

# ANNEX I

## Glossary

### A

#### Abundance

The size of a population of a particular life form (IPBES, 2016).

#### Abyssal plain

An extensive level area of the deep ocean floor typically situated between the foot of the continental rise or mid-ocean ridge and an oceanic trench and covered with fine sediments.

#### Access and benefit sharing (ABS)

Access and benefit-sharing (ABS) refers to the way in which genetic resources may be accessed, and how the benefits that result from their use are shared between the people or countries using the resources (users) and the people or countries that provide them (providers). In some cases, this also includes valuable traditional knowledge associated with genetic resources that comes from Indigenous Peoples and Local Communities. The benefits to be shared can be monetary, such as sharing royalties when the resources are used to create a commercial product, or non-monetary, such as the development of research skills and knowledge (Convention on Biological Diversity, 2002, 2010a, 2010b).

#### Acidification

Ongoing decrease in pH away from neutral value of 7. Often used in reference to oceans, freshwater or soils, as a result of uptake of carbon dioxide from the atmosphere (see 'Ocean acidification' for a specific definition).

#### 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 (Walker *et al.*, 2004).

#### 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 (Millennium Ecosystem Assessment, 2005).

#### Adaptive management

A systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, management is treated as a deliberate experiment for purposes of learning (Millennium Ecosystem Assessment, 2005).

#### Adaptive radiation

The evolution of a number of divergent species from a common ancestor, each species becoming adapted to occupy a different ecological niche (Lawrence, 2005).

#### Aerosol

A collection of solid or liquid particles suspended in a gas. They include dust, smoke, mist, fog, haze, clouds, and smog (Hinds, 1999).

#### Afforestation

Planting of new forests on lands that historically have not contained forests (IPCC, 2014a).

#### Agricultural extensification

The process of low and/or decreasing the use of capital and inputs (e.g., fertilisers, pesticides, machinery, labour) relative to land area (EUROSTAT, 2018a).

#### Agricultural intensification

The process of increasing the use of capital, labour, and inputs (e.g., fertilisers, pesticides, machinery) relative to land area, to increase agriculture productivity (EUROSTAT, 2018b).

#### Agrobiodiversity

Agricultural biodiversity includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary

to sustain key functions of the agro-ecosystem, its structure and processes (Convention on Biological Diversity, 2000).

#### Agroecology

The science and practice of applying ecological concepts, principles and knowledge (i.e., the interactions of, and explanations for, the diversity, abundance and activities of organisms) to the study, design and management of sustainable agroecosystems. It includes the roles of human beings as a central organism in agroecology by way of social and economic processes in farming systems. Agroecology examines the roles and interactions among all relevant biophysical, technical and socioeconomic as well as sociopolitical components of farming systems and their surrounding landscapes.

#### Agroecosystem

An ecosystem, dominated by agriculture, containing assets and functions such as biodiversity, ecological succession and food webs. An agroecosystem is not restricted to the immediate site of agricultural activity (e.g., the farm), but rather includes the region that is impacted by this activity, usually by changes to the complexity of species assemblages and energy flows, as well as to the net nutrient balance.

#### Agroforestry

Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as other agricultural crops and animals, in some form of spatial arrangement or temporal sequence (Choudhury & Jansen, 1999). For spatial quantification purposes, agroforestry has been defined on the basis of the percentage of tree cover on agricultural land, such as above 10% in Zomer *et al.* (2009).

#### Albedo

The fraction of solar radiation reflected by a surface or object, often expressed as a percentage (IPCC, 2014a).

**Alpha diversity**

The diversity of species within a particular area or ecosystem, expressed by the number of species (species richness) present there (Park, 2007).

**Animism**

A nature-culture ontology that is defined by the fact that humans acknowledge that non-humans have a different physicality or external appearance but that non-humans have an inner self that is similar to humans, which allows exchanges and relationships that may be conflictual or reciprocal.

**Anoxic event**

Extreme coastal hypoxic conditions (dissolved oxygen <0.5mL per liter), leading to “dead zones” with mass mortality of benthic fauna (Altieri *et al.*, 2017; Diaz & Rosenberg, 2008).

**Anthrome**

A shortened form for ‘anthropogenic biome’, also known as ‘human biome’. Describes the contemporary, human-altered form of biomes. Transformation to an anthrome occurs where people capture one or more nature’s contributions to people into anthropogenic pathways to a high degree. The four IPBES anthromes are broader and more aggregated than many formally described anthromes. Since anthromes are transformed parts of a biome, the pre-transformation extent of the biome may be relevant for analysis (Alessa & Chapin III, 2008; Ellis & Ramankutty, 2008).

**Anthropocene**

A proposed term for the present time interval, which recognizes humanity’s profound imprint on and role in the functioning of the Earth system. Since it was first proposed in 2000 (Crutzen, 2002; Crutzen & Stoermer, 2000), the term has evolved in breadth and diversity, now ranging from a proposed definition of a new geological epoch, a widely-used metaphor for global change, a novel analytical framework, a meme about the relationship of society to nature, and the framing for new and contested cultural narratives. Different starting periods have been proposed for the geological definition of the Anthropocene, including early agriculture and domestication, colonial species exchange, the onset of the industrial revolution, nuclear bomb deployment in 1945, and the post-WWII period characterized by the great acceleration of global changes and the spread of techno-fossils (Brondizio *et al.*, 2016). A proposal to formalize the ‘Anthropocene’ as a defined geological unit within the Geological Time Scale remains

under discussion by the ‘Anthropocene’ Working Group for consideration by the International Commission on Stratigraphy (IUGS, 2018).

**Anthropocentric**

Anthropocentric qualifies an action or a perception of a given situation that is interpreted by humans or consider humans as the main focus. Nature’s contributions to people are fundamentally anthropocentric.

**Anthropogenic assets**

Built-up infrastructure, health facilities, or knowledge - including indigenous and local knowledge systems and technical or scientific knowledge - as well as formal and non-formal education, technology (both physical objects and procedures), and financial assets. Anthropogenic assets have been highlighted to emphasize that a good quality of life is achieved by a co-production of benefits between nature and people.

**Anthropogenic biome**

See ‘Anthrome’.

**Anthropogenic landscapes**

Areas of Earth’s terrestrial surface where direct human alteration of ecological patterns and processes is significant, ongoing, and directed toward servicing the needs of human populations for food, shelter and other resources and services including recreation and aesthetic needs (Ellis *et al.*, 2006).

**Aquaculture**

The farming of aquatic organisms, including fish, mollusks, crustaceans and aquatic plants, in both inland and coastal areas, and involving some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated (FAO, 1997).

**Archetype**

In the context of scenarios, an overarching scenario that embodies common characteristics of a number of more specific scenarios.

**Article 8(j) of the CBD**

Article 8(j) states that each contracting Party of the Convention on Biological Diversity shall, as far as possible and as appropriate, subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities

embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge innovations and practices (Convention on Biological Diversity, 1992).

**Average genetic variation (heterozygosity)**

The condition of having two different alleles at a gene locus (Allendorf, 2014).

**Avoided deforestation in conjunction with afforestation and reforestation (ADAFF)**

Land-based climate change mitigation strategy based on maintaining and expanding global forest area, and thus the carbon uptake of forest ecosystems in biomass and soil (Krause *et al.*, 2017).

**B****Basal area**

Area occupied by the cross-section of tree trunks and stems at base height (130cm from the ground). It is used to characterize different variables in forest ecology and management, e.g., forest structure, productivity and growth rate (Faber-Langendoen & Gentry, 1991).

**Benefit sharing**

Distribution of benefits between stakeholders.

**Benthic**

Occurring at the bottom of a body of water; related to benthos (NOAA, 2018b).

**Biocentric worldview**

Ethical perspective holding that all life (including humans, fauna, flora and domestic animals) deserves equal moral consideration or has equal moral standing (DesJardins, 2013). It contrasts with worldviews characterized as anthropocentric, which places humans at the center.

**Biochemical oxygen demand (BOD)**

A measure of the amount of oxygen required or consumed for the microbiological decomposition (oxidation) of organic material in water. The purpose of this indicator is to assess the quality of water available to consumers in localities or communities for basic and commercial needs. It is also one of a group of indicators of ecosystem health (United Nations, 2007).

**Biocultural approaches to conservation / biocultural conservation**

Conservation actions made in the service of sustaining the biophysical and sociocultural components of dynamic, interacting, and interdependent social–ecological systems (Gavin *et al.*, 2015).

**Biocultural diversity**

Biocultural diversity is considered as biological and cultural diversity and the links between them (CBD, 2018b).

**Biodiversity**

The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in genetic, phenotypic, phylogenetic, and functional attributes, as well as changes in abundance and distribution over time and space within and among species, biological communities and ecosystems.

**Biodiversity conservation**

The management of human interactions with genes, species, and ecosystems so as to provide the maximum benefit to the present generation while maintaining their potential to meet the needs and aspirations of future generations; encompasses elements of saving, studying, and using biodiversity (WRI *et al.*, 1992).

**Biodiversity hotspot**

A generic term for an area high in such biodiversity attributes as species richness or endemism. It may also be used in assessments as a precise term applied to geographic areas defined according to two criteria (Myers *et al.*, 2000): (i) containing at least 1,500 species of the world's 300,000 vascular plant species as endemics, and (ii) being under threat, in having lost 70 % of its primary vegetation.

**Biodiversity Intactness Index**

An indicator of the average abundance of a large and diverse set of organisms in a given geographical area, relative to their reference populations (Scholes & Biggs, 2005).

**Biodiversity offset**

Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from development plans or projects after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve

no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity (UNDP, 2016a).

**Bioenergy**

Energy generated by combusting solid, liquid or gas fuels made from biomass feedstocks, which may or may not have undergone some form of conversion process (Committee on Climate Change, 2011).

**Bioenergy in combination 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 CO<sub>2</sub> being captured for long-term underground storage in geological reservoirs (Krause *et al.*, 2017).

**Bioethanol**

See 'Biofuel'.

**Biofuel**

Liquid, solid, or gaseous fuel produced by conversion of biomass. Examples include bioethanol from sugar cane or corn, charcoal or woodchips, and biogas from anaerobic decomposition of wastes (OECD, 2002).

**Biogas**

See 'Biofuel'.

**Biogenic volatile organic compounds (BVOC)**

Compounds that include organic atmospheric trace gases other than carbon dioxide and carbon monoxide; isoprenoids (isoprene and monoterpenes) are among the most prominent BVOC emitted (Kesselmeier & Staudt, 1999).

**Biogeochemical cycles**

Biogeochemical cycles involve the fluxes of chemical elements among different parts of the Earth: from living to non-living, from atmosphere to land to sea, and from soils to plants (Galloway *et al.*, 2014).

**Biological conservation**

See also 'Biodiversity conservation'. Application of science to conservation problems addressing the biology of species, communities and the ecosystem that are perturbed either directly or indirectly by human or other agents. Its

goal is to provide principles and tools for preserving biological diversity. The branch of biology that deals with threats to biodiversity and with preserving the biologic and genetic diversity of animals and plants (Soulé, 1985).

**Biological Oxygen Demand (BOD)**

See 'Biochemical Oxygen Demand (BOD)'.

**Biological pump**

The fixation of carbon at the oceans' surface by photosynthesizing organisms and subsequent sinking of a sizable fraction (15–20%) of total productivity creates a strong vertical transport that dominates the distribution of carbon, nutrients, and oxygen in the ocean, known as the 'biological pump' (Ridgwell, 2011).

**Biological resources**

Biological resources includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity (Convention on Biological Diversity, 1992).

**Biomass (ecology)**

The mass of non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms in a given area or volume.

**Biomass (for production)**

Biological material that can be used as fuel or for industrial production. Includes solid biomass such as wood, plant and animal products, gases and liquids derived from biomass, industrial waste and municipal waste (US Energy Information Administration, 2018).

**Biome**

A set of naturally occurring communities of plants and animals occupying an environmental and/or climatic domain, defined on a global scale. IPBES biomes (e.g., tropical and subtropical forests, shelf ecosystems, inland waters) are broader and more aggregated than many purely biological classification systems. Where biomes are transformed into anthromes, the pre-impact range of the biome may still be relevant for analysis. 'Natural biome' may be used to distinguish from 'anthropogenic biome' or 'anthrome'.

**Bioprospecting**

The purposeful evaluation of plant and animal biological material in search of valuable new products (Artuso, 2002).

**Biosphere**

The part of the Earth system comprising all ecosystems and living organisms, in the atmosphere, on land (terrestrial biosphere) or in the oceans (marine biosphere), including derived dead organic matter, such as litter, soil organic matter and oceanic detritus (IPCC, 2014a).

**Biotechnology**

Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use (Convention on Biological Diversity, 1992).

**Blue carbon**

The carbon stored in marine and coastal ecosystems (Howard *et al.*, 2014).

**Bottom-up control of the food web**

A mode of control of trophic interactions by resources, in which organisms on each trophic level are food limited, as opposed to a top-down control (by predators), in which organisms at the top of food chains are food limited, and at successive lower levels, they are alternately predator, then food limited (Power, 1992).

