

Thematic assessment of the interlinkages among biodiversity, water, food and health (nexus assessment)

FIRST ORDER DRAFT OF THE CHAPTERS EXTERNAL REVIEW PROCESS

IPBES members, observers and other interested stakeholders are invited to review the first order draft of the chapters of the nexus assessment during the first external review period; the review period is open from **9 January to 19 February 2023** (6 weeks).

The first external review, which focuses on the first draft of the chapters of the assessment, is one of the most important phases in the IPBES assessment process and is addressed to interested and qualified experts (referred to as “the expert reviewers”). The widest possible participation and most diverse engagement of interested and qualified experts, including scientists, decision makers, practitioners and other knowledge holders from all relevant disciplines and backgrounds, is vital to ensure the scientific quality, credibility and policy relevance of the assessment. Interested and qualified experts are invited to comment on text according to their knowledge and experience. The names of all expert reviewers will be acknowledged in the reports.

Please note:

- The following drafts are available for review: chapters 1, 2, 3, 4, 5.1, 5.2, 5.3, 5.4, 5.5, 6 and 7 and the glossary.
- The chapter 5 sub-chapters are presented individually for the first external review; for subsequent external reviews, chapter 5 will include introductory and concluding sections for the chapter as a whole and the draft chapter may be presented in its entirety to facilitate consideration of and comments on consistency and complementarity across the sub-chapters.
- Chapter 7 is a summary chapter for chapters 4, 5, and 6; the first order draft of chapter 7 is structured as an extended outline.

GUIDANCE ON COMMENTS

- Please focus on providing substantive comments that address content rather than providing comments on editing or formatting.
- General comments are welcome, but specific line-by-line comments are particularly helpful.
- Literature suggestions are welcome.

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If you have questions about the assessment and/or the first order draft of the chapters, please contact Tiff van Huysen (tiff.vanhuysen@un.org) – head of the nexus assessment technical support unit. Thank you in advance for your interest in reviewing the first order draft of the nexus assessment and your support of IPBES.

Glossary of the thematic assessment of the interlinkages among biodiversity, water, food and health (nexus assessment)

Actors (policy): Any individual or group that is directly or indirectly, formally or informally, affiliated with or affected by the policy process at any stage. They can include governments, businesses, NGOs, civil society organizations and communities as well as individuals. Policy actors seek to influence the outcome of a policy process through either direct or indirect action; they may also be those affected, positively or negatively, by a policy process (FAO, 2003).

Adaptive capacity: The general ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences (IPBES Glossary, n.d.).

Alternative pathways: Commonly understood as plausible what-if pathways based on assumptions of how the nexus might change in a different (future) setting (source: this assessment, chapter 3). See also **pathways**.

Archetypes: Nexus archetypes depict factors and processes that repeatedly determine the interactions between biodiversity, climate change, water, food, and health (Oberlack et al., 2019; Sietz et al., 2019). Interaction archetypes represent recurrent patterns of co-evolving biodiversity, climate, water, food and health dynamics. They provide insights into functionally similar interactions focusing on an intermediate scale in between the particularities of single cases and panacea perspectives (Basurto & Ostrom, 2009; Schellnhuber et al., 2002).

Archetypes (scenarios): In the context of scenarios, a nexus scenario archetype is an overarching nexus scenario that embodies common characteristics of a number of more specific scenarios. See also Archetypes (IPBES Glossary, n.d.).

Assessment reports: Assessment reports are published outputs of scientific, technical and socioeconomic issues that take into account different approaches, visions and knowledge systems, including global assessments of biodiversity and ecosystem services with a defined geographical scope, and thematic or methodological assessments based on the standard or the fast-track approach. They are to be composed of two or more sections including a summary for policymakers, an optional technical summary and individual chapters and their executive summaries. Assessments are the major output of IPBES, and they contain syntheses of findings on topics that have been selected by the IPBES Plenary (IPBES Glossary, n.d.).

Adaptability (part of resilience): The capacity to adjust responses to changing external drivers and internal processes, and thereby channel development along the preferred trajectory in what is called a stability domain (IPBES Glossary, n.d.).

Adaptive capacity: The general ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences (IPBES Glossary, n.d.).

- 39 **Afforestation:** Converting grasslands or shrublands into tree plantations. Afforestation is
40 sometimes suggested as a tool to sequester carbon, but it can have negative impacts on
41 biodiversity and ecosystem function (IPBES Glossary, n.d.).
- 42 **Agroecology:** The science and practice of applying ecological concepts, principles and
43 knowledge (i.e., the interactions of, and explanations for, the diversity, abundance and
44 activities of organisms) to the study, design and management of sustainable agroecosystems.
45 It includes the roles of human beings as central organisms by way of social and economic
46 processes in farming systems. Agroecology examines the roles and interactions among all
47 relevant biophysical, technical and socioeconomic components of farming systems and their
48 surrounding landscapes (IPBES Glossary, n.d.).
- 49 **Agroforestry:** Agroforestry is a collective name for land-use systems and technologies
50 where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the
51 same land-management units as agricultural crops and animals, in some form of spatial
52 arrangement or temporal sequence (IPBES Glossary, n.d.).
- 53 **Baseline:** A minimum or starting point with which to compare other information (e.g., for
54 comparisons between past and present or before and after an intervention) (IPBES Glossary,
55 n.d.).
- 56 **Benefit (sharing):** Distribution of benefits between stakeholders (IPBES Glossary, n.d.).
- 57 **Biodiversity:** The variability among living organisms from all sources including terrestrial,
58 marine and other aquatic ecosystems and the ecological complexes of which they are a part.
59 This includes variation in genetic, phenotypic, phylogenetic, and functional attributes, as well
60 as changes in abundance and distribution over time and space within and among species,
61 biological communities and ecosystems (IPBES Glossary, n.d.).
- 62 **Biodiversity conservation:** The management of human interactions with genes, species, and
63 ecosystems so as to provide the maximum benefit to the present generation while maintaining
64 their potential to meet the needs and aspirations of future generations; encompasses elements
65 of saving, studying, and using biodiversity (IPBES Glossary, n.d.).
- 66 **Biodiversity finance:** [To be defined.]
- 67 **Biodiversity finance (private):** financing provided by private businesses, corporations or
68 financial organizations, and private persons. This includes biodiversity and water offsets, the
69 certification of sustainable commodities, conservation NGOs, philanthropic foundations,
70 financing mobilized by countries' development finance institutions (e.g., development banks
71 or agencies), financing leveraged by GEF, carbon financing, and PES (Perry & Karousakis,
72 2020).
- 73 **Biodiversity finance (public domestic):** financing provided within a country by national and
74 subnational governments, public agencies, and public financial institutions (Perry &
75 Karousakis, 2020).
- 76 **Biodiversity finance (public international):** financing provided by governments, public
77 agencies, or public financial institutions in one (or more) country(ies) to support the pursuit

of biodiversity objectives in another country(ies). This includes official development assistance (ODA), other official financial flows (OOF), as well as both bilateral and multilateral flows (Perry & Karousakis, 2020).

Biodiversity financing gap: can either refer to 1) the gap between stated financial resource commitments and those actually delivered or provided, or 2) the gap between the scale of biodiversity finance and the scale of financial flows that are directly or indirectly harmful to biodiversity and sustainable development (Perry & Karousakis, 2020).

Biodiversity funding: [To be defined.]

Bioenergy with carbon capture and storage (BECCS): Land-based climate change mitigation strategy involving the planting of bioenergy crops or trees, which are burned in power stations or converted to biofuels, and the released CO₂ being captured for long-term underground storage in geological reservoirs (IPBES Glossary, n.d.).

Carbon sequestration: The long-term storage of carbon in plants, soils, geologic formations, and the ocean. Carbon sequestration occurs both naturally and as a result of anthropogenic activities and typically refers to the storage of carbon that has the immediate potential to become carbon dioxide gas (IPBES Glossary, n.d.).

