Draft Glossary of Terms

Used by the

International Resource Panel

Prepared by

Meghan O'Brien and Stefan Bringezu, Wuppertal Institute

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The purpose of this glossary is to develop a collection of definitions on which all Panel members agree. It shall be used by the Panel and will eventually be published online in order to enhance the public understanding of its work. Therefore, the glossary should include key terms, concepts and acronyms from all Working Groups; it should reflect the scope of work carried out by the Resource Panel.

This 0 draft builds on the version put together by Anna Bella Siriban-Manalang and Liazzat Rabbiosi, with contributions from Maite Aldaya for water-related terms. It has been compiled based on the terms and language used in the reports published by the Resource Panel and with the aid of major sources.

Cross-cutting key terms

Burden shifting	Burden shifting occurs when consumption and production happen in different places. It means that the *impacts* driven by consumption are translocated to countries where production takes place. It typically occurs between ‚developed' and ‚developing' countries. Related terms: *Problem shifting*	*	General
Circular economy	The circular economy is one in which waste materials and products are reused and recycled within the production and consumption system. It is the better use of waste for new materials.	*	General
Consumption	The use of products and services for (domestic) final demand, i.e. for households, government and investments. The consumption of resources can be calculated by attributing the life-cycle-wide resource requirements to those products and services (e.g. by *input-output* calculation).	*	General
Dematerialization	Dematerialization ultimately describes decreasing the material requirements of whole economies. It requires (a) reducing the *material-intensity* of products and services, i.e. by increasing *material efficiency*, and (b) especially reducing the use of primary material resources (such as ores, coal, minerals, metals, etc.) by improving recycling and re-use of *secondary materials* (i.e. shifting to a *circular economy*). It is frequently regarded as a necessary condition for the sustainable development of economies and is synonymous with *absolute resource decoupling.*	*	General
Ecosystem services	Ecosystem services are those functions and processes which ecosystems provide and which affect human well-being. They include (a) *provisioning services* such as food, water, timber, and fibre; (b) *regulating services* such as the regulation of climate, floods, disease, wastes, and water quality; (c) *cultural services* such as recreation, aesthetic enjoyment, and spiritual fulfilment; and (d) *supporting services* such as soil formation, photosynthesis, and nutrient cycling (MEA 2005).	*	General
Efficiency	Efficiency is a broad concept that compares the inputs to a system with its outputs; it essentially means achieving "more with less". The Resource Panel often refers to resource, material, energy and water efficiency across all levels of society, i.e. the system can refer to a production process (producing more with less) or an entire economy (achieving more usefulness with total input). Efficiency includes activities to improve *productivity* (value added / input) and minimize *intensity* (input / value added). See also: *material efficiency*, *resource efficiency*, *water efficiency*	*	General

Industrial metabolism	Societies exchange materials and energy with the surrounding natural systems and use them internally for various functions (building structures, providing energy etc.) in a similar way to the metabolism of plants, animals or humans. The 'inputs' in industrial metabolism include resources such as raw materials (including fossil fuels), water, and air. These resource inputs are transformed into products (goods and services) and are finally disposed back to the natural system in the form of outputs; mainly solid wastes, waste water and air emissions (Schütz and Bringezu 2008). The term "industrial metabolism" was coined by Ayres (1989).	*	General
Life-Cycle Assessment (LCA)	Life-Cycle Assessment (LCA) is the assessment of impacts associated with all life stages of a product or service, i.e. from the cradle to the grave. It focuses on individual product and service systems (distinguishing it from *Input-Output analysis*) and as such is often used for comparing competing goods. It involves the quantification of all relevant inputs and outputs, so that where the system boundary is drawn may cause differences in the aggregation of total environmental burden and cause controversy, for instance, with the quantification of *biofuels* (i.e. whether or not to include *indirect land use changes*).	*	General
Material flow analysis (MFA)	Material flow analysis (MFA) comprises a group of methods to analyse the physical flows of materials into, through and out of a given system. It can be applied at different levels of scale, i.e. products, firms, sectors, regions, and whole economies. The analysis may be targeted to individual substance or material flows, or to aggregated flows, e.g. of resource groups (fossil fuels, metals, minerals). Economy-wide MFA (ewMFA) is applied to whole economies and provides the basis for the derivation of indicators on the metabolic performance of countries in terms of material inputs and consumption (such as *DMI, DMC*, *TMR*, *TMC*).	*	General
Problem shifting	Problem shifting is the displacement or transfer of problems between different environmental pressures, product groups, countries or over time. See also: *burden shifting*	*	General
Rebound effect	The rebound effect happens when a positive eco-innovation on the micro level leads to negative impacts on the meso/macro level. This can happen due to a change in consumer behaviour, i.e. consumers using more of an efficient product, which – at least partly - outweighs the efficiency improvements per unit of that product.	*	General
Resource decoupling	Resource decoupling means delinking the rate of use of primary resources from economic activity. Absolute resource decoupling would mean that the *Total Material Requirement* of a country decreases while the economy grows. It follows the same principle as *dematerialization*, i.e. implying the use of less material, energy, water and land to achieve the same (or better) economic output.	*	General