**Buen vivir**

There is no single definition of Buen Vivir. Generally, it refers to an alternative to economic development-centered approaches, generally defined as forming part of the Andean indigenous cosmology, based on the belief that true wellbeing is only possible as part of a community in a broad sense, including people, nature and the Earth, linked by mutual responsibilities and obligations, and that the wellbeing of the community is above that of the individual.

**Buffer (ecology)**

A natural or anthropogenic feature which separates land uses.

**Buffer zones (protected areas)**

Areas between core protected areas and the surrounding landscape or seascape which protect the network from potentially damaging external influences and which are essentially transitional areas (Bennett & Mulongoy, 2006).

**Burden**

The resulting negative impacts of ecosystem use and management on people and nature, including distant, diffuse and delayed impacts (modified from Pascual *et al.*, 2017)

**By-catch**

The incidental capture of non-target species. The portion of a commercial fishing catch that consists of marine animals caught unintentionally (Merriam-Webster, 2015).

**C****C3 photosynthesis**

The major of the metabolic pathways for CO<sub>2</sub> fixation by plants, involving a 3-carbon organic intermediate molecule. C3 photosynthetic plants possess a specific leaf structure, and are not adapted to non-optimal conditions (Nature, 2018a).

**C3 plants**

Plants that use C3 photosynthesis to capture CO<sub>2</sub> (New South Wales Government, 2018).

**C4 photosynthesis**

C4 photosynthesis is an evolved metabolic mechanism for plant carbon fixation, in which atmospheric CO<sub>2</sub> is first incorporated into a 4-carbon intermediate molecule. It allows for a more efficient process compared to C3 photosynthesis, especially in non-optimal water availability conditions and in the presence of high solar radiation (Nature, 2018b).

**C4 plants**

Plants that use C4 photosynthesis to capture CO<sub>2</sub>. The Poaceae family (grasses) accounts for about half of the C4 species (New South Wales Government, 2018; Osborne *et al.*, 2014).

**Cap-and-trade**

An economic policy instrument in which the State sets an overall environmental target (the cap) and assigns environmental impact allowances (or quotas) to actors that they can trade among each other.

**Carbon cycle**

The flow of carbon (in various forms, e.g., as carbon dioxide (CO<sub>2</sub>)) through the atmosphere, ocean, terrestrial and marine biosphere and lithosphere (IPCC, 2014a).

**Carbon footprint**

A measure of the emission of gases that contribute to heating the planet in carbon dioxide (CO<sub>2</sub>)-equivalents per unit of time or product; there is no universally-accepted definition of the term (Ercein & Hoekstra, 2012).

**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.

**Carbon sink**

Any process, activity or mechanism that removes carbon dioxide from the atmosphere (IPCC, 2014a).

**Carbon uptake**

See 'Carbon sequestration'

**Carrying capacity**

In ecology, the carrying capacity of a species in an environment is the maximum population size of the species that the environment can sustain indefinitely. The term is also used more generally to refer to the upper limit of habitats, ecosystems, landscapes, waterscapes or seascapes to provide tangible and intangible goods and services (including aesthetic and spiritual services) in a sustainable way.

**Certification (environmental)**

A procedure by which a third party gives written assurance that a product, process or service is in conformity with certain environmental standards (Dankers & Liu, 2003).

**Certification principles and standards**

A list of principles that certification schemes need to satisfy in order to be effective and credible.

**Charismatic species**

Any species that has popular appeal and is used to focus attention on conservation campaigns (Froese & Pauly, 2018).

**Chemosynthesis**

Synthesis of organic compounds (as in living cells) by energy derived from inorganic chemical reactions.

**Circular economy**

A regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling (Geissdoerfer *et al.*, 2017).

**Citizen science**

Citizen science refers to research collaborations in which volunteers and scientists partner to answer real-world questions, typically through a connected interface. A major setback of citizen science

projects is that they may require some level of computer literacy and network connectivity, both rare in many rural areas of the world. Despite the challenge, some researchers have already been successful in implementing interactive multimedia web-based tools for the collection of data based on local monitoring systems (Ens, 2012; Gill & Lantz, 2014; Pulsifer *et al.*, 2010; Stevens *et al.*, 2014).

### **Clade**

A group of organisms believed to comprise all the evolutionary descendants of a common ancestor (Oxford Living Dictionaries, 2018).

### **Climate change**

A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2014a) (please see related definition for human-induced climate change below).

### **Collapse (social-ecological system)**

The rapid and durable loss of a defined social-ecological system as such, resulting in substantial loss of social-ecological capital (e.g., biomass) (Cumming & Peterson, 2017).

### **Co-management**

Process of management in which government shares power with resource users, with each given specific rights and responsibilities relating to information and decision-making (OECD, 2007b).

### **Community (ecological)**

An assemblage of populations of at least two different species which coexist, and to various degrees interact directly and indirectly within a defined local geographic area and in a particular time; it is characterized in terms of taxonomic and functional composition (the species and functional types present) and richness (e.g., richness, abundance, dominance and distribution of species, or phenotypes) (Stroud *et al.*, 2015).

### **Community forestry**

A broad term used to describe models of forest management that give local users the majority say in making decisions.

Similar terms include participatory forest management, collaborative forest management, social forestry, and community-based forest management. With an aim to reduce poverty, community forestry is participatory and is intended to serve all community members equitably.

### **Community-based conservation**

Institutions and/or processes involving community members in the protection of biodiversity aimed at promoting the coexistence of people and nature. This includes -but is not restricted to- Indigenous Peoples' and rural and coastal community conserved territories and areas (see 'ICCAs') (Western *et al.*, 1994).

### **Community-based monitoring**

Processes involving the participation of community members in a range of observation and measurement activities to maintain awareness of ecological and social factors affecting a community (Bliss *et al.*, 2001).

### **Community-based natural resource management**

A process by which local groups or communities organize themselves with varying degrees of interaction with state agencies and outside support so as to apply their skills and knowledge to the care of natural resources while satisfying livelihood needs (Pretty & Gujit, 1992).

### **Community-managed forests**

Decentralized system of forest resource management designed to promote more equitable outcomes for stakeholders' livelihoods changing relationships between stakeholders, government agencies, and markets (adapted from Newton *et al.*, 2015).

### **Conservation agriculture**

An approach to managing agroecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment. It is characterized by three linked principles, namely: 1) continuous minimum mechanical soil disturbance; 2) permanent organic soil cover; and 3) diversification of crop species grown in sequences and/or associations. This covers a wide range of approaches from minimum till to permaculture and "mimicking nature".

### **Conservation benefits**

The positive impacts on people and ecosystems due to conservation.

### **Conservation biology**

The branch of biological science concerned with the conservation, management, and protection of vulnerable species, populations, and ecosystems. Also see 'Biological conservation'.

### **Continental shelf**

The gently sloping, shelf-like part of the seabed adjacent to the coast extending to a depth of about 200m (IUCN, 2012a).

### **Continental slope**

The often steep, slope-like part of the seabed extending from the edge of the continental shelf to a depth of about 2,000m (IUCN, 2012a).

### **Co-production (of contributions between nature and people)**

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, 2016).

### **Coral bleaching**

When water is too warm, corals will expel the algae (zooxanthellae) living in their tissues causing the coral to turn completely white. Corals can survive a bleaching event, but they are under more stress and are subject to mortality (NOAA, 2018d).

### **Corridor / biological corridor**

A geographically defined area which allows species to move between landscapes, ecosystems and habitats, natural or modified, and is intended to ensure the maintenance of biodiversity and ecological and evolutionary processes.

### **Cosmic models**

A vision of reality that places the highest importance or emphasis in the universe or nature, as opposite to an anthropocentric vision, which strongly focuses on humankind as the most important element of existence.

### **Cosmologies (or cosmogonies)**

The ways any society develops worldviews that aim at explaining the content and the dynamics of the universe, its spatial and temporal properties, the types of living beings that inhabit it, the principles and energies that explain its origin and its future.

### **Country of origin of genetic resources**

Country possessing genetic resources in *in situ* conditions (Convention on Biological Diversity, 1992).



**Country providing genetic resources**

Country supplying genetic resources collected from *in situ* sources, including populations of both wild and domesticated species, or taken from *ex situ* sources, which may or may not have originated in that country (Convention on Biological Diversity, 1992).

**Crop wild relative**

See 'Wild relative'.

**Cross-pollination**

The movement of pollen between the flowers of two distinct plants (IPBES, 2016).

**Cryosphere**

The components of the Earth system that contain a substantial fraction of water in a frozen state, i.e., sea ice, glaciers, ice sheets (National Snow and Ice Data Center (NSIDC), 2018).

**Cultural change (or culture change)**

Cultural change is a continuous process in any society, which can vary from gradual to stochastic, resulting from interactions between processes that are internal (e.g., needs, local changes, crisis, mobility, ideas, invention and innovation, conflicts, etc.) and external (e.g., diffusion, external agents, political and economic forces, conflicts, etc.) (Berry, 2008; Redfield *et al.*, 1936). Cultural change is interpreted differently depending on theoretical orientation, such as diffusionism, modernization theory, world system theory, neocolonialism, globalization, among others (see Peña, 2005; Rudmin, 2009; Santos-Granero, 2009). Culture change can be selective or systemic and most often involves resistance and conflicts but can also lead to adaptation and resilience in changing contexts and environments.

**Cultural ecosystem services**

A category of ecosystem services first developed in the Millenium Ecosystem Assessment (2005) to refer to the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g., knowledge systems, social relations, and aesthetic values (Millenium Ecosystem Assessment, 2005). In the Global Assessment, cultural ecosystem services are included as part of both material and non-material nature's contributions to people (see chapter 1).

**Cultural keystone species / culturally important species**

The culturally salient species that shape in a major way the cultural identity of a people, as reflected in the fundamental roles these species have in diet, materials, medicine, and/or spiritual practices (Garibaldi & Turner, 2004).

**Cultural landscapes**

Cultural landscapes express the long-term co-evolution relationships between people and nature, influenced by internal and external forces affecting the aesthetic and productive configuration of land management, water bodies, wildlife, property systems, infrastructure and human settlements, and which are both a source and a product of changing social, institutional, economic, and cultural systems (also see WHC, 2008).

**Cultural values**

Cultural values are shared social values and norms, which are learned and dynamic, and which underpin attitudes and behaviour and how people respond to events and opportunities, and affects the hierarchy of values people assign to objects, knowledge, stories, feelings, other beings, forms of social expressions, and behaviours.

**Culture**

There is no single definition of culture. A commonly accepted definition of culture refers to the system of shared beliefs, values, customs, behaviours, and artifacts, and the meanings attributed to them, that the members of society use to cope and interact with the world and one another, and that are transmitted from generation to generation through learning (Bates & Plog, 1990).

**Customary land tenure**

The socially-embedded systems and institutions used within communities to regulate and manage land use and access, and which derive from the community itself rather than from the state.

**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 (CBD, 2018b).

**Customary rights**

Rights, such as land rights or political rights, that are granted by either customary or

statutory law. Customary rights exist where there is a consensus of relevant actors considering them to be 'law'.

**Customary sustainable use**

Uses of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements (CBD, 2018b).

**D****Deforestation**

Human-induced conversion of forested land to nonforested land. Deforestation can be permanent, when this change is maintained and definitive, or temporary when this change is part of a cycle that includes natural or assisted regeneration.

**Degraded lands**

Land in a state that results from persistent decline or loss of biodiversity and ecosystem functions and services that cannot fully recover unaided within decadal timescales.

**Demographic transition**

A model describing transition in demographic profile of a population, which has been associated with the development process that transforms an agricultural society into an industrial one and characterized by a rapid population growth due to a decline in the death rate while fertility remains high initially; the growth rate then declines due to a decline in the birth rate. Before the transition's onset, population growth is low as high death rates tend to offset high fertility. After the transition, population growth is again below replacement level as both birth and death rates reach low levels (Bongaarts, 2009).

**Denitrification**

The reduction of nitrates and nitrites to nitrogen by microorganisms.

**Deoxygenation (ocean)**

Decreased oxygen concentrations in the ocean, as a result of climate change and other anthropogenic stressors, e.g., nutrient input due to inefficient fertilizer use (Isensee & Valdes, 2015).

**Desertification**

Desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. Desertification does not refer to the natural expansion of existing deserts (UNCCD, 2014).

**Dispersal**

Movement of individuals (and in some species, their gametes) that has the potential for moving genes through space (Templeton, 2017).

**Domesticated species**

Species in which the evolutionary process has been influenced by humans to meet their needs (Convention on Biological Diversity, 1992).

**Domestication**

Evolutionary process driven by human (whether conscious or unconscious) selection but also involving natural processes applied to wild plants or animals and leading to adaptation to cultivation and consumption or utilization. Domestication can be complete, whereby organisms become entirely dependent on humans for their continued existence or can be partial or incipient, whereby they still reproduce independently of human intervention (Gepts, 2014). In traditional systems, farming practices still shape the genetic structure of crops and their evolution (Vigouroux *et al.*, 2011).