Climate: Climate is the average weather, or more rigorously, its statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. In the ocean, climate change is manifested as altered hydrologic conditions including temperature, oxygen, sea level, the carbonate system, and related changes in productivity, mixing and circulation (IPBES Glossary, n.d.).

Climatological normal: The long-term average of a climatic variable. The normal is typically computed by calculating a climatology over a period of at least 30 years (the climate normal period). The current climate normal period is January 1981 to December 2010 (Copernicus Climate Change Service, n.d.).

Climatological anomalies: The anomaly of a climatic variable is the variation relative to a baseline value i.e., climatological normal (see also **climatological normal**). For example, a positive anomaly of temperature means that the observed temperature was warmer than the baseline. A negative temperature anomaly indicates that the observed temperature was cooler than the long-term average. Similarly, positive and negative anomalies for precipitation indicate that it rained respectively more or less than the baseline (Copernicus Climate Change Service, n.d.).

Climate change: As defined in Article 1 of the United Nations Framework Convention on Climate Change, a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (IPBES Glossary, n.d.).

Climate change impacts: The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure (Matthews et al., 2021).

Climate change adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPBES Glossary, n.d.).

Co-benefit: Refers to benefits of development plans or sectoral policies and measures (IPBES Glossary, n.d.).

Co-production: In the context of the IPBES conceptual framework, this is the joint contribution by nature and anthropogenic assets in generating nature's contributions to people (IPBES Glossary, n.d.).

Conservation: See also **biodiversity conservation**.

Cross-sectoral: Relating to interactions between sectors (that is, the distinct parts of society, or of a nation's economy), such as how one sector affects another sector, or how a factor affects two or more sectors (IPBES Glossary, n.d.).

Customary law: Law consisting of customs that are accepted as legal requirements or obligatory rules of conduct; practices and beliefs that are so vital and intrinsic a part of a social and economic system that they are treated as if they were laws (IPBES Glossary, n.d.).

Decision support tools: Approaches and techniques based on science and other knowledge systems, including Indigenous and local knowledge, that can inform, assist and enhance relevant decisions, policy-making and implementation at the local, national, regional and international levels (IPBES Glossary, n.d.).

Driver: In the context of IPBES, drivers of change are all the factors that, directly or indirectly, cause changes in nature, anthropogenic assets, nature's contributions to people and a good quality of life.

- Direct drivers of change can be both natural and anthropogenic. Direct drivers have direct physical (mechanical, chemical, noise, light etc.) and behavior-affecting impacts on nature. They include, inter alia, climate change, pollution, different types of land use change, invasive alien species and zoonoses, and exploitation.
- Indirect drivers are drivers that operate diffusely by altering and influencing direct drivers, as well as other indirect drivers. They do not impact nature directly. Rather, they do it by affecting the level, direction or rate of direct drivers.

- Interactions between indirect and direct drivers create different chains of relationship, attribution, and impacts, which may vary according to type, intensity, duration, and distance. These relationships can also lead to different types of spill-over effects.
- Global indirect drivers include economic, demographic, governance, technological and cultural ones. Special attention is given, among indirect drivers, to the role of institutions (both formal and informal) and impacts of the patterns of production, supply and consumption on nature, nature's contributions to people and good quality of life (IPBES Glossary, n.d.).

Disease: The clinical and/or pathological manifestation of infection (CBD, n.d.)

Ecohealth: EcoHealth is committed to fostering the health of humans, animals, and ecosystems and to conducting research which recognizes the inextricable linkages between the health of all species and their environments. A basic tenet held is that health and well-being cannot be sustained in a resource depleted, polluted, and socially unstable planet. Adapted from (Lerner & Berg, 2017).

Ecosystem: A dynamic complex of plant, animal and micro-organism communities and their non- living environment interacting as a functional unit (IPBES Glossary, n.d.).

Ecosystem disservice: Ecosystem disservices (EDS) are functions or properties of ecosystems that cause effects that are. perceived as harmful, unpleasant or unwanted. Examples of EDS include pest damages to agriculture, pollen causing allergic reactions or fear related to night-time urban parks (Lyytimäki, 2015).

Ecosystem health: Ecosystem health is a metaphor used to describe the condition of an ecosystem, by analogy with human health. Note that there is no universally accepted benchmark for a healthy ecosystem. Rather, the apparent health status of an ecosystem can vary, depending upon which metrics are employed in judging it, and which societal aspirations are driving the assessment (IPBES Glossary, n.d.).

Ecological restoration: Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. See also Restoration (Society for Ecological Restoration, n.d.).

Ecosystem services: The benefits people obtain from ecosystems. In the Millennium Ecosystem Assessment, ecosystem services can be divided into supporting, regulating, provisioning and cultural. This classification, however, is superseded in IPBES assessments by the system used under nature's contributions to people. This is because IPBES recognizes that many services fit into more than one of the four categories. For example, food is both a provisioning service and also, emphatically, a cultural service, in many cultures (IPBES Glossary, n.d.).

Ecosystem-based adaptation: The conservation, sustainable management and restoration of natural ecosystems to help people adapt to climate change (IPBES Glossary, n.d.).

- 190 **Equity:** Fairness of rights, distribution, and access. Depending on context, this can refer to
191 resources, services or power (IPBES Glossary, n.d.).
- 192 **Energy security:** Access to clean, reliable and affordable energy services for cooking and
193 heating, lighting, communications and productive uses (IPBES Glossary, n.d.).
- 194 **Energy sector:** Broadly defined as the sector dealing with the production and creation of
195 energy (IPBES Glossary, n.d.). See also **sector**.
- 196 **Energy system:** The energy system comprises all components related to the production,
197 conversion, delivery, and use of energy (Allwood et al., 2014).
- 198 **Entry point (to the nexus):** Understood as the angle under which a nexus of two or more
199 elements is expected to change. Often captured quantitatively or qualitatively through targets
200 or goals which are meant to be achieved (source: this assessment, chapter 3). See also **goal**.
- 201 **Externality:** A positive or negative consequence (benefits or costs) of an action that affects
202 someone other than the agent undertaking that action and for which the agent is neither
203 compensated nor penalized through the markets (IPBES Glossary, n.d.).
- 204 **Feedback:** The modification or control of a process or system by its results or effects (IPBES
205 Glossary, n.d.).
- 206 **Food:** Includes all cultivated and wild foods, and all processes and activities from
207 production to consumption and disposal or reuse. The assessment also considers agricultural
208 and forestry activities associated with fodder, fuel and fibre within this nexus element
209 (source: this assessment, chapter 1).
- 210 **Food system:** The definition of food systems embraces the entire range of actors and their
211 interlinked value- adding activities involved in the production, aggregation, processing,
212 distribution, consumption, and disposal of food products that originate from agriculture,
213 forestry or fisheries, and food industries, and the broader economic, societal, and natural
214 environments in which they are embedded [source to be determined.]
- 215 A sustainable food system understood as one that delivers food security and nutrition for all
216 in such a way that the economic, social, cultural, and environmental bases to generate food
217 security and nutrition for future generations are safeguarded (UN Food Systems Summit,
218 n.d.).
- 219 **Food security:** The World Food Summit of 1996 defined food security as existing when all
220 people at all times have access to sufficient, safe, nutritious food to maintain a healthy and
221 active life (IPBES Glossary, n.d.).
- 222 **Functional relationship:** [To be defined.]
- 223 **Functional diversity:** Value, range and relative abundance of functional traits in a given
224 ecosystem (IPBES Glossary, n.d.).

