

Annex I - Nexus and Transformative Change Assessments: Key messages and key data and knowledge gaps

This document reproduces the key messages from two IPBES assessment reports:

- [IPBES Nexus Assessment Summary for Policymakers](#)
- [IPBES Transformative Change Assessment Summary for Policymakers](#)

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Nexus Assessment (12 key messages)

A. Past and current nexus interactions

KM-A1. Biodiversity is essential to our very existence, supporting our water and food supplies, our health and the stability of the climate. Biodiversity is declining in all regions of the world and at all spatial scales, impacting ecosystem functioning, water availability and quality, food security and nutrition, human, plant and animal health and resilience to the impacts of climate change. Biodiversity loss and climate change are interdependent and produce compounding impacts and impacts that threaten human health and human well-being

KM-A2. In the last 50 years global trends in a wide range of indirect drivers have intensified direct drivers of biodiversity loss and caused negative outcomes for biodiversity, water availability and quality, food security and nutrition, health and contributed to climate change

KM-A3. Societal, economic and policy decisions that prioritize short-term benefits and financial returns for a small number of people while ignoring negative impacts on biodiversity and other nexus elements lead to unequal human well-being outcomes. Existing governance approaches have often failed to account for and address these negative impacts in degrading nature, with the negative impacts disproportionately affecting the well-being of some more than others

B. Future nexus interactions

KM-B1. Continuation of current trends in direct and indirect drivers will result in substantial negative outcomes for biodiversity, water availability and quality, food security and human health, while exacerbating climate change. Scenarios that prioritize objectives for a single element of the nexus without regard to other elements (i.e., solely for biodiversity, water, food, human health or climate change) will result in trade-offs across the nexus

KM-B2. Nexus-wide benefits with positive outcomes for people and nature are feasible in the future, but achieving the highest levels of positive outcomes across all nexus elements is challenging. Scenarios that achieve balanced benefits across the nexus elements tend to include response options that effectively conserve, restore and sustainably use and manage ecosystems, reduce pollution across marine, freshwater and terrestrial realms, adopt sustainable healthy diets and mitigate and adapt to climate change

KM-B3. Scenarios focused on synergies among biodiversity, water, food, human health and climate change have more beneficial outcomes for global policy goals, such as the Sustainable Development Goals. Siloed policy approaches and actions

that prioritize a single nexus element limit the achievement of benefits across policy goals

Continuing with business-as-usual, prioritising single short-term issues, will make things worse, so we need joined-up approaches to manage ecosystems, reduce pollution, adopt healthy diets and address climate change

C. Response options that address nexus interactions

KM-C1. Numerous highly synergistic response options are already available to actors in multiple sectors for sustainably managing biodiversity, water, food, health and climate change. Response options not typically focused on biodiversity can often have greater benefits for biodiversity than those specifically designed as such. Response options, when implemented at appropriate scales and contexts, provide many benefits to different degrees across the nexus elements, and many are low cost

KM-C2. Response options can facilitate or impede each other, leading to potential synergies and trade-offs among them. The efficacy of response options in realizing nexus-wide benefits can be enhanced by implementing them together or sequentially, as some response options enable others or amplify their benefits

KM-C3. Response options can strongly advance global policy efforts, including the Sustainable Development Goals, the Kunming-Montreal Global Biodiversity Framework and the Paris Agreement, to achieve just and sustainable futures. Response options designed to benefit multiple nexus elements support multiple goals and targets across global policy frameworks, strengthening synergies and alignment among them

D. Governing the nexus for achieving just and sustainable futures

KM-D1. Transforming current siloed modes of governance through more integrative, inclusive, equitable, accountable, coordinated and adaptive approaches enable successful implementation of response options to manage the nexus elements in an integrated manner and their associated direct and indirect drivers with benefits for people and nature now and into the future

KM-D2. Gaps in finance to meet biodiversity needs are \$0.3–1 trillion per year, and additional investment needs to meet the Sustainable Development Goals most directly related to water, food, health and climate change are at least \$4 trillion per year. Urgent action to transform values and structures and address the dominance of a narrow set of interests within economic and financial systems can enable increased investments for biodiversity and the other nexus elements

KM-D3. Nexus governance approaches, decision-making and capacity strengthening can be enhanced through a series of deliberative steps and actions, informed by diverse evidence. A road map for nexus action can be used by a wide range of actors in multiple sectors to identify problems and shared values in order to work collaboratively towards solutions to help achieve just and sustainable futures aligned with global policy frameworks. Tools and methods facilitating a holistic understanding of nexus elements can increase knowledge and improve cooperation and decision-making

Governance and finance can be strengthened to adopt nexus approaches, helping to achieve just and sustainable futures aligned with global policy frameworks

Nexus Assessment key knowledge gaps

Nexus interlinkages

- higher-order interlinkages involving three or more nexus elements, particularly studies involving health
- interlinkages spanning across the terrestrial, freshwater and marine realms
- interlinkages spanning distant regions (telecoupling effects)
- quantifying nexus interlinkages, including trade-offs and synergies among three or more nexus elements

