate it. This assessment identified six broad approaches: systems, structural, inner 119 transformation, empowerment, knowledge co-creation and science and technology. Indigenous and local 120 knowledge contributes to all approaches, offering philosophies, ethics of care and, reciprocity, values and 121 practices to shape transformative change, including through the recognition, by some, of the rights of nature and 122 rights of Mother Earth. Attention to synergies across approaches and knowledge systems can promote and 123 accelerate transformative change.

124 **KM6. Transformative change is possible, and it is characterized by the quality and direction of change.** 125 **Both small-scale and large-scale changes contribute to transformative change for a just and sustainable** 126 **world when they address the underlying causes of biodiversity loss and nature's decline {A7, A10, A11,** 127 **C1, C11}.** Visions are of fundamental importance in inspiring transformative change, including small-scale or 128 incremental changes that address the underlying causes of biodiversity loss and nature's decline and have the 129 potential to scale. Challenges can be overcome through context-specific strategies and actions that embody the 130 principles of transformative change and are directed towards visions for a just and sustainable world. Many 131 existing initiatives have transformative potential, to generate fundamental, system-wide shifts in views, 132 structures and practices. Multiple historical and contemporary initiatives from around the world demonstrate 133 that actors and actor groups are planning and implementing a wide range of initiatives at different scales that are

[11] Principles, as used here, refer to a framework for understanding, reasoning and making judgments, and do not refer to principles of law. They often represent values or beliefs that guide decisions and behaviours.

[12] IPBES (2022): *Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Balvanera, P., Pascual, U., Christie, M., Baptiste, B., and González-Jiménez, D. (eds.). IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.6522522

134 equitable, just, pluralistic and inclusive, while also promoting respectful and reciprocal human-nature 135 relationships. Case studies show that examples of transformative change that explicitly include visions have 136 more positive outcomes in the ecological, economic and social dimensions of global sustainability. They also 137 show that positive outcomes for both nature and people can be achieved within less than a decade.

138 B. Strategies and actions for transformative change.

139 **KM7. Five key strategies and associated actions have complementary and synergistic effects and** 140 **substantial potential to advance deliberate transformative change for global sustainability. An integrated** 141 **set of actions for each strategy shifts entrenched views, structures and practices in an adaptive way {B1,** 142 **B2, B3, B4, B5, B6, B7, B8, B9, B10, B11} (figure SPM.6). Strategy 1** deals with conserving and regenerating 143 places of value to nature and

people {B1}(**box SPM.3**). **Strategy 2** focuses on driving systemic change in the 144 sectors most responsible for biodiversity loss and nature's decline {B2, B3} (**box SPM.4**). **Strategy 3** concerns 145 transforming economic systems for nature and equity {B4, B5, B6} (**figure SPM.7**). **Strategy 4** relates to 146 transforming governance systems to be integrated, inclusive, accountable and adaptive {B7, B8} (**box SPM.5**). 147 **Strategy 5** focuses on shifting societal views and values to recognize and prioritize fundamental 148 interconnections between humans and nature {B9, B10, B11, B12} (**figure SPM.8, box SPM.6**). Knowledge 149 co-creation and collaboration can be woven through these strategies to ensure effective knowledge exchange 150 and a commitment to the principle of plurality and inclusion {B10}.

151 **KM8. Conservation that involves sustainable stewardship, notably by Indigenous Peoples and local** 152 **communities, contributes to transformative change when it is inclusive, well-resourced, focused on places** 153 **of high value to nature and people and when the rights of Indigenous Peoples are recognized (strategy 1,** 154 **actions 1) {B1}.** Transformative change can include enhancing legal protections for biodiversity, respecting the 155 rights of nature and the rights of Mother Earth as recognized by some countries (action 1.2); basing 156 conservation on diverse values of nature (action 1.3); adopting regenerative views, structures and practices 157 (action 1.4); and advancing integrated spatial planning (action 1.5). A cost-effective strategy for transformative 158 change is to focus efforts on places where nature is already being conserved, restored, valued and wisely 159 stewarded by Indigenous Peoples and local communities, who manage or have tenure rights to about 40% of 160 protected areas and ecologically intact landscapes across 87 countries. Indigenous and local knowledges often 161 support biocultural approaches (integrating biodiversity conservation with cultural values) that have 162 demonstrated long-term sustainability in place-based conservation measures (**box SPM.3**). Supporting and 163 strengthening conservation led by Indigenous Peoples and local communities may involve adjusting national 164 legislation and other governance processes to reflect and protect applicable relevant rights, and knowledge and 165 biocultural governance systems, including those of Indigenous Peoples, and local communities consistent with 166 international instruments.

KM9. Transformative changes in sectors that heavily contribute to biodiversity loss[13] 167 **, including** 168 **agriculture and livestock, fisheries, forestry, infrastructure, mining and fossil fuel sectors are crucial and** 169 **urgent for advancing global sustainability, delivering social benefits to reach the 2050 Vision for** 170 **Biodiversity (Strategy 2) {B2, B3, B4} (figure SPM.7).** Actions towards this strategy include regulating direct 171 exploitation of organisms (Action 2.1); embedding technologies in transformative frameworks (Action 2.2); 172 financing for global sustainability (Action 2.3); and supporting civil society initiatives (Action 2.4). Over the 173 past five decades, unsustainable consumption and production patterns have accelerated biodiversity loss. In 174 2023, over half of the world's Gross Domestic Product (GDP), approximately $58 trillion, was generated by 175 economic activities moderately to highly dependent on nature, with critical sectors like agriculture being 176 particularly vulnerable to biodiversity loss and nature's decline (**figure SPM.7**). In 2020, industries with high 177 dependence on nature generate around $13 trillion (15% of global GDP), while those with moderate 178 dependence account for $31 trillion (37% of global GDP). Externalities (i.e., effects of an economic activity 179 affecting the environment, such as the greenhouse gas emissions, water pollution, or soil degradation, but not 180 reflected in market prices) associated with sectors contributing to biodiversity loss -such as agriculture, 181 livestock, fisheries, forestry and fossil fuels- are estimated to total $10.7 trillion inflation-adjusted to 2023 182 (**figure SPM.7**). Sustainable farming transitions enhance biodiversity, protect habitats and reduce external 183 inputs, for example by implementing nature-based solutions and ecosystem-based approaches (**box SPM.8**). 184 These approaches have been shown to increase agricultural productivity in numerous studies, for instance, by 185 enhancing pollinator abundance and diversity. They also contribute to fostering employment, healthier 186 livelihoods, food security and overall well-being. Eliminating, phasing out or reforming subsidies to economic 187 sectors driving nature decline, prioritizing sustainability and equity criteria in their allocation can improve their 188 environmental impact. Global coordination, policy alignment, impact monitoring and redistributive measures 189 are needed to support all relevant stakeholders, and particularly vulnerable populations, during the 190 transformation of economic sectors {B4}.

[13] Through direct drivers of biodiversity loss including land- and sea-use change, unsustainable exploitation of organisms, climate change, pollution and invasive alien species as presented by the IPBES Global Assessment (IPBES, 2019).

191 **KM10. Transformative change strategies include transforming dominant economic and financial** 192 **paradigms so that they prioritize nature and social equity over private interests (Strategy 3) {A6, B5, B6,** 193 **B7}.** Transforming economic systems includes mainstreaming innovative economic tools (Action 3.1); 194 supporting just transitions towards good quality of life (Action 3.2); reforming financial systems and 195 institutions (Action 3.3); and adopting metrics of success that focus on social, economic, cultural and 196 environmental goals (Action 3.4). Dominant global supply chains promote unsustainable sourcing and 197 overproduction, but well-designed international agreements can help regulate these supply chains to reduce 198 unsustainable consumption and production {B5}. Targeted and just downscaling of consumption and 199 production, alongside cultures of sufficiency, contribute to reducing global footprints to sustainable levels 200 across all countries. Overcoming inequities in consumption and production patterns, through governance that is 201 coherent and effective along the whole supply chain, is essential for transformative change {B5, B7}.

202 Increased taxes or fines on environmentally harmful activities, binding regulations on pollution and ecosystem 203 restoration, and policies that support the not-for-profit sector are valuable tools for embodying guiding 204 principles for transformative change toward sustainable well-being economies {B4}. Reimagining the goals, 205 metrics and indicators

of progress can promote new economic paradigms that emphasize justice, inclusion, 206 resilience and sustainability {B6}. Indicators that integrate economic, social (including cultural) and 207 environmental dimensions are available to track progress and to identify, measure, evaluate and influence 208 business' relationship to nature (e.g., ACT-D, LEAP) {B6}. Including nature in national income measures and 209 global financial flows will elevate biodiversity and the environment as essential criteria in both public and 210 private investments. As most of these tools and methodologies are still at early stages of development, many 211 countries would require enhanced technical and financial support to develop the capabilities for their 212 implementation and use.

213 **KM11. Inclusive, accountable and adaptive governance systems play a pivotal role in driving** 214 **transformative change by involving diverse stakeholders in decision-making and addressing governance** 215 **challenges (Strategy 4) {A4, A6, B7, B8, B9}.** Effective transformative change involves various stakeholders, 216 incorporating their diverse knowledge systems and multiple values in the planning, implementation and 217 evaluation of resource, land- and sea-use governance at all levels {B7, B8}. However, governance challenges 218 like institutional misfits (including fragmentation), unbalanced access to decision-makers, corruption, 219 disinformation and domination by powerful interest groups, can obstruct progress by giving low priority to 220 nature related values, such as those represented by Indigenous Peoples and local communities {B7, A6}. A 221 stronger representation and role of relational and intrinsic values of nature in decision-making processes (e.g., 222 by joint planning or alternating institutional structures and mandates), can strengthen their consideration in the 223 development of integrated visions for transformative change {B7} (action 4.1). Participatory processes, 224 including experimentation, co-creation, co-monitoring, co-evaluation and citizen science, reflects the interests 225 and needs of those affected, and makes transformative change processes more equitable, sustainable and 226 effective {B7, B8} (action 4.2). Securing collaboration and accountability through multilateral governance 227 addresses global interdependencies {B5, B7} (action 4.3). Monitoring, evaluation and clear accountability 228 structures enable adaptive learning to ensure that policy development, implementation and enforcement 229 processes can be adjusted to improve effectiveness and reduce unintended impacts {B8, B9} (action 4.4). 230 Transparent and inclusive review processes enable all actor groups to genuinely participate in evaluation 231 processes and require reflexivity for mutual learning {B8, B10}.

232 **KM12. Shifting dominant societal views and values to recognize and prioritize human-nature** 233 **interconnectedness is a powerful strategy for transformative change. These shifts can be facilitated** 234 **through cultural narratives and by changing dominant social norms, facilitating transformative learning** 235 **processes, co-creating new knowledge and weaving different knowledge systems, worldviews and values** 236 **that recognize human-nature interdependencies and ethics of care (Strategy 5, action 5.1) {B9, B10, B11,** 237 **B12}.** Transformative change involves questioning the individual and collective paradigms and cultural 238 narratives that perpetuate the underlying causes of biodiversity loss and nature's decline (action 5.2). This can 239 be done by recognising and promoting worldviews and values that emphasize care, reciprocity and harmony 240 with nature, including Mother Earth. These worldviews and values include those associated with Indigenous 241 and local knowledge systems. For example, unquestioned habits and social norms around consumption and 242 growth reinforce socioeconomic disparities and prevent transformative change by disrupting human-nature 243 relationships. Social norms that define what are acceptable behaviours within specific contexts can rapidly shift, 244 de-normalizing certain practices (e.g., single use plastics) and normalizing others (e.g., reusable containers) 245 towards transformative change. Shifts in social norms can contribute to widespread behavioural changes {B9} 246 (action 5.3) and can be promoted by governmental policy tools (e.g., regulations). Transformative learning can 247 be facilitated by integrating nature-connectedness into education, health, spatial planning, communication and 248 art, and by fostering the understanding that human well-being and quality of life are dependent on nature {B10} 249 (action 5.4). For example, educational curricula, from primary to higher education, can include content on 250 biodiversity, its loss, nature's contributions to people, including ecosystem services, nature-based solutions and 251 ecosystem-based approaches, and Mother Earth-centric actions to strengthen this connection. Additionally, 252 practices like nature appreciation, systems thinking, empathy, mindfulness, and transdisciplinary approaches 253 can help embed nature's values into decision-making. Knowledge co-creation and recognition of plural forms of 254 knowledge, worldviews and values are crucial for developing actionable and inclusive biodiversity and 255 sustainability strategies {B11} (action 5.5). Examples include the consideration of ancestral, embodied and

experiential knowledge and non-human[14] 256 perceptions and perspectives in conservation decision making. 257 Context-specific, timely and dynamic communication strategies notably through media, including social media 258 also play a critical role in shifting societal views and values {B12}.

259 **C. Enabling transformative change: Roles for all**

260 **KM13. Shared positive visions and their development is especially important to recognize socio-ecological** 261 **interdependencies, the agency of non-human life forms and an ethics of care, and thereby to inspire** 262 **transformative change {A8, C2, C3, C4}. Visions, which include narratives and stories, are desirable** 263 **future states of people and nature, including Mother Earth, shaped by values and worldviews and often** 264 **include defined goals and intentional efforts to attain such future states.** Transformative visions value 265 nature in multiple ways and no single vision is appropriate to all contexts and scales. Visions that recognize and 266 combine intrinsic, relational and instrumental values are the most promising for transformative change. 267 Additionally, visions that promote Indigenous and local

knowledge are associated with positive social, 268 economic and environmental outcomes. More transformative visions emerge from visioning processes that 269 centre clarity of purpose and scope, meaningfully include persons with common goals but diverse perspectives, 270 use imagination and creativity to move beyond existing patterns and adapt to new ideas flexibly. Five core 271 themes emerged from an assessment of 881 visions with transformative aspirations for desirable futures for 272 humans and nature: 1) regenerative and circular economies, 2) community rights and empowerment, 3) 273 biodiversity and ecosystem health, 4) spiritual reconnection (between humans and nature) and behavioural 274 change, and 5) innovative business and technology. Visions and values that foster harmony between humans 275 and nature to inform and guide the process of change and its direction facilitate the pursuit of deliberate 276 transformative change. Many cultures and groups have spiritual relationships to nature that respect non-human 277 species and entities. Such relationships and associated views contrast with views of nature that over-prioritize 278 instrumental values and practices and promote the exploitation and degradation of nature. Living in harmony 279 with nature is enhanced by recognizing alternative cultural narratives and holistic thinking and learning. Such 280 narratives are critical to raise awareness of the importance of biodiversity and nature. Therefore, we need 281 stronger imaginative efforts including those that attend to Indigenous and local knowledge to envision positive 282 futures for a just and sustainable world.

283 **KM14. Transformative change is system-wide, therefore, to achieve it requires a whole-of-society and** 284 **whole-of-government approach that engages all actors and sectors in visioning and contributing** 285 **collaboratively to transformative change (figure SPM.11) {B7, C5, C6, C7}.** Coalitions of actors are more 286 effective than individual actors in fostering transformative change. Successful transformative change is often 287 realized by diverse actor coalitions that bring together complementary resources and capacities including 288 visioning. Different groups of actors possess specific abilities, resources and powers and encounter different 289 opportunities to act for transformative change. Some coalitions of actors tend to work together to pursue the 290 five identified strategies and actions for transformative change. Individual citizens, Indigenous Peoples and 291 local communities, local governments, educators and the scientific community collaborate on place-based 292 conservation actions (**Strategy 1**). Businesses and scientific communities are often identified in the literature as 293 playing important roles in addressing direct drivers through their actions and research (**Strategy 2**). Research 294 identifies donors and financial sector actors most frequently as the key actors associated with transformative 295 change in economic systems (**Strategy 3**). Government actors are critical for changes, notably in governance 296 arrangements and systems, as are demands from civil society actors and citizens (**Strategy 4**). Individual 297 citizens, Indigenous Peoples and local communities, businesses, national governments, media, educators and 298 the scientific community overlap with actions oriented to shifting views, values and paradigms (**Strategy 5**). 299 Examples of such collaborative approaches are reflected across many community-based initiatives. Noteworthy 300 are community-based initiatives that bring together multiple actors with different but complementary skills and 301 capacities, such as agroecology initiatives (**box SPM.8**).

302 **KM15. Governments are powerful enablers of transformative change when they foster policy coherence,** 303 **enact and enforce stronger regulations to benefit nature and nature's contributions to people in policies** 304 **and plans (regulations, taxes, fees, tradable permits) across different sectors, deploy innovative economic** 305 **(including financial) and fiscal tools, eliminate, phase out or reform environmentally harmful subsidies,** 306 **and promote international cooperation {C6, C8, C9, B2, B7}.** Considering the existing support for financial 307 and economic instruments that are harmful to biodiversity and nature and the central role that governments play 308 in establishing conservation strategies, decision-makers at all levels of governance have a key role to play in 309 enabling transformative change. However, the breadth and scale of implementation of existing actions and 310 policy tools are insufficient. Policy instruments (234 biodiversity-relevant taxes in 62 countries, 194 fees and 311 charges in 50 countries and 39 tradable permits in 26 countries) have increased only marginally since 2010 and 312 do not address the underlying causes of biodiversity loss and nature's decline. Elimination, phase-out, or reform 313 of subsidies to economic sectors responsible for biodiversity loss and nature's decline is possible and effective 314 when accompanied by coordination across sectors and scales. More extensive reforms for global sustainability 315 go beyond reforms of economic instruments within the frame of growth-driven economies and include changes

[14] Elements of the natural world that are not human but are recognized by some as having intrinsic value, agency, or rights, e.g. animals, plants, ecosystems and other elements of nature.

316 in policies and regulation, the provision of green infrastructure and pursuit of alternative economic models. 317 Embedding innovations in legal and planning frameworks, strengthening their economic viability, and 318 supporting long-term capacity enhancement increase prospects for transformative change.

319 **KM16. Civil society organizations, by fighting against biodiversity loss and nature's decline, point to the** 320 **need for transformative change. Social mobilizations to pursue change, however, have often triggered** 321 **responses that do not possess key aspects of transformative change. Civil society initiatives and** 322 **environmental defenders have faced violence and rights violations. Protecting them supports** 323 **transformative change {B9, C5, C6, C10}.** Civil society organizations have piloted new, scalable models for 324 sustainable use of biodiversity, mobilized citizens for social actions against environmentally harmful processes, 325 held governments and private sector accountable for harmful practices and fuelled public debates on 326 biodiversity and nature. An analysis of 2,802 mobilizations between 1992 and 2023 provides evidence that they 327 contested 46,955 documented environmental threats. The most frequently contested threats relate to biodiversity 328 loss, soil contamination, climate change, groundwater, surface water and landscape degradation, waste overflow 329 and deforestation. More than half of the mobilizations (54%) resulted in reforms (e.g., relocation, technical

330 solutions, environmental improvements, application of existing regulations, compensation) that did not 331 correspond to key elements of transformative change identified in this assessment. Nearly a quarter (27%) of 332 the mobilizations had regressive outcomes, including repression and violence against activists. Violence linked 333 to extractive industries is often perpetrated by men against women, overlooked, and likely underreported. 19% 334 of the mobilizations resulted in outcomes with transformative potential, including the withdrawal, cancellation, 335 or temporary suspension of the activities responsible for environmental threats. Social mobilizations were more 336 successful when they were preventive and pursued a diversity of tactics, including litigation. Supporting and 337 amplifying civil society initiatives can help dismantle harmful practices. Inclusive governance processes and 338 protection of environmental defenders from violence and rights violations alleviate the vulnerability associated 339 with civil society action. Governmental efforts to create corporate due diligence policies and trade agreements 340 that incorporate support for the United Nations Declaration on the Rights of Indigenous Peoples and human 341 rights law and divestment campaigns targeting corporations involved in rights violations have the potential to 342 amplify the impact of civil society initiatives for transformative change towards a just and sustainable world.

343 **KM17. Well-designed policies, as well as business and private sector initiatives and tools, aimed at** 344 **transformative change for a just and sustainable world, provide economic incentives that influence** 345 **socioeconomic development and consumption practices {B6, C8, C10}.** Among different tools, 346 standardisation and certification schemes for sustainable production are instruments that businesses in diverse 347 sectors have piloted, often with positive effects. However, these instruments have at times been inadequately 348 designed and applied in ways that do not support transformative change. Their scale remains small and their 349 efficiency is debated. For example, evidence of sustainability and biodiversity impacts of forest and fish 350 certification remains mixed. Despite certification potential, the global proportion of certified forests is less 351 than 15% and less than 15% of the global marine catch is certified. Stronger incentives and more widespread 352 adoption of standards and other relevant regulatory measures in local-national contexts increase the likelihood 353 of success. Private sector and international financial institutions have played a role in debt-for-nature-swaps 354 creating additional financial opportunities to conserve nature. Such schemes could relieve debt burden, allowing 355 allocation of resources in a manner that addresses ecological, economic and social challenges. But, among other 356 weaknesses, they also pose risks for conflicts, have the potential to undermine the respective rights and interests 357 of Indigenous Peoples and local communities and marginalize small producers. Therefore, more intentional 358 design and implementation are key to mitigate such risks. Elements of such design vary by sectors but include 359 conservation priorities in business strategies and actions, sustainable supply chains, voluntary disclosures, and 360 commitments for engagement with Indigenous Peoples and local communities and small producers. Voluntary 361 action by business is a way to pilot solutions, their efficiency and their conditions of success. Given market 362 competition, these innovations may need supportive policies to avoid unfair competition.