- 225 **Goals (scenario):** Defines the goal or target a specific (future) indicator is meant to achieve
226 in (future) scenarios. Often interpreted as directional target to be achieved [source to be
227 determined.]
- 228 **Governance:** The way the rules, norms and actions in a given organization are structured,
229 sustained, and regulated (IPBES Glossary, n.d.).
- 230 **Governance (transformative):** The formal and informal (public and private) rules, rule-
231 making systems and actor-networks at all levels of human society (from local to global) that
232 enable transformative change, in our case, towards biodiversity conservation and sustainable
233 development more broadly (Visseren-Hamakers et al., 2021; Visseren-Hamakers & Kok,
234 2022). Transformative governance includes five governance approaches: integrative,
235 inclusive, adaptive, transdisciplinary, and anticipatory (Visseren-Hamakers & Kok, 2022).
- 236 **Governance (nexus): [placeholder definition]** engagement of multiple actors and their
237 horizontal (e.g., across various Nexus elements at one scale) and vertical (e.g., cross-scalar
238 connectivity, multi-level governance networks) policy coherence across sectors (source: this
239 assessment, chapter 1).
- 240 **Green and blue infrastructure:** Green infrastructure is a strategically planned network of
241 natural and semi-natural areas with other environmental features designed and managed to
242 deliver a wide range of ecosystem services such as water purification, air quality, space for
243 recreation and climate mitigation and adaptation. This network of green (land) and blue
244 (water) spaces can improve environmental conditions and therefore citizens' health and
245 quality of life (Eurostat, n.d.).
- 246 **Green bonds:** A mode of private financing that tap the debt capital market through fixed
247 income instruments (i.e., bonds) to raise capital to finance climate-friendly projects in key
248 sectors of, but not limited to, transport, energy, building and industry, water, agriculture and
249 forestry and waste (IPBES Glossary, n.d.).
- 250 **Green (environmental) gentrification:** Green gentrification refers to processes started by
251 the implementation of an environmental planning agenda related to green spaces that lead to
252 the exclusion and displacement of politically disenfranchised residents (Barcelona Lab, n.d.).
- 253 **Green growth:** Green growth means fostering economic growth and development while
254 ensuring that natural assets continue to provide the resources and environmental services on
255 which our well-being relies (IPBES Glossary, n.d.).
- 256 **Greenwashing:** false or misleading information, either intentionally or inadvertently,
257 regarding the environmental or sustainability attributes of a product, asset and activity, which
258 can have consequences on the assessment of financial and non-financial materiality
259 (International Organization for Standardization, 2022).
- 260 **Habitat:** The place or type of site where an organism or population naturally occurs. Also
261 used to mean the environmental attributes required by a particular species or its ecological
262 niche (IPBES Glossary, n.d.).

- 263 **Half-earth concept:** A specific vision of conserving at least 50% of the terrestrial and marine
264 environment for nature (Wilson, 2016).
- 265 **Health (human):** A state of complete physical, social and mental well-being, and not merely
266 the absence of disease or infirmity (World Health Organization, 2021).
- 267 **Health (nexus):** Health includes human physical and mental health and well-being, and the
268 role of ecological, environmental, socio-economic, cultural and health system factors. This
269 report recognises the link between human health, animal health and ecosystem health and the
270 need of achieving equity of health outcomes, addressing all elements of the nexus (source:
271 this assessment, chapter 1).
- 272 **Healthy diet:** A healthy diet is health-promoting and disease-preventing. It provides
273 adequacy without excess of nutrients and health promoting substances from nutritious foods
274 and avoids the consumption of health-harming substances (UN Food Systems Summit, n.d.).
- 275 **Health policy:** Health policy refers to decisions, plans, and actions that are undertaken to
276 achieve specific health care goals within a society (World Health Organization, 2021).
- 277 **Human rights:** The inalienable fundamental rights of each and every human being as
278 acknowledged in the United Nations Declaration of Human Rights (United Nations, 1948).
279 Arguments of intragenerational justice basically refer to human rights (IPBES, n.d.).
- 280 **Human wellbeing:** Human well-being is a state in which there is opportunity for satisfying
281 social relationships and where human needs are met, where one can act meaningfully to
282 pursue one's goals and where one enjoys a satisfactory quality of life (IPBES, n.d.).
- 283 **Indicator:** A quantitative or qualitative factor or variable that provides a simple, measurable
284 and quantifiable characteristic or attribute responding in a known and communicable way to a
285 changing environmental condition, to a changing ecological process or function, or to a
286 changing element of biodiversity (IPBES, n.d.).
- 287 **Institution:** Institutions encompass formal and informal rules and norms that structure
288 individual and collective behaviour, including interactions among stakeholders and social
289 structures that help to define how decisions are taken and implemented, how power is
290 exercised, and how responsibilities are distributed (IPBES, n.d.).
- 291 **Interaction:** Mutual or reciprocal action or influence [mention multiple levels of interactions
292 especially in the context of the nexus] (IPBES Glossary, n.d.). See also **driver**.
- 293 **Integrated approach:** [To be defined.]
- 294 **Integrity (ecological):** The ability of an ecosystem to support and maintain ecological
295 processes and a diverse community of organisms (IPBES Glossary, n.d.).
- 296 **Integrated land-use system:** Land use planning that seeks to balance the economic, social
297 and cultural opportunities provided by land with the need to maintain and enhance ecosystem
298 services provided by the land-based natural capital. It also aims to blend or coordinate

299 management strategies and implementation requirements across multiple sectors and
300 jurisdictions (UNCCD, n.d.).

301 **Interlinkages:** [To be defined.]

302 **Indigenous Peoples and local communities (IPLCs):** Indigenous peoples and local
303 communities (IPLCs) are, typically, ethnic groups who are descended from and identify with
304 the original inhabitants of a given region, in contrast to groups that have settled, occupied or
305 colonized the area more recently (IPBES Glossary, n.d.).

306 **Indigenous and local knowledge (ILK):** Indigenous and local knowledge (ILK) refers to
307 dynamic bodies of integrated, holistic, social and ecological knowledge, practices and beliefs
308 pertaining to the relationship of living beings, including people, with one another and with
309 their environments (IPBES Glossary, n.d.).

310 **Justice:** “Justice is understood as a variegated set of conditions – primary concerned with
311 distribution of resources, political processes, and social recognition – that allows for full
312 human flourishing. If conditions within a given society systematically support one but hinder
313 other individuals or groups with regard to basic flourishing (i.e., fundamentally thriving
314 within reasonable limits) according to achievable outcomes that they value in order to live a
315 healthy and fulfilled life, then that society is to some degree unjust” (Langemeyer &
316 Connolly, 2020).

317 **Knowledge system:** A body of propositions that are adhered to, whether formally or
318 informally, and are routinely used to claim truth (IPBES, 2019a).

319 **Land degradation:** Refers to the many processes that drive the decline or loss in
320 biodiversity, ecosystem functions or their benefits to people and includes the degradation of
321 all terrestrial ecosystems (IPBES, 2019a).

322 **Land use and land use (and cover) change:** Land use refers to the total arrangements,
323 activities, and inputs undertaken in a certain land cover type (a set of human actions). Land
324 use change refers to a change in the use or management of land by humans, which may lead
325 to a change in land cover. Land cover and land use change may have an impact on the surface
326 albedo, evapotranspiration, sources and sinks of greenhouse gases, or other properties of the
327 climate system and may thus have radiative forcing and/or other impacts on climate, locally
328 or globally (IPCC, 2014a).

329 **Livelihoods:** The resources used and the activities undertaken in order to live. Livelihoods
330 are usually determined by the entitlements and assets to which people have access. Such
331 assets can be categorised as human, social, natural, physical, or financial (IPCC, 2022).

332 **Maladaptation:** A trait that is, or has become, more harmful than helpful, in contrast with an
333 adaptation, which is more helpful than harmful (Barnett & O’Neill, 2010).

334 **Management, adaptive, co-:** [To be defined.]

335 **Marginalisation:** Refers to the set of processes through which some individuals and groups
336 face systematic disadvantages in their interactions with dominant social, political and

economic institutions. The disadvantages arise from class status, social group identity (kinship, ethnicity, caste and race categories), political affiliation, gender, age and disability (IPBES, 2019a).