	See also: *decoupling*, *absolute decoupling*, *relative decoupling*		
Resource efficiency	Resource efficiency is an overarching term describing the relationship between a valuable outcome and the input of natural resources required to achieve that outcome. It is the general concept of using less resource inputs to achieve the same or improved output (resource input/output). It indicates the effectiveness with which resources are used by individuals, companies, sectors or economies. Resource efficiency can be achieved by increasing *resource productivity* (value added / resource use) or reducing *resource intensity* (resource use / value added). See also: *efficiency*, *material efficiency*	*	General
Resource intensity	Resource intensity depicts the amount of natural resources used to produce a certain amount of value or physical output. It is calculated as resource use / value added or as resource use / physical output. Resource intensity is the inverse of *resource productivity*. See also: *intensity*, *material intensity*	*	General
Resource productivity	Resource productivity describes the economic gains achieved through resource efficiency. It depicts the value obtained from a certain amount of natural resources. As an indicator on the macro-economic level total resource productivity is calculated as GDP/TMR (OECD 2008). It may be presented together with indicators of labour or capital productivity. Resource productivity is the inverse of *resource intensity*. See also: *productivity*, *material productivity*	*	General
Resources	In the context of the Resource Panel, resources refer to the natural resources used by economies. They include abiotic materials (fossil fuels, metals and minerals), biomass, water, and land. In general, resources can be seen as 'gifts' of the natural system that can be used in the economic system, but which are not part of the economic system. See also: *abiotic resources*, *biotic resources* and *renewable resources*	*	General
Sustainable Resource Management	Sustainable resource management means both (a) ensuring that consumption does not exceed levels of *sustainable supply* and (b) ensuring that the earth's systems are able to perform their natural functions (i.e. preventing disruptions like in the case of GHGs affecting the ability of the atmosphere to 'regulate' the earth's temperature). It requires monitoring and management at various scales. The aim of sustainable resource management is to ensure the long-term material basis of societies in a way that neither resource extraction and use nor the deposition of waste and emissions will surpass the thresholds of a *safe operating space.*	*	General
Trade-off	Trade-off describes a situation where one option occurs at the expense of another. The Resource Panel describes trade-offs between environmental impacts (e.g. renewable energy technology and critical metal consumption) as well as social, ecological and economic objectives (e.g. cropland expansion and biodiversity loss).	*	General

Work Group specific key terms (5 per workgroup)

Biofuels

Bioenergy	Bioenergy describes all types of biomass used to convert its energy content into useful energy (heat and power). It Includes crops and trees grown specifically for energetic purposes as well as agricultural residues, forest products waste and municipal waste that can be used to provide heat and power for households and industrial processing.	* Biofuels
Biofuels	Biofuels are combustible materials directly or indirectly derived from biomass, commonly produced from plants, animals and micro-organisms but also from organic wastes. The Resource Panel uses the term biofuel to describe all uses of biomass for energetic purposes, meaning that biofuels may take solid, liquid or gaseous form. When the terms first, second or third-generation biofuels are used, they typically refer to biofuels used in the transport sector. See also: *first-generation biofuels, second-generation biofuels*, *third-generation biofuels*	* Biofuels
Cascading use	Cascading use in general means a sequence of use phases with declining product value. Cascading allows the use of materials to be extended. For instance, using biomass as a production material first, then recycling it (several times) before finally recovering the energy content from the resulting waste at the end of its lifecycle. Such cascading systems may provide general advantages for climate change mitigation and ease land use pressure.	* Biofuels
Indirect land use change (iLUC)	Indirect land use change is land conversion caused by the displacement of agricultural production. It occurs, for example, when land used for growing a certain food crop or for animal grazing is used for biofuel production, causing cropland expansion elsewhere to grow that food crop or to graze those animals.	* Biofuels
Third-generation biofuel	Third-generation biofuels typically refer to algae fuel. Algae are feedstocks from aquatic cultivation for production of triglycerides (from algal oil) to produce biodiesel. The processing technology is basically the same as for biodiesel from second-generation feedstocks. Other third-generation biofuels include alcohols like bio-propanol or bio-butanol, which due to lack of production experience are not usually considered to be relevant as fuels on the market before 2050. See also: *biofuels*	* Biofuels

Decoupling

Decoupling	In general, decoupling means removing the link between two variables. The Resource Panel often refers to *resource decoupling* (the delinking	* Decoupling

	of economic growth and resource use) and *impact decoupling* (the delinking of economic growth and negative environmental impacts). The term *double decoupling* refers to delinking economic growth from resource use and from environmental impacts. Moreover, decoupling can be *relative* (e.g. the *rate* of resource use increase is lower than the *rate* of economic growth) or *absolute* (e.g. resource use declines while the economy grows).		
Double decoupling	Double decoupling is when economic development is decoupled from resource use *and* resource use is decoupled from the generation of environmental impacts. See also: *decoupling*	*	Decoupling
Absolute decoupling	Absolute decoupling is a shorthand description of a situation in which resource productivity grows faster than economic activity (GDP) and thus resource use is absolutely declining.. See also: *decoupling*, *relative decoupling* and *double decoupling*	*	Decoupling
Relative decoupling	In relative decoupling the growth rate of the environmentally relevant parameter (e.g. resources used or environmental impact) is lower than the growth rate of the relevant economic indicator (for example GDP). See also: *decoupling*	*	Decoupling
Impact decoupling	Impact decoupling refers to the delinking of economic output and/or resource use from negative environmental impacts. See also: *decoupling*, *impacts*	*	Decoupling