363 **BACKGROUND**

364 A. Transformative change is urgent, necessary and challenging – 365 but possible

366 **A1. Transformative change is urgent because there is a closing window of opportunity to avoid further** 367 **biodiversity loss and prevent triggering the potentially irreversible decline and projected collapse of key** 368 **ecosystem functions. Delaying action to achieve global sustainability is costly compared to the benefits of** 369 **taking action now (*well established*) {1.1, 1.2, 1.2.1, 1.2.3}.** The current extent and pace of biodiversity loss 370 and nature's decline, combined with the magnitude of the multiple interconnected global crises, including 371 climate change, and pollution, seriously and irreversibly threatens human wellbeing and life on Earth, 372 decreasing quality of life and leading to substantial economic costs (*well established*) {1.1, 1.2.1}. These global 373 environmental challenges and crises are interconnected, enhancing the possibility that a crisis within one system (e.g., biodiversity, climate, water, food or health) has

effects on other systems[15] 374 (*well established*) {1.2.1}. 375 These challenges and crises are amplifying and accelerating one another in ways that significantly increase the 376 risks to humans and nature (*well established*) {1.2.1}. This entanglement of crises, increasingly referred to as a 377 polycrisis, points to the urgency and necessity of handling the different crises in a combined manner (*well* 378 *established*) {1.1, 1.2.1}.

379 Delaying action to halt and reverse biodiversity loss and nature's decline globally by ten years is estimated to be 380 twice as expensive as taking immediate action (*established but incomplete*) {1.2.1}. Taking actions now 381 delivers a range of co-benefits for both the economy and good quality of life. It contributes to poverty reduction 382 and progress towards agreed goals and targets, such as the 2030 Agenda and its Sustainable Development 383 Goals. It also unlocks business and innovation opportunities through sustainable economic approaches, such as 384 nature-positive economy, ecological economy and Mother-Earth centric economy. A recent study estimates that 385 over $10 trillion in business opportunity value could be generated and 395 million jobs could be supported 386 globally by 2030 (*established but incomplete*) {1.2.1}.

387 The urgency of transformative change is underscored by the projected collapse of key ecosystem functions 388 associated with current global trends driving biodiversity loss, which has implications for all ecosystems and for 389 human well-being (*well established*) {1.2.1, 1.2.3, 4.2.4}. For example, deforestation influences climate 390 regulation and carbon sequestration and coral bleaching has consequences for reef structures and coastal 391 protection. Under current trends, there is a serious risk of crossing several irreversible biophysical tipping 392 points, including die-off of low latitude coral reefs, die-back of the Amazon rainforest, and loss of the 393 Greenland and West Antarctic ice sheets, with the possibility for cascading negative impacts across linked 394 social and ecological systems (*established but incomplete*) {1.2.1}. Actors spanning intergovernmental 395 organizations, governments, civil society, the private sector and the scientific community are emphasizing the 396 magnitude of the crises and the urgency for action and there are increasing calls for transformative change (*well* 397 *established*) {1.1, 1.2}.

398 **A2. Transformative change is necessary globally because previous and currently dominant approaches** 399 **have failed to address interconnected global challenges and crises, including biodiversity loss, climate** 400 **change and pollution. These pose serious and potentially irreversible threats to nature and good quality** 401 **of life (*well established*) {1.1, 1.2.1, 1.2.3, 2.3.2, 4.2.4}.** Current actions to conserve, restore and sustainably use 402 biodiversity have created many positive outcomes, but they have not been able to halt or reverse global trends 403 in biodiversity loss and nature's decline (*well established*) {1.2.3, 4.2.4, figure 4.8}. For example, although 404 trends vary within and between regions, the global human ecological footprint has consistently exceeded the 405 world's biocapacity since the early 1970s while species extinction rates and risk for most taxa have increased 406 severely over recent decades {4.2.4, figure 3.10, figure 4.8}. These trends and their consequences for global 407 sustainability are well documented in IPBES assessments. Despite this recognition and despite increasing 408 numbers of multilateral environmental agreements and growing recognition of the need for transformative 409 change by a wide range of actors, global trends in biodiversity loss and nature's decline continue to move in the 410 wrong direction (*well established*) {1.1, 1.2.3}.

411 The failure to halt and reverse biodiversity loss and nature's decline resulting from these multiple interacting 412 crises is creating unacceptably high economic and non-economic costs, undermining the provision of nature's 413 contributions to people (e.g., food, fresh water, fuel, fiber), as well as the richness of social, cultural and 414 spiritual life (*well established*) {1.2.1}. The high economic costs and risks associated with failure to address 415 biodiversity loss are recognized, and several attempts have been made to quantify these costs based on the 416 economic value derived from ecosystems, and the scale of investments needed for restoration and regeneration 417 activities (*well established*) {1.2.1} **(figure SPM.7).** However, these do not account for non-material

[15] IPBES (2024) Summary for policymakers of the thematic assessment of the interlinkages among biodiversity, water, food and health (nexus assessment).

418 contributions of nature, such as opportunities for inspiration, education, and recreation, as well as important 419 contributions to sense of place, cultural diversity and religious or spiritual values *(well established)* {1.2.1}. 420 Quantifying the loss of such non-material contributions of nature is particularly challenging and has received 421 less attention in the assessed literature, although this does not make their loss any less significant or serious 422 (*established but incomplete*) {1.2.1}. The most transformative visions for a just and sustainable world 423 demonstrate immeasurable potential benefits across all life, by including diverse perspectives and multiple areas 424 of focus (*established but incomplete*) {2.3.2}.

425 **A3. Transformative change is a process that involves fundamental, system-wide shifts in views, structures** 426 **and practices (*well established*) {1.3.1, 1.3.2, 1.4, 3.2}.** The term 'fundamental' relates to the depth, quality 427 and direction of change and 'system-wide' refers to the breadth of changes at the different levels and scales in a 428 system *(well established)* {1.1}. Views include ways of seeing, thinking and knowing. Structures include ways 429 of organizing, regulating and governing. Practices include ways of doing, behaving and relating *(well* 430 *established)* {1.3.1}. The three dimensions are interwoven and affect each other; fundamental system-wide 431 shifts involve changes across all three of these dimensions *(well established)* {1.3.1}. Significant changes in one 432 dimension have the potential to influence changes in the others. Similarly, changes in one dimension can be 433 constrained by what is present or what changes in others (*established but incomplete*) {1.3.1, 1.4}.

434 Transformative changes do not always benefit biodiversity (*well established*) {3.5, 1.3.2}. Historically, many 435 transformations have contributed to nature's decline (**box SPM.1**) (*well established*) {3.1}. However, the 436 intersecting dimensions of views, structures and practices are created by humans and thus can potentially be 437 transformed (well established) {1.3.1}. The terms 'transitions' and 'transformations' are often used 438 interchangeably to refer to processes of

transformative change. In this assessment, a distinction is made between 439 transitions, which typically refer to orderly shifts occurring in specific sectors, systems or locations (for 440 example, the energy system), and transformations, which refer to broader and deeper societal shifts taking place 441 across multiple systems (for example, the Industrial Revolution, **box SPM.1**) (*established but incomplete*) 442 {1.1}. In complex systems characterized by uncertainty and emergence, transformative change is an adaptive 443 process (*established but incomplete*) {1.1}. It is possible to influence and guide processes of transformative 444 change, but it is difficult, if not impossible, to control outcomes precisely. This makes ongoing monitoring, 445 evaluation, learning and adaptation of plans and actions essential to address unintended consequences and 446 maintain alignment with agreed goals (*well established*) {1.3.1, 3.3, 5.6.4, 5.8, 3.5.7}.

Box SPM.1. The Industrial Revolution as an example of shifts in views, structures and practices.

Historical examples such as the Industrial Revolution illustrate how shifts in views, structures and practices have contributed to transformative change in the past {box 3.1}. Although this example contributed to biodiversity loss and nature's decline, the magnitude of transformative change that occurred during the Industrial Revolution is considered by some to be comparable to the scale and scope of changes needed to achieve global sustainability, but occurred over a much longer time period than is needed for transformative change for a just and sustainable world. In terms of views, the scientific revolution and the Enlightenment have been argued to be prime drivers of the Industrial Revolution. They promoted the idea that empirical knowledge and reason can be used to understand and control nature, which itself was increasingly viewed in terms of instrumental, rather than relational or intrinsic values. Structural shifts included the reorganization of production, where the new factory system enabled massive increases in productivity and European empires extended their search for natural resources through colonialism. Practices shifted as new technologies, such as the coal-fired steam engine and textile machinery, enabled vast increases in speed and efficiency of production through factory systems. Together, these interwoven changes transformed how nearly every product was made, contributing to deep changes in how people worked and how society was organized {box 3.1}.

447 **A4. Underlying causes influence all indirect and direct drivers of biodiversity loss and nature's decline.** 448 **Transformative change that addresses these underlying causes is vital for a just and sustainable world (*well* 449 *established*) {1.2.2, 1.3, 4.2}.** Underlying causes are deep-rooted and interconnected patterns that shape, influence 450 and reinforce the indirect and direct drivers of biodiversity loss and nature's decline (**figure SPM.1**) (*established but* 451 *incomplete*) {1.2.2}. They lie beneath the surface of what is immediately obvious but nevertheless have significant 452 links to the origin of observed problems (*established but incomplete*) {1.2.2}. The three key underlying causes 453 identified in this assessment and described below have co-evolved and continue to reinforce one another to have 454 far-reaching and systemic impacts that influence multiple, interconnected challenges and crises (*well established*) 455 {1.2, 1.2.1, 1.2.2}. Together, they undermine the effectiveness of efforts to conserve, restore and sustainably use 456 biodiversity and manifest in challenges and barriers to transformative change (*well established*) {4.1}.

457 **i)** Disconnection from and domination over nature and people refers to the view that humans are separate 458 from and superior to nature and that nature is comprised of objects for humans to use as resources (*well*

459 *established*) {1.2.1, 1.2.2}. This way of framing human-nature relations justifies not only the exploitation 460 of nature, but also the exploitation of specific people and communities to create the labour force necessary 461 for nature's exploitation (*well established*) {1.2.1, 1.2.2}. This reinforces their marginalization and can 462 push some communities into destructive relationships with nature (*well established*) {1.2.1, 1.2.2, box 3.3, 463 4.2.1}. This underlying cause has deep historical roots and has had widespread impacts through 464 colonialism, slavery, modernism, capitalism and growth-driven economies (*well established*) {1.2.1, 1.2.2, 465 box 3.3, 4.2.1, 4.2.2}. It continues to influence social and economic structures that justify the exploitation 466 of nature and of marginalized people and communities (*well established*) {4.2.1}. It is inconsistent with the 467 worldviews and values of many Indigenous Peoples and local communities (*well established*) {1.2.2, 1.2.3, 468 3.2.3, 3.5.2, 4.2.1, 5.7}.

469 **ii)** Concentration of power and wealth acknowledges that the activities and interests of a decreasing number 470 of people are disproportionately driving biodiversity loss and nature's decline (*well established*) {1.2.2, 471 4.2.2}. Inequalities in power and wealth exist both within and between countries and intersect with other 472 drivers of marginalization (including, for example, race, class, ability, gender or age) (*well established*) 473 {1.2.2, 4.2.2}. Concentration of power and wealth matter for biodiversity because the wealthy are 474 responsible for a disproportionate use of natural resources, unsustainable levels of consumption and 475 associated environmental impacts. Wealthy actors are currently driving biodiversity loss locally and in 476 other places through their levels of consumption and associated patterns of resource extraction. 477 Furthermore, nature's destruction can become a survival strategy in poorer communities. The concentration 478 of power and wealth also creates differential access to decision-making processes, and can be used to block 479 transformative change *(well established)* {1.2.2, 4.2.2, 4.2.4}.

480 In 2021, the share of global wealth held by the top 1% of the global population was 39.2%, while the 481 bottom 50% owned 1.85% of global wealth (*well established*) {4.2.2}. In 2015, Europe and North America 482 held 84% of the world's wealth per capita leaving the rest of the world holding only 16% (*well established*) 483 {4.2.2}.

484 **iii)** Prioritization of short-term, individual and material gains emphasizes immediate interests and desires 485 over

491
492 **Figure SPM.1. Underlying causes, indirect drivers and direct drivers of biodiversity loss and** 493 **nature's decline.** This figure shows how the transformative change assessment specifies and 494 synthesizes the key underlying causes that underpin, cut across, shape and reinforce all the indirect 495 and direct drivers of biodiversity loss and nature's decline. This figure builds on Figure SPM.2 of the 496 IPBES *Global Assessment of Biodiversity and Ecosystem Services*, including its identification

497 of indirect and direct drivers, with the latter represented in the bar chart showing the proportional 498 contributions of each direct driver to biodiversity loss in terrestrial, freshwater and marine ecosystems. 499 Further details on the analysis leading to identification of these indirect and direct drivers, and the 500 calculation of contributions to biodiversity loss across different ecosystems can therefore be found in 501 the IPBES Global Assessment. More information on the underlying causes and how they manifest 502 across views, practices and structures (including values and behaviours) is provided in the 503 transformative change assessment (1.2.2, 1.3.1).

504 **A5. Four principles address the underlying causes of biodiversity loss and nature's decline and guide** 505 **transformative change towards global sustainability: i) equity and justice, ii) pluralism and inclusion, iii)** 506 **respectful and reciprocal human-nature relationships, and iv) adaptive learning and action (well established) {1.2, 1.2.2, 1.3.2, 1.5, 2.3.2, 4.3, 5.3, 5.6, 5.7}.** In this assessment, principles[16] 507 refer to normative or procedural 508 guidelines that govern behaviour, decision-making, or actions. Principles are crucial to addressing the underlying 509 causes of biodiversity loss and fundamental to shifting views, structures and practices for a just and sustainable 510 world (*established but incomplete*) (**figure SPM.2**) {1.3.2, 1.4.3}. Views, structures and practices associated with 511 certain contexts or communities are already aligned with these principles and do not need to change, including 512 relational views of oneness of people and nature held by many Indigenous Peoples and local communities, among 513 others (*well established*) {1.3.2, 2.3.4, 5.3}. To address the global nature of current sustainability challenges and the 514 deep nature of the underlying causes of biodiversity loss and nature's decline, these guiding principles of 515 transformative change can be more widely embodied within prevailing views, structures and practices than is 516 currently the case (*well established*) {1.3.3, 1.4.3}.

517 **i)** The principle of equity and justice ensures that interventions for transformative change are designed in a 518 fair manner. The literature related to this principle highlights the critical importance of equitable and just 519 procedures *and* equitable and just outcomes for humans (including both present and future generations) and 520 other species (*well established*) {1.3.2, 2.3.5, 3.2.2, 4.3, 5.3.2, 5.7.2}.

521 **ii)** The principle of pluralism and inclusion ensures that differences in perspectives, voices and experiences 522 are recognized and honoured through the development of context-specific strategies and actions for 523 transformative change. Actions that are aligned with this principle engage diverse actors, visions and 524 worldviews and remain open to ongoing contestation, renegotiation and change (*well established*) {1.3.2, 525 2.2.3, 3.2.5, 3.3, 3.5.1, 3.52, 4.3, 5.3.3, 5.6.2, 5.6.4, 5.7.2}.

526 **iii)** The principle of respectful and reciprocal human-nature relationships acknowledges relational values 527 and responsibilities based on human-nature connectedness. It represents a move from instrumental 528 relationships of extraction, exploitation, domination and control towards fostering values of care, respect, 529 solidarity, responsibility and stewardship (*well established*) {1.3.2, 1.2.2, 1.3.2, 2.3.2, 3.2.3, 5.3.1, 5.3.3, 530 5.3.4, 5.6.1, 5.6.2, 5.7}.

531 **iv)** The principle of adaptive learning and action recognizes that transformative change is a dynamic and 532 emergent process with unfolding impacts and unintended consequences that need to be continuously 533 addressed (*well established*) {1.1, 1.3.2, 3.3, 5.6.4, 5.8}.

534

[16] Principles, as used here, refer to a framework for understanding, reasoning and making judgments, and do not refer to principles of law. They often represent values or beliefs that guide decisions and behaviours.

535 **Figure SPM.2 The framework of transformative change for a just and sustainable world.** *Section* 536 *A* indicates views, structures and practices (the inner golden spirals) being strongly shaped by the 537 underlying causes of biodiversity loss and nature's decline (solid grey ring). *Section B* shows shifts in 538 views, structures and practices breaking the influence of the underlying causes when they are guided 539 by the four key principles of transformative change (blue ring). *Section C* illustrates a just and 540 sustainable world, with prevailing views, structures, and practices aligned with the principles of 541 transformative change. This framework can be used by different actor groups to help identify where 542 and how they can promote, accelerate and scale the process of transformative change towards a just 543 and sustainable world.

544 **A6. The challenges to transformative change are complex, systemic, persistent, pervasive and power-laden.** 545 **Five overarching challenges to transformative change were identified in the assessment: i) persistent relations** 546 **of domination, especially those that emerged and were propagated in colonial eras; ii) economic and political** 547 **inequalities; iii) inadequate policies and unfit institutions; iv) unsustainable consumption and production** 548 **patterns and individual habits and practices; and 5) limited access to clean technologies and uncoordinated** 549 **knowledge and innovation systems (*well established*) {1.2.2, 3.5.7, 3.5.3, 4.1, 4.2, 5.8}.**

550 **i)** Relations of domination, both of people over nature and people over others, have a long history in many 551 societies. However, contemporary relations of domination that act as challenges to transformations in 552 people's relations to nature and biodiversity that can bring about a just, sustainable world emerged from a 553 convergence of prior relations and a focus on resource extraction during colonial eras (*established but* 554 *incomplete*) {4.2.1}. These relations are durable because they reproduce power imbalances and institutional 555 structures that benefit the privileged and the powerful (*established but incomplete*) {4.2.1}. 556 For example, contemporary political economic systems, rely upon intersectional inequalities and 557 hierarchies that shape which voices and ideas are included in plans for and visions of people's relations to 558 nature and biodiversity (*well established*) {4.2.1}. The environmental consequences of these plans often 559 impact those excluded, reproducing intersectional inequalities including those incorporating race and 560 gender (*well established*) {4.2.1}.

561 **ii)** Economic and political inequalities undermine the effectiveness of strategies for conservation, 562 restoration and sustainable use of biodiversity {4.2.2}. Powerful actors with vested interests, whether 563 individuals or institutions, may resist transformative change that reduces their privileges {4.2.2}. Marginal 564 or vulnerable populations may perceive transformative change as adding an unacceptable, even existential, 565 risk to their already precarious lives, such as when change might negatively affect employment and 566 development (*well established*) {4.2.2}.

567 **iii)** Inadequate policies and unfit institutions do not account for the dynamics and magnitude of biodiversity 568 loss and nature's decline (*well established*) {4.2.3}. Institutions have problems of fit when institutional 569 arrangements – the set of norms, rules, and decision-making procedures that seek to regulate human-nature 570 processes and governance systems – do not match the spatial extent and/or the spatiotemporal functioning 571 of the biophysical systems they are embedded in (*well established*) {4.2.3}. Misfits in spatial, temporal and 572 institutional dynamics limit the effectiveness of biodiversity-focused policies and practices (*well* 573 *established*) {4.2.3}.

574 The neoliberal (re)structuring of State policies, including liberalization and austerity, further constraints 575 States' ability to advance transformative change. While neoliberal policies are heterogeneously applied 576 throughout the globe, the prevailing framing of governmental policies shaped by neoliberalism legitimises 577 market-led development and

investment, at the expense of State-led environmental initiatives (*well established*) {4.2.3, 4.2.1}.

Reformist responses to biodiversity loss and nature's decline that do not address underlying causes can challenge transformative change when they obscure the indirect drivers of biodiversity loss and may lead to a sense that effective action has occurred. For example, many biodiversity offsets may seem to address biodiversity loss but have faced challenges with compliance, and difficulties in effectively managing the complexity of measurement and offsetting. There have also been instances where poorly designed and/or governed offset schemes led to dispossession and violations of the respective rights of Indigenous Peoples and local communities, among other challenges (*established but incomplete*) {4.2.3, box 4.1}.

iv) Unsustainable consumption and production patterns are often defined, encouraged, driven and reproduced by social and cultural norms, rather than by conscious, deliberate decision-making (*well established*) {4.2.4}. In a globalised economy, telecouplings over distance, including through trade, may create economic incentives to increase consumption through efficiencies of scale and obscure environmental impacts because they occur in far-away places (*established but incomplete*) {4.2.4, table 4.1, figure 4.8}. Telecouplings can result in rebound effects, such as when efficiency improvements result not in lower but higher consumption rates (because lower production costs result in lower costs of

consumption) *(established but incomplete)* {4.2.4}. For example, a societal emphasis on economic growth underpins modern-day consumerism, as do strategies to maximize profits, such as planned obsolescence and premature aging of technologies (*well established*) {4.2.4, 4.2.5}. These norms make it difficult to define alternative patterns with improved biodiversity outcomes.