**Downscaling**

Downscaling is a method that derives local- to regional scale information from larger-scale models or data analyses (IPCC, 2014b). It is the opposite of upscaling.

**Drivers of change**

Drivers of change refer to all those external factors that affect nature, and, as a consequence, also affect the supply of nature's contributions to people. The IPBES conceptual framework includes drivers of change as two of its main elements: indirect drivers, which are all anthropogenic, and direct drivers, both natural and anthropogenic. See chapter 1 and chapter 2 (Drivers) for a detailed typology of drivers.

**Drivers (direct)**

Drivers, both non human-induced and anthropogenic, that affect nature directly. Direct anthropogenic drivers are those that flow from human institutions and governance systems and other indirect drivers. They include positive and negative effects, such as habitat conversion, human-caused climate change, or species introductions. Direct non human-induced drivers can directly affect anthropogenic assets and quality of life (e.g., a volcanic eruption can destroy roads and cause human deaths), but these impacts are not

the main focus of IPBES. See chapter 1 and chapter 2.1 (Drivers) for a detailed typology of drivers.

**Drivers (indirect)**

Human actions and decisions that affect nature diffusely by altering and influencing direct drivers as well as other indirect drivers. They do not physically impact nature or its contributions to people. Indirect drivers include economic, demographic, governance, technological and cultural ones, among others. See chapter 1 and chapter 2 (Drivers) for a detailed typology of drivers.

**E****Earth Jurisprudence**

An emerging field of law that seeks to develop a philosophy and practice of law that gives greater consideration to nature, by recognizing the interconnectedness of Earth's natural systems, the inherent rights and value of nature, and the dependence of humanity and all living beings on a healthy Earth (United Nations, 2015).

**Ecological connectivity**

See 'Habitat connectivity'

**Ecological disturbance (natural and anthropogenic)**

An event that can disrupt any ecological level, environmental component as well as the organizational status of a biological cycle of organisms. Disturbances are an important aspect in the natural selection and the whole biological evolution, as they modify the environment in which every living being performs its vital functions (Battisti *et al.*, 2016).

**Ecological footprint**

A measure of the amount of biologically productive land and water required to support the demands of an individual, a population or productive activity. Ecological footprints can be calculated at any scale: for an activity, a person, a community, a city, a region, a nation or humanity as a whole.

**Ecoregion**

A large area of land or water that contains a geographically distinct assemblage of natural communities that:

- (a) Share a large majority of their species and ecological dynamics;
- (b) Share similar environmental conditions, and;
- (c) Interact ecologically in ways that are

critical for their long-term persistence (Olson *et al.*, 2004). In contrast to biomes, an ecoregion is generally geographically specific, is at a much finer scale, and contains ecologically interacting biota. For example, the "East African Montane Forest" eco-region of Kenya (WWF ecoregion classification, Olson and Dinerstein, 2002) is a geographically specific and coherent example of the globally occurring "tropical and subtropical forest" biome.

**Ecosystem**

A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (Convention on Biological Diversity, 1992).

**Ecosystem approach**

See 'Ecosystem-based approach'.

**Ecosystem ecology**

The integrated study of biotic and abiotic components of ecosystems and their interactions within an ecosystem framework. This science examines physical and biological structures and examines how these ecosystem characteristics interact with each other (Simon *et al.*, 2010).

**Ecosystem engineer**

Organism that changes the abiotic environment by physically altering structure, which often have effects on other biota and their interactions, and on ecosystem processes (Gutiérrez & Jones, 2008).

**Ecosystem function**

The flow of energy and materials through the biotic and abiotic components of an ecosystem. It includes many processes such as biomass production, trophic transfer through plants and animals, nutrient cycling, water dynamics and heat transfer.

**Ecosystem integrity**

The ability of an ecosystem to support and maintain ecological processes and a diverse community of organisms. It is measured as the degree to which a diverse community of native organisms is maintained, and is used as a proxy for ecological resilience, intended as the capacity of an ecosystem to adapt in the face of stressors, while maintaining the functions of interest (Ocean Health Index, 2018).

**Ecosystem sensitivity**

The degree to which an ecosystem is affected, either adversely or beneficially,

by climate related stimuli, including mean (average) climate characteristics, climate variability and the frequency and magnitude of extremes (IUCN, 2012a).

### **Ecosystem services**

The benefits people obtain from ecosystems. According to the original formulation of the Millennium Ecosystem Assessment, ecosystem services were divided into supporting, regulating, provisioning and cultural. See chapter 1 for the equivalence of the concept to the concept of nature's contribution to people predominantly used in this assessment

### **Ecosystem structure**

The individuals and communities of plants and animals of which an ecosystem is composed, their age and spatial distribution, and the non-living natural resources present (IUCN, 2012a).

### **Ecosystem-based adaptation**

The conservation, sustainable management and restoration of natural ecosystems to help people adapt to climate change (Colls *et al.*, 2009).

### **Ecosystem-based approach**

A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. An ecosystem approach is based on the application of appropriate scientific methods, focused on levels of biological organization that encompass the essential structure, processes, functions and interactions among and between organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems (UNEP, 2012).

### **Ectotherms**

Often referred to as cold-blooded and applied to organisms that cannot regulate their body temperature relative to the surrounding environment, i.e., deriving heat from outside the body (FAO, 2018a).

### **Edge effects**

A change in species composition, physical conditions or ecological factors at the boundary between two or more habitats (IUCN, 2012a).

### **El Niño / La Niña**

The term El Niño was initially used to describe a warm-water current that periodically flows along the coast of Ecuador

and Perú, disrupting the local fishery. It has since become identified with a basin-wide warming of the tropical Pacific Ocean east of the dateline. This oceanic event is associated with a fluctuation of a global-scale tropical and subtropical surface pressure pattern called the Southern Oscillation. This coupled atmosphere-ocean phenomenon, with preferred time scales of two to about seven years, is collectively known as the El Niño-Southern Oscillation (ENSO) (IPCC, 2014a).

### **Empowerment**

The process by which people gain control over the factors and decisions that shape their lives. It is the process by which they increase their assets and attributes and build capacities to gain access, partners, networks and/or a voice, in order to gain control (WHO, 2010).

### **Endangered species**

A species at risk of extinction in the wild.

### **Endemic species**

Species that is native to, and restricted to, a particular geographical region. Highly endemic species, those with very restricted natural ranges, are especially vulnerable to extinction if their natural habitat is eliminated or significantly disturbed (IUCN, 2012a).

### **Energy source**

Primary energy sources take many forms, including nuclear energy, fossil energy -like oil, coal and natural gas, biomass- and renewable sources like wind, solar, geothermal and hydropower. These primary sources are converted to electricity, a secondary energy source (US Department of Energy, 2018).

### **Environmental education**

The facilitation of an integrated perception of the problems of the environment, enabling more rational actions capable of meeting social needs to be taken (UNESCO, 1978).

### **Environmental envelope**

The environmental envelope of a species is defined as the set of environments within which it is believed that the species can persist: that is where its environmental requirements can be satisfied (see niche). Many large-scale vegetation or species models are based on environmental envelope techniques (Walker & Cocks, 1991).

### **Environmental gradients**

Environmental characteristics that explain the distribution of organisms and ecosystems in terms of environmental

tolerances (Government of New Brunswick, 2007).

### **Environmental Impact Assessment**

A formal, evidence-based procedure that assesses the economic, social, and environmental effects of public policy, such as the construction of large-scale infrastructure, or of any human activity.

### **Environmental justice**

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies (US Environmental Protection Agency, 2018a).

### **Environmental Kuznets Curve (EKC)**

The hypothesis of an inverted U-shaped relationship between economic output per capita and some measures of environmental quality: as GDP per capita rises, so does environmental degradation. However, beyond a certain point, increases in GDP per capita lead to reductions in environmental damage (Everett *et al.*, 2010).

### **Environmental taxes / green taxes**

A tax whose tax base is a physical unit (or a proxy of it) that has a proven specific negative impact on the environment. Four subsets of environmental taxes are distinguished: energy taxes, transport taxes, pollution taxes and resources taxes (OECD, 2005a).

### **Epifauna**

Animals living on or just above the seabed (IUCN, 2012a).

### **Epistemic community**

A professional network with recognized expertise and competence, and a claim for policy-relevant knowledge, in a particular domain (Haas, 1992).

### **Essential Biodiversity Variables (EBV)**

Essential Biodiversity Variables are promoted by the Group on Earth Observations Biodiversity Observation Network (GEO BON). The idea behind this concept is to identify, using a systems approach, the key variables that should be monitored in order to measure biodiversity change. The Essential Biodiversity Variables are an intermediate layer of abstraction between raw data, from *in situ* and remote sensing observations, and derived high-level indicators used to communicate the state and trends of biodiversity.



**Ethnobiology**

The study of dynamic relationships among peoples, biota, and environments, as encoded in the knowledge held by different societies and individuals. Its multidisciplinary nature allows it to examine complex, dynamic interactions between human and natural systems, and enhances our intellectual merit and broader impacts (Society of Ethnobiology, 2018).

**Eutrophic/eutrophicated habitats**

A condition of an aquatic system in which increased nutrient loading leads to progressively increasing amounts of algal growth and biomass accumulation. When the algae die off and decompose, the amount of dissolved oxygen in the water becomes reduced.

**Eutrophication**

An enrichment of water by nutrients that causes structural changes to the ecosystem, such as: increased production of algae and aquatic plants, depletion of fish species, general deterioration of water quality and other effects that reduce and preclude use (OECD, 1982).

**Evapotranspiration**

The sum of water loss from both plants and soil measured over a specific area (IUCN, 2012a).

**Evenness (biodiversity)**

In ecology, species evenness refers to the similarity of abundances of each species in an environment. It can be quantified by a diversity index as a dimension of biodiversity.

**Evolutionary anthropology**

The interdisciplinary study of the evolution of human physiology and human behaviour and the relation between hominids and non-hominid primates. Evolutionary anthropology is based in the natural and social sciences (McGee, 2003).

**Evolutionary biology**

A subdiscipline of the biological sciences concerned with the origin of life and the diversification and adaptation of life forms over time (Nature, 2018c).

**Exclusive economic zones (EEZs)**

An Exclusive Economic Zone (EEZ) is a concept adopted at the Third United Nations Conference on the Law of the Sea (1982), whereby a coastal State assumes jurisdiction over the exploration and exploitation of marine resources in its adjacent section of

the continental shelf, taken to be a band extending 200 miles from the shore. The Exclusive Economic Zone (EEZ) comprises an area which extends either from the coast, or in federal systems from the seaward boundaries of the constituent states (3 to 12 nautical miles, in most cases) to 200 nautical miles (370 kilometres) off the coast. Within this area, nations claim and exercise sovereign rights and exclusive fishery management authority over all fish and all Continental Shelf fishery resources (United Nations, 1997).

**Extinction**

A population, species or more inclusive taxonomic group has gone extinct when all its individuals have died. A species may go extinct locally (population extinction), regionally (e.g., extinction of all populations in a country, continent or ocean) or globally. Populations or species reduced to such low numbers that they are no longer of economic or functional importance may be said to have gone economically or functionally extinct, respectively. Species extinctions are typically not documented immediately: for example, the IUCN Red List categories and criteria require there to be no reasonable doubt that all individuals have died, before a species is formally listed as Extinct (see IUCN Red List, 2012b).

**Extinction debt**

Local, regional or global extinctions that have not yet taken place, but which have been set in train by environmental impacts - such as habitat destruction, degradation and fragmentation - that have already taken place and that have reduced the site, region or world's carrying capacity for species. Species or populations that make up the extinction debt can be said to be "committed to extinction". The length of time taken to repay the extinction debt is known as the relaxation time, and depends on multiple factors (Kuussaari *et al.*, 2009).

**F****Fallow**

Land normally used for production and left to recover for part or all of a growing season or in cycles that can vary from few years to decades, such as in the case of swidden agriculture (Gleave, 1996; United Nations, 1997).

**Family forestry**

Family forestry is forest tenure and activities by persons with ownership or tenure rights

to forest land. Persons owning or managing forests often include the extended family in the activities and the forest land goes from one generation to the next (International Family Forestry Alliance, 2016).

**Fishery**

A unit determined by an authority or other entity that is engaged in raising and/or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats and purpose of the activities (FAO, 2001a).

**Fitness (ecology)**

Fitness involves the ability of organisms— or populations or species— to survive and reproduce in the environment in which they find themselves, and thus contribute genes to the next generation (Orr, 2009).

**Folk biology**

People's everyday understanding of the biological world—how they perceive, categorize, and reason about living kinds (Medin & Atran, 1999).

**Folk categories**

The units of meaning into which a language breaks up the universe for example, folk plant and animal taxa (Berlin, 1973).

**Food security**

The World Food Summit of 1996 defined food security as existing "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life".

**Food web / food web interactions**

An important ecological concept representing feeding relationships within a community and implying the transfer of food energy from its source in plants through herbivores to carnivores; normally, food webs consist of a number of food chains meshed together (Hui, 2012).