Mariculture: A branch of aquaculture involving the culture of organisms in a medium or environment which may be completely marine (sea), or sea water mixed to various degrees with fresh water, including brackish water areas (Sivalingham, 1981).

Market-based instruments: [To be defined.]

Narrative (Scenario): A specific vision or interpretation underlying a scenario [source to be determined.] See also **pathway**.

Nature: In the context of IPBES (also referred to as living nature), it refers to the nonhuman world, including coproduced features, with particular emphasis on living organisms, their diversity, their interactions among themselves and with their abiotic environment. Within the framing of the natural sciences, nature include e.g., all dimensions of biodiversity, species, genotypes, populations, ecosystems, communities, biomes, Earth life support's systems, and their associated ecological, evolutionary and biogeochemical processes. Within the framework of economics, it includes categories such as biotic natural resources, natural capital and natural assets.

Within a wider context of social sciences and humanities and interdisciplinary environmental sciences, it is referred to with categories such as natural heritage, living environment, or the nonhuman. Within the framing of other knowledge systems, it includes categories such as Mother Earth (shared by many IPLCs around the world; see 'Mother Earth'), *Pachamama* (South American Andes), *se̱nluo'-wa`nxia`ng and tien-ti* (East Asia), Country (Australia), *fonua/ vanua/whenua/ples* (South Pacific Islands), *Iwigara* (Northern Mexico), *Ixofijmogen* (Southern Argentina and Chile), among many others. The degree to which humans are considered part of nature varies strongly across these categories. Many aspects of biocultural diversity are part of nature, while some others pertain more to nature's contributions to people and anthropogenic assets (IPBES, 2019a).

Nature's contributions to people (NCP): Nature's contributions to people (NCP) are all the contributions, both positive and negative, of living nature (i.e., all organisms, ecosystems, and their associated ecological and evolutionary processes) to people's quality of life. Beneficial contributions include e.g., food provision, water purification, flood control, and artistic inspiration, whereas detrimental contributions include, e.g., disease transmission and predation that damages people or their assets. NCP may be perceived as benefits or detriments depending on the cultural, temporal or spatial context (Díaz et al., 2018). IPBES considers a gradient of approaches to NCP, ranging from a purely generalizing approach to a purely context-specific one. Within the generalizing approach, IPBES identifies 18 categories of NCP, organized in three partially overlapping groups:

- Material contributions are substances, objects or other material elements from nature that directly sustain people's physical existence and material assets. They are typically physically consumed in the process of being experienced, for example when

organisms are transformed into food, energy, or materials for clothing, shelter or ornamental purposes.

- Non-material contributions are nature's effects on subjective or psychological aspects underpinning people's quality of life, both individually and collectively. Examples include forests and coral reefs providing opportunities for recreation and inspiration, or particular organism (animals, plants, fungi) or habitat (mountains, lakes) being the basis of spiritual or social-cohesion experiences.

- Regulating contributions are functional and structural aspects of organisms and ecosystems that modify environmental conditions experienced by people, and/ or regulate the generation of material and non-material contributions. Regulating contributions frequently affect quality of life in indirect ways. For example, people directly enjoy useful or beautiful plants, but only indirectly the soil organisms that are essential for the supply of nutrients to such plants (IPBES, 2019a).

Nature-based solutions (NbS): Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN, n.d.).

OR

Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (Cohen-Shacham et al., 2016).

Nature's Futures Framework (NFF): The Nature Futures Framework (NFF) forms the foundation for developing scenarios of positive futures for nature, to help inform assessments of policy options across multiple scales. The NFF places relationships between people and nature at its core. Because people relate to nature in multiple ways, there are a wide variety of desirable nature futures, with different goals and visions which can be synergistic or in conflict with one another. The NFF is broadly organized across three main pluralistic axes:

- Nature for Nature, where people view nature as having intrinsic value placed on biodiversity
- Nature as Culture highlights perspectives where nature and people live in harmony, and societies, cultures, traditions and faiths are intertwined with nature
- Nature for Society gives value to the utilitarian benefits that nature provides to human society (see also **nature's contributions to people**) (adapted from (IPBES Glossary, n.d.)

Nexus: For this assessment, nexus is defined as the interlinkages between biodiversity, climate change, water, food, and health. The nexus approach includes social, economic and environmental components among the nexus elements and its interactions across scales, geographic regions and ecosystems. In defining the nexus, we fully recognize and consider

different world views and different knowledge systems, including science and Indigenous and local knowledge systems (source: this assessment, chapter 1).

OR

A perspective which emphasizes the inter-relatedness and interdependencies of ecosystem components and human uses, and their dynamics and fluxes across spatial scales and between compartments. Instead of just looking at individual components or a specific sector (e.g., water, energy, food), the functioning, productivity and management of a complex system is taken into consideration. In such complex systems there are trade-offs as well as facilitation and amplification between the different components. A nexus approach can help address synergies and trade-offs among multiple sectors and among various Sustainable Development Goals and biodiversity targets simultaneously (IPBES, 2019a).

One Health: One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent. The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development (World Health Organization, 2021).

Official Development Assistance (ODA): Resource flows to developing countries (on the DAC List of ODA Recipients) and to multilateral agencies which are: (a) undertaken by the official sector; (b) with promotion of economic development and welfare as the main objective; (c) at concessional financial terms. In addition to financial flows, technical co-operation is included in aid (Perry & Karousakis, 2020).

Official Development Finance (ODF): is a broad measure of developing countries' official receipts for developmental purposes, and is defined as the sum of bilateral ODA flows, bilateral OOF except OOF grants and loans for commercial purposes, and all grants and loans by multilateral development institutions, irrespective of the grant element of the loans (Perry & Karousakis, 2020).

Other effective area-based conservation measures (OECM): Areas outside protected areas that deliver the effective and long-term in situ conservation of biodiversity. OECMs complement protected areas in landscapes and seascapes and help promote equitable governance and effective conservation, including through enhancing ecological representation and connectivity (IUCN, n.d.).

Other Official Flows (OOF): Transactions by the official sector with countries on the DAC List of ODA Recipients which do not meet the conditions for eligibility as Official Development Assistance, either because they are not primarily aimed at development, or because they have a grant element of less than 25% (Perry & Karousakis, 2020).

Power (relationship): [To be defined.]

- 453 **Pathway:** A plausible trajectory of development in certain fields (e.g., policy and
454 governance, socio-economical, technical, energy-industrial)' pathways evolve over time and
455 can be combined with other assumptions or conditions to create scenarios (IPCC, 2014a).
- 456 OR
- 457 Trajectories toward the achievement of goals and targets for biodiversity conservation, the
458 management of nature and nature's contributions to people, and, more broadly, the UN 2030
459 Sustainable Development Goals (IPBES, 2019a).
- 460 **Planetary boundary:** Planetary boundaries are human-determined values of some variable
461 set at a safe distance from a dangerous level (for processes without known thresholds at the
462 continental to global scales) or from its global threshold. A planetary boundary may not be
463 equivalent to a global threshold or tipping point (Steffen et al., 2015).
- 464 **Planetary health:** Planetary health is a solutions-oriented, transdisciplinary field and social
465 movement focused on analysing and addressing the impacts of human disruptions to Earth's
466 natural systems on human health and all life on Earth (PlanetaryHealthAlliance, n.d.).
- 467 OR
- 468 The achievement of the highest attainable standard of health, well-being and equity
469 worldwide through judicious attention to the human systems – political, economic and social
470 – that shape the future of humanity, and the Earth's natural systems that define the safe
471 environmental limits within which humanity can flourish (World Health Organization, 2021).
- 472 **Plausible futures (for the nexus):** A realistic pathway towards a future configuration of the
473 nexus in the context of a scenario (source: this assessment, chapter 3). See also **pathway** and
474 **scenario**.
- 475 **Pluriverse:** A call to recognize a diversity of world views and conceptualizations of
476 planetary wellbeing, particularly those opposed to Eurocentric traditional development
477 models (Demaria & Kothari, 2017).
- 478 **Policy:** General principles that guide a government in its management of public affairs. A
479 course or principle of action adopted or proposed by an organization or individual (IUCN,
480 n.d.).
- 481 **Policy options:** Policies are a course of action taken and/or mandated by a government or
482 local/regional authority (IPCC, 2018a). See also **response options**.
- 483 **Policymaker:** [To be defined.]
- 484 **Protected area:** A protected area is a clearly defined geographical space, recognized,
485 dedicated and managed, through legal or other effective means, to achieve the long-term
486 conservation of nature with associated values to people. There are multiple categories of
487 protected areas, including and excluding people from within its boundaries (IPBES, 2019a).