Environmental Impacts

Impacts	The term impact is used by the Resource Panel to refer to negative environmental impacts. These are the unwanted side-effects of economic activities and can take the form of a loss of nature or biodiversity, as well as diminished human health, welfare or well-being. Impacts can be intentional (e.g. land conversion impacts habitat change and biodiversity) or unintentional (e.g. humans may inadvertently alter environmental conditions such as the acidity of soils, the nutrient content of surface water, the radiation balance of the atmosphere, and the concentrations of trace materials in food chains). Impacts occur across all stage of the life cycle, from extraction (i.e. groundwater pollution) to disposal (i.e. emissions). "Impacts" in an LCA-context correspond to "pressures" in the DPSIR framework. See also: *pressures*	*	Env Impacts
Pressure	The Resource Panel uses the term pressure to describe environmental pressures. These are pressures evoked by human activities (commonly tied to the extraction and transformation of materials and energy) that are changing the state of the environment and leading to negative	*	Env Impacts

	environmental *impacts*. Priority environmental pressures identified by the Millennium Ecosystem Assessment are habitat change, pollution with nitrogen and phosphorus, overexploitation of biotic resources such as fisheries and forests, climate change, and invasive species.		
Driving force – Pressure – State – Impact – Response (DPSIR) framework	The DPSIR framework aims to provide a step-wise description of the causal chain between economic activity (the driver), the pressures (e.g. land use change, emissions of pollutants), changes in the state of the environment (e.g. land cover change, eutrophication) and impacts (such as the loss of nature or biodiversity and diminished human health, welfare or well-being) which leads to a societal response which changes the driving forces in order to reduce the impacts (UNEP 2010b).	*	Env impacts
Input-output (I-O) method	Input-output tables describe the interdependence of all production and consumption activities in an economy. In an input-output model, the economy is represented by industry sectors (including resource extraction, processing, manufacturing and service sectors) and final demand categories (including households, government,, investment, export, and stock changes). Integrating information on emissions and resource use caused by sectors and final demand allows "environmentally extended IO tables (eeIOT)" to be provided; these can be used to calculate environmental pressures induced by production sectors or final demand categories in a way a similar to value-added or labour (UNEP 2010b).	*	Env impacts
Life-Cycle Impact Assessment	Life-cycle impact assessment is defined as the "phase of Life-Cycle Assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts of a product system" -ISO 14044 (2006)	*	Env Impacts

Land and Soils

Safe operating practices	Safe operating practices target the sustainability of production on a certain unit of land. As regards agriculture, sustainable practices maintain soil quality and land conditions while sustaining or increasing biomass production.	*	Land & Soils
Sustainable supply	Sustainable supply refers to the amount of resources that can be extracted and used for production and consumption before the threshold of a *safe operating space* is surpassed. At a global scale, (sustainable) levels of production equal (sustainable) levels of consumption. At a local scale, sustainable supply is aimed at by *safe operating practises*. See also: *sustainable levels*	*	Land & Soils
Safe operating space	Safe operating space is a concept developed by Rockström et al. (2009) that reflects a corridor for human development where the risks of irreversible and significant damage to global life-sustaining systems seem tolerably low.	*	Land & Soils
Sustainable levels	Sustainable levels refer to the amount of resources that can be	*	Land &

(of resource consumption)	consumed before the threshold of a *safe operating space* is surpassed. Sustainable levels of consumption require (a) globally acceptable resource extraction and (b) fair distribution. While sustainable levels typically refer to the consumption side of the picture, *sustainable supply* refers to the production side. See also: *sustainable consumption and production (SCP)*		Soils
Global land use accounting (GLUA)	Global land use accounting is a method to account for the global land use of agricultural land (GLU_A) or forestry (GLU_F) needed to supply domestic consumption of agricultural or forestry products (respectively). It follows the principles of economy-wide *material flow analysis*, meaning it is calculated using land equivalents for domestic production plus imports minus exports of all agricultural or forestry goods. Land quantities are expressed in per capita terms to enable a cross-country comparison.	*	Land & Soils