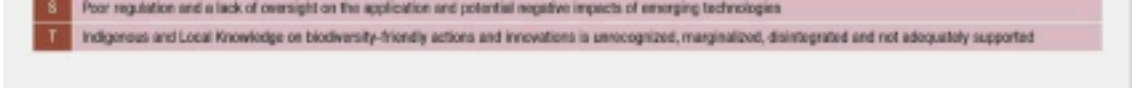
v) Limited access to clean technologies and uncoordinated knowledge and information systems prevents resource- and energy-intensive producers and consumers from adopting technologies that support transformative change (*established but incomplete*) {4.2.5}. Planned obsolescence and premature ageing of technologies, exacerbated by 'rebound effects', cause unsustainable production and use (*well established*). There are operational-procedural limitations on access to sustainable technology, such as weak market institutions and inadequately-trained professionals tasked with operating or maintaining these technologies, that impede the adoption of such technologies by companies, organizations and producers in low to middle income nations. Many producers continue to rely on unsustainable technologies that harm people and biodiversity because of the limited availability and high costs of cleaner technologies (*established but incomplete*) {4.2.5}.

A7. The challenges to transformative change manifest across contexts as a wide range of barriers that perpetuate and reinforce patterns and relationships, contributing to biodiversity loss and nature's decline (*well established*) {1.2, 4.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5}. Transformative change for a just and sustainable world involves power struggles, tensions and trade-offs among actors with different worldviews, values, visions, stakes in and experiences of transformative change (*well established*) {3.5.3}. Powerful actors that benefit from the status quo are mobilizing resources to protect their interests (*well established*) {1.2.2, 1.2.3, 4.2.2, 4.2.3}. Indicative of this is the use of force and violence against civilians, activists and environmental defenders fighting environmentally destructive activities related to deforestation, dam building or mining and journalists covering such conflicts, with estimations of 2,000 people killed between 2012 and 2022, around one third of whom are Indigenous Peoples (*well established*) {1.2.2}. Environmental defenders are also subject to displacement, repression, criminalization, harassment and digital attacks (*well established*) {1.2.2}. Research shows that the impact of actions and scale of resources devoted to blocking transformative change currently overwhelm those devoted to the conservation and sustainable use of biodiversity (*well established*) {1.2.1, 1.2.2, 1.2.3}.

Each of the overarching challenges is linked to the underlying causes of biodiversity loss and nature's decline and associated with a set of barriers that impede transformative change (**figure SPM.3**). An assessment of the literature identified 20 barriers to transformative change. For example, the challenge of economic and political inequalities manifests as a barrier when wealth and power shape policy, or when decisions about investments are made according to shareholder interests and profit, rather than public interest, including biodiversity conservation, restoration and sustainable use (*well established*) {4.2.2}.

The power dynamics within the international monetary and financial systems influencing biodiversity finance further entrench structural inequalities by hampering policy autonomy and limiting institutional change towards distributional equity and justice (*well established*) {4.2.2, 4.2.3}.

System lock-ins, such as path dependencies, compartmentalized and/or short-term thinking and concentration of power also impede transformative practices (*well established*) {4.2.2}. The dominant economic system, with its focus on market-led development, investment and export-led growth, reduces nature to a single economic value and marginalizes other ways of valuing nature and biodiversity, including relational and intrinsic values (*well established*) {2.3.2, 4.2.1, 4.2.3, 4.2.4, 4.2.5}.



634

635 **Figure SPM.3. Relationship between challenges and barriers to transformative change.** This 636 figure represents the wheel of the interconnected challenges (different colours) and barriers (different 637 letters) to transformative change. It illustrates the relationship between these challenges, which are 638 interrelated through views, structures, and practices associated with the underlying causes of 639 biodiversity loss and nature's decline. Their entangled character at this deep level explains how they 640 reinforce one another, but also shows how each barrier within a challenge is an entry point to catalyze 641 transformative change that can alter views, structures, and practices and thus trigger wider changes 642 across other challenges {adapted from figure 4.2}. The table describes the barriers in detail (A, B and 643 C: correspond to Chapter 4, Section 4.2.1.; D, E, F, G: Section 4.2.2., H, I, J, K: Section 4.2.3, L, M, 644 N, O: Section 4.2.4, and P, Q, R, S, T: Section 4.2.5).

645 **A8. Pathways to transformative change entail overcoming context-specific challenges and barriers through** 646 **strategic decisions, willingness and courage and actions aligned with principles of transformative change (*well* 647 *established*) {1.4.2, 2.3.2, 3.5, 4.3, 5.8}.** Pathways to transformative change involve policies, programmes and 648 projects that address the underlying causes of biodiversity loss and nature's decline and are consistent with 649 principles of transformative change (*well established*) {1.3.1, 4.3}. This includes multiple actions by diverse actors 650 working

collectively to implement strategies for transformative change (*established but incomplete*) {5.8}. The 651 challenges and barriers to transformative change are interrelated and cannot be overcome through approaches that 652 focus on only one of them. Visioning processes often involve collective imagining of fundamental changes in 653 human-nature relationships, helping people see the connections among system dimensions and processes, and how 654 they think about the world around them (*well established*) {2.3.2, 2.4.2}. They are powerful and effective in 655 generating transformative change when they incorporate: 1) clarity of purpose and scope; 2) meaningful inclusion of 656 persons with shared goals and diverse perspectives; 3) imagination and creativity to move beyond existing patterns 657 and 4) flexibility to adapt to new ideas (*established but incomplete*) {2.2.3}.

658 Each challenge offers strategic opportunities to catalyze actions that address multiple barriers. For example, efforts 659 to improve a policy's fit to the spatial context can also address relations of domination that preserve institutions in 660 their current forms and the lack of coordination between knowledge systems (*well established*) {4.3}. Addressing 661 barriers sometimes includes active disruption or careful phasing out of existing path dependencies (*well established*) 662 {4.3}. Overcoming challenges and barriers requires attention to transformative ways of thinking, doing, organizing, 663 governing, relating and knowing in all contexts and across all scales (*established but incomplete*) {4.3}. Ignoring 664 contextual factors introduces higher risks that transformative initiatives fail, diverge significantly from their 665 intended outcomes, or create other harmful consequences (*established but incomplete*) {3.5.1, 3.5.4}.

666 **A9. Six broad approaches highlight complementary insights for promoting and accelerating deliberate** 667 **transformative change. Each provides unique insights to understand, describe, analyze, trigger and navigate** 668 **how transformative change occurs. Weaving together multiple approaches can lead to synergies that** 669 **reinforce pathways towards a just and sustainable world (*well established*) {3.2, 3.3, 3.5}.** No single theory or 670 approach provides a complete understanding of how to achieve transformative change across contexts and scales 671 (*well established*) {3.3, 3.5.1}. Six broad approaches have been identified in the literature, each representing a group 672 of related theories and frameworks that have commonalities in their underlying assumptions and understandings of 673 how to bring about transformative change; Indigenous and local knowledges contribute to all these approaches 674 (**table SPM.1**) (*well established*) {3.2, 3.3, 3.5}. The six approaches and their core focus are:

675 **i)** Systems approaches: transformative change takes place through systems shifts and therefore requires 676 attention to multiple aspects of the system, such as the visions or objectives, feedbacks and structures that 677 make up a system {3.2.1};

678 **ii)** Structural approaches: Transformative change occurs when there are shifts in the economic, cultural, 679 political, or social structures in ways that promote sustainability {3.2.2};

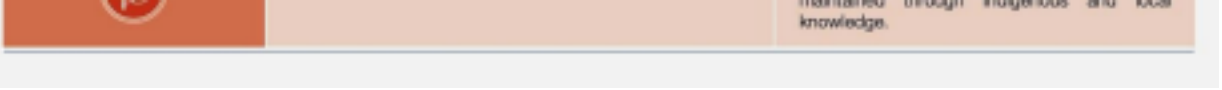
680 **iii)** Inner transformation approaches: transformative change takes place through shifts in personal values, 681 beliefs and worldviews and a recognition of intra- and inter-generational, human- and non-human 682 relationships, leading to integrated actions across levels {3.2.3};

683 **iv)** Empowerment approaches: transformative change occurs when agency and power are asserted by 684 currently marginalized groups in ways that transform power relations for the benefit of equity and 685 sustainability {3.2.4};

686 **v)** Knowledge co-creation approaches: transformative change is supported through the process of 687 knowledge co-creation by a variety of actors (such as civil society, Indigenous Peoples and local 688 communities, or scientific actors) working together {3.2.5};

689 **vi)** Science and technology approaches: transformative change happens when scientific and technical 690 discoveries deliver new technologies, perspectives, or solutions that are taken up by society and brought to 691 scale {3.2.6}.

692 **Table SPM.1. The main actions and interventions associated with six broad approaches to** 693 **transformative change, and the role of Indigenous and local knowledge in each approach.**



694
695 **A10. Despite challenges transformative change for a just and sustainable world is possible. A wide range of** 696 **case studies demonstrate transformative potential and show substantial positive environmental and social** 697 **consequences for nature and people within a decade (*established but incomplete*) {1.2.1, 1.4, 2.3.5, 3.1, 3.4}.** A 698 rapidly growing number of actors, sectors and social movements are demanding and implementing changes that are 699 equitable, just, inclusive and respectful (*well established*) {1.4}. Many existing initiatives have transformative 700 potential, defined as latent capacities for generating fundamental, system-wide shifts in views, structures and 701 practices (*established but incomplete*) {1.4}. Historical examples and contemporary initiatives demonstrate that 702 transformative change is possible across scales to generate a just and sustainable world (*established but incomplete*) 703 {3.3, 2.3.5}.

704 An assessment of 391 case studies covering all regions of the world highlights the characteristics of initiatives with 705 the potential to contribute to transformative change. These cases include 48 from Africa, 100 from the Americas, 68 from Asia and the Pacific, and 100 from Europe and Central Asia[17] 706 . They show that coalitions of actors are already 707 working across scales to contribute to a just and sustainable world (*well established*) {3.4}. Many are activating 708 transformative potential by embodying the principles of transformative change and engaging with views, structures 709 and practices {1.4.3}. These cases show that transformative change is facilitated when enabling conditions are 710 present and when a variety of actors engage through diverse, context-specific actions (*established but incomplete*) 711 {3.5.4, 3.5.5, figure 3.8}. Some have negative and unintended consequences as well, which underscores the 712 importance of adaptive learning and action (*well established*) {1.3.2, 3.5.7}.

713 Most of the assessed case studies involve collaboration among actor groups, including individual citizens, 714 Indigenous Peoples and local communities, businesses, financial actors, national governments, educators and the 715 scientific community (*well established*) {3.5.1, 3.5.2, figure 3.3}. An analysis of the cases reveals numerous positive 716 impacts on nature and people, with many occurring within a decade (**figure SPM.4**) (*well established*) {3.3}. The 717 case studies demonstrate the potential of diverse actors and forms of agency to build momentum and contribute to 718 transformative change and they emphasize the importance of actor coalitions and collaborative processes (**box** 719 **SPM.2**) (*established but incomplete*) {3.5.7, figure 3.3}.

[17] IPBES Transformative Change Assessment Data Management Report on the case studies database with transformative potential and pitfalls (https://doi.org/10.5281/zenodo.10260233).

720 Translating transformative potential into deliberate transformative change for a just and sustainable world can be 721 promoted and accelerated by addressing the underlying causes of biodiversity loss and nature's decline, by 722 anchoring transformative pathways in inspiring visions and by drawing on diverse knowledge systems and 723 approaches (*established but incomplete*) (**figure SPM.5)** {1.4.1; 2.3.2; 3.5.1; 5.8}. The transformative potential of 724 different actors and initiatives can be more fully realized by developing transformative capacities (e.g., the 725 knowledge, skills, attitudes and resources) necessary to realize transformative change (*established but incomplete*) 726 {1.4.3}.

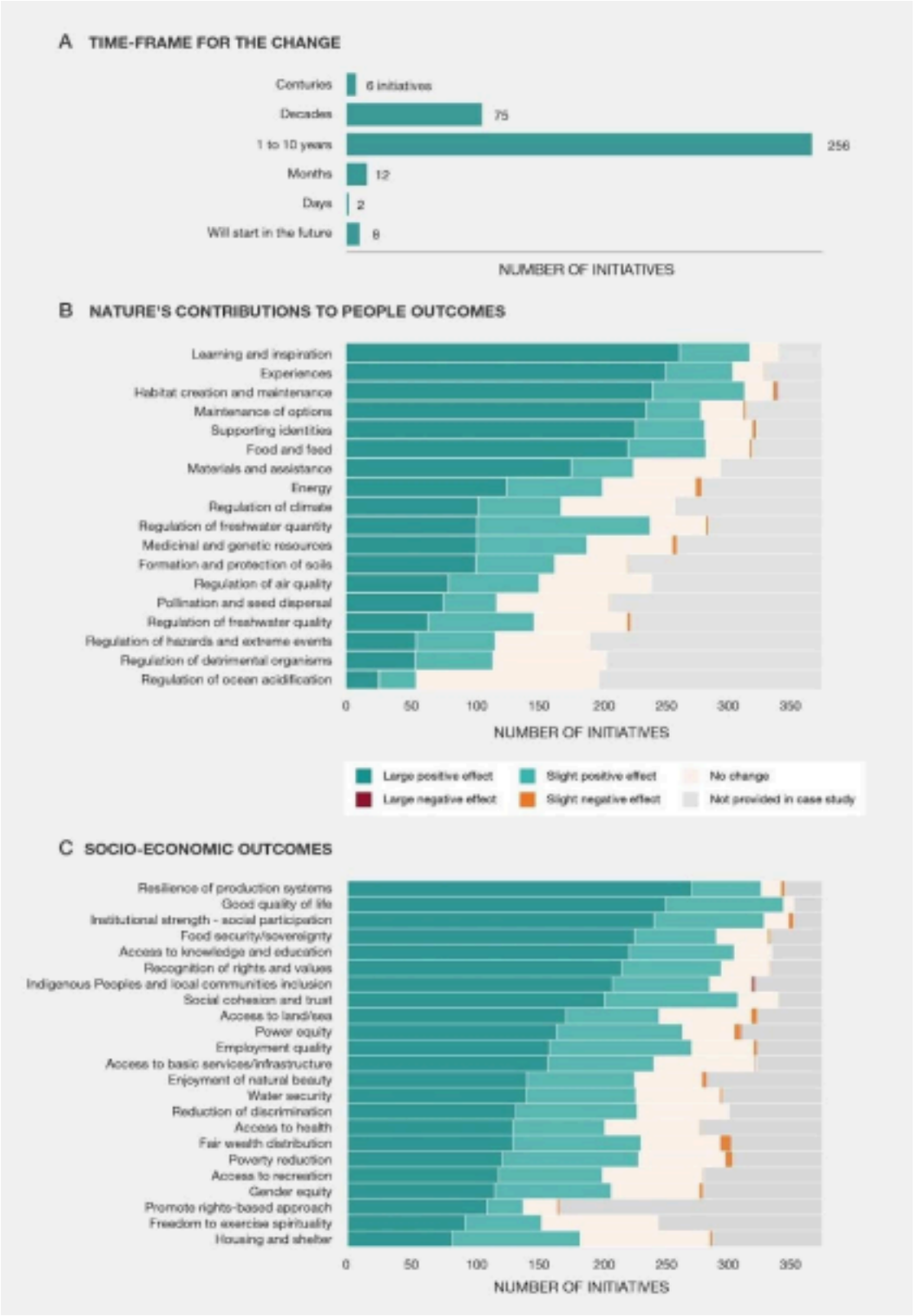
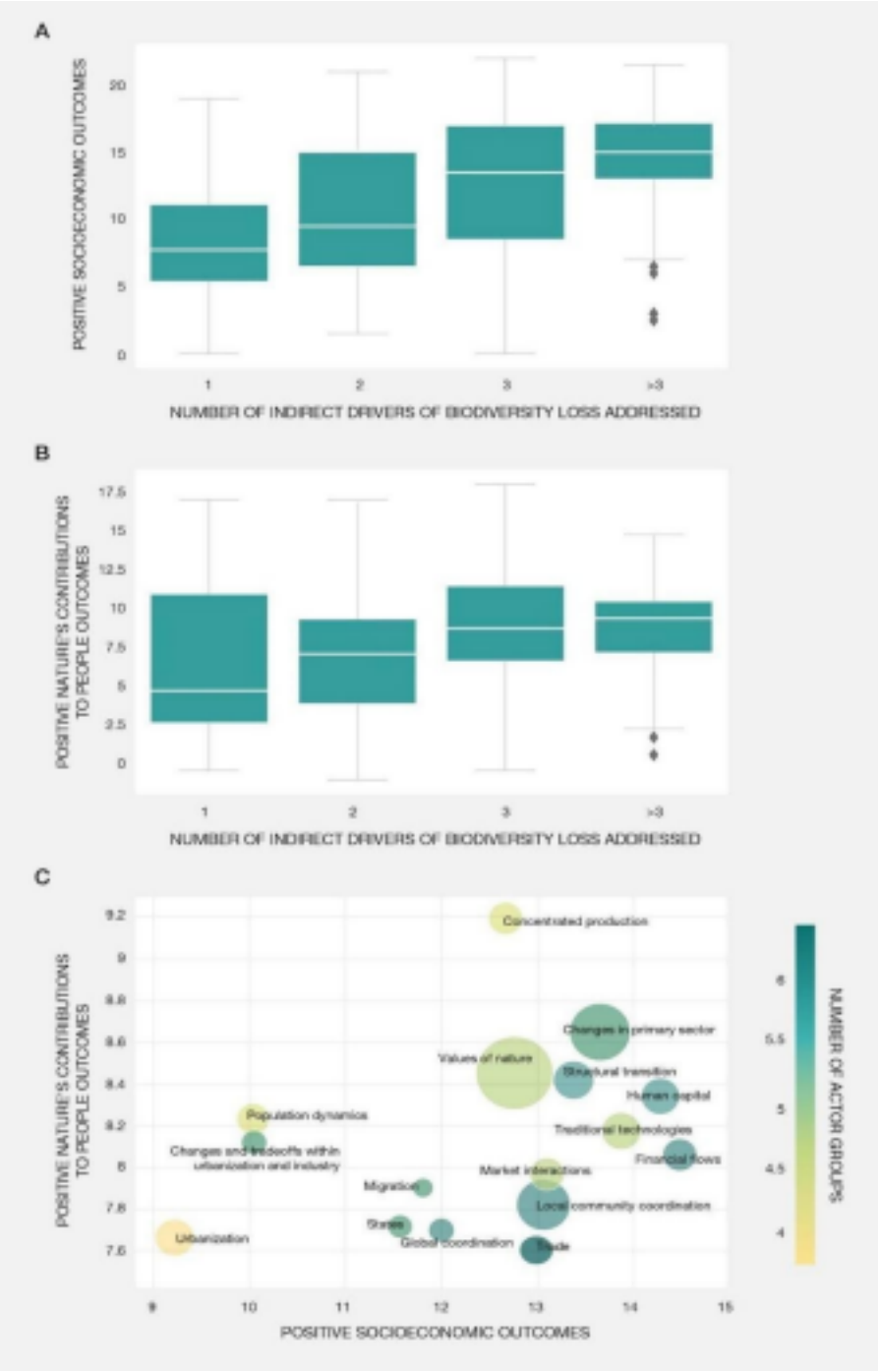


Figure SPM.4. Positive outcomes have evidenced within a decade or less (panel A) **for a diverse set of social, economic and environmental indicators** (panels B and C)**.** This figure shows the number of initiatives with transformative potential identified in the database of 391 case studies assembled for this assessment, according to: the time frame for the change (A); outcomes for nature's contributions to people (the typology of Nature's Contribution to Peoples follows chapter 2 of the IPBES Global Assessment)[18] (B); and outcomes for socio-economic indicators (C) {3.4}. Not all initiatives measured all dimensions of outcomes.

Box SPM.2. The role of actor coalitions in the co-creation of transformative change. The co-management of the Marine Reserve "Os Miñarzos" in Galicia, Spain is an example of a transformative change in small-scale fisheries co-created by fishers, scientists and the government administration after the abrupt shock of an oil spill. These actors jointly developed a new vision based on shared values that supported sustainable local fisheries and the well-being of coastal communities dependent on the marine protected area. The process of knowledge co-production began by sharing the traditional knowledge (e.g., identification of the most sensitive and productive habitats and species) of fishers with scientists and management. This practice then became part of the formal decision-making process of the management body. Co-construction has been a complex process and not without tensions and contested actions by some fishers. These tensions indicated the need to address underlying causes of transformative change, such as the prioritization of short-term, individual and material gains and disconnection from nature. More than 17 years after its implementation, this marine protected area has generated positive effects on fishing structures and practices, leading to measurable outcomes (e.g., higher abundance of species and economic revenues) and greater trust and cooperation among the actors. The marine protected area has inspired not only the Food Agriculture Organization Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication[19], but also served as the seed to create a new network of small-scale fishers in Ibero-American countries, involving more than 20 million fishers {1.4}.