- 488 **Public domestic biodiversity finance:** financing provided within a country by national and
 489 subnational governments, public agencies, and public financial institutions (Perry &
 490 Karousakis, 2020).
- 491 **Public international biodiversity finance:** financing provided by governments, public
 492 agencies, or public financial institutions in one (or more) country(ies) to support the pursuit
 493 of biodiversity objectives in another country(ies). This includes official development
 494 assistance (ODA), other financial flows (OOF), as well as both bilateral and multilateral
 495 flows (Perry & Karousakis, 2020).
- 496 **Reducing emissions from deforestation and forest degradation (REDD+):** Mechanism
 497 developed by Parties to the United Nations Framework Convention on Climate Change
 498 (UNFCCC), which creates a financial value for the carbon stored in forests by offering
 499 incentives for developing countries to reduce emissions from forested lands and invest in
 500 low-carbon paths to sustainable development. Developing countries would receive results-
 501 based payments for results-based actions. REDD+ goes beyond simply deforestation and
 502 forest degradation, and includes the role of conservation, sustainable management of forests
 503 and enhancement of forest carbon stocks (IPBES, 2019a).
- 504 **Reforestation:** Conversion to forest of land that has previously contained forests but that has
 505 been converted to some other use (IPCC, 2022).
- 506 **Renewable energy:** Any form of energy from solar, geophysical, or biological sources that is
 507 replenished by natural processes at a rate that equals or exceeds its rate of use (IPCC, 2014a).
- 508 **Representation concentration pathways (RCPs):** Scenarios that include time series of
 509 emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and
 510 chemically active gases, as well as land use/land cover (IPCC, 2014b).
- 511 **Response option:** A diverse range of human actions to address specific issues, needs,
 512 objectives, opportunities, or problems in the governance and management of the nexus that
 513 account for a diversity of worldviews, behaviors, norms and values. Response options can
 514 encompass combinations of voluntary or mandatory policies, strategies, measures, and
 515 interventions that are intended, designed and/or implemented to change nexus dimensions
 516 and interconnections between nexus dimensions directly, and those that modify direct or
 517 indirect drivers shaping the nexus. They can include legal, regulatory, economic and financial
 518 mechanisms, human rights-based tools, social, cultural and technological approaches and
 519 management instruments. These can operate across different time scales (short/long term) and
 520 levels (national, regional, local). Response options are normally implemented to help achieve
 521 just, sustainable and healthy futures, however, some response options may be considered as
 522 negative drivers of change that can result in undesirable changes and trade-offs in the nexus
 523 with associated negative impacts and trade-offs on development opportunities, human
 524 wellbeing, dimensions of equity and nature's contributions to people (source: this assessment,
 525 chapters 1 and 4).
- 526 **Resilience:** Ecosystem resilience – the capacity of a system to absorb disturbance and
 527 reorganize while still retaining similar function, structure, and feedbacks. In plant and animal
 528 communities, this property is highly dependent on adaptations by individual species to

529 disturbances or stresses experienced during the species' evolution (Society for Ecological
530 Restoration, n.d.).

531 OR

532 The ability of a social or ecological system to absorb disturbances while retaining the same
533 basic structure and ways of functioning, the capacity for self-organization, and the capacity to
534 adapt to stress and change (IPCC, 2018a).

535 OR

536 The capacity of a system to absorb disturbance and reorganize while undergoing change so as
537 to still retain essentially the same function, structure, identity, and feedbacks (Walker et al.,
538 2004). A concept initially developed and applied in ecology, which progressively gained
539 usage in the social and environmental sciences (IPBES, 2019a).

540 OR

541 The capacity of interconnected social, economic and ecological systems to cope with a
542 hazardous event, trend or disturbance, responding or reorganizing in ways that maintain
543 their essential function, identity and structure. Resilience is positive attribute when it
544 maintains capacity for adaptation, learning and/or transformation (IPCC, 2022).

545 **Restoration:** Any intentional activities that initiates or accelerates the recovery of an
546 ecosystem from a degraded state (IPBES, 2019a).

547 **Results-based payments:** [To be defined.]

548 **Rewilding:** The preservation of land with the goal of restoring natural ecosystem processes
549 and reducing human control of landscapes (Gillson et al., 2011) to allow declining
550 populations to rebound.

551 **Risk:** The potential for consequences where something of value is at stake and where the
552 outcome is uncertain, recognizing the diversity of values (Mach et al., 2014).

553 **Sector:** A distinct part of society, or of a nation's economy (IPBES, 2019a). See also **cross-**
554 **sectoral**.

555 **Scale:** The spatial, temporal, quantitative and analytical dimensions used to measure and
556 study any phenomenon. The temporal scale is comprised of two properties:

557 • Temporal extent – the total length of the time period of interest for a particular study
558 (e.g. 10 years, 50 years, or 100 years)

559 • Temporal grain (or resolution) – the temporal frequency with which data are observed
560 or projected within this total period (e.g., at 1-year, 5-year or 10-year intervals)

561 The spatial scale is comprised of two properties:

- Spatial extent – the size of the total area of interest for a particular study (e.g., a watershed, a country, the entire planet)
- Spatial grain (or resolution) – the size of the spatial units within this total area for which data are observed or predicted (e.g., fine-grained or coarse-grained grid cells) (IPBES, 2019a)

Scapes (land/sea) approach: A multifaceted integrated strategy that aims to bring together multiple stakeholders from multiple sources to provide solutions to multiple objectives at a landscape (or seascape) scale (Reed et al., 2021).

Scenario analysis: A process of analysing possible future events by considering alternative possible outcomes or scenarios (IUCN, n.d.). See also **scenarios**.

Scenarios: Representations of possible futures for one or more components of a system, particularly for drivers of change in nature and nature's benefits, including alternative policy or management options.

- Exploratory scenarios (also known as explorative scenarios or descriptive scenarios) are scenarios that examine a range of plausible futures, based on potential trajectories of drivers – either indirect (e.g., socio-political, economic and technological factors) or direct (e.g., habitat conversion, climate change).
- Target-seeking scenarios (also known as goal-seeking scenarios or normative scenarios) are scenarios that start with the definition of a clear objective, or a set of objectives, specified either in terms of achievable targets, or as an objective function to be optimized, and then identify different pathways to achieving this outcome (e.g., through backcasting).
- Intervention scenarios are scenarios that evaluate alternative policy or management options – either through target seeking (also known as goal seeking or normative scenario analysis) or through policy screening (also known as ex-ante assessment).
- Policy-evaluation scenarios are scenarios, including counterfactual scenarios, used in ex-post assessments of the gap between policy objectives and actual policy results, as part of the policy-review phase of the policy cycle.

Policy-screening scenarios are scenarios used in ex-ante assessments, to forecast the effects of alternative policy or management options (interventions) on environmental outcomes (IPBES, 2019a).

Sedimentary process: [To be defined.]