Metals

Critical metal	A critical metal is a metal of high economic importance that faces supply risks (i.e. geographical and/or geopolitical constraints) and for which there is no actual or commercially viable substitute. It is a relative concept, and the list of critical metals will vary depending upon the needs of industry, especially those of emerging technologies.	*	Metals
Materials	Materials are substances or compounds. They are used as inputs to production or manufacturing because of their properties. A material can be defined at different stages of its life cycle: unprocessed (or raw) materials, intermediate materials and finished materials. For example, iron ore is mined and processed into crude iron, which in turn is refined and processed into steel. Each of these can be called materials. Steel is then used as an input in many other industries to make finished products (UNEP 2010b).	*	Metals
Metals	Metals are elements (or mixtures of elements) characterized by specific properties, i.e. conductivity of electricity. Major engineering metals include e.g. aluminium, copper, iron, lead, steel and zinc. Precious metals include gold, palladium, platinum, rhodium and silver while specialty metals include antimony, cadmium, chromium, cobalt, magnesium, manganese, mercury, molybdenum, nickel, tin, titanium, and tungsten. Because metals are elements they are not degradable and cannot be depleted in an absolute sense: once in the environment they do not disappear, but some, like heavy metals, may accumulate in soils, sediments, and organisms with impacts on human and ecosystem health. See also: *critical metals*	*	Metals
Secondary material	A secondary material has already been used and recycled (= recycled material). It refers to the amount of the outflow which can be recovered to be re-used or refined to re-enter the production stream. One aim of *dematerialization* is to increase the amount of secondary materials used	*	Metals

	in production and consumption to create a more *circular economy*.	
Stocks	A stock is the quantity (e.g. mass) of a chosen material that exists within a given system boundary at a specific time. In terms of measurement units, stock is a level variable (i.e. it is measured in kg) as opposed to *material flows* (which are rate variables). See also: *anthropogenic stocks, hibernating stocks*, *in-use stocks*, *material stocks*	* Metals

Water

Water efficiency	Water efficiency is described by the ratio of useful water outputs to inputs of a given system or activity. It implies using less water to achieve more goods and services and entails finding ways to maximize the value of water use and allocation decisions within and between uses and sectors (Global Water Partnership 2006). See also: *efficiency*	* Water
Water footprint	The water footprint is an indicator mapping the impact of human consumption on global fresh water resources (Hoekstra 2003). The water footprint of an individual, community or business is defined as the total volume of freshwater that is used (directly and indirectly) to produce the goods and services consumed by the individual or community or produced by the business. Water use is measured in water volume consumed (evaporated) and/or polluted per unit of time.	* Water
Water harvesting	Rainwater harvesting refers to the collection of rain that otherwise would become run-off. Various sorts of rainwater harvesting techniques exist to provide drinking water, water for livestock or water for irrigating crops or gardens (FAO 2011).	* Water
Water productivity	Water productivity measures how a system converts water into goods and services. It refers to the ratio of net benefits derived from e.g. crop, forestry, fishery, livestock and industrial systems to the amount of water used in the production process (product units/m^3). Generally, increased productivity of water means increasing the volume of benefit, i.e. output, service or satisfaction from a unit of water used. When water productivity is measured in monetary output instead of physical output, we speak about 'economic water productivity'. See also: *productivity*	* Water
Water recycling	Water recycling is the re-use of water from one economic activity for the same or another activity after significant treatment. It requires the treatment and disinfection of municipal wastewater to provide a water supply suitable for non-potable reuse, i.e. for non-drinking purposes such as landscape irrigation, toilet flushing, ornamental fountains, industrial cooling, creating ponds, and dust control at irrigation sites.	* Water

Terms

Abandoned land	Abandoned land is land that was once cultivated, but is no longer used for agriculture. It may comprise *degraded land* with low productivity or land with high productivity. Set-aside land does not belong to this category. See also: *degraded land*, *'marginal' land*	Land & Soils
Abiotic resources	Abiotic resources are non-living resources that cannot regenerate by themselves. They include fossil fuels, *metals* and *minerals*. Therefore, they are often called *non-renewable resources* (UNEP 2010b).	Env Impacts
Acidification (soil)	Acidification of soils refers to the reduction of soil pH. It can occur naturally and soils have different levels of susceptibility, but it is also exacerbated as a result of continual removal of crops (which remove alkalinity from the soil in order to compensate carbon dioxide assimilation). Farmers control acidification by application of lime or other alkaline minerals.	Land & Soils
Aggregation methods	Aggregation is used to make different environmental impacts comparable (normalization). It involves normative assumptions on the relative weight between different impacts (e.g. global warming, eutrophication). For instance, *ecological footprints* are an aggregation of environmental pressures (to land units) based on the concept of biocapacity. Other methods include monetary aggregation (putting a price on impacts by contingency valuation), distance-to-target normalization or weighting (for instance through expert judgement).	Env impacts
Agricultural land	According to the FAO classification, agricultural area (or land) refers to the sum of all areas under *arable land*, permanent crops and permanent meadows and pastures (FAOSTAT).	Land & Soils
Agricultural productivity	In general productivity is a comparison of inputs to outputs. Agricultural productivity often describes yield rates (i.e. harvest per hectare).	Biofuels
Agro-ecological zoning	Agro-ecological zoning is one method to prevent agricultural land expansion from encroaching on valuable natural systems. It aims to distinguish land with the potential for production from land that has a high value for biodiversity.	Biofuels
Agroecology	Agroecology does not refer to any specific type of farming system per se, but rather to a body of principles. The key principles of agroecology are (1) recycle and re-use all available biomass; (2) grow the plants by building the soils; (3) minimize losses of growth factors above and below ground; (4) maximize species and plant diversity; and (5) enhance beneficial biological interactions and synergies.	Land & Soils