**Forest**

A vegetation type dominated by trees. Definitions of forest varies according to the use of parameters such as biogeography, physiognomy, biomass, human management, species dominance and composition, among others, therefore affecting estimates of extent and type of change (also see IPCC, 2014a).

**Forest degradation**

A process leading to a temporary or permanent deterioration in the density or

structure of vegetation cover or its species composition. It is a change in forest attributes that leads to a lower productive capacity caused by an increase in disturbances. Continued degradation of the forests can destroy the entire forest cover and biodiversity, and it mainly occurs because of environmental and anthropogenic changes (Tejawasi, 2007).

#### **Forest garden**

A range of systems for the management of forest resources that are intermediate on a continuum between pure extraction and plantation management, and ranging from wild forests modified for increased production of selected products (e.g., fruit and nut trees) to anthropogenic forests with a high density of valuable species within a relatively diverse and complex structure (Belcher *et al.*, 2005).

#### **Forest Law Enforcement, Governance and Trade (FLEGT)**

A reduction of illegal logging by strengthening sustainable and legal forest management, improving governance and promoting trade in legally produced timber (EUFLEGT Facility, 2018a).

#### **Forest transition**

Attributed to Mather (1992), this term denotes a process of land-use change in a country or region with a period of decline in forest cover, during earlier economic development, then forest recovery.

#### **Fossil fuels**

Fossil fuels are derived from the remains of ancient plant and animal life: coal, oil and natural gas. In common dialogue, the term fossil fuel also includes hydrocarbon-containing natural resources that are not derived from animal or plant sources (OECD, 2001a).

#### **Free, prior and informed consent (FPIC) / prior, informed consent**

Free implies that Indigenous Peoples and Local Communities are not pressured, intimidated, manipulated or unduly influenced and that their consent is given, without coercion; prior implies seeking consent or approval sufficiently in advance of any authorization to access traditional knowledge respecting the customary decision-making processes in accordance with national legislation and time requirements of Indigenous Peoples and Local Communities; informed implies that information is provided that covers relevant aspects, such as: the intended purpose of the access; its duration and

scope; a preliminary assessment of the likely economic, social, cultural and environmental impacts, including potential risks; personnel likely to be involved in the execution of the access; procedures the access may entail and benefit-sharing arrangements; consent or approval is the agreement of the Indigenous Peoples and Local Communities who are holders of traditional knowledge or the competent authorities of those Indigenous Peoples and Local Communities, as appropriate, to grant access to their traditional knowledge to a potential user and includes the right not to grant consent or approval (derived from CBD, 2018b).

#### **Functional diversity**

The range, values, relative abundance and distribution of functional traits in a given community or ecosystem (Diaz *et al.*, 2007).

#### **Functional extinction**

See 'Extinction'.

#### **Functional group**

A collection of organisms with similar suites of co-occurring functional attributes. Groups are traditionally associated with similar responses to external factors and/or effects on ecosystem processes. A functional group is often referred to as 'guild', especially when referring to animals, e.g., the feeding types of aquatic organisms having the same function within the trophic chain (De Bello *et al.*, 2010).

#### **Functional redundancy**

The occurrence in the same ecosystem of species filling similar roles, which results in a sort of "insurance" in the ecosystem, with one species able to "replace" a similar species from the same functional niche (Rosenfeld, 2002).

#### **Functional traits**

Any feature of an organism, expressed in the phenotype and measurable at the individual level, which has demonstrable links to the organism's function (Lavorel *et al.*, 1997; Violle *et al.*, 2007). As such, a functional trait determines the organism's response to external abiotic or biotic factors (Response trait), and/or its effects on ecosystem properties or benefits or detriments derived from such properties (Effect trait). In plants, functional traits include morphological, ecophysiological, biochemical and regeneration traits. In animals, these traits include e.g., body size, litter size, age of sexual maturity, nesting habitat, time of activity.

## **G**

#### **Gene**

The basic physical and functional unit of heredity. Genes are made up of DNA, and occupy a fixed position (locus) on a chromosome. Genes achieve their effects by directing the synthesis of proteins (Encyclopaedia Britannica, 2018).

#### **Gene flow**

The movement of individuals, and/or the genetic material they carry, from one population to another. Gene flow includes lots of different kinds of events, such as pollen being blown to a new destination or people moving to new cities or countries (University of California Museum of Paleontology, 2018a).

#### **Generalist species**

A species able to thrive in a wide variety of environmental conditions and that can make use of a variety of different resources (for example, a flower-visiting insect that lives on the floral resources provided by several to many different plants).

#### **Genetic composition**

The composition in alleles of a population (University of Leicester, 2018).

#### **Genetic diversity**

The variation at the level of individual genes, which provides a mechanism for populations to adapt to their ever-changing environment. The more variation, the better the chance that at least some of the individuals will have an allelic variant that is suited for the new environment, and will produce offspring with the variant that will in turn reproduce and continue the population into subsequent generations (NBII, 2011).

#### **Genetic engineering**

The artificial manipulation, modification, and recombination of DNA or other nucleic acid molecules in order to modify an organism or population of organisms.

#### **Genetic erosion**

The loss of genetic diversity, including the loss of individual genes or particular combinations of genes, and loss of varieties and crops (Vetriventhan *et al.*, 2016).

#### **Genetic resources**

Genetic material of actual or potential value (Convention on Biological Diversity, 1992).

**Genetically Modified Organism (GMO)**

Organism in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination (WHO, 2014). The Cartagena Protocol on Biosafety defines 'living modified organism' as any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology (CBD, 2000).

**Genotype**

The genetic constitution of an individual or group (IUCN, 2012a).

**Germplasm**

Living tissue from which new plants can be grown. It can be a seed or another plant part – a leaf, a piece of stem, pollen or even just a few cells that can be turned into a whole plant (University of California Seed Biotechnology Center, 2018).

**Gini index**

The Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure or other variables) among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality (World Bank, 2018).

**Global commons or global common pool resources (CPR)**

Common pool resources (CPR) that have a global nature, such as the atmosphere, the oceans, global species diversity, migratory species, global biogeochemical processes, among others. It does not refer to property rights, such as a common property system. In general, CPR include natural and human-constructed resources in which (i) exploitation by one user reduces resource availability for others, and (ii) exclusion of beneficiaries through physical and institutional means is especially costly. These two characteristics – difficulty of exclusion and subtractability – create potential CPR dilemmas in which people following their own short-term interests produce outcomes that are not in anyone's long-term interest (Ostrom *et al.*, 1994).

**Global North – Global South**

The Global South and the Global North is a terminology that distinguishes not only between political systems or degrees of poverty, but between the victims and the benefactors of global capitalism (Wolters *et al.*, 2015).

**Good Quality of Life (GQL)**

Within the context of the IPBES Conceptual Framework – the achievement of a fulfilled human life, a notion which may vary strongly across different societies and groups within societies. It is a context-dependent state of individuals and human groups, comprising aspects such as access to food, water, energy and livelihood security, and also health, good social relationships and equity, security, cultural identity, and freedom of choice and action. "Human wellbeing", "inclusive wealth", "living in harmony with nature", "living-well in balance and harmony with Mother Earth" are examples of different perspectives on a "Good quality of life". See detailed description in chapter 1.

**Governance**

A comprehensive and inclusive concept of the full range of means for deciding, managing, implementing and monitoring actions and measures, including policies. Whereas government is defined strictly in terms of the nation-state, the more inclusive concept of governance recognizes the contributions of various levels of government (global, international, regional, sub-national and local) and the contributing roles of the private sector, of nongovernmental actors, and of civil society to addressing the many types of issues from local to global levels (adapted from IPCC, 2018).

**Great Acceleration**

Great Acceleration refers to the acceleration of human-induced changes of the second half of the 20th century, unique in scale in the history of human existence. Many human activities reached take-off points and sharply accelerated since the 1950s with world regions changing their contributions to globally-aggregated changes over time (adapted from International Geosphere-Biosphere Programme, 2015).

**Green bonds**

A mode of private financing that tap the debt capital market through fixed income instruments (i.e., bonds) to raise capital to finance climate-friendly projects in key sectors of, but not limited to, transport, energy, building and industry, water, agriculture and forestry and waste (OECD, 2017).

**Green growth**

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the

resources and environmental services on which our well-being relies (OECD, 2018a).

**Green infrastructure / grey infrastructure**

Green infrastructure refers to the natural or semi-natural systems (e.g., riparian vegetation) that provide services for water resources management with equivalent or similar benefits to conventional (built) "grey" infrastructure (e.g., water treatment plants) (UNEP, 2014).

**Green Revolution**

A term attributed to a period of food crop productivity growth that started in the 1960s due to a combination of high rates of investment in crop research, infrastructure, market development, and policy support, and whose environmental impacts have been mixed: on the one side, it is said to have contributed to saving land conversion to agriculture, on the other side, it is said to have contributed to promoting an overuse of inputs and cultivation on areas otherwise improper to high levels of intensification, such as slopes, and high levels of pesticide pollution (adapted from Pingali, 2012). It is also argued that development policies promoting the Green Revolution contributed to undermine otherwise productive and resilient locally-based food production systems.

**Greenhouse gases (GHGs)**

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and ozone (O<sub>3</sub>) are the primary greenhouse gases in the Earth's atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Beside CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (IPCC, 2014a).

**Gross primary productivity**

The amount of carbon fixed by the autotrophs (e.g., plants and algae) (IPCC, 2014a).

**Habitat**

The place or type of site where an organism or population naturally occurs. Also used to mean the environmental attributes required by a particular species or its ecological niche.

**Habitat connectivity**

The degree to which the landscape or waterscape facilitate the movement of organisms (animals, plant reproductive structures, pollen, pollinators, spores, etc.) and other environmentally important resources (e.g., nutrients and moisture) between similar habitats. Connectivity is hampered by fragmentation (q.v.).

**Habitat degradation**

A general term describing the set of processes by which habitat quality is reduced. Habitat degradation may occur through natural processes (e.g., drought, heat, cold) and through human activities (forestry, agriculture, urbanization). It is sometimes used as a synonym of habitat deterioration or nature deterioration.

**Habitat fragmentation**

A general term describing the set of processes by which habitat loss results in the division of continuous habitats into a greater number of smaller patches of lesser total and isolated from each other by a matrix of dissimilar habitats. Habitat fragmentation may occur through natural processes (e.g., forest and grassland fires, flooding) and through human activities (forestry, agriculture, urbanization).

**Habitat heterogeneity**

The number of different habitats in a landscape (Cramer & Willig, 2005).

**Habitat modification**

Changes in an area's primary ecological functions and species composition due to human activity and/or non-native species invasion (UNEP-WCMC, 2014).

**Habitat specialist**

Species that require very specific habitats and resources (e.g., narrow range of food sources or cover types) to thrive and reproduce (Maryland State Wildlife Action Plan, 2015).

**Harmful algal blooms (HABs)**

Harmful algal blooms (HABs) occur when colonies of algae grow out of control and produce toxic or harmful effects on people, fish, shellfish, marine mammals and birds. The human illnesses caused by HABs,

though rare, can be debilitating or even fatal (NOAA, 2016).

**Heat island effect**

Describes built up areas that are hotter than nearby rural areas. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality (US Environmental Protection Agency, 2018b).

**Holocene**

The Holocene is the current geological epoch. It began after the Pleistocene, approximately 11,650 calendar years before present.

**Homegarden**

Areas surrounding a house for vegetable and fruit production and keeping of domestic animals. In many regions homegardens contain wild species utilized as medicinal plants, timber or other uses (Walker *et al.*, 2009).

**Homeotherms**

Organisms (vertebrates) with a constant and high body temperature, with a high level of energy exchange (Ivanov, 2006).

**Hotspot of agrobiodiversity**

Areas with significantly high levels of agrobiodiversity.

**Hotspot of endemism**

See 'Biodiversity hotspot'

**Human appropriation of net primary production (HANPP)**

The aggregate impact of land use on biomass available each year in ecosystems (Haberl *et al.*, 2007).

**Human capital**

Human capital is the stock of skills that people possess. It encompasses the notion that there are investments in people (e.g., education, training, health) and that these investments increase an individual's productivity (Goldin, 2016). In the IPBES conceptual framework, human capital is part of anthropogenic assets.

**Human history**

A general term used to refer to pre-historical and historical periods describing the development of humanity. Different classifications of periods exist reflecting different interpretation of human history.

**Human-induced climate change**

Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1 of the UNFCCC, "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" The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes (IPCC, 2014a) (please see related definition for climate change above).

**Hunting**

The capture by humans of wild mammals, birds, and reptiles, whether dead or alive, irrespective of the techniques used to capture them or the reasons to do so (Bennett & Robinson, 2000).

**Hypoxia**

Low dissolved oxygen levels in coastal and oceanic waters (<2mL per liter of water), either naturally occurring or as a result of a degradation (e.g., eutrophication) (Altieri *et al.*, 2017; Diaz & Rosenberg, 2008).