[18] IPBES (2019a): *Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Díaz, S., Settele, J., Brondízio, E. S., Ngo, H. T., Guèze, M., Agard, J., Arneth, A., Balvanera, P., Brauman, K. A., Butchart, S. H. M., Chan, K. M. A., Garibaldi, L. A., Ichii, K., Liu, J., Subramanian, S. M., Midgley, G. F., Miloslavich, P., Molnár, Z., Obura, D., Pfaff, A., Polasky, S., Purvis, A., Razzaque, J., Reyers, B., Roy Chowdhury, R., Shin, Y. J., Visseren-Hamakers, I. J., Willis, K. J., and Zayas C.N. (eds.). IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.3553458

[19] FAO. 2015. *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. Rome.



735

736 **Figure SPM.5. Positive outcomes in initiatives with transformative potential depend on the** 737 **number and types of indirect drivers of biodiversity loss that are addressed.** Initiatives with 738 transformative potential addressing more indirect drivers of biodiversity loss and nature's decline lead 739 to more positive socioeconomic (A) and to more positive nature's contributions to people outcomes 740 (B) (p-values from the analysis of variance are below 0.001 in both cases). (C): Addressing different 741 indirect drivers of biodiversity loss requires collaborating with a varying number of actors (e.g., trade 742 involves many actor groups) with contrasting outcomes. Changes in indirect drivers related to the 743 primary sector (e.g., agriculture) can achieve the highest benefits on both socioeconomic indicators 744 and indicators related to nature's contributions to people. The size of the circles reflects the number of 745 initiatives addressing that indirect driver. The outcomes for the socioeconomic dimension and nature's 746 contributions to people are a composite index (no units) of a diverse set of indicators measured in the 747 case study database (n = 391). The complete list of socioeconomic indicators can be found in **figure** 748 **SPM. 4,** whereas the typology of indirect drivers follows chapter 2.1 of the IPBES Global 749 Assessment.

750 **A11. Transformative change concerns the quality and direction of change. Both small-scale and large-scale** 751 **initiatives contribute to transformative change when they address the underlying causes of biodiversity loss** 752 **and nature's decline and include explicit visions of desirable futures. They have the potential to scale when** 753 **they overcome challenges and barriers, guided by the principles of transformative change (*established but*** 754 ***incomplete*) {1.3, 2.3.5, 5.2}.** It is misleading to think of change as being either incremental or transformative in a 755 simple, binary sense because diverse small-scale initiatives with transformative potential can contribute to a just and 756

sustainable world *(established but incomplete)* {1.1, 1.4.3}. Transformative change takes place over time and 757 seemingly small changes that address the underlying causes can spread in ways that inspire or influence larger and 758 more systemic shifts, especially when they overcome barriers and challenges *(established but incomplete)* {1.1, 759 1.4.1, box 1.1}. Local sustainability initiatives, such as the implementation of nature-based solutions and ecosystem 760 based approaches, can contribute to global sustainability through various scaling processes, including scaling out 761 (e.g., replication of innovations to other geographical contexts), scaling up (e.g., institutionalizing innovations in 762 policy, law, rules), scaling deep (e.g., shifting mindsets, paradigms, values) and forming new constellations of 763 initiatives *(established but incomplete)* {3.5.6}. Efforts at different scales reinforce and amplify one another when 764 aligned with principles for transformative change and work against each other when not aligned *(well established)* 765 {3.5.6}.

766 Transformative change may have global positive effects but may also consolidate or worsen existing inequalities. 767 Large-scale changes alone do not generate fundamental, systems-wide shifts for a just and sustainable world *(well* 768 *established)* {1.4.1, 2.3.5}. For example, many technological advances (e.g., artificial intelligence and 769 biotechnologies) have generated positive effects in terms of driving business innovation, scientific and human health 770 progress, improved efficiency and productivity, and greater capacity to monitor environmental changes *(established* 771 *but incomplete)* {2.3.3}. But they have been less successful in safeguarding sustainable uses of nature, driving a 772 more equitable economic development, or ensuring that more vulnerable groups have equal access *(established but* 773 *incomplete)* {2.3.3}. Some technologies may even have globally positive effects on average but consolidate or 774 worsen existing inequalities (*established but incomplete*) {2.3.3}. This underscores the importance of transformative 775 change that addresses the underlying causes of biodiversity loss and nature's decline based on principles of equity 776 and justice, pluralism and inclusion, respectful and reciprocal human-nature relationships, and adaptive learning and 777 action (*well established*) {1.3.2}.

778 B. Strategies and actions for transformative change

779 **B1. A key strategy for transformative change for global sustainability is to conserve, restore and regenerate** 780 **places of value to nature and people that exemplify biocultural diversity (*well established*) (Strategy 1) {5.3}.** 781 References to place-based conservation actions are widely represented in the literature on transformative change 782 (mentioned in 28% of the references of the assessment corpus that included a mention to any action in the title or 783 abstract and 33% of the references of the transformative change assessment corpus of literature on case studies, 784 referred to hereafter as case corpus) (*well established*) {5.2} (**figure SPM.6**). **Strategy 1** represents a transformative 785 biocultural conservation approach with actions to conserve and sustain the places where people and nature are still 786 flourishing with relational worldviews, governance structures and practices (**action 1.1)** {5.3.1}, while envisioning 787 new legal protections for peoples and places through rights-based approaches, respecting the rights of nature and 788 rights of Mother Earth as recognized by some (**action 1.2**) {5.3.2}, and place-based conservation based on diverse 789 values of nature (**action 1.3**) {5.3.3}. These actions are complemented by the establishment of regenerative views, 790 structures and practices in extractive sectors (**action 1.4**) {5.3.4}, which are implemented through spatial planning 791 and policies as a pathway to establish effective conservation of biodiversity across landscapes and seascapes across 792 scales (**action 1.5)** {5.3.5}.
793 Among the actions assessed, the literature emphasizes instruments used in conservation, management and 794 monitoring in support of 'basing conservation on diverse values of nature' (*established but incomplete*) (**figure** 795 **SPM.6**) (**action 1.3**) {5.3.3}. Deliberately connecting biological conservation with cultural values, referred to as 796 biocultural approaches, has been demonstrated as an actionable way to enhance place-based actions for long-term 797 sustainability (**box SPM.3**) (**action 1.3)** (*well established*){5.3.3}.
798 Regenerative strategies that protect and promote both biological and cultural (biocultural) diversity simultaneously 799 provide multiple co-benefits over time (**action 1.4)** {5.3.4}. Regeneration refers to processes by which 800 socio-ecological systems revive themselves after disturbance, and evolve through positive reinforcing cycles that 801 allow for emergence (e.g., of biocultural diversity). Restoration activities are one way for humans to initiate that 802 revival process. While restoration typically suggests humans doing things *to* nature, regeneration refers to humans 803 co-evolving *with* and participating *as* nature. Regenerative strategies can support cultural values, sustainable 804 production and biodiversity conservation (**action 1.4)** (*established but incomplete*) {5.3.4}. For example, the 805 Community Forestry Programme in Nepal integrates decentralized forest policy into local communities' needs, 806 views and practices to restore and manage degraded forests (*well established*) {5.3.4}. Other approaches (e.g., 807 *Satoyama*/*Satoumi* in Japan, which refer to the harmonious interaction between humans and nature in rural

808 landscapes and seascapes) also take the view that culture and ecosystems are integrated and co-evolving (*well* 809 *established*) {5.3.4}.

Figure SPM.6. Dendrogram displaying the proportion of occurrences of terms associated with strategies or actions. The line thickness in the dendrogram depicts the proportion of occurrences of 566 terms associated to 22 actions and 5 strategies on the title and abstract of documents occurring in at least one main strategy (n = 420,523).

Box SPM.3. The transformative potential of values and placed-based conservation.

The Nashulai Maasai Conservancy is an Indigenous-owned and run conservancy located in the Maasai Mara (Kenya), one of the world's most biodiverse ecosystems. The initiative is based on the values of co-existence, dignity, inclusivity, self-determination, empowerment and human rights. It represents a new model for conservation that simultaneously responds to species loss, loss of cultural knowledge, livelihood struggles and climate change. Through the establishment of community-managed protected areas and other initiatives, such as tree planting and river cleaning projects, it has been successful in creating mixed-use community areas where both humans and wildlife thrive. The conservancy is promoting the return of wildlife and generating livelihood and cultural opportunities for Maasai families, illustrating how Indigenous biocultural practices support multiple goals. It serves as a focal point for inspiring and scaling change in other communities around the world {box 1.4}.

B2. Reaching the 2050 Vision for Biodiversity involves driving systemic change and mainstreaming biodiversity in the sectors that heavily contribute to its loss and nature's decline, including agriculture and livestock, fisheries, forestry, infrastructure, mining and energy, particularly fossil fuel sectors (*well established*) (Strategy 2) {5.4}. For example, multifunctional and regenerative land use approaches promote multiple benefits of nature, evident in agroecological farming transitions that emphasize nature, healthy food production and physical and mental well-being (**box SPM.8**). Studies suggested that increasing biodiversity, protecting native habitats and reducing external inputs in agricultural landscapes can enhance crop productivity, for instance, by enhancing pollinator abundance and diversity (*well established*) {5.8.2}. Such improvements elevate employment levels, promote healthy livelihoods and foster a sense of identity and spiritual connection. Phasing out ecologically harmful practices in sectors most responsible for biodiversity loss is not achieved by single instruments, but rather depends on mainstreaming biodiversity in all relevant policies, planning, support schemes, and administrative procedures **(action 2.1)** (*well established*){5.4.1}**.** A parallel opportunity exists in the energy sector, where replacing fossil fuels with biodiversity-friendly renewable energy sources can present clear solutions to biodiversity and climate challenges. This transition involves adopting renewable energy technologies, innovations

and practices that conserve biodiversity and protect nature, such as smart grids, which reduce reliance on resource

intensive materials and lower mining-related biodiversity impacts **(action 2.2)** (*well established*) {5.4.2}**.**

B3. Technologies can redirect development towards sustainability and equity when embedded in transformative frameworks (*established but incomplete*) (Strategy 2, action 2.2) {1.3.3, 2.3.3, 3.2.6, 5.4.2}. In transformative frameworks, technologies aim to address the underlying causes of biodiversity loss and nature's decline, rather than exacerbating them (*established but incomplete*) {1.3.3, 3.2.6. 5.4.2}. Technologies in transformative change processes redirect development away from activities that drive biodiversity loss toward regenerative practices aligned with nature-positive goals (*established but incomplete*) {2.3.3, 5.4.2}. However, for technology to be truly transformative, it must also incorporate equity and human rights considerations, ensuring that innovations and their benefits are shared fairly {1.3.2, 3.2.6; 5.4.2}. The success of technologies is context dependent, varying across regions due to differences in social and economic conditions (*established but incomplete*) {5.4.2}. Moreover, democratic accountability throughout the technology development process is essential for their responsible use. Transformative technological changes are most effective when integrated into legal frameworks, such as intellectual property rights, and supported by long-term cooperation and capacity-building efforts, particularly in low-income countries (*established but incomplete*) {5.4.2}. Examples of technologies that can be embedded in transformative frameworks include smart energy and water management, biomimetics, the digitalization of food systems, and financial technology (fintech) innovations (**box SPM.4**) {5.4.2}. However, there is limited empirical evidence on the role of technology in driving transformative change (only 1.8% of all transformative change literature analysed) (*established but incomplete*) {2.3.3; figure 2.6}. Technologies can also be deployed in non-transformative or even harmful ways, contributing to unsustainable consumption patterns (*established but incomplete*) {2.3.3, box 3.3}. For example, transforming energy use may involve addressing rebound effects, such as savings from energy efficiency being offset by increased demand for energy-consuming services, or reinforcing patterns of extraction for rare metals in ways that echo colonial practices (*well established*) {5.4.2}. Many emerging technologies depend on critical minerals, the extraction of which often harms ecosystems. For instance, research on deep-sea activities (e.g., mining) in response to rising demand for critical minerals like lithium, cobalt, and graphite from the ocean floor reveals the importance of increased attention to the ecological implications of such activities on deep-sea ocean functioning (*established but incomplete*) {2.3.3}.

Box SPM.4. The transformative potential of technologies for global sustainability. Technologies can potentially play an important role in transformative change. One example of an initiative with transformative potential facilitated by technology is Ant Forest. This is a mobile phone application that uses financial technology (fintech) to convert a user's uptake of lower-carbon activity into what has become China's largest private sector tree-planting scheme. Ant Forest uses the Alipay mobile payment app as its platform. Every time a user performs a carbon mitigation activity (such as commuting to work by walking, biking or using public transport, or reducing paper and plastics), they are rewarded with 'green energy points' that grow into a virtual tree. For each virtual tree grown, Ant Forest donates and plants a real tree with local residents. Since its launch in 2016, Ant Forest has engaged over 500 million users and planted more than 548 million trees in 13 provinces. Recognizing a wide range of ecological and social goals, the plants are suited to specific contexts and provide jobs in eco-agriculture and ecotourism in remote rural areas facing environmental degradation in China. Potential remains for this case study initiative to expand into all elements of the transformative framework. This case highlights the importance of actor coalitions, including the private sector working with citizens and community engagement in ecosystem restoration and reforestation facilitated by technology. See the transformative change assessment case study database for more details.

B4. Efforts for conserving, restoring and sustainably using biodiversity, nature, nature's contributions to people, including ecosystem services, are significantly under-resourced in relation to the global economic value generated by activities dependent on nature (*well established*) (Strategy 2) {1.2.1, 4.2.3, 5.4.3}. More than half of the world's total Gross Domestic Product ($58 trillion in 2023) is generated by sectors dependent on nature to a moderate or high extent (**figure SPM.7**) **(action 2.3)**{5.4.3}. In 2020, industries highly reliant on nature generated 15% of global GDP and moderately-dependent industries generated 37% of global Gross Domestic Product **(action 2.3)** (*established but incomplete*) {5.4.3}. Eliminating, phasing out or reforming economic incentives harmful to biodiversity can significantly reduce pressures on nature and could allow redirecting these resources to conserve, restore and sustainably use biodiversity **(action 2.3)** *(well established)*. Global public explicit subsidies to sectors directly driving nature's decline ranged within $1.4 and $3.3 trillion for 2023, depending on the source. Agriculture ($520-851 billion) and fossil fuel ($440-1260 billion) are the sectors receiving more subsidies. Road and irrigation infrastructure ($254-938 billion), forestry ($55-175 billion), and fisheries ($41-60 billion) are also heavily subsidized. No global estimates are available for the mining sector *(well established)* {5.4.3}. The same economic sectors create environmental impacts in the form of air and water pollution or soil degradation that are not accounted for in market exchanges (i.e., they generate negative externalities) that are estimated up to $10.7 trillion per year in 2023 (**figure SPM.7**) (*well established*) {5.4.3}.

By comparison, the estimated annual support needed to sustainably manage biodiversity and maintain ecosystem integrity is between $722 and $967 billion per year leaving a biodiversity financing gap of $598–824 billion per year, depending on the source. Currently, $135-156 billion (inflation-adjusted to 2023) per year are spent on biodiversity conservation (**figure SPM.7**). Restoration and regeneration efforts will require even greater investments, likely exceeding one trillion dollars annually **(action 2.3)** *(well established)* {5.4.3}. Financial and economic

899

900 **Figure SPM.7: The economic landscape of global sustainability: interdependencies and funding** 901 **gaps.** The figure illustrates the sharp contrast between economic sectors' dependence (2) and impact 902 (3) on nature, and between public investment in economic sectors driving nature's decline (4) and 903 biodiversity funding (6). The length of the arcs is adjusted to inflation to represent a share of the 2023 904 global GDP (estimated at $105.6 trillion). 1) Global GDP in 2022 ($105.6 trillion); 2) Global GDP

905 moderately to highly dependent on nature in 2023 ($58 trillion/year). 3) Externalities of sectors most 906 responsible for nature decline estimated at $10 trillion in 2021, inflation-adjusted to 2023 ($10.7 907 trillion). 4) Global direct subsidies to sectors most responsible for nature´s decline estimated between 908 $1.3 and $3.1 trillion in 2021, inflation-adjusted to 2023 $1.4 and $3.3 trillion. 5) Global biodiversity 909 funding gap ($598-824 billion/year until 2030). 6) Global biodiversity conservation financing 910 estimated between US$124-143 billion in 2019, (US$135-156 billion inflation-adjusted to 2023).

911 **B5. Current global supply chain arrangements encourage unsustainable sourcing and overproduction,** 912 **leading to over-exploitation of nature {figure 4.7}. Ensuring sustainability, including through targeted and** 913 **just downscaling of consumption and production, alongside cultures of sufficiency, contributes to reducing** 914 **global**

footprints to sustainable levels across all countries. Overcoming inequities in consumption and 915 **production patterns, through governance that is coherent and effective along the whole supply chain, is** 916 **essential for transformative change *(established but incomplete)* (Strategy 3, Strategy 4) {5.5.2, 5.6.3}.** 917 International trade is primarily driven by the for-profit economic and financial sectors, where government regulation 918 of land- and sea-use activities that are harmful to nature, is often insufficient (*established but incomplete*) {5.5.2}. 919 Noting uncertainties in the model used, according to one estimate, over the period 1990-2015, high-income 920 countries obtained without adequate compensation in equivalent terms through trade with low-income countries the 921 equivalent of 12 billion tons of embodied raw material equivalents, 822 million hectares of embodied land, 922 21 hexajoules of embodied energy and 188 million person-years of embodied labour, worth $10.8 trillion – enough 923 to end extreme poverty 70 times over (*well established*) {5.5.2}. Over the period, losses from low-income countries 924 were $242 trillion. Low-income countries' losses due to unequal exchange outstrip their total aid receipts over the 925 period by a factor of 30 (*established but incomplete*) {5.5.2}.

926 Mitigating ecologically unequal exchange between producer and consumer countries has the potential to reduce 927 excess consumption and ecological footprints (**action 3.2**) (*established but incomplete*) {5.5.2; 5.6.3}. Similarly, 928 regulation of entire global supply chains to reduce their reliance on ecologically harmful extractive processes and 929 practices is a powerful means to reduce negative impacts of trade on biodiversity and ecosystems, and can be 930 supported by positive incentives by for example adjusting taxes, subsidies, payments for ecosystem services, 931 permits, standards or regulations, when designed in an equitable and inclusive manner (*established but incomplete*) 932 (**action 3.1**) {5.5.1}. Current dominant approaches to economic activities remain significantly coupled with 933 environmental pressures. Economic growth is pursued by all, but is globally unevenly distributed, and exacerbates 934 ecological overshoot while threatening possibilities for just and sustainable development (**action 3.2**) (*established* 935 *but incomplete*) {5.5.2, 4.2.2, 4.2.4}. Policy instruments that impose declining caps on resource use or support not 936 for-profit models (e.g., foundation-owned limited liability companies, consumer cooperatives, credit unions or 937 mutual companies) can foster a transition to a just, sustainable economy and avoid trade-offs between investor 938 interests and social and environmental benefits (**action 3.1, action 3.2)** (*established but incomplete*) {5.5.2}. 939 Revising procedures of multi-lateral collaboration and designing coherent and consistent policies between countries 940 linked by trade and other interdependencies can be a powerful lever for overcoming global inequalities and 941 institutional misfits, noting the importance of a just sustainable economy for all and the need to protect livelihoods 942 (**action 4.3)** (*established but incomplete*) {5.6.3}.

943 **B6. Redefining goals, metrics and indicators to acknowledge economic, social (including cultural) and** 944 **environmental dimensions as well as the many different values of nature can promote new paradigms of** 945 **progress that centre on justice and sustainability (Strategy 3) (*established but incomplete*) {4.4.2, 5.5.4, 5.5.3,** 946 **5.6.3}.** Gross Domestic Product, although a measure of economic flow, is widely used to proxy economic growth 947 (*well established*) {5.5.4}. The measure has been criticised due to its reliance on marketed goods and services only 948 (*well established*) {5.5.4}. Beyond Gross Domestic Product, alternative metrics of development that go beyond the 949 limited paradigm of economic growth have been proposed, which include other social, cultural, economic and 950 ecological dimensions of quality of life. These metrics either adjust the traditional Gross Domestic Product metrics 951 (e.g., Green GDP, Genuine Progress Indicator, Genuine Savings, Gross Ecosystem Products), replace it with more 952 inclusive indices that account for human wellbeing and environmental impact (e.g., Happy Planet Index, Inclusive 953 Wealth, Gross National Happiness), or supplement it to account for natures' contributions to economic well-being 954 into the mainstream metrics of economic progress (e.g., System of Environmental Economic Accounting – 955 Ecosystem Accounts (SEEA – EA) {figure 5.10, 5.5.4} (*well established*). Options for assuring the inclusion of 956 nature in global financial flows include elevating nature to become a central criterion for financial bonification of 957 private companies, governmental fund allocation and development funds and aid {4.4.2, 5.5.4} (*established but* 958 *incomplete*). The compliance to these obligations is tied to transparency and monitoring, as well as institutional 959 arrangements that evaluate and enforce the accountability of actors towards biodiversity values (*established but* 960 *incomplete*) {5.5.4, 5.6.3}. Such reforms imply establishing mechanisms that facilitate socially and ecologically fair 961 access to resources globally and new roles for Central Banks and other funders (*established but incomplete*) {5.5.3}. 962 Frameworks are emerging on how to identify, measure, evaluate, disclose, and act on business' relationship to 963 nature, including the ACT-D high level business actions on nature (Act, Commit, Transform, Disclose) or the LEAP 964 (Locate, Evaluate, Assess, Prepare) framework {5.5.4} (*established but incomplete*). Sector-specific tools and 965 guidance materials are being developed to leverage natural capital accounting by assessing and disclosing

966 businesses' nature-related risks, impacts, dependencies, and opportunities (e.g., Taskforce on Nature-related 967 Financial Disclosure, Global Reporting Initiative, UN SEEA EA for Ecosystem Accounting, Product Biodiversity 968 Footprint) {5.5.4} (*established but incomplete*). Some business sectors and financial institutions are currently 969 piloting recommendations by the Taskforce on Nature-related Financial Disclosure, but they call for improved 970 quantification methodologies to assess the financial implications of biodiversity loss and nature's decline for 971 institutions' clients or investees and for improved internal capacity building and better understanding {5.5.4}(*well* 972 *established*).