Anthropogenic metal stocks	Anthropogenic metal stocks refer to the *stocks* of metal in society. They have already been extracted, processed, and put into use, and are currently providing service as parts of buildings, infrastructures or products (i.e. *in-use stocks*). After use, metals may be discarded and enter waste deposits (another type of stock), or they are dissipated over time, entering the environment.	Metals
Arable land	According to the FAO classification, arable land is the land under temporary agricultural crops (multiple-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (less than five years). It does not include *abandoned land* resulting from shifting cultivation and is not meant to indicate the amount of land that is potentially cultivable (FAOSTAT).	Land & Soils
Biodiversity	The Millennium Ecosystem Assessment (MEA 2005) defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems." Biodiversity forms the foundation for *ecosystem services*.	Land & Soils
Biogas	Biogas is a type of *biofuel* typically produced by fermentation of biomass and slurry to a gas (comprising mostly methane and carbon dioxide). While biogas from residues, waste and manure seem to mostly provide benefits, land use may be a relevant concern when facilities are fed with energy crops such as maize.	Biofuels
Biomaterials	Biomaterials refer to the use of biomass for material purposes. They encompass existing products (paper, pulp, detergents, and lubricants), modern biomaterials (pharmaceuticals, industrial oils, biopolymers and fibres) and innovative products (wood-plastic-composites, bio-based plastics, etc.). Biomaterial markets are expected to grow as the options to substitute fossil raw materials in production industries appears limited, however, they may also exacerbate land use pressure through competition with food and bioenergy for land and water resources.	Land & Soils
Biotic resources	Biotic resources are living resources. They include plants and agricultural crops, timber, fish and animals that bring use benefits today or that may do so in the future (OECD 2002).	Env Impacts
Bottom-up approach	Bottom-up approaches analyse a system by first gathering information about its components and then aggregating to generate data on the sub-systems and system itself. It is the opposite of a *top-down* strategy. In *anthropogenic metal stock* estimation, a bottom-up approach is used to gather information on stock variables in a system in order to estimate *in-use stock*, and (if desired) infer the behaviour of *flows*.	Metals
Built-up land	Built-up land or the "built environment" refer to areas covered by infrastructures, buildings and settlements. A significant part of built-up	Land & Soils

	land is sealed by artifical surfaces.	
Carbon debt	The carbon debt is the time necessary to counterbalance the CO_2 emissions resulting from the conversion of native ecosystems to cropland. It calculates how much carbon is released by mobilising the carbon stocked in the vegetation and organic matter above and below ground. In the case of biofuels, the carbon debt is used to indicate how long biofuels produced on that land area must be driven to compensate for the emissions caused by *land use change*. Determining the carbon debt critically depends on the assumptions made and parameters considered.	Biofuels
Choice editing	Choice editing describes instances where governments and/or businesses influence the choices made by consumers. For example, if a government decides to eradicate all non-energy efficient light bulbs, it choice edits by removing the choice for consumers to buy light bulbs that are not energy efficient (UNEP 2009b based on CSR).	General
Clean production	Clean production refers to manufacturing processes that minimize environmental impacts (e.g. through low use of energy and raw materials, low emissions and waste) through changes in production processes (OECD 2002).	Env Impacts
Cleaner Production	Cleaner production refers to the continuous application of an integrated preventive environmental strategy to processes, goods, and services with the aim of increasing overall efficiency and reducing risks to humans and the environment (UNEP 2009b).	Env Impacts
Climate change	According to the UNFCCC (1994) "climate change means 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."	General
Collapse	The Resource Panel uses the term collapse to refer to a rapid and uncontrolled decline of both population and welfare within a system. It may follow an overshoot (when the thresholds of a *safe operating space* have been exceeded).	Env Impacts
Cropland	Cropland is *arable land* plus permanent crops.	Land & Soils
Decarbonization	Decarbonization is a metaphor which describes an envisioned decrease in the use of fossil fuels and thereby carbon dioxide (CO_2) emissions. It occurs when the CO_2 emission-intensity of a product, service or economy is reduced. The metaphor may be misleading when interpreted as a goal to reduce the use of carbon in production and consumption irrespective of its source, as carbon can be recycled.	General
Deforestation	Deforestation refers to the clear-cutting of a forest. The FAO (2001) define it as a "change in land cover with depletion of the tree crown cover to less than 10%."	General