**I****Identity**

The ways in which people understand who they are, their belonging and role in society, and their relation to their broader environment (Fearon, 1999; Ingalls & Stedman, 2017). Identity can be multiple and situational.

**Illegal logging**

The harvesting, processing, transporting, buying or selling of timber in contravention of national and international laws (EUFLEGT Facility, 2018b).

**Illegal, unreported and unregulated (IUU) fishing**

A broad term which includes: fishing and fishing-related activities conducted in contravention of national, regional and international laws; non-reporting, misreporting or under-reporting of information on fishing operations and their catches; fishing by "Stateless" vessels; fishing in convention areas of Regional Fisheries Management Organizations (RFMOs) by non-party vessels; fishing activities which are not regulated by States and cannot be easily monitored and accounted for (FAO, 2016).

**In situ conservation of biodiversity and agrobiodiversity**

The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties (Convention on Biological Diversity, 1992)

**Indicator**

A quantitative or qualitative factor or variable that provides a simple, measurable and quantifiable characteristic or attribute responding in a known and communicable way to a changing environmental condition, to a changing ecological process or function, or to a changing element of biodiversity.

**Indigenous and local knowledge (ILK)**

The knowledge, practices and innovations embedded in the relationships of Indigenous Peoples and Local Communities to nature. ILK is situated in a place and social context, but at the same time open and hybrid, continuously evolving through the combination of written, oral, tacit, practical, and scientific knowledge attained from various sources, and validated by experimentation and in practice of direct interaction with nature. See chapter 1 (section 1.3.2.1) and chapter 2.2 (section 2.2.2) for a discussion on the differences between 'indigenous knowledge' and 'local knowledge'.

**Indigenous and local knowledge (ILK) systems**

Indigenous and local knowledge systems are social and ecological knowledge practices and beliefs pertaining to the relationship of living beings, including people, with one another and with their environments. Such knowledge can provide information, methods, theory and practice for sustainable ecosystem management.

**Indigenous Peoples and Local Communities (IPLCs)**

The Convention on Biological Diversity does not define the terms indigenous and local communities or Indigenous Peoples and Local Communities. The United Nations Declaration on the Rights of Indigenous Peoples does not adopt or recommend a universal definition for Indigenous Peoples (Decision CBD/COP/DEC/14/13). As used in the global assessment, Indigenous Peoples and Local Communities (IPLCs) is a term

used internationally by representatives, organizations, and conventions to refer to individuals and communities who are, on the one hand, self-identified as indigenous and, on the other hand, are members of local communities that maintain inter-generational connection to place and nature through livelihood, cultural identity and worldviews, institutions and ecological knowledge. The term is not intended to ignore differences and diversity within and among Indigenous Peoples and between them and local communities; Indigenous Peoples have recognized and distinct rights, which are not extendable to the broader and encompassing concept of local communities. See chapter 1 (Section 1.3.2.1).

**Indigenous Peoples' and community conserved territories and areas (ICCAs)**

Natural and/or modified ecosystems containing significant biodiversity values, ecological services and cultural values, voluntarily conserved by Indigenous Peoples and Local Communities, both sedentary and mobile, through customary laws or other effective means (CBD, 2018b).

**Individual fishing quotas (IFQs)**

An allocation to an individual (a person or a legal entity (e.g., a company)) of a right [privilege] to harvest a certain amount of fish in a certain period of time. It is also often expressed as an individual share of an aggregate quota, or total allowable catch (TAC) (OECD, 2001b).

**Individual transferable quotas (ITQs)**

A type of quota (a part of a Total Allowable Catch) allocated to individual fishermen or vessel owners and which can be sold to others (OECD, 2005b).

**Infauna**

Animals that live within the sediment (IUCN, 2012a).

**Institutions**

Institutions encompass formal and informal rules and norms that structure individual and collective behaviour, including interactions among stakeholders and social structures that help to define how decisions are taken and implemented, how power is exercised, and how responsibilities are distributed.

**Insular systems**

Any area of habitat suitable for a specific ecosystem, surrounded by an expanse of unfavorable habitat that limits the dispersal of individuals. Insular systems can be either

physical islands or isolated habitats (e.g., resulting of fragmentation) (Brown, 1978).

**Integrated Assessment Models (IAMs)**

Interdisciplinary models that aim to describe the complex relationships between environmental, social, and economic drivers that determine current and future state of the ecosystem and the effects of global change, in order to derive policy-relevant insights. One of the essential characteristics of integrated assessments is the simultaneous consideration of the multiple dimensions of environmental problems.

**Integrated pest management (IPM)**

Integrated Pest Management (IPM) is an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides (FAO, 2018b).

**Integrated Water Resource Management (IWRM)**

A process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (Hassing *et al.*, 2009).

**Intellectual property rights**

Intellectual property rights are the rights given to persons over the creations of their minds. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time. Intellectual property rights are customarily divided into two main areas: rights related to copyright and industrial property (World Trade Organization, 2018).

**Intercropping**

Refers to growing two or more crops in the same field at the same time (FAO, 2018a).

**Intermediate disturbance hypothesis**

The intermediate disturbance hypothesis (IDH) suggests that local species diversity is maximized when ecological disturbance is neither too rare nor too frequent (Connell, 1978).

**Invasive alien species (IAS)**

Species whose introduction and/or spread by human action outside their natural distribution threatens biological diversity, food security, and human health and well-being. "Alien" refers to the species'



having been introduced outside its natural distribution (“exotic”, “non-native” and “non-indigenous” are synonyms for “alien”). “Invasive” means “tending to expand into and modify ecosystems to which it has been introduced”. Thus, a species may be alien without being invasive, or, in the case of a species native to a region, it may increase and become invasive, without actually being an alien species.

### **IPBES conceptual framework**

A simplified representation of the complex interactions between the natural world and human societies. This framework emerged from an extensive process of consultation and negotiation, leading to formal adoption by the second IPBES Plenary (IPBES/2/4), and therefore represents a key foundation for all IPBES activities. The framework recognizes different knowledge systems, including indigenous and local knowledge (ILK) systems, which can be complementary to those based on science (see chapter 1 for detailed description).

### **IUCN Red List**

The IUCN Red List is an indicator of the health of biodiversity. It provides taxonomic, conservation status and distribution information on plants, fungi and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction (IUCN, 2012b).

## **J**

### **Jevons paradox**

See ‘Rebound effect’.

### **Joint production**

See ‘Co-production’.

## **K**

### **Key Biodiversity Areas (KBAs)**

Sites contributing significantly to the global persistence of biodiversity. They represent the most important sites for biodiversity conservation worldwide, and are identified nationally using globally standardized criteria and thresholds (UNEP-WCMC, 2014).

### **Keystone species**

A species whose impact on the community or ecosystem is disproportionately large

relative to its abundance. Effects can be produced by consumption (trophic interactions), competition, mutualism, dispersal, pollination, disease, or habitat modification (nontrophic interactions) (Millennium Ecosystem Assessment, 2005).

## **L**

### **Land cover**

The physical coverage of land, usually expressed in terms of vegetation cover or lack of it. Related to, but not synonymous with, land use (Millennium Ecosystem Assessment, 2005).

### **Land degradation**

Refers to the many processes that drive the decline or loss in biodiversity, ecosystem functions or their benefits to people and includes the degradation of all terrestrial ecosystems. See ‘Habitat degradation’.

### **Land grabbing**

See ‘Large-scale land acquisition’.

### **Land sharing and sparing**

Concepts used to describe, in general terms, spatial-temporal arrangements of agricultural and non-agricultural areas. Land sharing is a situation where farming practices enable biodiversity to be maintained within agricultural landscapes. Land sparing, also called “land separation” involves restoring or creating non-farmland habitat in agricultural landscapes at the expense of field-level agricultural production - for example, woodland, natural grassland, wetland, and meadow on arable land. This approach does not necessarily imply high-yield farming of the non-restored, remaining agricultural land (Rey Benayas & Bullock, 2012). See also ‘Conservation agriculture’.

### **Land use**

The human use of a piece of land for a certain purpose (such as irrigated agriculture or recreation or conservation). Influenced by, but not synonymous with, land cover (Millennium Ecosystem Assessment, 2005). Land-use change refers to a change in the use or management of land by humans, which may lead to a change in land cover.

### **Land use intensification**

Activities undertaken with the intention of enhancing the productivity or profitability per unit area of land use, such as in agriculture, including intensification of particular land uses as well as changes between land uses (Martin *et al.*, 2018).

### **Landrace**

A breed that has largely developed through adaptation to the natural environment and traditional production system in which it has been raised (FAO, 2013).

### **Landscape**

An area of land that contains a mosaic of ecosystems, including human-dominated ecosystems.

### **Landscape functioning**

The capacity or potential of landscapes to maintain ecosystem functions and to provide services (adapted from Bolliger & Kienast, 2010).

### **Landscape heterogeneity**

Landscape heterogeneity is a complex phenomenon involving the size, shape and composition of different landscape units and the spatial (and temporal) relations between them, such as between different land cover types (Cale & Hobbs, 1994).

### **Large-scale land acquisition (LSLA)**

The control (whether through ownership, lease, concession, contracts, quotas, or general power) of larger than locally-typical amounts of land by any persons or entities (public or private, foreign or domestic) via any means (‘legal’ or ‘illegal’) for purposes of speculation, extraction, resource control or commodification usually at the expense of local ownership and access, agroecological principles, customary forms of land stewardship, and affecting food sovereignty and human rights (adapted from Baker-Smith & Miklos-Attila, 2016). It is sometimes also called “land grabbing”.

### **Law of the Sea**

The United Nations Convention on the Law of the Sea (UNCLOS), in force since 1994, defines the rights and obligations of nations (167 at present) with regard to the use of the world’s oceans and their resources, and the protection of the marine and coastal environment. The UNCLOS also defines national marine jurisdiction on maritime territories and provides guidelines related to the use and management of marine environment and resources.

### **Leaf Area Index (LAI)**

The total area of green leaves per unit area of ground covered (FAO, 2018a).

### **Leakage effect**

Phenomena whereby the reduction in emissions (relative to a baseline) in a

jurisdiction/sector associated with the implementation of mitigation policy is offset to some degree by an increase outside the jurisdiction/sector through induced changes in consumption, production, prices, land use and/or trade across the jurisdictions/sectors. Leakage can occur at a number of levels, be it a project, state, province, nation or world region (IPCC, 2014a).

### **Learning (traditional and formal)**

Learning refers to the process of knowledge and skills acquisition. Studies on learning have paid attention to the different ways people acquire knowledge, practices, and beliefs (i.e., imitation, copying, trial-and-error), but also to the dynamics of knowledge transmission, or the different sources from which knowledge, practices, and beliefs are passed from one individual to another (i.e., from parents, peers, teachers, prestigious peoples, media, etc). Social learning is defined as the acquisition of new information by observing and emulating others, and it is a key human strategy that allows for the accumulation of culturally transmitted knowledge (Boyd & Richerson, 2005; Boyd & Silk, 2014).

## **M**

### **Macroecology**

A subfield of ecology that deals with the study of relationships between organisms and their environment at large spatial scales, and involves characterizing and explaining statistical patterns of abundance, distribution and diversity (Blackburn & Gaston, 2002).

### **Maladaptation**

A trait that is, or has become, more harmful than helpful, in contrast with an adaptation, which is more helpful than harmful (Barnett & O'Neill, 2010).

### **Malnutrition**

Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is 'undernutrition' — which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related noncommunicable diseases (such as heart disease, stroke, diabetes and cancer) (WHO, 2016).

### **Marginal lands**

Land having limitations which in aggregate are severe for sustained application of a given use. On these lands, options are limited for diversification without the use of inputs; inappropriate management of lands may cause irreversible degradation (CGIAR, 1999).

### **Marginalization**

Marginalization refers to the set of processes through which some individuals and groups 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 (Institute of Development and Economic Alternatives, 2016).

### **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 brackishwater areas (Sivalingam, 1981).

### **Mechanistic modelling**

A model with hypothesized relationship between the variables in the dataset where the nature of the relationship is specified in terms of the biological processes that are thought to have given rise to the data.

### **Megadiverse country**

Countries (17) which have been identified as the most biodiversity-rich countries of the world, with a particular focus on endemic biodiversity (UNEP-WCMC, 2014).

### **Mesic areas**

Synonym for moist areas (IUCN, 2012a).

### **Meta-analysis**

A quantitative statistical analysis of several separate but similar experiments or studies in order to test the pooled data for statistical significance.

### **Metabolic activity**

Chemical transformations that sustain life at the cell level.

### **Microevolution**

A change in gene frequency within a population. Evolution at this scale can be observed over short periods of time — for example, between one generation and the next, the frequency of a gene for pesticide

resistance in a population of crop pests increases. Such a change might come about because natural selection favored the gene, because the population received new immigrants carrying the gene, because some nonresistant genes mutated to the resistant version, or because of random genetic drift from one generation to the next (University of California Museum of Paleontology, 2018b).