Shared socio-economic pathways (SSPs): Shared Socio-economic Pathways (SSPs) describe alternative socio-economic futures in the absence of climate policy intervention, comprising sustainable development (SSP1), regional rivalry (SSP3), inequality (SSP4), fossil-fueled development (SSP5) and middle-of-the-road development (SSP2). The combination of SSP-based socio-economic scenarios and Representative Concentration

599 Pathway (RCP)-based climate projections provides an integrative frame for climate impact
600 and policy analysis (IPCC, 2018a).

601 **Social security:** The condition of a society emphasizing happiness and contentment; social
602 welfare relates to how individuals use their relationships to other actors in societies for their
603 own and for the collective good; it has both material elements and wider spiritual and social
604 dimensions (Adger et al., 2003).

605 **Stakeholder:** An individual, group, or organization, who may affect, be affected by, or
606 perceive itself to be affected by a decision, activity, or outcome (UNCCD, n.d.).

607 **Smart city:** A smart city is a place where traditional networks and services are made more
608 efficient with the use of digital solutions for the benefit of its inhabitants and business. A
609 smart city goes beyond the use of digital technologies for better resource use and less
610 emissions. It means smarter urban transport networks, upgraded water supply and waste
611 disposal facilities and more efficient ways to light and heat buildings. It also means a more
612 interactive and responsive city administration, safer public spaces and meeting the needs of
613 an ageing population (Eurostat, n.d.).

614 **Socio-political options:** [To be defined.]

615 **Synergies:** Combined and simultaneous action of two or more forces, so that the resulting
616 total effect is greater than the sum of the parts. It is the effect of network work (IUCN, n.d.).

617 **System (socio-ecological):** A concept used in a variety of analytical approaches intended to
618 examine the mutual and interdependent relationship between people and nature as inter-
619 linked, recognizing that humans should be seen as a part of, not apart from, nature (Berkes &
620 Folke, 2002), and nature as inter-linked to social systems (Ostrom, 2009).

621 **Storylines (scenarios):** Qualitative narratives which provide the descriptive framework from
622 which quantitative exploratory scenarios can be formulated (IPBES, 2019a).

623 **Sustainability:** A characteristic or state whereby the needs of the present and local human
624 population can be met without compromising the ability of future generations or populations
625 in other locations to meet their needs (Millennium Ecosystem Assessment, 2005). There are
626 multiple and complementary, and in cases conflicting, definitions of sustainability.

627 **Sustainable development:** Originally popularized by the UN report 'Our Common Future'
628 (1987), it is intended to mean development that meets the needs and aspirations of the current
629 generation without compromising the ability to meet those of future generations (Hesselink et
630 al., 2007).

631 **Sustainable Development Goals (SDGs):** A set of goals adopted by the United Nations on
632 September 25, 2015, to end poverty, protect the planet, and ensure prosperity for all as part of
633 a new sustainable development agenda. Each goal has specific targets to be achieved over the
634 next 15 years (IPBES, 2019a).

635 **Telecoupling:** Refers to socioeconomic and environmental interactions between distant
636 coupled human and natural systems, and has become more extensive and intensive in the

globalized era. The integrated framework of telecoupling examines flows of information, energy, matter, people, organisms, and other things such as financial capital and goods and products around the globe. It pinpoints causes and effects arising from engagement of diverse agents in the global sphere (Hull & Liu, 2018).

OR

Socioeconomic-environmental interactions over distances (Liu et al., 2013). It is an umbrella concept that encompasses various types of distant interactions, such as international trade, tourism, migration, foreign investment, species invasion, payments for ecosystem services, water transfer, information dissemination, knowledge transfer, and technology transfer (Liu et al., 2015). Another related term is teleconnection (IPBES, 2019a).

Thresholds: In the context of the nexus defined as non-linear transitions in the functioning of coupled-environmental systems and are intrinsic features of those systems (Lenton et al., 2008).

Trade-off: A trade-off is a situation where an improvement in the status of one aspect of the environment or of human well-being is necessarily associated with a decline in or loss of a different aspect. Trade-offs characterize most complex systems, and are important to consider when making decisions that aim to improve environmental and/or socio-economic outcomes. Trade-offs are distinct from synergies (the latter are also referred to as win-win scenarios): synergies arise when the enhancement of one desirable outcome leads to enhancement of another (IPBES Glossary, n.d.).

Transformation: To be informed by 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)..

Transformative change: To be informed by the transformative change assessment.

OR

A fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values (IPBES, 2018b; IPCC, 2018b).

Urban planning: Describes the quantitative and qualitative process of deciding priorities for how urban systems can be designed [source to be determined.]

OR

Urban planning encompasses the preparation of plans for and the regulation and management of towns, cities, and metropolitan regions. It attempts to organize socio-spatial relations across different scales of government and governance. Urban planning is concerned with the social, economic, and environmental consequences of delineating spatial boundaries and influencing spatial distributions of resources (Kobayashi, 2020).

Values: Values reflect life goals, beliefs and general guiding principles. They also reflect the opinions or judgements of the importance of specific things in particular situations and

contexts. When considering the values of nature, values can refer to nature itself, how nature contributes to people's quality of life, in addition to the way people express the value of life-supporting processes, functions, and systems – interrelating biophysical, spiritual, or symbolic aspects. IPBES Values Assessment refers to instrumental, intrinsic and relational value types.

- **Instrumental value:** Instrumental values, which relate to things that are a means to a desired or valued end or satisfy people's preferences, are the most commonly reported value type in environmental policy documents. They are generally associated with nature as an asset, capital or resource and are strongly related to the concept of ecosystem services.
- **Intrinsic value:** Intrinsic values relate to the values of nature expressed independently of any reference to humans as valuers and include entities such as a habitat or species that are worth protecting as ends in-and-of themselves. They are consistent with biocentric worldviews and with the understanding of values as existing objectively in nature.
- **Relational value:** Relational values refer to the importance of desirable, meaningful, and often reciprocal relationships – beyond means to an end – between humans and nature, and among humans (including across generations) through nature (e.g., sense of place, spirituality, responsibility, care, reciprocity, stewardship) (IPBES Glossary, n.d.).

Vectors: Any living or non-living carrier that transports living organisms intentionally or unintentionally. In the context of epidemics and more widely health, a vector can be an organism or substance that carries a disease or health risk (adapted from (CBD, n.d.)).

Vision (scenarios): A specific set of quantitative or qualitative parameters that characterize a pathway [source to be determined.]

Vulnerability: [To be defined].

Water: all forms of surface and ground water and the biophysical and human processes and systems that regulate its quality, quantity, distribution and use (source: this assessment, chapter 1).

Water security: The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability (UN Water, n.d.).

Water (virtual): Virtual water is the water embodied in commodities, so in the production of food and fiber and non-food commodities, including energy (Allan, 2003).

710 **Zoonotic disease:** Zoonotic disease or zoonoses are directly transmitted from animals to
711 humans via various routes of transmission (e.g., air - influenza; bites and saliva - rabies)
712 (IPBES, 2019a).