Degradation	Degradation refers to a deterioration in environmental quality, often triggered by a combination of causes. In agriculture, degradation may include *erosion*, compaction, *acidification*, declining soil organic matter, nutrient depletion, water scarcity, salinity, biological degradation and soil pollution, among others. In forestry, degradation can be caused by selective logging or by the replacement of a natural forest rich in biodiversity with a monoculture plantation.	Land & Soils
Degraded land	Degraded land has been cultivated before and become 'marginal' due to soil degradation or other impacts resulting from inappropriate management or external factors (e.g. *climate change*). See also: *abandoned land*, *'marginal' land*	Land & Soils
Depletion	Depletion of *renewable resources* refers to the part of the harvest, logging, or catch above the sustainable level of use of that resource stock (i.e. removal above levels which can be renewed). Depletion of *non-renewable resources* refers to the quantity of resources extracted (OECD 2002).	General
Direct Material Input (DMI)	DMI is an indicator derived from economy-wide *material flow analysis*. It measures the direct flows of materials that physically enter the economic system as an input, e.g. raw materials and the materials contained in products. DMI equals domestic (used) extraction plus the direct mass of imports.	General
Domestic Material Consumption (DMC)	DMC is an indicator derived from economy-wide *material flow analysis*. It measures the mass (weight) of the materials that are physically used in the consumption activities of the domestic economic system (i.e. the direct apparent consumption of materials). It excludes indirect flows, making it a less comprehensive indicator of consumption than *Total Material Consumption*. DMC equals *DMI* minus exports, i.e. domestic used extraction plus imports minus exports (OECD 2002).	General
Downcycling	Downcycling means converting waste into a new product of lesser quality and reduced functionality. For instance, when plastic is recycled into a lower grade plastic. Both downcycling and high-level recycling may contribute to reducing the need for primary extraction.	General
Eco-innovation	Eco-innovation is the introduction of any new or significantly improved product (good or service), process, organisational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle (EIO 2010).	General
Ecological Footprint	The ecological footprint represents society's burden on the planet in theoretical global hectares. It expresses how much land humanity requires to produce all the resources it consumes and to absorb all the waste it generates under the assumption that those would come from and be recycled by biotic resources (Wackernagel and Rees 1996).	General

Ecological rucksack	The ecological rucksack quantifies the primary resource requirements of products and services which do not enter the final product itself (Schmidt-Bleek 1993).	General
Economic efficiency	Economic efficiency is the process of achieving maximum benefit for minimum cost for the satisfaction of human needs and wants (Bartelmus 2010).	General
Economic growth	Economic growth is measured by indicators like Gross Domestic Product (GDP). GDP is the aggregate value of all goods purchased and used by final consumers. (UNEP 2010b)	General
Emissions	The Resource Panel uses the term emissions to refer to all material releases to air and water, including gases, effluents and radioactivity, as well as noise, heat, and light pollution.	Env Impacts
Environmentally Weighted Material Consumption (EMC)	Environmentally-Weighted Material Consumption (EMC) is an approach that combines information on the *flows* of selected specific materials in terms of apparent consumption (domestic production plus imports minus exports) with information on environmental *impacts* (e.g. per kilogram of material derived from *LCA* data).	Env Impacts
Eutrophication	Eutrophication happens when substances such as nitrates or phosphates pollute soils or water bodies. It changes the growth of soil organisms and plants, and thus effects species composition and in extreme forms may cause hypoxia (the depletion of oxygen) in water bodies, which negatively impacts fish and animal populations. Increased eutrophication may result from uncontrolled intensification of agricultural production.	Biofuels
Extensive farming	Extensive farming is a type of agricultural production system that uses small (or 'low') inputs of fertilizer, labour and capital in relation to the size of the land area being farmed. It is the opposite of *intensive farming*. Whereas intensive farming may require less land extension to produce more harvest, extensive farming is usually associated with lower impacts, such as eutrophication, and higher levels of biodiversity.	Land & Soils
Externalities	Externalities are by-products of economic activities that are not reflected in market prices. They affect the well-being of people or damage the environment and are often associated with production processes (e.g. in developing countries) that are far apart from consumption (e.g. in developed countries).	General
First-generation biofuels	First-generation biofuels are biofuels in the first phase of development; they are the biofuels commercially produced today using conventional technology. The basic feedstocks include seeds, grains, or whole plants from crops which are otherwise used for food and feed such as corn, sugar cane, rapeseed, wheat, sunflower or oil palm. The most common first-generation biofuels are bioethanol, followed by biodiesel, vegetable oil, and *biogas*.	Biofuel