Data and quantitative information availability and access

- quantifying the role of biodiversity in interlinkages among nexus elements that go beyond simple indicators based on presence of certain ecosystems or species (e.g., ecosystem functioning, genetic diversity)
- identifying indicators to assess and quantify linkages and interactions between indirect and direct drivers and their impact on the interlinkages among nexus elements
- economic costs and benefits of nexus response options, particularly in biodiversity and health

Assessment methods, tools, scenarios, models

- Modelling tools that better account for nexus interlinkages and can simulate pathways to sustainable outcomes across multiple nexus elements at a range of spatial scales (global, regional, local), as well as accounting for inherent modelling uncertainties
- Policy implementation scenarios and models representing multiple response options and interlinkages among three or more nexus elements that could assist in understanding how targets might be achieved across different temporal and spatial scales, including achieving synergies or multiple benefits among sectoral response options and related issues such as poverty, equity and power relation among actors
- Novel methods, models and decision support tools for assessing interlinkages among three or more nexus elements and actors in the implementation of nexus governance options, including methods focused on spatial/temporal dynamics and scaling up, out, down and deep of response options and their long-term outcomes for the nexus

ILK and IPLC

- Studies to improve understanding of IPLC-managed systems that have nexus-wide benefits, their importance, monetary and non-monetary value, and potential to scale up, including consideration of contested property rights and traditional rights as well as financing
- Scenarios that better account for the visions embedded in ILK and include the participation of IPLC
- Studies on ILK-based response options that consider the role of IPLC cultural practices and innovation for the implementation of nexus response options, their context dependency and feasibility for scaling

Nexus response

- evaluating the impacts of response options on multiple nexus elements before and after implementation to understand synergies and trade-offs

and how these are influenced by the implementation process, including across multiple scales and contexts

- successful examples of scaling out response options plus evidence on where options are non-scalable owing to context-dependencies
- design and aggregate outcomes of combinations (bundles and/or sequences) of response options at landscape, national, regional and global scales
- how the transformative potential of nexus response options can be harnessed

Nexus governance

- alternative and innovative approaches to nexus governance, including improving understanding of what comprises good nexus governance, and for whom and under which conditions it takes place
- how governance and policy can enable improved engagement, alignment and collaboration among actors from different nexus elements across a variety of scales taking account of actor networks across the nexus, power dynamics and effects on reducing inefficiencies and promoting inclusiveness
- linking nexus approaches to their implications for multilateral agreements, such as the Kunming-Montreal Global Biodiversity Framework and the Paris Agreement, including consequences for the nexus elements (biodiversity, water, food, health and climate change) and their interlinkages

Nexus financing

- scale and distribution of financial flows impacting nexus elements and interlinkages among them, including subsidies that have the potential to harm other nexus elements or trade-off against other response options
- spatial distribution of drivers of sustainable investments/disinvestments and the impacts of such investments/disinvestments on biodiversity and the other nexus elements, including their ability to reduce inefficiencies in resource management and outcomes
- integrate nexus benefits into financial decision-making and asset pricing, including how to scale up and amplify public-private investment and financing in synergistic outcomes among nexus elements

Capacity gaps

- Training and capacity strengthening on understanding and overcoming the nexus challenges (high complexity, inadequate scaling, siloed governance, multiple values and lack of finance) associated with nexus approaches
- Strengthened partnerships to achieve more harmonized and holistic approaches among actors in the biodiversity, water, food, health and climate change sectors
- Training and capacity-building on boundary (bridging) work, negotiation and methodologies for incorporating multiple types of knowledge
- Greater dissemination and communication of knowledge and good practice gained from implementation of nexus approaches and nexus response options

Technology gaps

- Improved understanding of sociocultural and economic constraints on technology development and adoption related to nexus response options
- Studies on the potential of digital technologies, most notably artificial intelligence/data science, digital twins and integrated modelling platforms, to discover, explore and improve understanding of interlinkages in nexus assessments
- Improved mechanisms for open science and FAIR data practices to ensure equitable access to data and technology

Transformative Change Assessment (17 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

KM2. Transformative change is defined as fundamental, system-wide shifts in views, structures and practices. Deliberate transformative change for a just and sustainable world shifts views, structures and practices in ways that address the underlying causes of biodiversity loss and nature's decline. At the same time, it remains important to recognise and strengthen views, structures and practices that are aligned with generating a just and sustainable world, such as those of many Indigenous Peoples and local communities

KM3. Four key principles are responsive to and address the underlying causes of biodiversity loss and nature's decline and guide the process of deliberate transformative change. These principles are equity and justice; pluralism and inclusion; respectful and reciprocal human-nature relationships; and adaptive learning and action

KM4. Transformative change for a just and sustainable world faces challenges that are systemic, persistent and pervasive. Systemic challenges manifest as barriers that impede or prevent transformative change and reinforce the status quo

KM5. Weaving together insights from diverse approaches and knowledge systems, including Indigenous and local knowledge, enhances strategies and actions for transformative change

KM6. Transformative change is possible, and it is characterized by the quality and direction of change. Both small-scale and large-scale changes contribute to transformative change for a just and sustainable world when they address the underlying causes of biodiversity loss and nature's decline