973 **B7. Governance systems that effectively reduce biodiversity loss and nature's decline integrate biodiversity** 974 **into sector policies and decision-making, engage diverse actors and hold actors accountable (Strategy 4) (box** 975 **SPM.5) (*well established*) {1.4, 3.2, 5.6}.** Institutional options to foster integrated and nexus governance include 976 joint planning procedures, assigning legal responsibilities, co-developing practical solutions, fostering collaborative 977 structures and facilitating co-evaluation processes {5.6} (*established but incomplete*). Positioning biodiversity and 978 its advocates in land, sea and resource-use decisions, project approvals, financial incentives and criteria for 979 allocating funds and investments strengthens the integration of governance systems and thereby fosters support for 980 nature and

biodiversity (**action 4.1**) {5.6.1, 5.6.3}(*well established*). Inclusive governance systems that engage 981 diverse actors ensure the representation of a plurality of worldviews, practices and knowledge systems **(action 4.2)** 982 {5.6.2, 3.2.2} (*well established*). Consistent participation and collaborative structures strengthen perceived 983 responsibilities among actors and provide opportunities to shift decisions towards just and equitable transformations 984 **(action 4.2)** {5.6.2, 3.5.5} (*established but incomplete*). Global interdependencies of causes and effects of 985 biodiversity loss, climate change, pollution, poverty and other sustainability issues require effective and integrated 986 multilateral and bilateral agreements that coordinate balanced solutions **(action 4.3)** {5.6.3} (*established but* 987 *incomplete*). Effective governance of nature and biodiversity in producing systems further depends on 988 complementary regulation of consumption patterns, acknowledging the role of high consuming actors {5.6.3} (*well* 989 *established*). Governance systems hold actors accountable by clearly assigning responsibilities and timeframes, 990 providing complementary institutional mandates and iteratively and transparently evaluating and revising policies 991 and regulations as well as trade agreements to assure a fair and sustainable governance of nature **(action 4.4)** {5.6.4, 992 5.6.3} (*well established*).

Box SPM.5. Examples of governance systems with transformative potential.

Governance systems that place biodiversity at the core of policies and legislation are better equipped to mitigate harmful actions that contribute to biodiversity loss and nature's decline {5.6.1}. For example, the European Union's Common Agricultural Policy has gradually adopted and strengthened financial incentives for agri-environmental and climate measures and introduced conditionality in farmer support schemes to encourage biodiversity-friendly practices {5.6.1}. These practices include incorporating landscape elements, buffer strips, fallow land, organic farming, or agroforestry to maintain wildlife habitats and promote sustainable farming. These efforts have the potential to drive transformative changes in lands use across Europe. For instance, the share of fallow land (important for biodiversity and ecosystem services) in the overall cropland area has drastically changed in response to changes in support schemes {5.6.1}.

However, the transformative potential of the Common Agricultural Policy's measures has been hampered by an underrepresentation of environmental advocates in decision-making overshadowed by a dominance of vested interest groups, and constant policy redesign that undermine evaluation and learning procedures. This has resulted in imbalanced regulatory power and only a limited share of the budget being allocated to effective biodiversity measures, despite biodiversity being one of the ten objectives of the Common Agricultural Policy. Literature on the Common Agricultural Policy suggests that biodiversity, nature and sustainable rural development could be better supported by phasing out direct farmer support and replacing it with targeted incentives or regulations {5.6.2}. Transforming the Common Agricultural Policy will, however, require increasing transparency, supporting stakeholder engagement and strengthening evaluation procedures, enhancing policy learning {5.6.1, 5.6.2, 5.6.4}.

Another example of governance that benefits both nature and people is the ecosystem-based spatial management approach in the Galapagos Marine Reserve, which supports sustainable fisheries and tourism—a vital source of livelihood for over 30,000 residents and 300,000 annual visitors to the Galapagos. However, climate change, local waste management and water treatment remain major challenges impacting the food security, nutrition and health of residents. This illustrates the importance of governance systems to be adaptable to incorporate policy innovations and accommodate changing social and structural conditions {1.3.2, 3.2.6, 5.6.1}. Such adaptability enables governance systems to respond more effectively to lessons learned from ongoing monitoring and evaluation processes {5.6.4}.

993 **B8. Adaptive learning and action address uncertainties associated with transformative change (Strategy 4)** 994 **(*well established*) {1.3.2, 3.4, 5.6.4}.** Transformative change is a complex and dynamic process that is characterized 995 by emergent and unexpected outcomes and therefore may require a combination of different approaches to achieve 996 the expected results (*well established*) {1.1, 1.3.2, 3.4}. For example, Costa Rica has experienced an inspiring

997 transformation in relation to biodiversity conservation and forest recovery but faces remaining challenges such as 998 conflicts among stakeholders, including Indigenous Peoples, and water pollution {figure 3.5}. The dynamic nature 999 of transformative change highlights the importance of processes that facilitate adaptive learning and the effective 1000 implementation of context-specific actions in response to this learning **(action 4.4)** {1.3.3, 3.4, 3.5.1, 5.6.4} (*well* 1001 *established*). Transparent and inclusive monitoring that engages a diversity of actors and hence a diversity of 1002 perspectives, learnings and evaluative frameworks that go beyond predefined metrics and enable empowerment, 1003 participation and reflection, allow for the identification of targeted actions to address these unintended consequences 1004 {1.3.2, 5.6.4} (*established but incomplete*). Adaptive governance supporting these processes is based on flexible 1005 structures, provisions for experimentation and evaluation as well as positive coordination, which can be fostered 1006 through policy entrepreneurship and knowledge brokerage, new coalitions, co-creation and co-evaluation as well as 1007 flexible structures in dynamic network governance arrangements {5.6.4} (*established but incomplete*).

1008 **B9. Strengthening human-nature interconnectedness addresses underlying causes of biodiversity loss and** 1009 **nature's decline and is a powerful driver of transformative change. Shifting dominant societal views and** 1010 **values, alongside transforming cultural narratives and social norms around production and consumption,** 1011 **fosters a just and sustainable world (Strategy 5, actions 5.1, 5.2, 5.3) {5.7.1, 5.7.2, 5.7.3} (*established but* 1012 *incomplete*).** Feelings of

nature-connectedness are associated with pro-environmental behaviours and support 1013 individual and collective engagement in nature conservation, including environmental activism **(action 1)** {5.7.1}. 1014 Language, concepts and practices reflecting harmony and interdependencies with nature based on ethics of care are 1015 central to the worldviews, values and practices of many Indigenous Peoples and local communities, as well as other 1016 groups (*well established*) {2.3.4, 5.3.1, 5.3.3, 5.3.4, 5.7.1, figure 5.13, table 5.3, figure 5.14, figure 5.6}. **Figure** 1017 **SPM.8** provides examples of relational worldviews and values held by Indigenous Peoples and local communities to 1018 express relations of care. Such worldviews and values are evident and expressed in many other cultures, 1019 philosophies and initiatives with transformative potential. Increasing awareness of and exposure to alternative views 1020 of nature can be facilitated through formal and informal education and can contribute to transformative learning 1021 *(well established*) {5.7.4}.

1022 Shared narratives and imaginaries also shape relationships between humans and non-humans **(action 5.2)** (*well* 1023 *established*) {5.7.2}. New social imaginaries, which are sets of widely accepted ideas that influence and structure 1024 how people envision the present and future, can shift core understandings of human-nature relationships and provide 1025 guidance for pathways to achieving them (*established but incomplete*) {2.4.2, 5.7.2}. An example of this is eco 1026 social contracts, which propose societal agreements that serve all of life and reflect an understanding that humans 1027 are part of and fully interdependent with nature for all they have, do, consume, wear and inhabit {2.4.2}.

1028 Changes in social norms are essential to new behaviours and practices that strengthen human-nature connectedness 1029 and accelerate transformative change **(action 5.3)** (*well established)* {5.7.3}. Understanding the mechanisms behind 1030 the spread of new social norms and behaviours is crucial for designing effective strategies for transformative change 1031 **(action 5.3)** {5.7.3}. Many behaviours are habitual and learned within certain social and environmental conditions 1032 and they can be changed (*well established*) (action 3) {4.2.4, 5.7.3}. The propagation of new ideas, social norms and 1033 behaviours often occurs through complex processes within social networks, starting slowly until a critical mass of 1034 early adopters is reached. This process is influenced by similarities among interacting individuals, the alignment of 1035 new norms with existing values and the practicality of the behaviours being promoted **(action 5.3)** {5.7.3}. 1036 Strategically enhancing the visibility of desired behaviours and deploying targeted policy measures catalyzes and 1037 sustains new social norms and behaviours **(action 5.3)** (*well established*) {5.7.3}. The spread of misinformation or 1038 disinformation among the public by social networks and social media is also influential and may pose challenges to 1039 transformative change which involves decolonizing academia and making space for Indigenous and local knowledge 1040 (*well established*) {5.4.2, 5.7.3, 5.7.4}. Transitioning to new behaviours often entails significant costs, and 1041 supportive policies such as subsidies and infrastructure investments facilitate behavioural transitions (*well* 1042 *established*) {5.4.1, 5.4.2, 5.4.3, 5.8.2}.

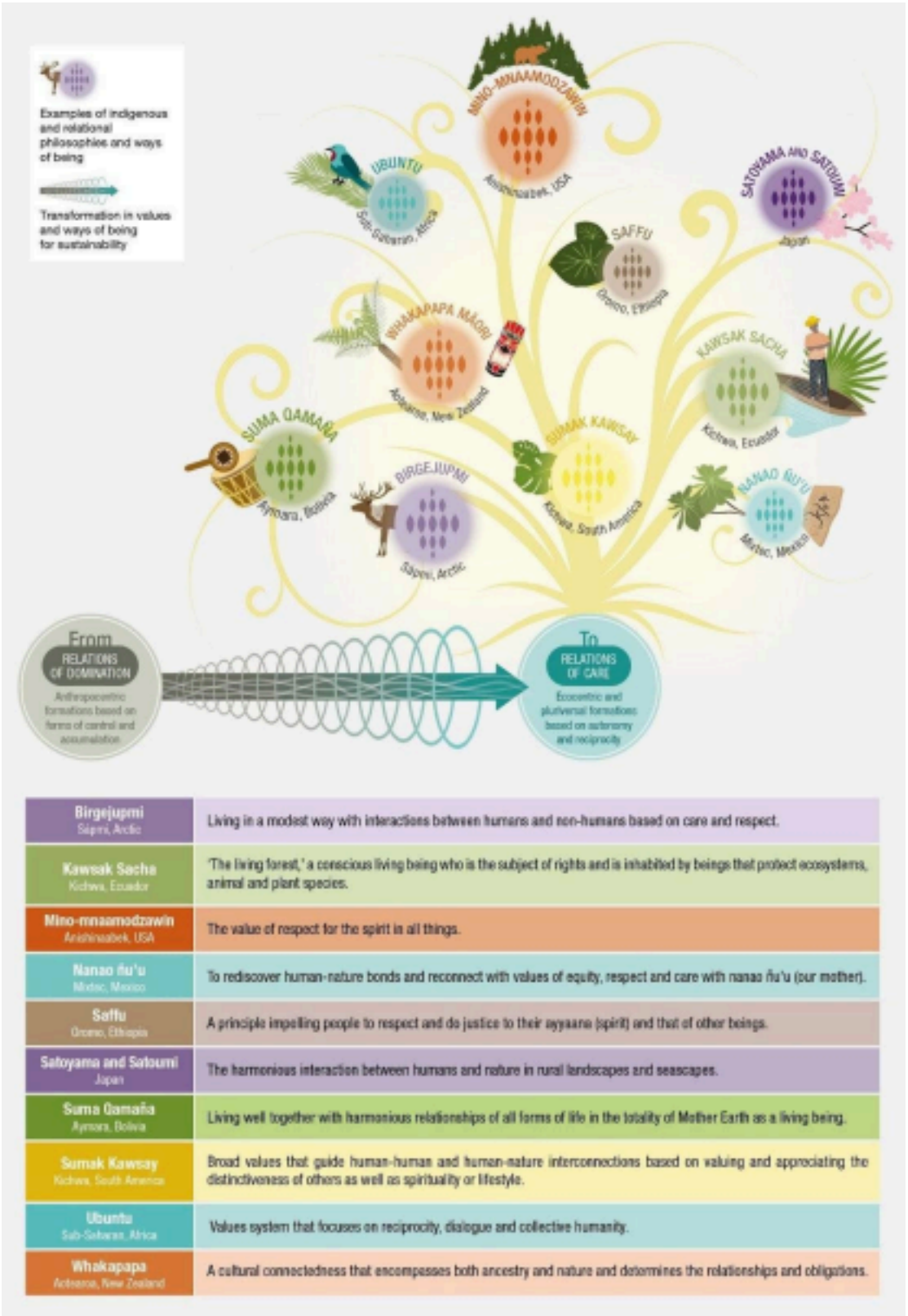


Figure SPM.8. Examples of Indigenous and relational philosophies and ways of being. Many Indigenous philosophies are expressed through relational languages, concepts and practices based upon an ethics of care that acknowledges the importance of respect and reciprocity between humans and nature {table 5.3}. Revitalization and support for such cultures, languages and philosophies present opportunities to move from anthropocentric relations of domination towards ecocentric relations of care for all. The figure represents a small sample of concepts/practices that are aesthetically placed to illustrate the diversity of Indigenous and other relational philosophies.

B10. Transformative learning promotes holistic and experiential understandings and engagement with biodiversity and sustainability challenges. It reshapes identities and fosters a sense of responsibility towards nature (Strategy 5, action 5.4) (*established but incomplete*) {5.7.1, 5.7.4}. Formal and informal education, including that based on Indigenous and local knowledge, plays an important role in supporting transformative change for a just and sustainable world (*established but incomplete*) {3.2.2, 3.5.2, 5.7.1, 5.7.4}. Collaboration across different educational

approaches can help foster transformative change (**box SPM.6**) {3.2.2, 5.7.4}. For example, 1057 complementing scientific ways of producing knowledge with approaches based on Indigenous and local knowledge 1058 has potential to shift views, structures and practices in ways that expand the potential for transformative change 1059 {3.2.4}.

1060 Experiential nature-related activities and relational values and practices are essential for shifting perceptions and 1061 values toward biodiversity and crucial for promoting sustainable behavioural and structural changes **(action 5.1)** 1062 (*established but incomplete*) {5.7.1}. Integrating education on biodiversity into formal, non-formal and informal 1063 educational programmes, developing teaching curricula on biodiversity conservation and sustainable use, and 1064 promoting knowledge, attitudes, values, and behaviours that are consistent with living in harmony with nature can 1065 all support transformative change **(action 5.1, action 5.4, action 5.5)** {5.7.1, 5.7.4, 5.7.5}. Education that includes 1066 materials on nature's contributions to people, including ecosystem services, nature-based solutions and ecosystem 1067 based approaches, and Mother Earth-centric actions to conservation and restoration can help develop capacities to 1068 address multiple intersecting challenges and crises **(action 5.1, action 5.4, action 5.5)** {5.7.1, 5.7.4, 5.7.5}. 1069 Universities, colleges, trade schools and apprenticeships can, for example, offer training for future work forces in 1070 sustainability, regenerative agriculture, forestry, design and finance, as well as include training in empathy and 1071 compassion, nature appreciation, systems thinking and transdisciplinary learning **(action 5.4)** {5.7.4}. Furthermore, 1072 developing knowledge, skills and attitudes relevant for transformative learning and adaptive learning amongst 1073 education providers at all levels provides a strong foundation for designing curricula and training programmes to 1074 support transformative change in education, outreach and awareness-raising initiatives **(action 5.4)** {5.7.4}. 1075 Recognizing diverse knowledge systems, including Indigenous, local and scientific knowledges, supports 1076 transformative learning by helping people better understand and value the interdependencies of humans and nature 1077 in complex and dynamic webs of life (*established but incomplete*) (**action 5.4, action 5.5)** {5.7.1, 5.7.4, 5.7.5}.

1078 **B11. Embracing Indigenous and local knowledge and processes of knowledge co-creation fosters** 1079 **transformative change for a just and sustainable world (Strategy 5, action 5.5) (*established but incomplete*)** 1080 **{2.3.4, 3.2.4, 3.5.1, 5.7.5}.** Recognizing different ways of knowing, linking knowledge to action and finding ways to 1081 transcend the limits of imagination are crucial for transformative change (*established but incomplete*) {2.2.1, 2.2.2, 1082 2.2.3, 2.4.2, box 2.1, 3.5.1, 3.5.5, 5.7.5}. This involves decolonising academia and making space for Indigenous and 1083 local knowledge, as well as social sciences, arts and humanities, and public engagement. Indigenous Peoples and 1084 local communities provide many visions of transformative change related to their diverse histories and 1085 socio-ecological, cultural and spiritual contexts (*well established*) {2.3.4}. Acknowledging and embracing such 1086 knowledge is consistent with a move from relations of domination to relations of care {5.7.1, 5.12, 5.13, figure 1087 5.12}. An ethics of care recognizes the agency and sentience of non-human entities, such as plants, animals and 1088 rivers, affording them value, respect and reciprocal relations of care {5.7.1, 5.7.2, figure 5.13}.

1089 Knowledge co-creation enhances biodiversity management and nature's contributions to people by combining 1090 different knowledge systems, including Indigenous and local knowledge, and scientific knowledge, ensuring 1091 strategies are culturally appropriate, scientifically robust and ecologically viable (*established but incomplete*) {3.2.5, 1092 5.7.5}. Co-creation principles such as equity, respect, recognition and collaboration emphasize inclusivity and 1093 prioritize the needs of marginalized groups, facilitating transformative interventions (*well established*) {5.7.5}. A 1094 review of empirical studies shows that knowledge co-creation improves processes (e.g., power redistribution, 1095 reflexivity) and is associated with both short-term (e.g., expand knowledge base, increase capacities) and long-term 1096 outcomes (e.g., well-being and product improvement, changes in knowledge systems) (*established but incomplete*) 1097 {5.5, 5.7.5}. Examples of this include increased adaptive capacity in Arctic communities, disaster preparedness of 1098 communities in Nepal and the establishment of adaptive management of climate change monitoring in a rural 1099 community in Tanzania (*well established*) {5.7.5}.

1100 The marginalization of Indigenous and local knowledge hinders transformative change (*well established*) {2.3.4, 1101 4.2.1, 4.2.5}. Several specific policy instruments based on the principles of consent, intellectual and cultural 1102 autonomy and justice exist, or have been proposed to support and provide accountability {5.7.5}. These instruments 1103 mostly focus on knowledge co-creation with Indigenous Peoples and local communities and include Free, Prior and 1104 Informed Consent, recognition of customary law, intellectual property rights, Indigenous data governance, 1105 sovereignty and capacity-building for the use of technology (*well established*) {5.7.5}. While these instruments 1106 cannot address all barriers, their absence makes knowledge co-creation unlikely if not impossible. The expansion of 1107 their use and their full implementation have powerful transformative potential (*established but incomplete*) {5.7.5}.

Box SPM.6. Education as a catalyst for transformative change.

Educators and education programmes across all levels play an important role in fostering shifts in views, structures and practices. The Vegetable Academy (*GemüseAckerdemie*) is an educational programme for children from 8 to 12 years old (grades 3 to 6) that focuses on creating school gardens and promoting cooking skills and dietary changes in Germany, Austria and Switzerland [20]. In Germany, more than 115,000 children have completed the programme. The children experience firsthand how food is produced and where it comes from; together they take responsibility for their school gardens and gain a better understanding of the impacts of their actions on the environment. The programme helps increase connections to nature, shifts social norms and shares knowledge about sustainable food and culinary and gardening skills among children, parents and cooks in the schools. Similar initiatives related to supporting more sustainable, regenerative food systems exists at all educational levels and in professional training.