### **Micro-habitats**

The small-scale physical requirements of a particular organism or population.

### **Micronutrients**

Substances that are only needed in very small amounts but essential to organisms to produce enzymes, hormones and other substances fundamental for proper growth and development (WHO, 2015).

### **Microparticles**

Particles with dimensions between 0.1 and 100 micrometers, e.g., pollen, sand, dust (Vert *et al.*, 2012).

### **Micro-plastics**

Plastic debris that are less than five millimeters in length (NOAA, 2018a).

### **Minimum tillage**

Minimum tillage systems are tillage systems in which the ground is worked very little before the seed is sown, and where crops can be sown almost immediately after the previous crop has been harvested (Rawson & Gómez Macpherson, 2000).

### **Moisture recycling**

The contribution of local evaporation and evapotranspiration to local precipitation (Trenberth & Trenberth, 1999).

### **Monitoring**

The repeated observation of a system in order to detect signs of change in relation to a predetermined or expected standard.

### **Monoculture**

The agricultural practice of cultivating a single crop over a whole farm or area (FAO, 2001b).

### **Monophyletic**

The condition in which a group of taxa share a common ancestry, being the entire set of evolutionary descendants from a common ancestor.

### Mother Earth

An expression used in a number of countries and regions to refer to the planet Earth and the entity that sustains all living things found in nature with which humans have an indivisible, interdependent physical and spiritual relationship (see 'Nature').

### Mutualism

Interaction between two species that benefits the two species (Bronstein, 1994).

## N

### Nagoya protocol

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) is a supplementary agreement to the 1992 Convention on Biological Diversity. It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources, thereby contributing to the conservation and sustainable use of biodiversity. The Nagoya Protocol aims to create greater legal certainty and transparency for both providers and users of genetic resources by establishing more predictable conditions for access to genetic resources and helping to ensure benefit-sharing when genetic resources leave the country providing the genetic resources. The Nagoya Protocol on ABS was adopted on 29 October 2010 in Nagoya, Japan and entered into force on 12 October 2014.

### National biodiversity strategies and action plans (NBSAPs)

The Convention on Biological Diversity calls on each of its Parties to prepare a National Biodiversity Strategy and Action Plan (Article 6a) that establishes specific activities and targets for achieving the objectives of the Convention. These plans mostly are implemented by a partnership of conservation organizations. Species or habitats which are the subject of NBSAPs are the governments stated priorities for action and therefore raise greater concern where they are threatened. NBSAPs do not carry legal status and listed species and habitat types are not necessarily protected (although some are covered by other legislation) (Hesselink *et al.*, 2007).

### Natural capital

A concept referring to the stock of renewable and non-renewable natural

resources (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people (UNDP, 2016b). Within the IPBES conceptual framework, it is part of the "nature" category, representing an economic-utilitarian perspective on nature, specifically those aspects of nature that people use (or anticipate to use) as source of NCP (see chapter 1).

### Natural habitat

Areas composed of viable assemblages of plant and/or animal species of largely native origin and/or where human activity had not essentially modified an area's primary ecological functions and species composition (UNEP-WCMC, 2014).

### Natural heritage

Natural features, geological and physiographical formations and delineated areas that constitute the habitat of threatened species of animals and plants and natural sites of outstanding universal value from the point of view of science, conservation or natural beauty (UNESCO, 1972).

### Nature

In the context of IPBES (also referred 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 IPLC around the world; see 'Mother Earth'), Pachamama (South American Andes), se'nluo'-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 (also see Chapter 1).

### Nature-based solutions

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 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.

(see chapters 1 and 2.3 for detailed definitions)

#### **NCP (potential)**

The capacity of an ecosystem to provide NCP (see chapter 2.3).

#### **NCP (realized)**

The actual flow of NCP that humanity receives. Realized NCP typically depends not only on potential NCP but also anthropogenic assets (e.g., boats and fishing gear, or farm equipment), human labor, and institutions. Institutions can facilitate or prevent access to resources and are often important for determining whether or not potential NCP generates realized NCP (see chapter 2.3).

#### **Neo-endemic taxa**

Recently diverged taxa that are endemic because of lack of dispersal/migration out of their ancestral area, as opposed to paleo-endemic taxa that were perhaps more widespread in the past and are now restricted to a local region (Mishler *et al.*, 2014).

#### **Net Primary Production (NPP)**

The difference between how much CO<sub>2</sub> vegetation takes in during photosynthesis (gross primary production) minus how much CO<sub>2</sub> the plants release during respiration (NASA Earth Observatory, 2018). It corresponds to the increase in plant biomass or carbon of a unit of a landscape (IPCC, 2001).

#### **Nexus**

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

(adapted from UNU-FLORES, 2018; also see Chapter 5).

#### **Niche (ecological)**

A species' position within an ecosystem. This definition includes both the abiotic and biotic conditions necessary for the species to be able to persist (e.g., temperature range, food sources) and its ecological role, function or "job" (Polechová & Storch, 2008).

#### **Niche models**

Also known as species distribution models, niche models predict the spatial distribution of a species as a function of environmental variables. They are often used to project the future distributions of species in response to climate change (Wiens *et al.*, 2009).

#### **Nitrogen deposition**

The nitrogen transferred from the atmosphere to the Earth's surface by the processes of wet deposition and dry deposition (IPCC, 2014a).

#### **Nitrogen-fixing species**

Plants, such as legumes, living in symbiosis with micro-organisms in their roots that can perform biological nitrogen fixation, i.e., convert atmospheric nitrogen (N<sub>2</sub>) to ammonia (NH<sub>3</sub>). Plants can then assimilate NH<sub>3</sub> to produce biomolecules (Wagner, 2011).

#### **Non-timber forest products (NTFPs)**

Any biological resources found in forests other than timber, including fruits, fuel wood and small wood, nuts, seeds, oils, foliage, game animals, berries, medicinal plants, fish, spices, barks, and mushrooms, among others (Prasad, 1993).

#### **NOX**

A generic term for the nitrogen oxides most relevant for air pollution (NO and NO<sub>2</sub>) (Omidvarborna *et al.*, 2015).

#### **Nutrient availability**

Nutrients that can be extracted by plant roots, generally from the soil (Silver, 1994).

#### **Nutrient cycling**

The processes by which elements are extracted from their mineral, aquatic, or atmospheric sources or recycled from their organic forms, converting them to the ionic form in which biotic uptake occurs and ultimately returning them to the atmosphere, water, or soil (Millennium Ecosystem Assessment, 2005).

## **O**

#### **Ocean acidification**

A reduction in the pH of the ocean over an extended period, typically decades or longer, which is caused primarily by uptake of carbon dioxide from the atmosphere, but can also be caused by other chemical additions or subtractions from the ocean. Anthropogenic ocean acidification refers to the component of pH reduction that is caused by human activity (IPCC, 2014a).

#### **Oceanic gyre**

Large system of rotating ocean currents. There are five major gyres: the North and South Pacific Subtropical Gyres, the North and South Atlantic Subtropical Gyres, and the Indian Ocean Subtropical Gyre (NOAA, 2018c).

#### **Oceanic oxygen minimum zones (OMZs)**

Oxygen-deficient layers in the ocean water column. OMZs correspond to subsurface oceanic zones reaching ultra-low values of O<sub>2</sub> concentration (Paulmier & Ruiz-Pino, 2008).

#### **Old-growth forest**

From an ecological point of view, old-growth forests are a stage of forest development characterized by large/old trees and structural complexity including live and dead trees, and vertical and horizontal heterogeneity (including a multi-layered canopy). The structural diversity of old growth forests often supports distinctive/specialist biodiversity; large/old trees are keystone components of the ecosystem (Lindenmayer *et al.*, 2012). In addition, the long-period of forest development without stand replacement disturbance allows many poor-dispersing species to accumulate (IUFRO, 2018). Other definitions can be found based on economic and social perspectives (Hilbert & Wienscczyk, 2007).

#### **Oligotrophic**

Nutrient-poor environment (IUCN, 2012a).

#### **Ontology**

The philosophical study of the nature of being, becoming, existence, or reality, as well as the basic categories of beings and their relations.

#### **Open Ocean Pelagic Systems (OOPS)**

Marine ecosystems in the light-flooded (euphotic) zone.

### Organic agriculture

Any system that emphasizes the use of techniques such as crop rotation, compost or manure application, and biological pest control in preference to synthetic inputs. Most certified organic farming schemes prohibit all genetically modified organisms and almost all synthetic inputs. Its origins are in a holistic management system that avoids off-farm inputs, but some organic agriculture now uses relatively high levels of off-farm inputs. Recognition and certification of organic agriculture may vary significantly across countries.

### Other Effective Area-based Conservation Measures (OECM)

A geographically defined area other than a protected area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the *in situ* conservation of biodiversity (CBD, 2018a).

### Overexploitation

Overexploitation means harvesting species from the wild at rates faster than natural populations can recover. Includes overfishing, and overgrazing.

## P

### Paired catchment

Paired catchment studies have been widely used to assess the likely impact of land use change on water yield around the world. Such studies involve the use of two catchments (drainage basins) with similar characteristics in terms of slope, aspect, soils, area, precipitation and vegetation located adjacent to each other. Following a calibration period, where both catchments are monitored, one of the catchments is subjected to treatment and the other remains as a control. This allows the climatic variability to be accounted for in the analysis. The change in water yield can then be attributed to changes in vegetation. The paired catchment studies reported in the literature can be divided into four broad categories: (i) afforestation experiments; (ii) regrowth experiments; (iii) deforestation experiments; and (iv) forest conversion experiments (Best *et al.*, 2003).

### Palma ratio

The share of all income received by the 10% people with highest disposable income divided by the share of all income received by the 40% people with the lowest disposable income (OECD, 2018b).

### Participatory methods

Participatory research methods are a variety of qualitative and quantitative methods “geared towards planning and conducting the research process with those people whose life-world and meaningful actions are under study” (Bergold & Thomas, 2012). Participatory methods acknowledge the possibility, the significance, and the usefulness of involving research partners in the knowledge-production process (Bergold, 2007).

### Participatory process

Specific methods employed to achieve active participation by all members of a group in a decision-making process (Chatty *et al.*, 2003).

### Particulate matter (PM)

A mixture of suspended solid particles and liquid droplets (dust, dirt, soot, or smoke) found in the air (US Environmental Protection Agency, 2018c); also referred to as particulate pollution.

### Particulate organic carbon (POC)

The carbon content of particulate organic matter (Fiedler *et al.*, 2008).

### Particulate organic matter

The large fraction (usually more than 7 micrometers) of soil organic matter (Fiedler *et al.*, 2008).

### Pathways

In the context of the IPBES global assessment, trajectories toward the achievement of goals and targets for biodiversity conservation, the management of nature and nature’s contributions to people, and, more broadly, the UN 2030 Sustainable Development Goals.

### Patrimonial species

A rare or threatened species which needs local management and which may be a flagship species and may have cultural importance (Pervanchon, 2004).

### Payments for ecosystem services (PES)

Payments for ecosystem services (PES) is a term used to describe a process whereas a beneficiary or user of an ecosystem service makes a direct or indirect payment to a provider of that service. PES involve a series of payments to land or other natural resource owners in return for a guaranteed flow of ecosystem services or certain actions likely to enhance their provision over- and-above what would otherwise be provided in the absence of payment (UNDP, 2018).

### Peatland

Wetlands which accumulate organic plant matter *in situ* because waterlogging prevents aerobic decomposition and the much slower rate of the resulting anaerobic decay is exceeded by the rate of accumulation.

### Pelagic

Occurring or living in open waters or near the surface with little contact with or dependency on the bottom (IUCN, 2012a).

### People and Plants initiative

A collaboration initiated in 1992 between the World-Wide Fund for Nature (WWF), UNESCO-MAB and the Royal Botanic Gardens Kew on the promotion of ethnobotany and the equitable and sustainable use of plant resources.

### Permafrost

Ground (soil or rock and included ice and organic material) that remains at or below 0°C for at least two consecutive years (IPCC, 2014a).

### Persistent organic pollutants (POPs)

Organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes. POPs persist in the environment for long periods, are capable of long-range transport, bioaccumulate in human and animal tissue and biomagnify in food chains, and have potentially significant impacts on human health and the environment. Exposure to POPs can cause serious health problems including certain cancers, birth defects, dysfunctional immune and reproductive systems, greater susceptibility to disease and even diminished intelligence (Stockholm Convention Secretariat, 2017).

### Phenological shifts

Changes in species phenology, mostly as a result of climate change (Scranton & Amarasekare, 2017).

### Phenology

The study of the relationship between climate and the timing of periodic natural phenomena such as migration of birds, bud bursting, or flowering of plants (IUCN, 2012a).

### Phenotype

The characteristics of an individual resulting from interaction between its genotype (genetic constitution) and its environment (IUCN, 2012a). These characteristics often



include behaviour, physiology (e.g., oxygen consumption, heart rate), life history (e.g., body size, age, offspring number), or morphology (e.g., body proportions).