B. Strategies and actions for transformative change.

KM7. Five key strategies and associated actions have complementary and synergistic effects and substantial potential to advance deliberate transformative change for global sustainability. An integrated set of actions for each strategy shifts entrenched views, structures and practices in an adaptive way

KM8. Conservation that involves sustainable stewardship, notably by Indigenous Peoples and local communities, contributes to transformative change when it is inclusive, well-resourced, focused on places of high value to nature and people and when the rights of Indigenous Peoples are recognized

KM9. Transformative changes in sectors that heavily contribute to biodiversity loss, including agriculture and livestock, fisheries, forestry, infrastructure, mining and fossil fuel sectors are crucial and urgent for advancing global sustainability, delivering social benefits to reach the 2050 Vision for Biodiversity

KM10. Transformative change strategies include transforming dominant economic and financial paradigms so that they prioritize nature and social equity over private interests

KM11. Inclusive, accountable and adaptive governance systems play a pivotal role in driving transformative change by involving diverse stakeholders in decision-making and addressing governance challenges

KM12. Shifting dominant societal views and values to recognize and prioritize human-nature interconnectedness is a powerful strategy for transformative change. These shifts can be facilitated through cultural narratives and by changing dominant social norms, facilitating transformative learning processes, co-creating new knowledge and weaving different knowledge systems, worldviews and values that recognize human-nature interdependencies and ethics of care

C. Enabling transformative change: Roles for all

KM13. Shared positive visions and their development is especially important to recognize socio-ecological interdependencies, the agency of non-human life forms and an ethics of care, and thereby to inspire transformative change {A8, C2, C3, C4}. Visions, which include narratives and stories, are desirable future states of people and nature, including Mother Earth, shaped by values and worldviews and often include defined goals and intentional efforts to attain such future states.

KM14. Transformative change is system-wide, therefore, to achieve it requires a whole-of-society and whole-of-government approach that engages all actors and sectors in visioning and contributing collaboratively to transformative change

KM15. Governments are powerful enablers of transformative change when they foster policy coherence, enact and enforce stronger regulations to benefit nature and nature's contributions to people in policies and plans (regulations, taxes, fees, tradable permits) across different sectors, deploy innovative economic (including financial) and fiscal tools, eliminate, phase out or reform environmentally harmful subsidies, and promote international cooperation

KM16. Civil society organizations, by fighting against biodiversity loss and nature's decline, point to the need for transformative change. Social mobilizations to pursue change, however, have often triggered responses that do not possess key aspects of transformative change. Civil society initiatives and environmental defenders have faced violence and rights violations. Protecting them supports transformative change

KM17. Well-designed policies, as well as business and private sector initiatives and tools, aimed at transformative change for a just and sustainable world, provide economic incentives that influence socioeconomic development and consumption practices

Transformative Change Assessment key knowledge gaps

Monitoring and valuing transformative change

Metrics and indicators:

- evaluating impacts on both nature and people, including the effects of subsidies, social movements, and other interventions
- more reliable early indicators that predict successful transformative changes
- indicators based on different knowledge systems, worldviews and values

Monitoring across scales:

- monitoring and evaluating transformative actions at multiple scales and contexts, especially in terms of their long-term effectiveness.

Integration of different approaches:

- how to integrate evidence of the social and ecological dimensions of transformative change processes, as well as qualitative and quantitative approaches.
- coordinating knowledge for effective sustainability transitions
- tools to assess surprises and uncertainties in transformative processes, particularly regarding their differential impacts on both nature and people

Overcoming challenges to transformative change

Benefits and trade-offs:

- 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

Vision development and participatory processes:

- understanding how visions for a sustainable world are developed across diverse cultures and contexts.
- integration of participatory processes, particularly involving Indigenous Peoples and local communities, into the development and evaluation of visions for a sustainable world

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

Governance and institutional structures:

- 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

Relations of domination as barriers to transformative change:

- how the elements of relations of domination manifest as barriers to transformative change

Science-policy relations:

- science-policy relations, and the incorporation of different knowledge systems in transdisciplinary learning processes
- underlying power structures in science-policy relations

Building capacities for transformative change

Case study research:

- integrating case studies of transformative change from across different time periods to draw general conclusions to understand how transformative processes unfold in practice and 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) to build a solid empirical foundation for scaling up transformative actions

Imagination gap:

- the imagination gap in envisioning positive futures where humans are seen as an integrated part of nature and living in harmony with nature

Cultural insights and social dimensions:

- cultural dimensions of transformative change, 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.
- specific needs and issues of concern for diverse social actor groups, and how different social actors and cultural perspectives can inform broader sustainability transformations.

Philosophical and theoretical foundations:

- underlying philosophical, theoretical assumptions and epistemologies of transformative change, including how these link to adult learning and development

Inner transformations and empowerment:

- the role of transformative capacities, including inner transformations and empowerment, in transformative change processes, and how to cultivate those capacities.

Overall

- prioritising these gaps through integrative and actionable transdisciplinary research can guide and activate science, policy and society for transformative change.
- linking knowledge and action to produce context-specific and measurable results for transformative change.