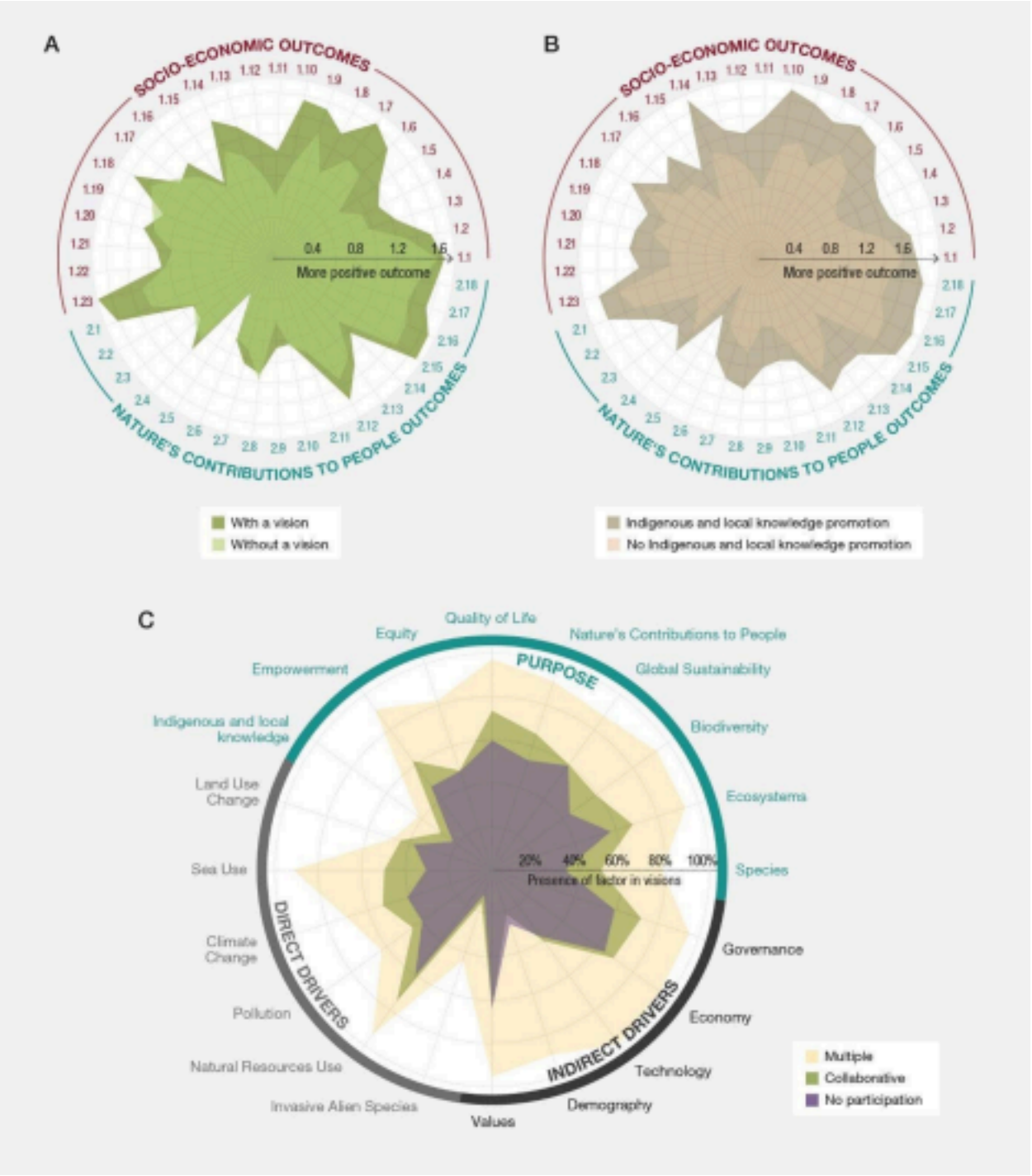
B12. Context-specific, timely and dynamic communication can convey powerful messages to trigger actions for transformative change (*well established*) {2.2.1, 3.4, 5.3.3, 5.4.2, 5.7.2}. Well-designed messages inform diverse stakeholders about the meaning, intention and actions associated with aspirational and impactful visions. An assessment of the literature shows that media plays an important role in communications, but that many other actors, including youth, civil society organizations, Indigenous Peoples and local communities, social media activists, political leaders and artists are also important in communicating messages about transformative change (*well established*) {2.2.2, 2.2.3, 2.2.4, 5.6.2}. An assessment of frequency of occurrence in the assessment corpus indicates that actors in the media and communication sectors are not prominently featured in the literature, appearing in about 4% of the assessed contributions. This highlights a significant gap in understanding how media can raise awareness about transformative change among the broader population (*established but incomplete*) {5.2, figure 5.4}. In addition, visions collected from social media capturing instrumental values (related to mining, shipping, tourism and fashion industries) were found to be more likely to operationalize sustainability discourses for marketing purposes, implying higher greenwashing potential (*established but incomplete*) {2.3.2}.

Journalists, creators and influencers on social media can promote narratives that help shift values, paradigms and goals in support of transformative change based on ethics of care (*established but incomplete*) {2.3.2). Social media can help people organize and resist biodiversity-damaging dominant views, structures and practices to advance alternatives that express ethics of care {5.7.2}. Yet communication technology has also been able to speed up the pace of pervasive and massive exposure of citizens to disinformation that can threaten biodiversity and nature {5.4.2}. To counter this, education and transformative learning play critical roles in supporting transformative change (*established but incomplete*) {5.7.4}.

C. Enabling transformative change: Roles for all

C1. Visions of a sustainable world for nature and people are shaped by values and worldviews {2.1}. They are of fundamental importance to inspire transformative change (figure SPM.9). The diversity of societies, economies, cultures and peoples in the world means that no single vision is appropriate across contexts and that scales and shared transformative visions for a just and sustainable world have greater likelihood to inspire change (*well established*) {2.3, 3.5.3}. An assessment and analysis of 881 visions reveals five core themes: i) regenerative and circular economies, ii) community rights and empowerment, iii) biodiversity and ecosystem health, iv) spiritual reconnection (between humans and nature) for behavioural change, and v) innovative business and technology (*established but incomplete*) {figure 2.4, 2.3.1}. These thematic visions also cluster into four cross cutting categories: i) integrated or holistic visions that simultaneously attend to both ecological and social issues; ii) predominantly ecological visions oriented towards better human-nature relationships; iii) predominantly social visions oriented towards greater equity and other social dimensions; and iv) visions with a relatively narrow social or ecological focus (*established but incomplete*) {figure 2.3, 2.3.1}. Diverse visions illuminate the interdependency of humans and nature for advancing towards a flourishing future and transformations towards a just and sustainable world (*established but incomplete*) {2.3.5}.

[20] IPBES Transformative Change Assessment Data Management Report on the case studies database with transformative potential and pitfalls (https://doi.org/10.5281/zenodo.10260233).



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1144 **Figure SPM.9. Realizing transformative changes through visions.** A) Transformative cases with 1145 explicit or implicit visions behind them are associated with more positive socio-economic and nature's 1146 contribution to people environmental outcomes; B) Transformative cases where Indigenous and local 1147 knowledge is promoted are associated with more positive socio-economic and nature's contribution to 1148 people outcomes; C) Visions with higher levels of participation address a more comprehensive set of 1149 purposes and consider more comprehensive sets of direct and indirect drivers. A direct driver is a 1150 factor that unequivocally influences ecosystem processes and can be identified and measured with 1151 varying degrees of accuracy, whereas an indirect driver primarily serves as a catalyst, influencing or 1152 triggering changes that guide the system toward a desired future; Multiple: different stakeholders 1153 involved in the visioning process; Collaborative: two-way dialogue to seek input from different 1154 individuals in the visioning process. Data for panels A and B come from the transformative change 1155 assessment case study database {1.4.2, 3.4}. Values denote the following: 0 = neutral; 1=slightly 1156 positive, 2=largely positive. The values on radar plots represent the average across cases. Socio 1157 economic outcomes include 1.1: good quality of life, 1.2: food security/sovereignty, 1.3: water 1158 security, 1.4: gender equity, 1.5: reduction of race/religion/cultural/linguistic discrimination, 1.6: 1159 social cohesion and trust, 1.7: institutional strength, revive and social participation, 1.8: power equity,

1160 1.9: recognition of rights and values, 1.10: Indigenous Peoples and local communities' inclusion, 1.11: 1161 freedom to exercise ritual/spirituality, 1.12: access to recreation and leisure, 1.13: enjoyment of 1162 natural beauty, 1.14: promote rights-based approach, 1.15: housing and shelter, 1.16: access to 1163 land/sea, 1.17: access to basic services and infrastructure, 1.18: access to knowledge and education, 1164 1.19: access to health, 1.20: employment and job quality, 1.21: reduction of inequality/fair wealth 1165 distribution, 1.22: poverty reduction, 1.23: conservation

of the productive capacity/resilience of the 1166 ecosystem, Nature's contributions to people outcomes include 2.1: habitat creation and maintenance, 1167 2.2: pollination and dispersal of seeds, 2.3: regulation of air quality, 2.4: regulation of climate, 2.5: 1168 regulation of ocean acidification, 2.6: regulation of freshwater quantity, 2.7: regulation of freshwater 1169 quality, 2.8: formulation and protection of soils, 2.9: regulation of hazards and extreme events, 2.10: 1170 regulation of detrimental organisms, 2.11: energy, 2.12: food and feed, 2.13: materials and assistance, 1171 2.14: medicinal and genetic resources, 2.15: learning and inspiration, 2.16: Experiences, 2.17: 1172 supporting identities, 2.18: maintenance of options; Data for panel C comes from the vision database 1173 in which 0 indicates absence and 1 indicates presence, the values on the radar plot represent the 1174 average across visions {2.3.2}.

1175 **C2. Values play an important role in supporting transformative change visions. Of the three types of** 1176 **nature-related values recognized by IPBES, which include intrinsic (nature for nature), relational** 1177 **(nature as culture / one with nature) and instrumental (nature for society), relational values are** 1178 **considered essential for humans to live in harmony with and as part of nature and Mother Earth as** 1179 **recognized in the IPBES Nature Futures Framework (*well established*) {1.3.2, 3.5.3, 2.3.3, 5.7.1, 5.7.5}.** 1180 Just as there are many ways of 'living in harmony with nature', there are also multiple pathways towards transformative change for a just and sustainable world as elaborated in the IPBES Values Assessment[21] 1181 and the Nature Futures Framework[22] 1182 (*well established*) {1.3.2, 2.3.2, 5.8}. The most transformative visions for 1183 change recognize and prioritize combinations of relational, intrinsic and instrumental values (*established but* 1184 *incomplete*) {2.3.2}. Instrumental values remain prominent in many visions of transformative change 1185 (*established but incomplete*) {2.3.2}. Relational values are fundamental to all four identified principles of 1186 transformative change and, in particular, to the principle of respectful and reciprocal human-nature 1187 relationships {1.3.2}. Recognizing relational values and responsibilities acknowledges human-nature 1188 connectedness and the extensive damage done by relationships based on objectification and exploitation and 1189 is emphasized as a necessary normative principle for transformative change (*well established*) {1.2.2, 1.3.2, 1190 5.7.1}. There has been an evolution of values over time from largely instrumental and intrinsic to greater 1191 inclusion of relational values, as suggested by an analysis of key texts related to the Sustainable Development 1192 Goals, the 1992 Convention on Biological Diversity and the Kunming-Montreal Global Biodiversity 1193 Framework (*well established*) {2.3.2}. The Kunming-Montreal Global Biodiversity Framework recognizes 1194 all three values, demonstrating the possibility of reconciling three different sets of nature values for 1195 transformative change (*well established*) {2.3.2}. There is room for deliberate improvement of the 1196 transformative potential of visions {2.3.2}. The importance of comprehensiveness of visions for 1197 transformative change and support of consequential decision makers suggest options for advancing existing 1198 and newly developed visions towards greater transformative capacity (*established but incomplete*) {2.3.2}. 1199 Such improvements occur through greater emphasis on the role of power dynamics to improve achievability, 1200 broadening the scope of visions by dealing with more aspects that enable change, and emphasizing 1201 implementation pathways to bring aspirations closer to reality {figure. 2.5A}.

1202 **C3. Deliberate transformative change is founded on visions grounded in sustainability-aligned values that are** 1203 **equitable, inclusive, respectful and adaptive and have impacts beyond any single scale (*well established*)** 1204 **{1.3.2, 2.3.3}.** Inclusive and innovative visions for sustainable and equitable futures support the wellbeing of nature 1205 and people. Global visions need fundamental changes in mindsets and current paradigms about human-nature 1206 relationships and recognition of alternative worldviews and knowledge systems. They are foundational to 1207 transformative change for a just and sustainable world. Participatory visioning processes, when they guide 1208 transformative change, provide hope and inspiration (*established but incomplete*) {2.3.1}. Evidence from an 1209 analysis of visions and ongoing initiatives for transformative change shows that visions are more transformative 1210 when they incorporate shifts related to views, structures and practices, are equitable and inclusive and address 1211 underlying causes and direct drivers of biodiversity loss (*established but incomplete*) {2.3.2}. More participatory 1212 visions have more holistic purposes (both for nature and people) and they take into consideration a greater variety of

[21] IPBES (2022): *Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Balvanera, P., Pascual, U., Christie, M., Baptiste, B., and González-Jiménez, D. (eds.). IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.6522522

[22] IPBES (2023). The Nature Futures Framework, a flexible tool to support the development of scenarios and models of desirable futures for people, nature and Mother Earth, and its methodological guidance, version July 2023, IPBES secretariat, Bonn, Germany. DOI: https://doi.org/10.5281/zenodo.8171339

1213 direct and indirect drivers. Visions for living in harmony with nature are more likely to succeed when they emerge 1214 from inclusive, rights-based approaches and stakeholder processes and when they incorporate cross-sectoral 1215 collaboration for change (*established but incomplete*) {2.3.1, 5.6.4, 5.6.1, 5.6.2}. These initiatives also show that 1216 transformative changes are guided by explicit visions have more positive outcomes in the ecological, economic and 1217 social dimensions of nature's contributions to people (**figure SPM.9**) (*well established*) {2.3.1}.

1218 An analysis of initiatives with transformative potential shows that visions where Indigenous Peoples and local 1219 communities played a meaningful role, had a greater likelihood of advancing transformative change compared to 1220 visions where they did not have a role (**figure SPM.9**) (*well established*). Many Indigenous Peoples and local 1221 communities have long-standing, powerful and holistic visions for living in harmony with nature and can support 1222 new ways of thinking and understanding in other knowledge systems (*well established*) {1.3.2, 2.3.4, 3.2, 5.7}. 1223 Their ways of life have often proven to be sustainable for biodiversity over time, yet their worldviews, values and 1224 knowledge

systems are marginalized in conservation science, policy and practice (*well established*) {1.3.2, 2.3.4, 1225 3.2}. Respectful, reciprocal and responsible relations between humans and nature can be embedded in policies that 1226 shift patterns and relationships among views, structures, and practices, independent of scale (*well established*) 1227 {2.3.2, 2.3.4, 2.4.2}.

1228 **C4. New ways of imagining the future are critical to shift people's relationships with nature. One way to** 1229 **achieve such changes are stronger imaginative efforts across different partners and stakeholder groups,** 1230 **including Indigenous Peoples' and local communities' worldviews, values and knowledge to envision positive** 1231 **futures for a just and sustainable world (*established but incomplete*) {2.2.1, 2.2.3, 2.4.2}.** Visions of a better 1232 future for humans and for nature are abundant, yet most do not change the status quo (*well established*) {2.3.2}. 1233 Constrained engagement with imaginative ways of envisioning the future has limited possibilities for transformative 1234 changes that move beyond the constraints of dominant narratives and harmful practices. Achieving stronger 1235 imagination efforts demands more comprehensive, creative and inclusive visioning processes that include silent 1236 voices and non-human perspectives (**box SPM.7**). Co-creative or collaborative visioning captivates peoples' 1237 imaginations, instils hope and inspiration and supports transformative change {figure 2.7}, providing guidance on 1238 what changes are needed and how to make them. Participatory methods of visioning can foster deliberative 1239 discussions and help bridge different values, cultures, as well as historical and cultural contexts {2.2.3}. This calls 1240 for stronger imaginative efforts including greater attention to the visions of Indigenous Peoples, local communities 1241 and underrepresented groups. Imagination is a vital ingredient in creating a vision, because it allows people to move 1242 outside the patterns of existing behaviours that reinforce systemic problems. Examples of such visions include new 1243 eco-social or natural contracts, which can shift core understandings of human-nature relationships and provide 1244 guidance for pathways to achieving them (*established but incomplete*) {2.4.2}. Such visions emphasize greater 1245 equity and wellbeing for all and the use of regenerative practices that preserve biodiversity and nature {2.3.1, 2.3.2}.

1246 **C5. Diverse actors and actor groups play important roles in transformative change based on their capacities,** 1247 **goals and contexts. Different roles of actors include innovating and creating change, adopting and following** 1248 **change, raising awareness, unlocking changes for others and/or influencing powerful actors to create change** 1249 **(*well established*). The diversity in capacities and interests means that there is substantial potential for more** 1250 **collaboration among actor groups and for the development of new coalitions (*well established*) {1.4.1, 3.3,** 1251 **3.5.5, 5.2, 5.4.4}.** Many different actor groups contribute to advancing and accelerating transformative change (*well* 1252 *established*) {1.4.2, 5.4.4}. Transformative actions of decision-makers in civil society, government, private sector 1253 and other domains are related to the five strategies of transformative change identified in this assessment (*well* 1254 *established*) (**figure SPM.6**) {5.2}. Coalitions of actor groups (**figure SPM.10**){figure 5.4, figure 5.5}, including 1255 individual citizens, Indigenous Peoples and local communities, civil society organizations, non-governmental 1256 organizations, trade unions, funders, faith-based organizations, governments at multiple levels, the private sector, 1257 financial institutions and the scientific community are more effective in pursuing transformative change (*well* 1258 *established*) {1.4.2, 1.5, 5.2, 3.4, figure 3.3}. As citizens, people often hold multiple overlapping aspects of their 1259 identities across professional and personal lives and mobilize action around these. For example, women, youth and 1260 Indigenous Peoples and local communities have instigated change by speaking and acting from these specific 1261 identities (*well established*) {1.4.2, 1.5}. Within these identities, people employ different mechanisms and actions to 1262 innovate and create change, adopt or follow change, raise awareness, unlock broader change for others and influence 1263 powerful actors to create change (*established but incomplete*) {1.4.2}.

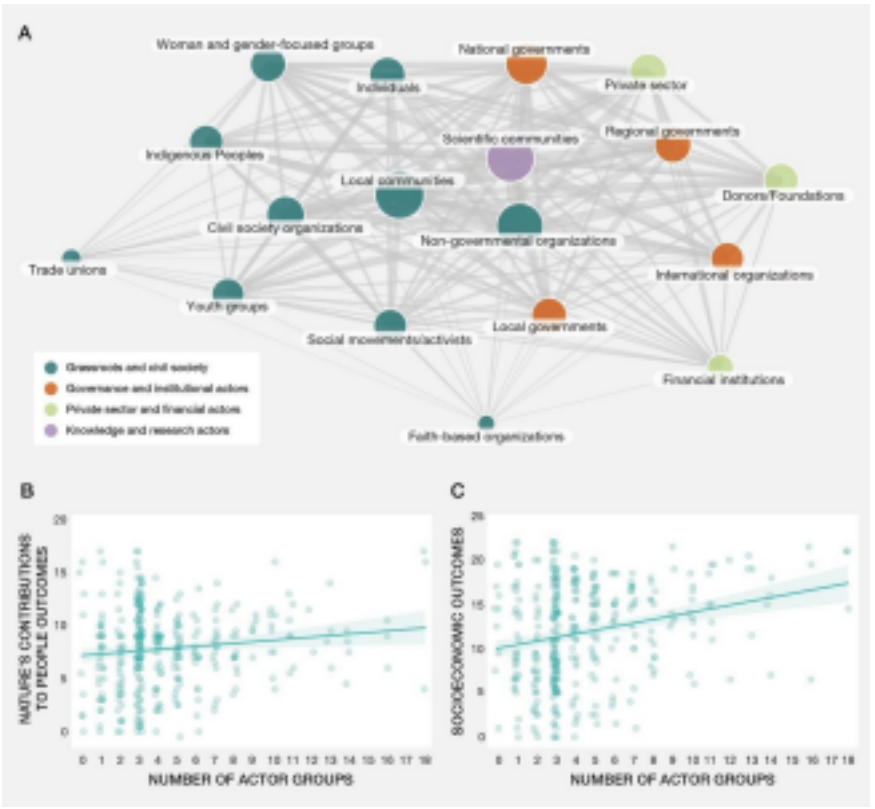

Figure SPM.10. Different actor groups collaborate closely with one another, and initiatives involving greater collaborations among actor groups achieve more positive outcomes. Echoing examples demonstrating that all actor groups can collaborate in various combinations, a network analysis (see the data management report for the case study database of the chapter 3 for details on the network analysis) of initiatives with transformative potential in the transformative change assessment case study database reveals that four groups of actors interact closely to pursue transformative change (A). The width of the lines represents the number of initiatives that two actor groups share, while the size of the circles corresponds to the number of initiatives in which each actor group is involved. The bottom panels (B and C) show that when more actor groups collaborate the initiatives achieve more positive nature's contributions to people and socioeconomic outcomes ($p < 0.01$). These outcomes are a composite index of a diverse set of indicators (see **figure SPM.5** for the complete list of indicators).