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References

- Adger, N. W., Brown, K., Fairbrass, J., Jordan, A., Paavola, J., Rosendo, S., & Seyfang, G. (2003). Towards a “thick” analysis of environmental decision-making. *Environment and Planning A*, 35(6), 1095–1110.
- Allan, J. A. (2003). Virtual Water—The Water, Food, and Trade Nexus. Useful Concept or Misleading Metaphor? *Water International*, 28(1), 106–113.
<https://doi.org/10.1080/02508060.2003.9724812>
- Allwood, J., Bosetti, V., Dubash, N. K., Gomez-Echeverri, L., & von Stechow, C. (2014). *Glossary. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press.
https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_annex-i.pdf
- Barcelona Lab. (n.d.). *Barcelon Lab for Urban Environmental Justice and Sustainability*. Barcelona Lab for Urban Environmental Justice and Sustainability. Retrieved December 19, 2022, from <https://www.bcnuej.org/>
- Barnett, J., & O’Neill, S. (2010). Maladaptation. *Global Environmental Change*, 20(2), 211–213.
<https://doi.org/10.1016/j.gloenvcha.2009.11.004>
- Basurto, X., & Ostrom, E. (2009). Beyond the tragedy of the commons. *Economia Delle Fonti Di Energia e Dell’Ambiente*, 52(1), 35–60. <https://doi.org/10.3280/EFE2009-001004>
- Berkes, F., & Folke, C. (Eds.). (2002). *Linking social and ecological systems: Management practices and social mechanisms for building resilience* (Transferred to digital printing). Cambridge Univ. Press.
- CBD, B. (n.d.). *Glossary of Terms*. Secretariat of the Convention on Biological Diversity. Retrieved December 19, 2022, from <https://www.cbd.int/invasive/terms.shtml>
- Cohen-Shacham, E., Walters, G., Janzen, C., & Maginnis, S. (Eds.). (2016). *Nature-based solutions to address global societal challenges*. IUCN International Union for Conservation of Nature.
<https://doi.org/10.2305/IUCN.CH.2016.13.en>
- Copernicus Climate Change Service. (n.d.). <https://climate.copernicus.eu/>
- Demaria, F., & Kothari, A. (2017). The Post-Development Dictionary agenda: Paths to the pluriverse. *Third World Quarterly*, 38(12), 2588–2599. <https://doi.org/10.1080/01436597.2017.1350821>
- Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R. T., Molnár, Z., Hill, R., Chan, K. M. A., Baste, I. A., Brauman, K. A., Polasky, S., Church, A., Lonsdale, M., Larigauderie, A., Leadley, P. W., van Oudenhoven, A. P. E., van der Plaats, F., Schröter, M., Lavorel, S., ... Shirayama, Y. (2018). Assessing nature’s contributions to people. *Science*, 359(6373), 270–272. <https://doi.org/10.1126/science.aap8826>
- Eurostat. (n.d.). *Thematic glossaries*. Retrieved December 19, 2022, from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Thematic_glossaries

- 750 FAO. (2003). *Cross-sectoral Policy Impacts Between Forestry and Other Sectors*.
751 <https://www.fao.org/3/Y4653E/y4653e00.htm#TopOfPage>
- 752 Gillson, L., Ladle, R. J., & Araújo, M. B. (2011). Baselines, Patterns and Process. In R. J. Ladle & R.
753 J. Whittaker (Eds.), *Conservation Biogeography* (1st ed., pp. 31–44). Wiley.
754 <https://doi.org/10.1002/9781444390001.ch3>
- 755 Hesselink, F., Goldstein, W., van Kempen, P. P., Garnett, T., & Dela, J. (2007). *Communication,*
756 *Education and Public Awareness (CEPA): A Toolkit for National Focal Points and NBSAP*
757 *Coordinators*. <https://www.cbd.int/cepa/toolkit/2008/doc/CBD-Toolkit-Complete.pdf>
- 758 Hull, V., & Liu, J. (2018). Telecoupling: A new frontier for global sustainability. *Ecology and*
759 *Society*, 23(4), art41. <https://doi.org/10.5751/ES-10494-230441>
- 760 International Organization for Standardization. (2022). *Guidance on environmental criteria for*
761 *projects, assets and activities to support the development of green finance* (No. 14100).
762 <https://www.iso.org/obp/ui/#iso:std:iso:14100:ed-1:v1:en:term:3.1.12>
- 763 IPBES. (n.d.). *IPBES Glossary*. IPBES Glossary. Retrieved November 16, 2022, from
764 <https://ipbes.net/glossary>
- 765 IPBES. (2016). *The methodological assessment report on scenarios and models of biodiversity and*
766 *ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and*
767 *Ecosystem Services*. IPBES Secretariat.
768 http://www.ipbes.net/sites/default/files/downloads/pdf/spm_deliverable_3c_scenarios_20161
769 [124.pdf https://www.ipbes.net/dataset/methodological-assessment-scenarios-and-models-](https://www.ipbes.net/dataset/methodological-assessment-scenarios-and-models-biodiversity-and-ecosystem-services)
770 [biodiversity-and-ecosystem-services](https://www.ipbes.net/dataset/methodological-assessment-scenarios-and-models-biodiversity-and-ecosystem-services)
- 771 IPBES. (2018a). *The assessment report on land degradation and restoration of the Intergovernmental*
772 *Science-Policy Platform on Biodiversity and Ecosystem Services*. Secretariat of the
773 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
- 774 IPBES. (2018b). *The IPBES regional assessment report on biodiversity and ecosystem services for*
775 *Europe and Central Asia*. IPBES Secretariat. <https://doi.org/10.5281/ZENODO.3237428>
- 776 IPBES. (2019a). *Global Assessment Report on Biodiversity and Ecosystem Services*. IPBES
777 Secretariat. <https://ipbes.net/node/35274>
- 778 IPBES. (2019b). *Global assessment report on biodiversity and ecosystem services of the*
779 *Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES
780 Secretariat. <https://doi.org/10.5281/zenodo.6417333>
- 781 IPBES Glossary. (n.d.). *IPBES glossary*. IPBES Glossary. Retrieved November 16, 2022, from
782 <https://ipbes.net/glossary>
- 783 IPCC. (2014a). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III*
784 *to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (p. 151).
785 IPCC.
- 786 IPCC. (2014b). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III*
787 *to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (p. 151).
788 IPCC.

- 789 IPCC. (2018a). *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming*
790 *of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in*
791 *the context of strengthening the global response to the threat of climate change, sustainable*
792 *development, and efforts to eradicate poverty* (p. 616). Cambridge University Press.
- 793 IPCC. (2018b). *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming*
794 *of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in*
795 *the context of strengthening the global response to the threat of climate change, sustainable*
796 *development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner,
797 D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S.
798 Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor,
799 and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY,
800 USA, 616 pp.
- 801 IPCC. (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability Contribution of Working*
802 *Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*
803 (No. AR6).
804 https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Citation.pdf
- 805 IUCN. (n.d.). *Terminology for IUCN usage*. IUCN. Retrieved December 19, 2022, from
806 [https://www.iucn.org/our-work/science-led-approach/publications-and-publishing/how-](https://www.iucn.org/our-work/science-led-approach/publications-and-publishing/how-publish-iucn/terminology-iucn-usage)
807 [publish-iucn/terminology-iucn-usage](https://www.iucn.org/our-work/science-led-approach/publications-and-publishing/how-publish-iucn/terminology-iucn-usage)
- 808 Kobayashi, A. (2020). *Encyclopedia of human geography* (Second edition). Oxford ; Elsevier.
- 809 Langemeyer, J., & Connolly, J. J. T. (2020). Weaving notions of justice into urban ecosystem services
810 research and practice. *Environmental Science & Policy*, 109, 1–14.
811 <https://doi.org/10.1016/j.envsci.2020.03.021>
- 812 Lenton, T. M., Held, H., Kriegler, E., Hall, J. W., Lucht, W., Rahmstorf, S., & Schellnhuber, H. J.
813 (2008). Tipping elements in the Earth’s climate system. *Proceedings of the National Academy*
814 *of Sciences*, 105(6), 1786–1793. <https://doi.org/10.1073/pnas.0705414105>
- 815 Lerner, H., & Berg, C. (2017). A Comparison of Three Holistic Approaches to Health: One Health,
816 EcoHealth, and Planetary Health. *Frontiers in Veterinary Science*, 4.
817 <https://doi.org/10.3389/fvets.2017.00163>
- 818 Liu, J., Hull, V., Batistella, M., DeFries, R., Dietz, T., Fu, F., Hertel, T., Izaurrealde, R. C., Lambin, E.,
819 Li, S., Martinelli, L., McConnell, W., Moran, E., Naylor, R., Ouyang, Z., Polenske, K.,
820 Reenberg, A., de Miranda Rocha, G., Simmons, C., ... Zhu, C. (2013). Framing Sustainability
821 in a Telecoupled World. *Ecology and Society*, 18(2). [https://doi.org/10.5751/ES-05873-](https://doi.org/10.5751/ES-05873-180226)
822 [180226](https://doi.org/10.5751/ES-05873-180226)
- 823 Liu, J., Hull, V., Luo, J., Yang, W., Liu, W., Viña, A., Vogt, C., Xu, Z., Yang, H., Zhang, J., An, L.,
824 Chen, X., Li, S., Ouyang, Z., Xu, W., & Zhang, H. (2015). Multiple telecouplings and their
825 complex interrelationships. *Ecology and Society*, 20(3), art44. [https://doi.org/10.5751/ES-](https://doi.org/10.5751/ES-07868-200344)
826 [07868-200344](https://doi.org/10.5751/ES-07868-200344)
- 827 Lyytimäki, J. (2015). Ecosystem disservices: Embrace the catchword. *Ecosystem Services*, 12, 136.
828 <https://doi.org/10.1016/j.ecoser.2014.11.008>