	See also: *biofuels*	
Food security	"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food for a healthy and active life. This involves 4 conditions: adequacy of food supply or availability; stability of supply, without fluctuations or shortages from season to season or from year to year; accessibility to food or affordability; and quality and safety of food." -World Food Summit (1996)	Land & Soils
Geological stocks	Geological stocks are natural or virgin stocks of *metals* or other *minerals* deposited by geological processes in concentrations suitable for being extracted and processed, now and in the future (UNEP 2010c).	Metals
GHG balance (of biofuels)	The GHG balance of biofuels is a comparison of the GHG emissions associated with biofuel production and use compared to fossil fuel production and use. If it is positive, biofuels emit fewer GHG emissions than fossil fuels. It is calculated using *LCA* methodology, but results depend critically on the feedstock, technology considered and boundary conditions assumed (especially *land use change*).	Biofuels
Global Warming Potential (GWP)	Global warming potential (GWP) is an indicator of how much heat a greenhouse gas (GHG) traps in the atmosphere (usually over 100 years), contributing to the greenhouse effect. Carbon dioxide (CO_2) is used as the baseline (meaning it has a GWP of 1) so that GWP expresses the contribution of different GHGs (there are over 60) to climate change in relation to CO_2. For instance CH_4 has a GWP of 25—meaning it is 25 times more effective at trapping heat than CO_2--and N_2O has a GWP of 298.	Biofuels
Green economy initiative	The UNEP-led Green Economy Initiative (GEI) consists of "several components whose collective overall objective is to make a macroeconomic case for, and provide guidance on, investing in green sectors and in greening brown sectors. The initiative is to demonstrate that investing in sectors such as renewable energies, clean and efficient technologies, water services, and sustainable agriculture can contribute to economic growth, creation of decent jobs, social equity, and poverty reduction while addressing climate and other ecological challenges". -UNEP 2009b	General
Hibernating stocks (metals)	Hibernating *stocks* refer to *metals* that are no longer in use, but not yet recovered and recycled, for instance metals in obsolete undersea cables or end-of-life products stored in cellars. While these metals may be potentially reusable, their recovery may not be economically feasible.	Metals
High External Input' (HEI) agriculture	High External Input agriculture uses large amounts of chemical inputs (fertilizer, pesticides), hybrid seeds and mechanized irrigation systems. It describes the agriculture management techniques which emerged during the Green Revolution. It is synonymous to *intensive farming*.	Land & Soils
In-use stocks	The *metal* portion of in-use stock can be defined in two ways. If an	Metals

(metals)	individual element is specified, it refers to the total mass of that element, regardless of its chemical form, being used in a given system at a given time. If a metal alloy is specified, in-use stocks refer to the total mass of that alloy (including all its constituent elements). Most studies use a time-scale of one year and a system boundary corresponding to an industrial sector or to a geopolitical boundary (i.e. city, region or country).	
Indicator	Indicators are measurable and directionally reliable quantitative parameters that reduce and reflect the complexity of facts and situations. Environmental indicators point to, provide information about and/or describe the state or performance characteristics of an observed system (e.g. on environmental pressures, conditions and responses) (OECD 2007). Every indicator answers certain target question(s).	General
Indirect (material) flows	Indirect (material) flows encompass the upstream material requirements needed to produce an imported product, but which are not physically embodied in the product itself. As such, indirect flows reflect the life-cycle dimension of the production chain and are also called hidden flows or *ecological rucksacks*. See also: *material flows*	General
Intensity	Intensity describes the amount of inputs needed to obtain a unit of output. In the context of resource use, inputs refer to the "use of nature" (e.g. materials / energy / pollution) and outputs refer either to value added (e.g. GDP) or physical variables (e g. mass). Intensity is the inverse of efficiency or *productivity*. See also: *efficiency*, *resource intensity*, *material intensity*	General
Intensive farming	Intensive farming is a type of agricultural production system that uses high inputs of fertilizer, pesticides, labour and capital in relation to the size of the land area being farmed. It is the opposite of *extensive farming.* Intensification may be associated with rising impacts and *externalities* such as biodiversity loss, salinization, *soil erosion*, *eutrophication*, and agrochemical contamination, resulting in both environmental and health effects.	Land & Soils
Land grabbing	Land grabbing is a somewhat controversial term that describes large-scale land acquisition – be it purchased or leased – for agricultural production by foreign investors. It received much media attention in the first decade of the 21st century through cases where 'land grabbing' was accompanied by violations of human rights and exacerbated environmental consequences.	Land & Soils
Land use change (LUC)	Land use change is a term to describe conversion between various types of land use, for instance the expansion of *built-up land* at the expense of *agricultural land* or the expansion of agricultural land at the expense of grasslands, savannahs and forests. Land use change is often associated with a profound alteration of land cover. It may result in a deprivation of natural capital such as shrinking natural ecosystems, losses of	Land & Soils