C6. The underlying causes of biodiversity loss and nature's decline also create inequalities and injustices. Those who have benefited most from economic activities associated with biodiversity loss and nature's decline have greater capacity to act. Meeting the principle of equity and justice depends on mobilising these capacities. Doing so while involving others in balanced decision-making processes can unleash agency as well as resources to create change (*established but incomplete*) {1.4, 1.2}. Some people have more opportunity and resources to create change, as a result of having greater wealth and power (*well established*) {1.2.2, 1.3.2, 1.4.2}. In particular, wealthy actors have benefited more from processes of dominating nature and serving their own material gains, often with the consequence of creating negative effects on nature and exacerbating the marginalization of other people (*well established*) {1.2.2, 5.5.3}. Government decision-makers, business leaders and individuals with high levels of wealth, occupy positions of power with the potential to incentivize cascading transformative changes across different problems, sectors and levels (*established but incomplete*) {1.4.2}. These roles imply that positions of power come with additional capacities for engaging in and enabling transformative change (*established but incomplete*) {1.2.2, 1.4.2}. Meeting the principle of equity and justice depends on mobilizing capacities of those who have thus far benefited most from biodiversity loss and nature's decline *(established but incomplete)* {1.4.2}. Governments can create actions to overcome power asymmetries in decision-making, by adjusting legal responsibilities, reorganising the roles of actors in decision making structures and assuring transparency, while reallocating resources and strengthening the role of key environmental agencies (*well established*) {5.6.1}. The example of the EU's Common Agricultural Policy illustrates that agri-environmental measures can be an effective tool for strengthening biodiversity in agricultural landscapes, but that this potential is hampered by an underrepresentation of environmental advocates in decision-making, overshadowed by a dominance of vested interest groups, and constant policy redesign that undermine evaluation and learning processes (*established but incomplete*) (**box SPM.5**) {5.6.1}.

C7. Coalitions of actors and actor groups are more effective for transformative change than when actors pursue change individually. Such coalitions for change run the risk of co-optation by higher level or more powerful actor groups (*well established*) {3.4}. Past experiences and ongoing examples provide crucial insights into

how agents work together for transformative change in diverse contexts (**figures SPM.11 and SPM.12**). For 1302 example, in many parts of the world, community-based agroecological initiatives exemplify the principles of equity 1303 and justice (**box SPM.8**) (*established but incomplete*) {5.6}. These projects involve local communities in 1304 decision-making processes, respecting their traditional knowledge and fostering a sense of ownership over 1305 agricultural practices. Community-supported agriculture models, where consumers directly support local farmers, 1306 exemplify how agroecology can create relational values and responsibilities between producers and consumers 1307 {5.8.2} (**box SPM.8**). It has been shown that countries where there is greater crop diversity also support more 1308 agricultural employment {5.3.4}. Specific groups can facilitate change in their power of steering networks and 1309 influencing powerful actors to create change (*established but incomplete*) {5.4.4, 1.4.2}. 1310 The multiple databases assembled for the assessment consistently show that specific actors and actor groups work 1311 together more frequently with each other, but not with others {3.4, 5.2}. Network analysis of the case study database 1312 shows that governments (local, regional, national), international organizations, the scientific community and the 1313 private sector are inclined to collaborate more closely with each other, referred to here as 'top-down' initiatives 1314 (**figure SPM.11**) {3.4, figure 5.5}. On the other hand, another set of examples with transformative potential arises 1315 from citizen-led initiatives. Among these, local communities connect various positive initiatives involving 1316 individual citizens, civil society organizations, women and gender-focused groups, youth, social movements, trade 1317 unions and faith-based organizations (**figure SPM.11**) {3.4}. Such initiatives are critical to counter threats and 1318 power imbalances in environmental governance and contribute to more just and sustainable futures {5.4.4}. 1319 Bringing together a diversity of actors is therefore critical for developing options and metrics for transformative 1320 change. This evidence shows that everyone can play an important role in creating transformative change for a just 1321 and sustainable world.

Box SPM.7. Cultural approaches to transformative change: The role of theatre.

Cultural initiatives like music, storytelling, documentaries, film and theatre support transformative learning by fostering imagination and emotional engagement with ecological issues {2.2.4, 5.7.2}. For example, Empatheatre is an award-winning, research-based theatre company that emerged from the solidarity among artists, writers, theatre makers, academic researchers and sensitive citizens responsible for the implementation of several pioneering projects over the last decade in South Africa. Empatheatre has developed innovative new ways of building transformative spaces for equitable public dialogue to explore different ways of being, thinking and doing. This includes dialogues about complex social challenges ranging from rural communities under pressure from coal mining companies, stories of vulnerability of female migration, homelessness and inequalities in urban land justice, to supporting sustainable governance of the oceans. This initiative represents a new form of participatory justice and it is expanding into both international policy dialogues and grassroot engagements (see the transformative change assessment case study database).

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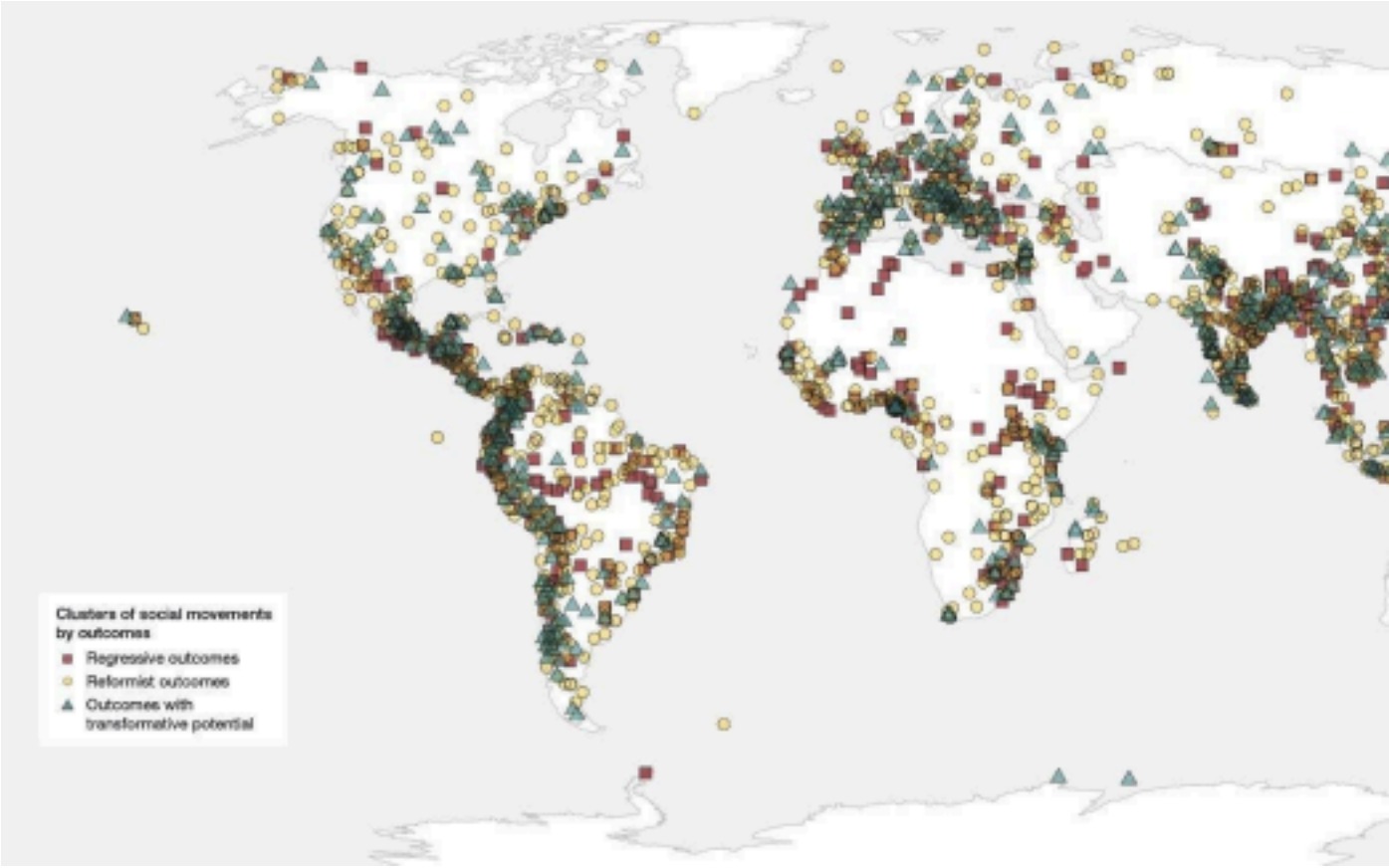

1324 **Figure SPM.11. Map illustrating that social movements play a crucial role in challenging drivers of biodiversity loss and fostering transformative change.** 1325 The map illustrates the critical role that social movements play in challenging direct drivers of biodiversity loss and fostering transformative change, including in 1326 areas with high priority for conservation. Geometric shapes show the location of social movements contesting threats to the Kunming-Montreal Global Biodiversity 1327 Framework targets (n=2,802). [Square shape]: social movements resulting in regressive outcomes (e.g., fail court decisions, criminalization, violence); [Circle shape]: 1328 social movement resulting in reformist outcomes (e.g., environmental improvements, technical solutions); [Triangle shape]: social movement resulting in outcomes 1329 with transformative potential (e.g., cancellation or withdrawal of the activity threatening nature).

1330 **C8. Pursuit of transformative change by governments contributes to policy coherence when it is based on a whole-of-government and nexus approach**[23] 1331 **. Such an approach reinforces support for policies and plans** 1332 **across different sectors, minimizes the likelihood that policies will be at cross-purposes across agencies, and** 1333 **reduces unintended tensions (*established but incomplete*) {4.2, 5.1, 5.6.4}.** Current governmental actions for 1334 transformative change are undermined by institutional misfits, such as between the scale of biodiversity challenges 1335 and the jurisdiction of the institution {4.2.3}. In this sense, the length of time it takes for a policy to demonstrate its 1336 effectiveness may be longer than the length of time between elections that bring new political authorities to power 1337 who oppose that policy. These misfits are exacerbated when there are conflicts between the interests of consumers, 1338 activities in extractive sectors, and uncoordinated subsidies and regulations {4.2.3, 5.4.1, 5.6.1} (*established but* 1339 *incomplete*). These actor constellations can undermine the policy autonomy that results when countries find 1340 themselves dependent on extractive industries or external financing with a vested interest in maintaining the status 1341 quo {4.2}. Effective implementation is therefore conditioned by the ability of governments to position and prioritize 1342 biodiversity-related values in relevant decision-making and policies across sectors and scales, and within a legal 1343 framework that holds governmental and non-governmental actors accountable {5.4, 5.4.2, 5.6.1} (*established but* 1344 *incomplete*).

1345 Governments across all levels are key actors in engaging diverse State and non-State actors and can facilitate 1346 collaborative approaches and new societal contracts to strengthen engagement, ownership and accountability in line 1347 with the principles for transformative change {5.4}. The global reach of underlying causes (and indirect drivers) of 1348 biodiversity loss and nature's decline requires collaborative and coherent policy solutions within and beyond 1349 national jurisdictions {5.6.1, 5.6.2} (*established but incomplete*). Institutional lock-ins can be overcome by engaging 1350 new actors in participatory approaches and revising procedural rules {5.6.1} (*established but incomplete*). The 1351 effectiveness of adaptive learning processes is improved by engaging governmental actors across sectors, political 1352 parties, and levels to assure accountability beyond terms of government {5.6.4}.

1353 **C9. Many existing policies that comprise financial, economic and regulatory instruments (such as regulations,** 1354 **taxes, fees and tradable permits) have substantial negative effects on nature-friendly practices. But these** 1355 **instruments have the potential to become transformative. Some governments have revised their regulatory** 1356 **instruments - exemplified by subsidies that are based on environmental criteria (*established but incomplete*)** 1357 **{5.5.1, 5.5, 5.4.3}.** Governments heavily subsidize economic sectors that substantially contribute to biodiversity loss 1358 and nature's decline, such as agriculture, livestock, fisheries, forestry and fossil fuel sectors (*well established*) 1359 {figure 5.8, 5.4.3}. The Organisation for Economic Co-operation and Development found that during 2020-2022, 1360 farmers received $630 billion annually in environmentally harmful subsidies. Since 2021, the total public funding 1361 for environmentally harmful subsidies has increased by 55% (*well established*) {5.4.3}.

1362 National governments, international organizations (e.g., World Trade Organization) and internationally-adopted 1363 instruments (e.g., Kunming-Montreal Global Biodiversity Framework, Paris Agreement, Sustainable Development 1364 Goals) aim or contribute to subsidies reform, but progress has been limited. Moreover, an analysis assessing whether 1365 subsidies are presented as "positive", "neutral", or "negative" for nature and biodiversity shows an increasing 1366 stabilization of presenting subsidies as positive in the literature (*established but incomplete*) {5.4.1}. Nonetheless, 1367 several countries have endeavoured to reform subsidies to benefit nature and people. Examples of subsidy reforms 1368 include New Zealand's fisheries subsidy reform which includes strict sustainability criteria as a condition for access, 1369 Zambia's reallocation of funds to climate-smart agriculture and biodiversity conservation, or Chile's Lafkenche Act 1370 reallocating resources to Indigenous communities to promote their involvement in coastal management {5.4.3}. 1371 Subsidy reforms are politically challenging. But they are more feasible and effective with an emphasis on 1372 redistributive policies to address the needs of those left vulnerable due to reforms, greater policy coherence across 1373 sectors, coordinated action that extend beyond specific locations and contextualization and monitoring of multiple 1374 impacts for adaptation (*established but incomplete*) {5.4.6, 5.4.8}. These key elements of meaningful reforms have 1375 substantial potential to yield positive outcomes (*established but incomplete*) {5.4.6, 5.4.8}.

1376 **C10. Civil society plays an important role in bringing about transformative change and it is more effective in** 1377 **an enabling environment. It does so by mobilizing citizens, creating initiatives that propagate, and holding** 1378 **governments and the private sector accountable for harmful environmental practices. Supporting and** 1379 **amplifying civil society initiatives for a just and sustainable world and protecting environmental defenders** 1380 **from violence and rights violations, supports transformative change (*well established*) {5.4.4} (action 2.4).** 1381 Education, including citizenship education, play a critical role in fostering active engagement in sustainability

[23] IPBES (2024). Summary for Policymakers of the Thematic Assessment Report on the Interlinkages among Biodiversity, Water, Food and Health of the *Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. McElwee, P. D., Harrison, P. A., van Huysen, T. L., Alonso Roldán, V., Barrios, E., Dasgupta, P., DeClerck, F., Harmáčková, Z. V., Hayman, D. T. S., Herrero, M., Kumar, R., Ley, D., Mangalagiu, D., McFarlane, R. A., Paukert, C., Pengue, W. A., Prist, P. R., Ricketts, T. H., Rounsevell, M. D. A., Saito, O., Selomane, O., Seppelt, R., Singh, P. K., Sitas, N., Smith, P., Vause, J., Molua, E. L., Zambrana-Torrelio, C., and Obura, D. (eds.). IPBES secretariat, Bonn, Germany. DOI: https://doi.org/10.5281/zenodo.13850289

1382 practices (*well established*) {5.7.4}. By fuelling public debate and screening companies' impact on biodiversity, 1383 citizens have contributed to create voluntary market standards for sustainable production and trade and promote 1384 market adoption of these standards (*well established*) {5.4.4}. Civil society organizations have also experimented 1385 with social innovations that can help curb nature's decline (*well established*) {5.4.4}. A systematic review of 1386 100 empirical case studies of rural social innovations across Europe during 1970-2024 illustrates the variety of 1387 social innovation and intentional change in the agrifood, tourism and forestry sectors (*well established*) {5.4.4}. 1388 An analysis of 2,802 environmental social mobilizations during the period 1992-2022 provides evidence of a total of 1389 46,955 incidents that undermined 13 of the 23 Kunming-Montreal Global Biodiversity Framework Targets. 1390 Approximately 40% of social mobilizations (n=1083) occur in areas that fall within the top 30% priority regions for 1391 species conservation (*well established*) {5.4.4}. Social movements identified threats of biodiversity loss, soil 1392 contamination, climate change impacts, landscape degradation, deforestation, surface and groundwater degradation 1393 and waste overflow. Many mobilizations led to reformist outcomes (54%) (e.g., technical solutions, application of 1394 existing regulations, compensation) and about one fourth (27%) ended up in regressive outcomes, including failure 1395 of court decisions, but also repression and violence against environmental defenders. 19% of social mobilizations 1396 had outcomes with transformative potential, resulting in the withdrawal, cancellation, or temporal suspension of the 1397 activity driving the social mobilization (**Figure SPM.11**) (*well established*). Despite their critical importance, 1398 actions led by environmental movements and civil society organizations have received limited scholarly attention 1399 (**figure SPM.6**). Inclusive governance processes and the recognition of individual rights can reduce the vulnerability 1400 of socio-environmental initiatives and enable actors to contribute to transformative change as collaborative 1401 participants, rather than as opposing forces (*established but incomplete*) {5.4.4, 5.6.2}. Governmental efforts to 1402 create corporate due diligence policies and trade agreements that incorporate support for the United Nations 1403 Declaration on the Rights of Indigenous Peoples and human rights law and divestment campaigns targeting 1404 corporations involved in rights violations have the potential to amplify the impact of civil society initiatives for 1405 transformative change towards a just and sustainable world (*well established*) {5.4.4}.

1406 **C11. Pathways for transformative change involve diverse actors working collectively to implement integrated** 1407 **and purposive actions associated with strategies to achieve desired visions (figure SPM.13). Many context** 1408 **specific initiatives have promoted, accelerated and scaled transformative change for a just and sustainable** 1409 **world**

where humans and nature thrive together (*established but incomplete*) {2.2, 3.1, 3.5.5, 5.8}. 1410 Transformative change is rarely the outcome of a single event, driver or actor. It is better understood as a pathway or 1411 process of change involving collective agency and multiple cascading changes that trigger and reinforce one 1412 another, often in unexpected ways (*well established*) {3.2, 3.5}. Transformative pathways emerge and unfold 1413 through continuous and sequential actions in any given context that align with visions, strategies and principles of 1414 transformative change. Enabling conditions facilitate transformative pathways informed by diverse values and 1415 knowledge systems to achieve future visions (*well established*) {2.3.2, 3.2, 5.8.2}. Customized bundles of 1416 economic, governance and legal options can be combined to achieve different desirable futures for humans and 1417 nature, based on different value framings; but these are not mutually exclusive and can be operationalized in various 1418 combinations depending on different needs (*established but incomplete*) {3.2.2, 3.2.4, 3.5.1}. Complex 1419 interdependencies, path dependencies, lock-ins and barriers, together with changing contextual factors emphasize 1420 the importance of iterative and reflexive approaches to planning, implementing, monitoring, evaluating, and 1421 reviewing transformative change initiatives (*well established*) (see **box SPM.9** for knowledge gaps) {1.3.2, 5.6.3, 1422 5.6.4}.

1423

1424 **Figure SPM.12. Synergies across principles, visions, approaches and strategies address barriers** 1425 **and challenges and guide actions and initiatives along pathways for transformative change for a** 1426 **just and sustainable world.** Transformative strategies and actions can be identified and implemented 1427 to achieve global

objectives, such as the 23 action targets of the Kunming-Montreal Global
1428 Biodiversity Framework {table 5.8.1}. For example, in the case of target 14 ('Integrate biodiversity in 1429 decision-making at every level'), the key implementation challenge is inadequate policies and unfit 1430 institutions {4.2.3}. Identified actions include strengthening biodiversity in integrated governance and 1431 strengthening learning through informed, accountable and adaptive governance {5.8, Table 5.4}. 1432 Desired outcomes are facilitated through the development of transformative capacities, which refer to 1433 the knowledge, skills, attitudes and resources necessary to realize transformative change {1.4, 1.2}. 1434 Realizing the potential for transformative change for a just and sustainable world involves a whole-of 1435 society and whole-of-government approach with roles for everyone. This assessment demonstrates 1436 that principles, visions, approaches and strategies can work synergistically to overcome barriers and 1437 challenges to transformative change. It concludes that transformative change is difficult, complex, 1438 challenging but it is also urgent, necessary and possible.

Box SPM.8. Agroecological transitions as examples of transformative change.

Agroecological transitions offer a potent example of transformative change in food systems, redirecting unsustainable agricultural practices towards biodiverse and equitable solutions {5.8.2}. Recognizing the pivotal role of small-scale farmers, these transitions address food security, poverty, biodiversity restoration, climate change adaptation and disaster risk reduction. Aligned with transformative change principles {1.3.2}, agroecology emphasizes equity, pluralism and relational responsibilities. It champions sustainable agrifood systems, challenging dominant discourses on industrial agriculture while promoting distributive justice and biodiversity restoration. Agroecology embodies holistic values encompassing ecological diversity, synergies, resilience and social values such as equity and dignity {2.4}. Knowledge co-creation and empowerment, central to agroecology, enable grassroots movements to drive change {3.2.5, 5.7.5}. Agroecology proposes actionable knowledge to restore soils and make agriculture more sustainable and resilient across all countries, as demonstrated by the 30% of farms (mainly small-scale) around the world that have adopted some agroecological practices or redesigned their production systems {5.8.2}.