#### **Phenotypic attributes (biodiversity)**

A distinct variant of a phenotypic characteristic of an organism; it may be either inherited or determined environmentally, but typically occurs as a combination of the two (Lawrence, 2005).

#### **Phenotypic plasticity**

The capacity of a single genotype to exhibit a range of phenotypes in response to variation in the environment (Whitman & Agrawal, 2009).

#### **Phylogenetic diversity**

Although species richness is a commonly used measure of biodiversity, it fails to capture the reality that species without close relatives contribute more uniqueness than do species with many close relatives. Phylogenetic diversity is used as a general term for a range of measures that consider the total length of all the branches linking a set of species on their phylogeny ("evolutionary tree") and so reflect species' evolutionary uniqueness. One of the first such measures (Faith, 1992) is simply the sum of the branch lengths.

#### **Phylum**

A major taxonomic grouping of animals linked by having a similar general body plan and thought to be a clade. In plants the similar category is called a division (Lawrence, 2005).

#### **Plankton**

Aquatic organisms that drift or swim weakly. Phytoplankton are the plant forms of plankton (e.g., diatoms), and are the dominant plants in the sea. Zooplankton are the animal forms of plankton. Picoplankton are all forms of plankton which size is comprised between 0.2 and 2 micrometers (mostly bacteria) (Mullin, 2001).

#### **Poaching**

Animal killing or trapping without the approval of the people who controls or own the land (Survival International, 2018).

#### **Pollination**

The transfer of pollen from an anther to a stigma. Pollination may occur within flowers of the same plant, between flowers of the same plant, or between flowers of

different plants (or combinations thereof) (IPBES, 2016).

#### **Polycentric governance**

An organizational structure where multiple independent actors mutually order their relationships with one another under a general system of rules. There are different types of polycentric governance arrangements. (Ostrom, 2010).

#### **Polyphyletic taxon**

A group composed of a collection of organisms in which the most recent common ancestor of all the included organisms is not included, usually because the common ancestor lacks the characteristics of the group. Polyphyletic taxa are considered "unnatural", and usually are reclassified once they are discovered to be polyphyletic (University of California Museum of Paleontology, 2009).

#### **Population bottleneck**

A decrease in the gene pool of the population due to an event that drastically reduces the size of that population, such as an environmental disaster, the hunting of a species to the point of extinction, or habitat destruction that results in the deaths of organisms. Due to the event, many alleles, or gene variants, that were present in the original population are lost and the remaining population has a very low level of genetic diversity (Nature, 2017).

#### **Population genetic structure**

The total genetic diversity and its distribution within and among a set of populations. It is shaped by many factors, including life history, population size, geographical or environmental barriers, gene flow, selection and population crashes or bottlenecks (Gilleard & Redman, 2016).

#### **Pore-water pressure**

The pressure exerted by a fluid phase in a porous medium (soil or rock) composed of a solid framework and pores filled or partially filled with water or other fluid (Reid, 2013).

#### **Poverty**

Poverty is, at the most basic level, a state of economic deprivation. Its manifestations include hunger and malnutrition, limited access to education and other basic services. Other corollaries of poverty are social discrimination and exclusion as well as the lack of participation in decision-making.

#### **Primary vegetation**

Vegetation in a particular plant assemblage that has not been subject to human disturbance, or has been so little affected that its natural structure, functions and dynamics have not undergone any change that exceed the elastic capacity of the ecosystem (IUCN, 2012a).

#### **Prior, informed consent (PIC)**

See 'Free, prior and informed consent (FPIC)'.

#### **Private deforestation (see deforestation)**

Deforestation occurring on private lands.

#### **Protected area**

A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated values to people. There are multiple categories of protected areas, including and excluding people from within its boundaries.

#### **Protected Area Downgrading, Downsizing and Degazettement (PADDD)**

Refers to legal changes that ease restrictions on the use of a protected area, shrink a protected area's boundaries or eliminate legal protections entirely (Mascia & Pailler, 2011).

## **R**

#### **Reactive nitrogen**

All biologically, photochemically, and/or radiatively active forms of nitrogen; a diverse pool of nitrogenous compounds that includes organic compounds (e.g., urea, amines, proteins, amides), mineral nitrogen forms, such as nitrates and ammonium, as well as gases that are chemically active in the troposphere (NO<sub>x</sub>, ammonia, nitrous oxide) and contribute to air pollution and the greenhouse effect (FAO, 2018a).

#### **Rebound effect**

The pattern by which resource users tend to compensate for improved efficiency by shifting behaviour towards greater consumption, which undermines apparent gains. For example, an increased fuel saving of motor vehicle tends to be compensated by spending more money on other resources or by driving more (Alcott, 2005).

#### **Recruitment (species)**

The influx of new members into a population by reproduction or immigration (IUCN, 2012a).

**REDD+****(Reducing emissions from deforestation and forest degradation)**

Mechanism developed by Parties to the United Nations Framework Convention on Climate Change (UNFCCC), which creates a financial value for the carbon stored in forests by offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. Developing countries would receive results-based payments for results-based actions. REDD+ goes beyond simply deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

**Reduced impact logging (RIL)**

The intensively planned and carefully controlled implementation of timber harvesting operations to minimize the environmental impact on forest stands and soils (FAO, 2018a).

**Reforestation**

Planting of forests on lands that have previously contained forests but that have been converted to some other use (IPCC, 2014a).

**Regime**

A long-term qualitative behaviour where the system's dynamics tend to stabilize, at different spatial and temporal scales in marine, terrestrial and polar systems (Rocha *et al.*, 2015).

**Regime shift**

Substantial reorganization in system structure, functions and feedbacks that often occurs abruptly and persists over time.

**Remediation**

Any action taken to rehabilitate ecosystems after their degradation.

**Remote sensing**

Methods for gathering data from a distance. In environmental studies and in monitoring, it usually refers to the use of satellite or airborne sensors to examine conditions and changes over large regions or landscape-scale analysis; often used in conjunction with Geographic Information Systems and often involves validation through on-the-ground activities (adapted from IUCN, 2012a).

**Representation concentration pathways (RCPs)**

Scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and chemically active gases, as well as land use/land cover (IPCC, 2014a).

**Resilience**

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

**Restoration**

Any intentional activities that initiates or accelerates the recovery of an ecosystem from a degraded state.

**Re-wilding**

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

**Richness (biodiversity)**

The number of distinct biological entities (typically species, but also genotypes, taxonomic genera or families, etc.) within a given sample, community, or area (Millennium Ecosystem Assessment, 2005).

**S****Sacred groves**

A particular type of sacred natural sites represented, for instance, by patches of forest revered as sacred (Bhagwat & Rutte, 2006). Sacred groves may be revered e.g., as burial grounds (Mgumia & Oba, 2003) or sites of ancestral or deity worship (Ramakrishnan *et al.*, 1998). There are locally-established rules that regulate how sacred groves can be used (Hughes & Chandran, 1998). Observation of those rules often contributes to the biodiversity conservation on those sites (Bhagwat & Rutte, 2006).

**Sacred natural sites (SNS)**

Areas of land or water that have special spiritual significance to peoples and communities (Verschuuren *et al.*, 2010). They consist of natural features, ranging from entire ecosystems, such as mountains, forests or islands, to single natural features such as a tree, spring or boulder, and

are very important for the conservation of nature and culture. Sacred natural sites have been managed based on indigenous and local knowledge systems, developed over long periods of time, and are source of cultural identity.

**Salinization**

The process of increasing the salt content in soil is known as salinization. Salinization can be caused by natural processes such as mineral weathering or by the gradual withdrawal of an ocean. It can also come about through artificial processes such as irrigation.

**Sea ice**

Any form of ice found at sea which has originated from the freezing of sea water (sea ice does not include superstructure icing). Ice formed from the freezing of the waters of the Great Lakes will be considered the same as sea ice (NOAA's National Weather Service, 2009).

**Seascape**

The marine equivalent to landscape, which describes marine and coastal ecosystems defined primarily by their biological and environmental structure but also by ecosystem functioning, e.g., reefs shaped by corals living in symbiosis with microalgae and associated to a rich additional fauna comprising invertebrates and fish.

**Second-growth forest**

Regenerating forest after disturbance, such as fire or clear-cutting (IUCN, 2012a).

**Sedimentary upper slope**

Refers to the upper part of continental slopes. See 'Continental slope'.

**Selection pressure**

The effect of any feature of the environment that results in natural selection, e.g., food shortage, predator activity, competition from members of the same or other species (Lawrence, 2005).

**Semi-natural habitats**

An ecosystem with most of its processes and biodiversity intact, though altered by human activity in strength or abundance relative to the natural state.

**Sense of place**

Characteristics that make a place special or unique, as well as to those that foster a sense of authentic human attachment and belonging (Casey, 2001).

**Sessile**

Attached or stationary, as opposed to free-living or motile (Lawrence, 2005).

**Shale gas**

Natural gas from shale formations (European Commission, 2018).

**Shamanism**

A system that links people to the vital forces of nature, especially the soul or inner-self of non-humans or nature spirits, through the mediation of a specialist, the shaman. Shamans are generally trained through enduring experiences including the consumption of psychotropic substances that lead them to experience spiritual connections that are mobilized to combat illness and any dangers that may affect their community.

**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-fuelled development (SSP5) and middle-of-the-road development (SSP2). The combination of SSP-based socio-economic scenarios and Representative Concentration Pathway (RCP)-based climate projections provides an integrative frame for climate impact and policy analysis (IPCC, 2018).

**Shelf ecosystems**

See 'Continental shelf'.

**Shifting cultivation**

An agricultural system in which plots of land are cultivated temporarily, then abandoned to regenerate soil fertility by the regeneration of natural vegetation; the system can continue to produce food and materials even after abandoned. The system involves 1) the removal of the natural vegetation (usually forest or shrub land) in most cases (though not exclusively) by cutting and subsequent burning, mulching, or their combinations (such as in slash-and-burn, slash-and-mulch); 2) an alternation between a short duration of cultivation and a comparatively long duration of bush or forest fallow (such as in swidden agroforestry); and 3) the regular, in most cases cyclical, shifting of field (Erni, 2015). Shifting cultivation systems are found around the world, particularly in tropical areas, in a wide range of soils and vegetation types, under a diversity of land and resource management, using

different crops and cultivation methods, and are practiced by innumerable Indigenous Peoples and Local Communities (Heinimann *et al.*, 2017; Nye & Greenland, 1960).

**Slash-and-burn agriculture**

See 'Shifting cultivation'.

**Small-scale or non-industrial fisheries**

Traditional fishing performed by family and/or community units rather than commercial units, using a relatively small amount of capital and energy, and carrying out short fishing trips close to coasts and mainly for local consumption (FAO, 2018a).

**Social capital**

As used in the global assessment, social capital refers to networks together with shared norms, values and understandings that facilitate co-operation within or among groups. Put together, these networks and understandings engender trust and so enable people to work together (OECD, 2007a). The term is also used in other ways, such as to refer to assets facilitating the achievement and/or maintenance of individual and family goals and privileges (Brondizio, *et al.*, 2009).

**Social network**

A network of social interactions and personal relationships.

**Social norms**

A social norm is what people in a group generally agree as shared expectations guiding individual and collective behaviour and action, that is, believed to be a typical action, an appropriate action, or both, and without necessarily representing a formal rule (adapted from Mackie *et al.*, 2015).

**Social welfare**

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

**Socio-ecological production landscapes and seascapes (SEPLS)**

Dynamic mosaics of habitats and land uses where the harmonious interaction between people and nature maintains biodiversity while providing humans with the goods and services needed for their livelihoods, survival and well-being in a sustainable manner (IPSI, 2018).

**Social-ecological system**

A concept used in a variety of analytical approaches intended to examine the mutual and interdependent relationship between people and nature as inter-linked, recognizing that humans should be seen as a part of, not apart from, nature (Berkes & Folke, 1998), and nature as inter-linked to social systems (Ostrom 2009).

**Soil compaction**

An increase in density and a decline of porosity in a soil that impedes root penetration and movements of water and gases.

**Soil degradation**

An alteration of soil properties which cause negative effects on one or more soil functions, human health or the environment (ISO, 2013). Also see 'Habitat degradation' and 'Land degradation'.

**Soil fertility**

The capacity of a soil to receive, store and transmit energy to support plant growth. It is the component of overall soil productivity that deals with its available nutrient status, and its ability to provide nutrients out of its own reserves and through external applications for crop production (FAO, 2018c).

**Soil organic matter (SOM)**

Matter consisting of plant and/or animal organic materials, and the conversion products of those materials in soils (FAO & ITPS, 2015).

**Species**

An interbreeding group of organisms that is reproductively isolated from all other organisms, although there are many partial exceptions to this rule in particular taxa. Operationally, the term species is a generally agreed fundamental taxonomic unit, based on morphological or genetic similarity, that once described and accepted is associated with a unique scientific name (Millennium Ecosystem Assessment, 2005).

**Species composition**

The array of species in a specific sample, community, or area.

**Species extirpation**

The local extinction of a species.