- 829 Mach, K., Planton, S., & von Stechow, C. (2014). Annex II: Glossary [Mach, KJ, S. Planton and C.
830 von Stechow (eds.)]. In *Climate Change 2014: Synthesis Report. Contribution of Working*
831 *Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate*
832 *Change* (pp. 117–130). IPCC. [https://www.ipcc.ch/site/assets/uploads/2019/01/SYRAR5-](https://www.ipcc.ch/site/assets/uploads/2019/01/SYRAR5-Glossary_en.pdf)
833 [Glossary_en.pdf](https://www.ipcc.ch/site/assets/uploads/2019/01/SYRAR5-Glossary_en.pdf)
- 834 Matthews, J., Möller, V., van Diemen, R., Fuglestvedt, J., Masson-Delmotte, V., Mendez, C.,
835 Semenov, S., & Reisinger, A. (2021). IPCC, 2021: Annex VII: Glossary. In *Climate Change*
836 *2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment*
837 *Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
838 https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_AnnexVII.pdf
- 839 Millennium Ecosystem Assessment. (2005). *Ecosystems and Human Well-Being*. Island Press.
- 840 Oberlack, C., Sietz, D., Bürgi Bonanomi, E., De Bremond, A., Dell’Angelo, J., Eisenack, K., Ellis, C.,
841 Epstein, G., Giger, M., Heinimann, A., & et. al. (2019). Archetype analysis in sustainability
842 research: Meanings, motivations, and evidence-based policy making. *Ecology and Society*,
843 24(2), 26. <https://doi.org/10.5751/es-10747-240226>
- 844 Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems.
845 *Science*, 325(5939), 419–422. <https://doi.org/10.1126/science.1172133>
- 846 Perry, E., & Karousakis, K. (2020). *A Comprehensive Overview of Global Biodiversity Finance* (p.
847 41). Organisation for Economic Cooperation and Development (OECD).
848 [https://www.oecd.org/environment/resources/biodiversity/report-a-comprehensive-overview-](https://www.oecd.org/environment/resources/biodiversity/report-a-comprehensive-overview-of-global-biodiversity-finance.pdf)
849 [of-global-biodiversity-finance.pdf](https://www.oecd.org/environment/resources/biodiversity/report-a-comprehensive-overview-of-global-biodiversity-finance.pdf)
- 850 PlanetaryHealthAlliance. (n.d.). *Planetary Health Alliance*. Planetary Health Alliance. Retrieved
851 December 19, 2022, from <http://www.planetaryhealthalliance.org/>
- 852 Reed, J., Kusters, K., Barlow, J., Balinga, M., Borah, J. R., Carmenta, R., Chervier, C., Djoudi, H.,
853 Gumbo, D., Laumonier, Y., Moombe, K. B., Yuliani, E. L., & Sunderland, T. (2021). Re-
854 integrating ecology into integrated landscape approaches. *Landscape Ecology*, 36(8), 2395–
855 2407. <https://doi.org/10.1007/s10980-021-01268-w>
- 856 Schellnhuber, H., Lüdeke, M., & Petschel-Held, G. (2002). The Syndromes Approach to Scaling
857 Describing Global Change on an Intermediate Functional Scale. *Integrated Assessment*, 3(2–
858 3), 201–219. <https://doi.org/10.1076/iaij.3.2.201.13577>
- 859 Sietz, D., Frey, U., Roggero, M., Gong, Y., Magliocca, N., Tan, R., Janssen, P., & Václavík, T.
860 (2019). Archetype analysis in sustainability research: Methodological portfolio and analytical
861 frontiers. *Ecology and Society*, 24(3), 34. <https://doi.org/10.5751/es-11103-240334>
- 862 Sivalingham, S. (1981). *BASIC APPROACH TO MARICULTURE, PROBLEMS AND*
863 *DEVELOPMENT STRATEGIES*. <https://www.fao.org/3/AC571E/AC571E00.htm>
- 864 Society for Ecological Restoration. (n.d.). *Society for Ecological Restoration*. Retrieved December 19,
865 2022, from <https://www.ser.org/>
- 866 Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R.,
867 Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M.,
868 Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries:

- 869 Guiding human development on a changing planet. *Science*, 347(6223), 1259855.
870 <https://doi.org/10.1126/science.1259855>
- 871 UN Food Systems Summit, U. (n.d.). *Food Systems Summit*. United Nations; United Nations.
872 Retrieved December 19, 2022, from <https://www.un.org/en/food-systems-summit>
- 873 UN Water. (n.d.). *UN-Water | Coordinating the UN's work on water and sanitation*. UN-Water.
874 Retrieved December 19, 2022, from <https://www.unwater.org/>
- 875 UNCCD. (n.d.). *United Nations Convention to Combat Desertification*. UN Women – Headquarters.
876 Retrieved December 19, 2022, from [https://www.unwomen.org/en/how-we-](https://www.unwomen.org/en/how-we-work/intergovernmental-support/climate-change-and-the-environment/united-nations-convention-to-combat-desertification)
877 [work/intergovernmental-support/climate-change-and-the-environment/united-nations-](https://www.unwomen.org/en/how-we-work/intergovernmental-support/climate-change-and-the-environment/united-nations-convention-to-combat-desertification)
878 [convention-to-combat-desertification](https://www.unwomen.org/en/how-we-work/intergovernmental-support/climate-change-and-the-environment/united-nations-convention-to-combat-desertification)
- 879 Visseren-Hamakers, I. J., & Kok, M. T. J. (Eds.). (2022). *Transforming Biodiversity Governance*.
880 Cambridge University Press. <https://doi.org/10.1017/9781108856348>
- 881 Visseren-Hamakers, I. J., Razzaque, J., McElwee, P., Turnhout, E., Kelemen, E., Rusch, G. M.,
882 Fernández-Llamazares, Á., Chan, I., Lim, M., Islar, M., Gautam, A. P., Williams, M.,
883 Mungatana, E., Karim, M. S., Muradian, R., Gerber, L. R., Lui, G., Liu, J., Spangenberg, J.
884 H., & Zaleski, D. (2021). Transformative governance of biodiversity: Insights for sustainable
885 development. *Current Opinion in Environmental Sustainability*, 53, 20–28.
886 <https://doi.org/10.1016/j.cosust.2021.06.002>
- 887 Walker, B., Holling, C., Carpenter, S. R., & Kinzig, A. (2004). Resilience, Adaptability and
888 Transformability in Social-ecological Systems. *Ecology & Society*, 9(2).
889 <http://www.ecologyandsociety.org/vol9/iss2/art5/>
- 890 Wilson, E. O. (2016). *Half-earth: Our planet's fight for life* (First edition). Liveright Publishing
891 Corporation.
- 892 World Health Organization. (2021). *Health promotion glossary of terms 2021*. World Health
893 Organization. <https://apps.who.int/iris/handle/10665/350161>