Barriers to scaling up agroecology include entrenched narratives favouring industrial agriculture and asymmetries in research funding {4.2.5}. Investments in agricultural innovation favour technologies and approaches that dissociate agriculture from nature and make it dependent on non-renewable resources and technologies provided by few multinationals. Such asymmetries in R&D investment of public and private

funding contributes to sustaining a productivity gap of an estimated 20% between industrial and alternative farming systems {5.8.2}, although other studies point to substantial yield increases, elevated employment and farm profitability under agroecological practices {5.3.4, 5.8.2}, or to co-benefits of greenhouse gas reductions and biodiversity conservation {5.8.2}. Indeed, examples worldwide showcase the efficacy of agroecology in enhancing climate resilience, recycling resources and promoting circularity. Community-based initiatives exemplify relational values, fostering local economies and social cohesion.

Lessons from agroecology for transformative change:

1. Diverse entry points: Agroecological transitions demonstrate that transformative change can occur through diverse entry points. Whether through changes in crop selection, farming practices, consumer demand, community engagement, or conducive policies, there are multiple pathways to achieving sustainability.

2. Context-specific approaches: Recognizing the diversity of context-specific approaches is crucial. Far from prescribing blueprints or recipes, Agroecology emphasizes understanding and respecting local values, norms and customs. What works in one region may need adaptation to fit the ecological and cultural context of another.

3. Iterative learning and adaptation: Agroecological transitions involve an iterative and transdisciplinary process of monitoring, evaluation and learning. This dynamic approach ensures that practices evolve based on local conditions, fostering a dialogue of wisdoms, continuous improvement and resilience.

4. System-wide reorganization: Agroecology showcases the importance for fundamental, system-wide reorganization across technological, economic and social domains. This aligns with the transformative change required to address the root causes of biodiversity loss and nature's decline.

Some examples of agroecological transitions are listed in the table below (more details of each of these examples can be found in the case study database) {5.8.2}.

Enhanced	Examples

process	
Climate resilience	Following Hurricane Mitch in Central America in 1998, biodiverse agroecological farms including agroforestry, contour farming and cover cropping retained 20- 40 percent more topsoil, suffered less erosion and experienced lower economic losses than neighbouring farms practicing conventional monocultures. Pastoralist households of North Patagonia exhibited greater resilience to 10 years of frequent droughts and a faster recovery from a massive volcanic ashfall in 2011, when they were able to diversify, relying on local and adapted landraces and knowledge and when household decisions were shared between male and female pastoralists.
Recycling and pest regulation	In Asia, integrated rice systems combine rice cultivation with the generation of other products such as fish, ducks and trees. Rice and fish form a symbiosis: The rice provides the fish with shelter and shade and a reduced water temperature, along with herbivorous insects and other small animals that feed on the rice. Rice benefits from nitrogenous waste from the fish, while the fish reduce insect pests such as brown planthoppers and diseases such as sheath blight of rice and weeds. Push-pull cropping systems in East Africa combine species that repel insect pests and attract their natural enemies through volatile semio-chemicals; such combinations of species (e.g. cereals, legumes and grasses) may provide other services, such as fodder production, biological N fixation and erosion control.
Synergies through diversification	Agroforestry systems that include deep rooting trees can capture nutrients lost beyond the roots of annual crops, improve the soil water balance for crops and grasslands and improve animal welfare. Globally, biological nitrogen fixation by pulses in intercropping systems or rotations generates close to $10 million savings in nitrogen fertilizers every year while contributing to soil health, climate change mitigation and adaptation. It has been shown that countries where there is greater crop diversity also support more agricultural employment.

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Circularity through crop-livestock integration	Nutrient cycling accounts for 51% of the economic value of all non-provisioning ecosystem services. Integrating livestock plays a large role in crop–livestock systems as it promotes recycling of organic materials by using manure for composting or directly as fertilizer and crop residues and by-products as livestock feed. About 15% of the nitrogen applied to crops comes from livestock manure, highlighting synergies resulting from crop–livestock integration. Mixed farming allows alternating cropping-pasture rotational cycles that promote a regenerative soil fertility management.
Promoting human values and local economies	In many parts of the world, community-based agroecological initiatives exemplify the principles of equity and justice and contribute to their social resilience (for example when facing food shortages during the COVID-19 pandemic). These initiatives involve local communities in decision-making processes, respecting their traditional knowledge and fostering a sense of ownership over agricultural practices. Community-supported agriculture models, where consumers directly support local farmers, exemplify how agroecology can create relational values and responsibilities between producers and consumers. The *Union de Trabajadores de la Tierra* that started in Argentina after the 2001 economic crisis is an example of food system transformation at scale, counting nowadays 22,334 farming families (out of a total of 33,400 small family farms in the country) that produce agroecological food at affordable prices through 420 selling points and online sales, independent from government support.

Box SPM.9. Knowledge gaps in assessing the underlying causes of biodiversity loss and determinants of transformative change to achieve the 2050 Vision for Biodiversity.

The transdisciplinary field of research on transformative change is growing, but it is still young. The field has not integrated fundamental insights from many theories and frameworks that do not explicitly state they are about transformative change. Beyond issues associated with the lack of such a theoretical integration, this assessment identifies multiple types of knowledge gaps, ranging from geographic, jurisdictional and linguistic gaps to gaps related to the impacts of interventions or the relationships between interventions for transformative change and their multi-dimensional impacts {table 1.4}. Each chapter identifies specific knowledge gaps related to its focus. Based on these and a broader assessment of the field, some general knowledge and knowledge-action gaps are important to highlight. These include, but are not limited to, the following:

- ***Monitoring and valuing transformative change***

1. Metrics and indicators: While the development of new metrics and indicators for assessing transformative change is underway, much remains to be done in terms of evaluating the impacts on both nature and people, including the effects of subsidies, social movements, and other interventions {1.3.2, 2.3.5, 2.6, 4.2.1, 4.2.2, 5.5.4}. There is also a need for more reliable early indicators that predict successful transformative changes. An additional challenge is to include indicators based on different knowledge systems, worldviews and values {1.5, 4.2.5}.

2. Monitoring across scales: There is a significant gap in monitoring and evaluating transformative actions at multiple scales and contexts, especially in terms of their long-term effectiveness{1.5, 2.6, 3.5.6, 4.2.3, 5.6.2, 5.6.3, 5.6.4}.

3. Integration of different approaches: It is unclear how to integrate evidence of the social and ecological dimensions of transformative change processes, as well as qualitative and quantitative approaches {1.5, 2.3.5, 2.6, 3.3, figure 3.4, table 3.2}. There is a gap in coordinating knowledge for effective sustainability transitions {2.2.3, 3.5.1, 4.4, 5.7.5}. Additionally, tools to assess surprises and uncertainties in these processes are underdeveloped, particularly regarding their differential impacts on both nature and people {4.4, 5.4.2}.

- ***Overcoming challenges to transformative change***

1. Benefits and trade-offs: There is little documentation and assessment of the benefits and trade-offs (including both the intended and unintended impacts) of different transformative actions particularly with attention to the principles of equity and justice, pluralism and inclusion and respectful and reciprocal human-nature relationships over time {1.5, 2.3.5, 3.5.4, 5.7.1}.

2. Vision development and participatory processes: Although visions for a sustainable world are critical for inspiring transformative change, there is a gap in understanding how these visions are developed across diverse cultures and contexts {2.2.3, 2.3.5}. Participatory processes, particularly involving Indigenous Peoples and local communities, are not sufficiently integrated into the development and evaluation of these visions {2.2.3, 2.3.5, 3.5.4, 5.7.5}.

3. Technological innovations: Assessment of the transformative potential of technological innovations for advancing just and sustainable futures, including critical assessment of negative impacts and unintended consequences and distributional effects over time {2.3.3, 3.2.5, 3.2.6, 4.4, 5.4.2}.

4. Governance and institutional structures: Attention to the institutional factors and power relations influencing and shaping governance strategies, including the role of lobbying, misinformation and corruption in challenging or blocking transformative change processes, global interdependencies and dependencies in underlying actor networks {4.2.3, 4.4, 5.2, 5.6.1}.

5. Relations of domination as barriers to transformative change: While there is extensive literature that examines how relations of domination are underlying causes of biodiversity loss, the literature that examines how the elements of these relations are manifest as barriers to transformative change is limited. The number of empirical studies of relations of domination as barriers to transformative change is very small, and they address this question implicitly, rather than the central research question {4.1, 5.3.1, 5.3.2, 5.7.1, 5.7.5}.

6. Science-policy relations: Science-policy relations, and the incorporation of different knowledge systems in transdisciplinary learning processes as well as the underlying power structures need to be better understood {5.6.4}

- ***Building capacities for transformative change***

1. Case study research: There is a significant knowledge gap on integrating case studies of transformative change from across different time periods to draw general conclusions. These case studies are essential to understanding how transformative processes unfold in practice and can provide valuable insights into the factors that lead to success or failure. More robust documentation and analysis of real-world cases (including both historical and current cases) are needed to build a solid empirical foundation for scaling up transformative actions {3.4, figure 3.5, 5.2, 5.4.4}.

2. Imagination gap: Addressing the imagination gap in envisioning positive futures where humans are seen as an integrated part of nature and living in harmony with nature (box 2.1, figure 2.2.}.

3. Cultural insights and social dimensions: The cultural dimensions of transformative change remain underexplored, especially regarding how different cultures and societies envision positive futures where humans and nature are integrated harmoniously and how shifts in cultural values can be supported to advance transformative change for a just and sustainable world {5.3.1, 5.3.3, 5.3.4, 5.7.1, 5.7.2, 5.7.3, 5.7.4, 5.7.5}. The specific needs and issues of concern for diverse social actor groups are also under-represented in work on transformative change {1.5, 5.2, 5.3.1, 5.7.1}. More research is needed on how different social actors and cultural perspectives can inform broader sustainability transformations {1.5, 3.2.1, 3.5.5, 5.2, 5.7}.

4. Philosophical and theoretical foundations: Assessment of the underlying philosophical, theoretical assumptions and epistemologies of transformative change, including how these link to adult learning and development {5.7.4}.

5. Inner transformations and empowerment: Assessment of the role of transformative capacities, including inner transformations and empowerment, in transformative change processes, and how to cultivate those capacities {2.3.4, fig 2.5, 3.2.1, 5.2, 5.7}.

Prioritizing these gaps through integrative and actionable transdisciplinary research can guide and activate science, policy and society for transformative change. General research on transformative change for global sustainability is two-orders of magnitude larger than research featuring case studies. This suggests an implementation gap that can be addressed by linking knowledge and action to produce context-specific and measurable results for transformative change.

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1441 Appendices

1442 Appendix I: Communication of the degree of confidence 1443

1444 **Figure SPM.13. The four-box model for quantitative communication of confidence.** Confidence increases towards the top-right corner, as suggested by the increasing strength of shading. Source: IPBES (2016)[24] 1445 . Further details of the approach are documented in the *IPBES Guide on the Production of Assessments*[25] 1446 . 1447 In this assessment, the degree of confidence in each main finding is based on the quantity and quality of evidence 1448 and the level of agreement regarding that evidence (**figure SPM.13**).

1449 The evidence includes data, theory, models and expert judgement.

1450 ● Well established: there is a comprehensive meta-analysis or other synthesis or multiple independent studies that agree.

1451 ● Established but incomplete: there is general agreement, although only a limited number of studies exist; there is no 1452 comprehensive synthesis and/or the studies that exist address the question imprecisely.

1453 ● Unresolved: multiple independent studies exist but their conclusions do not agree.

1454 ● Inconclusive: there is limited evidence and a recognition of major knowledge gaps.

1455

[24] IPBES (2016): *Summary for Policymakers of the Assessment Report on Pollinators, Pollination and Food Production of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Potts, S.G., Imperatriz-Fonseca, V. L., Ngo, H. T., Biesmeijer, J. C., Breeze, T. D., Dicks, L. V., Garibaldi, L. A., Hill, R., Settele, J., Vanbergen, A. J., Aizen, M. A., Cunningham, S. A., Eardley, C., Freitas, B. M., Gallai, N., Kevan, P. G., Kovács-Hostyánszki, A., Kwapong, P. K., Li, J., Li, X., Martins, D.J., Nates-Parra, G., Pettis, J.S., Rader, R. and Viana, B.F. (eds.). IPBES secretariat, Bonn, Germany. http://doi.org/10.5281/zenodo.2616458.

[25] IPBES (2018): *IPBES Guide on the Production of Assessments*. *Secretariat of the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany*. Available at: https://ipbes.net/guideproduction-assessments.

1456 Appendix II

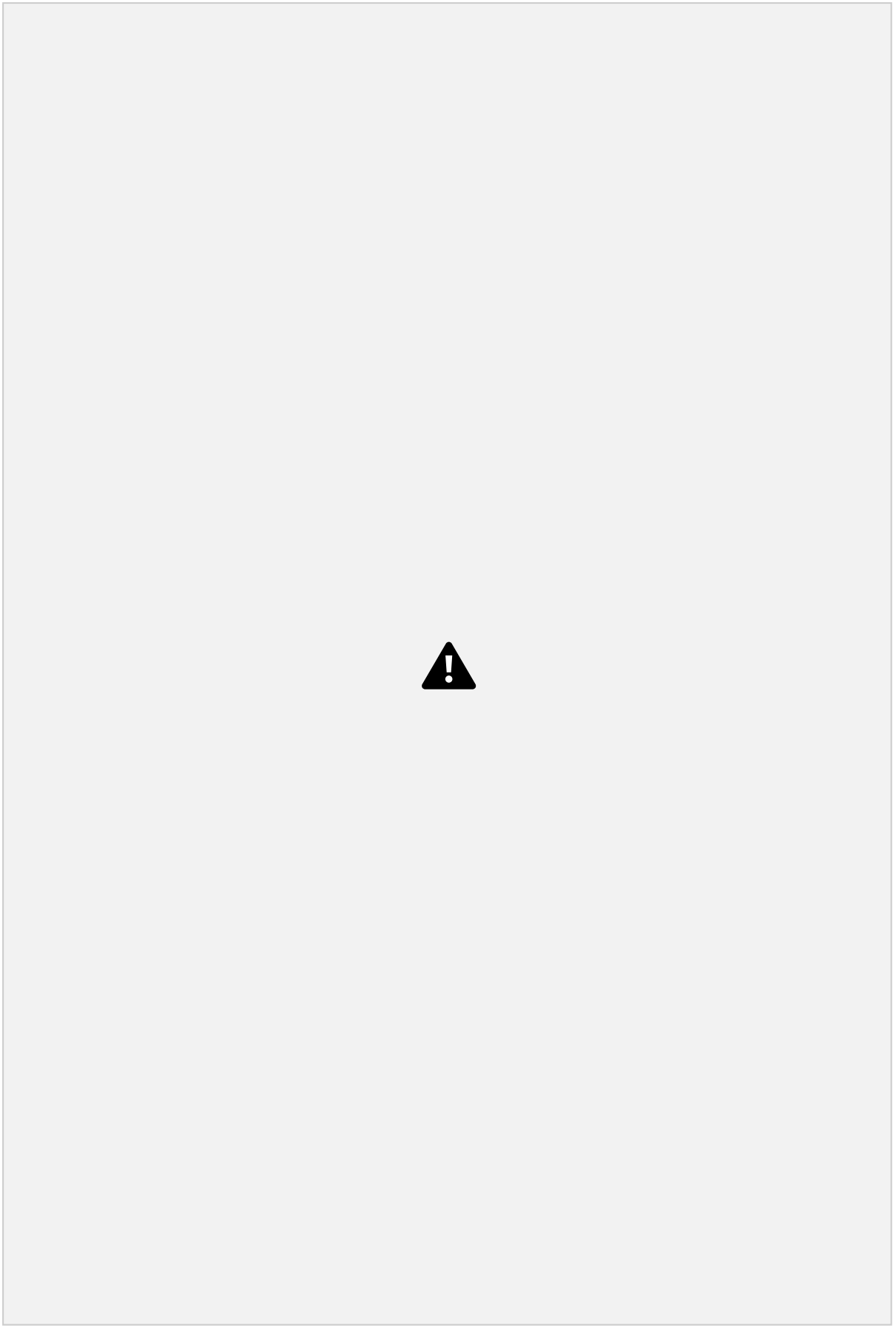
1457 Practical guidance for realizing the transformative potential of 1458 policies,

projects and other initiatives in any sector to address biodiversity loss and nature's decline

This appendix provides practical guidance on how to use the transformative change assessment to help achieve the goals and targets of the Kunming-Montreal Global Biodiversity Framework of the Convention on Biological Diversity as well as the Sustainable Development Goals. Transformative change is a process that involves moving from fragmented, partial and instrumental approaches that fail to address the underlying causes of biodiversity loss and nature's decline to initiatives that are integrated and guided by the principles of transformative change.

Achieving the goals mentioned above requires a recognition that all actor groups can contribute to transformative change. The strategies and actions assessed in this report help in achieving visions for a just and sustainable world when they 1) address the underlying causes of biodiversity loss and nature's decline, 2) draw on a range of theories and approaches; and 3) contribute to overcoming overarching challenges that have served as barriers to transformative change.

Figure SPM.14 offers ten steps for practical guidance on using this assessment to generate transformative change. The aim is to encourage a whole-of-government/whole of society approach to transformative change. The ten iterative steps described in the figure are not a checklist, but rather provide practical guidance for realizing the transformative potential of policies, projects and other initiatives in any sector to address biodiversity loss and nature's decline.



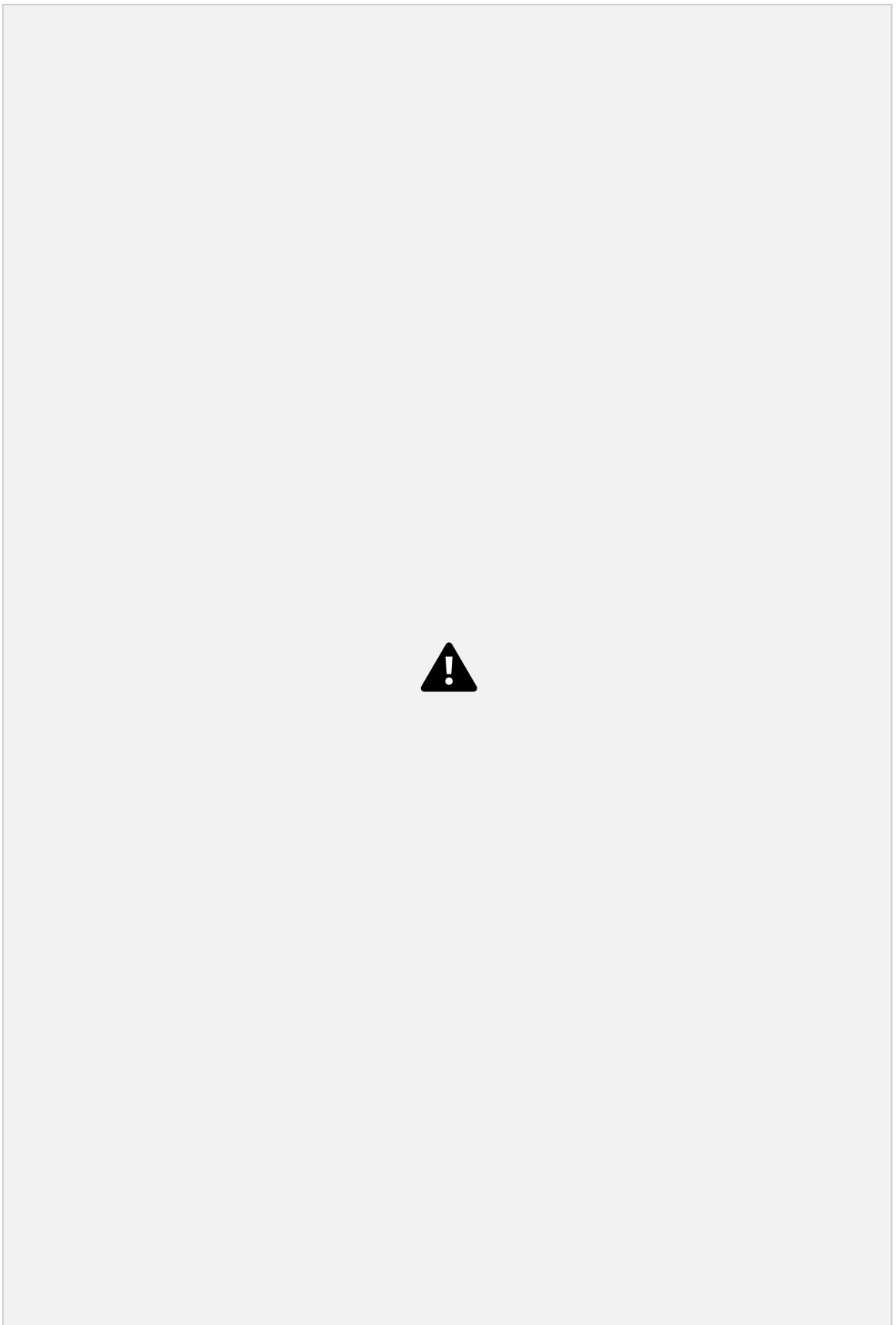


Figure SPM.14. Practical guidance for realizing the transformative potential of policies, projects and other initiatives in any sector.