**Species traits**

The morphological, physiological, phonological or behavioural characteristics of an organism, that typically inform about its response to the environment and effects

on the ecosystem (Lavorel & Garnier, 2002; Violle *et al.*, 2007).

### **Species-area relationship**

A well-known strong empirical relationship between the area (A) of a region or patch of habitat and the number of species (S) it contains. Over most spatial scales, a power-law relationship  $S = cAz$  provides a good fit to data, with  $z$  often around 0.25 for separate sets of regions (known as the island species-area relationship) and 0.15 for nested parts of the same region (known as the continental species-area relationship). The species-area relationship has often been used to estimate the size of an extinction debt (qv) resulting from habitat loss (Rosenzweig, 1995).

### **Spillover effects/off-site effects**

Human impacts or natural disturbances beyond system boundaries. These effects can be positive or negative, socioeconomic or/and environmental and can be much more profound than the effects within the focal system (Liu *et al.*, 2013).

### **Stability (social-ecological system)**

The degree to which a system can continue to function if inputs, controls, or conditions are disrupted. It is a reflection of how minor a perturbation is capable of rendering the system inoperable or degraded; the types of perturbation to which the system is especially vulnerable; whether the system can "ignore" certain stresses; and the degree to which the system can be altered by surprise (Kerner & Thomas, 2014).

### **State (social-ecological system)**

The collection of variables that describe the whole of the social-ecological system, including the attributes of ecosystem service providers and beneficiaries (Harrington *et al.*, 2010).

### **Stewardship practices**

The responsible use and protection of the natural environment through conservation actions, active restoration and the sustainable use and management of resources (Bennett *et al.*, 2018).

### **Stratification (water column)**

The formation of layers of water masses with different properties - salinity, oxygenation, density, temperature - that act as barriers to water mixing. These layers are normally arranged according to density, with the least dense water masses sitting above the more dense layers (Miller & Wheeler, 2012).

### **Subsistence agriculture**

Farming system emphasizing production for use rather than for sale (FAO, 1998), but it may also involve some level of market-oriented production.

### **Succession (ecological)**

The process whereby communities of plants, animals and microorganisms are replaced by others, usually more complex, over time as an area is colonized. Primary succession occurs on bare ground (e.g., after a volcanic eruption); secondary succession follows the interruption of a primary succession, e.g., after disturbances such as logging, ploughing or burning (Lawrence, 2005).

### **Sustainability**

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

### **Sustainable community forestry**

Forestry management strategies and practices designed to meet present needs of forest resource use without compromising the needs and options of future generations.

### **Sustainable development**

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

### **Sustainable use**

The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations (Convention on Biological Diversity, 1992)

### **Swidden agriculture**

See 'Shifting cultivation'.

### **Symbiosis**

A long-term interaction between two species that can often have mutual benefit for both species (IUCN, 2012a).

## **T**

### **Taboo**

A social or religious custom prohibiting or restricting a particular practice or forbidding association with a particular person, place, species or behavior.

### **Taxon / taxonomic group**

A category applied to a group in a formal system of nomenclature, e.g., species, genus, family etc. (plural: taxa).

### **Taxonomic diversity**

Variety of species or other taxonomic categories (IUCN, 2012a).

### **Telecoupling**

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'.

### **Tele-grabbing**

Transboundary acquisition of land.

### **Tenure security**

An agreement between an individual or group to land, resources, and residential property, which is governed and regulated by a legal and administrative framework and that may include both customary and statutory systems (Payne & Durand-Lasserve, 2012).

### **Territorial use rights in fisheries (TURFs)**

The restriction of access to, and use of, a particular fishing ground or site to a group or an individual. This group, usually small in size, can determine how to harvest fish from the site and to whom the fish is allocated (Ward *et al.*, 2004).

### **Threatened species**

In the IUCN Red List terminology, a threatened species is any species listed in the Red List categories Critically Endangered, Endangered, or Vulnerable.

### **Tidal flats**

Intertidal, non-vegetated, soft sediment habitats, found between mean high-water and mean low-water spring tide datums and generally located in estuaries and

other low energy marine environments (Dineen, 2010).

#### **Timber line**

The altitude (in mountains) and latitude above which trees are unable to grow — also called tree line (Lawrence, 2005).

#### **Tipping point**

A set of conditions of an ecological and/or social-ecological system where further perturbation will cause rapid change and prevent the system from returning to its former state.

#### **Total allowable catch (TAC)**

The total catch allowed to be taken from a resource within a specified time period (usually a year) by all operators; designated by the regulatory authority. Usually allocated in the form of quotas (IUCN, 2012a).

#### **Totemism**

A principle or an ontology found within societies that differentiate different sections of the society, according to the attachment of these sections to animal or plant tutelary and ancestral spirits. In other words, totemism defines discontinuities in social order according to each group's attachment to a specific animal or plant spirit that is perceived as having similar features to this section (or clan) and an inner self that also resembles people in this section (and reciprocally).

#### **Traditional and community-based management systems**

Resource management strategies and practices based on accumulated indigenous and local knowledge acquired through community-based learning processes and transmitted between successive generations, and implemented through community-based institutional arrangements.

#### **Traditional ecosystem healing principles**

Restoration and ecosystem management activities based on indigenous and local knowledge and often executed by Indigenous Peoples and Local Communities to restore and maintain the healthy functioning of ecosystems.

#### **Traditional farming**

A term used to refer to complex, diverse and locally-adapted agricultural systems, managed with time-tested through multi-generational experimentation, as well as diffusion of knowledge and practices. While the term 'traditional' is used to refer to a persisting long-term farming system, it does

not intend to imply that such systems are static (see Altieri & Koohafkan, 2008).

#### **Transformability (part of resilience)**

The capacity to cross thresholds, enter new development trajectories, abandon unsustainable actions and chart better pathways to established targets (Folke *et al.* 2010).

#### **Transformative change**

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

#### **Trophic level**

The level in the food chain in which one group of organisms serves as a source of nutrition for another group of organisms (e.g., primary producers, primary or secondary consumers, decomposers).

#### **Trophic transfer**

The transport of contaminants between two trophic levels (Suedel *et al.*, 1994).

## **U**

#### **Units of Analysis**

In the context of IPBES, a broad-based classification system of terrestrial, freshwater and marine systems at the global level, considering both the state of nature in classes equivalent to 'biomes', and classes where ecosystem structure and function have been severely altered through human management, which can be called 'anthropogenic biomes' or 'anthromes'. Seventeen units of analysis have been identified by IPBES to serve as a framework for comparison within and across assessments and represent a pragmatic solution. The IPBES units of analysis are not intended to be prescriptive for other purposes than those of IPBES assessments. They are likely to evolve as the work of IPBES develops (see chapter 1).

#### **Upscaling**

See 'Downscaling'.

#### **Upwelling**

A process in which deep, cold water rises toward the surface replacing warmer water pushed away by winds. Water that rises to the surface as a result of upwelling is typically colder and rich in nutrients, which "fertilize" surface waters, meaning that these surface waters often have high biological productivity (NOAA, 2018e).

#### **Urban ecosystems**

Any ecological system located within a city or other densely settled area or, in a broader sense, the greater ecological system that makes up an entire metropolitan area (Pickett, 2015).

#### **Urban metabolism**

A method to evaluate the flows of energy and materials within an urban system, which can provide insights into the system's sustainability and the severity of urban problems such as the impact of excessive social, community, and household metabolism at scales ranging from global to local (Zhang *et al.*, 2015).

#### **Urbanization**

The increase in the proportion of a population living in urban areas; the process by which a large number of people becomes permanently concentrated in relatively small areas, forming cities (OECD, 2001c).

## **V**

#### **Values**

- **Value systems:** Set of values according to which people, societies and organizations regulate their behaviour. Value systems can be identified in both individuals and social groups (Pascual *et al.*, 2017).
- **Value (as principle):** A value can be a principle or core belief underpinning rules and moral judgments. Values as principles vary from one culture to another and also between individuals and groups (IPBES/4/INF/13).
- **Value (as preference):** A value can be the preference someone has for something or for a particular state of the world. Preference involves the act of making comparisons, either explicitly or implicitly. Preference refers to the importance attributed to one entity relative to another one (IPBES/4/INF/13).
- **Value (as importance):** A value can be the importance of something for itself or for others, now or in the future, close by or at a distance. This importance can be considered in three broad classes. 1. The importance that something has subjectively, and may be based on experience. 2. The importance that something has in meeting objective needs. 3. The intrinsic value of something (IPBES/4/INF/13).
- **Value (as measure):** A value can be a measure. In the biophysical sciences,



any quantified measure can be seen as a value (IPBES/4/INF/13).

- **Non-anthropocentric value:** A non-anthropocentric value is a value centered on something other than human beings. These values can be non-instrumental or instrumental to non-human ends (IPBES/4/INF/13).
- **Intrinsic value:** This concept refers to inherent value, that is the value something has independent of any human experience or evaluation. Such a value is viewed as an inherent property of the entity and not ascribed or generated by external valuing agents (Pascual *et al.*, 2017).
- **Anthropocentric value:** The value that something has for human beings and human purposes (Pascual *et al.*, 2017).
- **Instrumental value:** The value attributed to something as a means to achieving a particular end (Pascual *et al.*, 2017).
- **Non-instrumental value:** The value attributed to something as an end in itself, regardless of its utility for other ends.
- **Relational value:** The values that contribute to desirable relationships, such as those among people or societies, and between people and nature, as in "Living in harmony with nature" (IPBES/4/INF/13).
- **Integrated valuation:** The process of collecting, synthesizing, and communicating knowledge about the ways in which people ascribe importance and meaning of nature's contributions to humans, to facilitate deliberation and agreement for decision making and planning (Pascual *et al.*, 2017).

(see chapter 1 for more details)

## W

### Water footprint

The water footprint measures the amount of water used to produce each of the goods and services we use. It can be measured for a single process, such as growing rice, for a product, such as a pair of jeans, for the fuel we put in our car, or for an entire multi-national company. The water footprint can also tell us how much water is being consumed by a particular country – or globally – in a specific river basin or from an aquifer (Hoekstra *et al.*, 2011).

### Water grabbing

A situation where powerful actors are able to take control of, or reallocate to their own benefits, water resources already used by local communities or feeding aquatic

ecosystems on which their livelihoods are based (Mehta *et al.*, 2012).

### Water stress

Water stress occurs in an organism when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use (European Environment Agency, 2018).

### Water use efficiency

The ratio between effective water use and actual water withdrawal. In irrigation, it represents the ratio between estimated plant water requirements (through evapotranspiration) and actual water withdrawal (FAO, 2018a).

### Welfare

See 'Social welfare'.

### Wellbeing (human)

A perspective on a good life that comprises access to basic resources, freedom and choice, health and physical, including psychological, well-being, good social relationships, security, equity, peace of mind and spiritual experience. Well-being is achieved when individuals and communities can act meaningfully to pursue their goals and can enjoy a good quality of life. The concept of human well-being is used by many countries and societies. In the context of IPBES' conceptual framework, it is used complementary and together with living in harmony with nature, and living well in balance and harmony with Mother Earth. All these are different perspectives on a good quality of life (see chapter 1).

### Wetlands

In the context of IPBES, wetlands are permanent or temporary freshwater, brackish and marine areas (floodplains, bogs, swamps, marshes, estuaries, deltas, peatlands, potholes, vernal pools, fens and other types, depending on geography, soil, and plant life) where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year. A division was made between inland waters (lakes, rivers, reservoirs) and wetlands.

### Wild habitat

See 'Natural habitat'.

### Wild relative

Wild species related to crops, including crop progenitors (FAO, 2018a).

### Wilderness

Ecosystems, landscapes and seascapes with a very low degree of human influence, at present with full recognition that they are often inhabited and managed by people, and have been so for centuries or millennia, often at low population densities, and therefore their native biodiversity and ecological and evolutionary processes have not been reconfigured by human drivers to a significant degree (Kormos *et al.*, 2017; Potapov *et al.*, 2017; Watson *et al.*, 2016). Not all areas designated as wilderness conform to this definition, especially in Europe where abandoned agricultural areas 'managed' by 'wild living' large herbivores are also called wilderness. Some wilderness areas in the world show transition to cultural landscapes with low human influence.

### Willingness-to-accept

Estimate of the amount people are prepared to accept in exchange for a certain state or good (e.g., WTA for protection of an endangered species) (IUCN, 2012a).

### Willingness-to-pay

Estimate of the amount people are prepared to pay in exchange for a certain state or good (e.g., WTP for protection of an endangered species) (IUCN, 2012a).

### Worldviews

Worldviews are defined by the connections between networks of concepts and systems of knowledge, values, norms and beliefs. Individual person's worldviews are molded by the community(ies) the person belongs to. Practices are embedded in worldviews and are intrinsically part of them, such as through rituals, institutional regimes, social organization, but also in environmental policies, in development choices, among others.

## Z

### Zoonotic disease

Zoonotic disease or zoonoses are directly transmitted from animals to humans via various routes of transmission (e.g., air - influenza; bites and saliva - rabies).

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