	biodiversity and GHG emissions, and degraded functions in the form of fertile soils. See also: *indirect land use change*	
Level	Level refers to a position along a scale. The Resource Panel performs analysis at the systems level of economies to the level of certain resource groups (such as metals), as well as assessments at the global level.	Metals
Life cycle	Life cycle is a concept used to describe the environmental burden (resource requirements and environmental impacts) of products and services from the cradle to the grave, i.e. along the extraction-production-consumption-recycling-disposal chain. See also: *life-cycle assessment*	General
Marginal land	'Marginal' land encompasses all non-cultivated areas where actual primary production is too low to allow for competitive agriculture. This type of land classification only refers to marginality in terms of agricultural production capacity; it says nothing toward the potential socio-cultural value of the land. Some 'marginal' areas may also harbour high levels of biodiversity. See also: *abandoned land*, *degraded land*	Land & Soils
Material efficiency	Material efficiency describes the relationship between the desired output of a process to the corresponding material requirement or input. If the output is an economic measure (e.g. value added or GDP) the term *material productivity* is used. Material efficiency may be achieved, for example, through improved product design, reduced production waste or process innovation. See also: *material productivity (companies)*, *material productivity (economies)*, *resource efficiency*	General
Material Flow	In *material flow analysis*, flows refer to inflows (inputs) and outflows (outputs) of materials that physically cross the boundary of a given system within a certain period of time (= direct flows) or are related to the production or consumption of a certain (group of) products (= indirect flows). Flows are a rate variable (i.e., kg per unit of time, kg per kg), in contrast to *stocks*. See also: *indirect flows*	General
Material input per unit of service (MIPS)	MIPS is the life cycle-wide input of natural material (MI) which is employed in order to fulfil a human desire or need (S) by technical means (Schmidt-Bleek 1993). It is used to compare the material and energy requirements of functionally comparable goods or services. MIPS accounts for five major primary material input categories: (a) abiotic materials, (b) biotic materials, (c) earth movements, (d) water and (e) air. Categories (a-c) are aggregated to provide the total material requirement (TMR), i.e. all primary material extractions besides water	General

	and air.	
Material intensity	Material intensity describes either (a) the amount of materials needed to produce a certain amount of economic value (e.g. material-input / GDP, or the inverse of MIPS) or (b) the material-input related to a physical unit of measure (e.g. material-input / weight). See also: *intensity*, *resource intensity*	General
Material productivity (companies)	At the company level, material productivity expresses the amount of economic value generated by a unit of material input or material requirement. See also: *material efficiency*	General
Material productivity (economies)	On the scale of economies, material productivity is an indicator calculated as economic growth per material input. Material productivity is measured by GDP/DMI or GDP/DMC (OECD 2008). See also: *resource productivity*	General
Material resources	Material resources are natural assets deliberately extracted and modified by human activity for their utility to create economic value (UNEP 2010).	General
Material security	Material security refers both to the availability and access to the material resources on which economies depend, as well as the ability to cope with volatility, increasing scarcity and rising prices (EIO 2011).	General
Material stock	The material stock describes the material resources contained within the built environment of an economy (in other words, the *in-use stock*).	Metals
Minerals	Minerals are solid substances with a characteristic chemical composition (normally crystalline) that are formed as a result of geological processes; they can range from pure elements to salts and to complex silicates. Minerals comprise construction minerals (sand, gravel, etc.) and industrial minerals (comprising phosphate, clays but also gems like diamonds). In a chemical sense, metal ores are also minerals, however, due to their special applications they are often considered as a separate category.	Metals
Modern bioenergy	Modern bioenergy describes biomass that is processed, either to biofuels for transport or to biomass for heat and electricity production. These are “modern” applications of biomass in contrast with traditional bioenergy (biomass used only for heat, mainly combustion of wood and dung).	Biofuels
Net Primary Production (NPP)	Net Primary Production is a measure used to describe the amount of energy produced by plants through photosynthesis after respiration. It is a useful parameter for quantifying the potential of biotic resources which could be extracted at maximum.	Land & Soils
Non-renewable	Non-renewable resources are exhaustible natural resources whose	General

resources	natural stocks cannot be regenerated after exploitation or that can only be regenerated or replenished by natural cycles that are relatively slow at human scales. Examples include *metals*, *minerals* and fossil energy carriers (OECD 2002).	
Nutrient pollution	Nutrient pollution is the contamination of soil or water bodies by too much nutrient input (i.e. nitrogen and phosphorous), for instance from fertilizer run-off. *Eutrophication* is a form of nutrient pollution.	Land & Soils
Precautionary principle	The precautionary principle can be seen as an extension of the basic principle, 'first, do no harm'. It allows policy makers to make discretionary decisions in the absence of extensive scientific consensus or information insufficient for comprehensive assessment when there is a risk of causing harm to the public or environment.	Biofuels
Production	The manufacturing of products and provision of services by industries which use raw materials and semi-manufactures (from domestic resources or imports) and convert them to products for final domestic *consumption* and export.	General
Production-consumption chain	The term production-consumption chain is often used to describe the linear system of extract, produce, and consume, and the impacts which occur across these stages.	General
Productivity	Productivity describes how much economic value can be achieved per unit of input. It is thus a type of efficiency improvement (value added / input), although more attributed to whole economic sectors and national economies rather than to single processes and technologies. The Resource Panel often refers to resource, material and water productivity. Productivity is the inverse of *intensity*. See also: *efficiency*, *resource productivity*, *material productivity*, *water productivity*	General
Renewable resources	Renewable resources stem from renewable natural stocks that, after exploitation, can return to their previous stock levels by natural processes of growth or replenishment. Conditionally renewable resources are those whose exploitation eventually reaches a level beyond which regeneration will become impossible. Such is the case with the clear-cutting of tropical forests. (OECD 2002)	General
Resource access	Resource access has to do with the ability to retrieve or use existing reserves. Because the geographic distribution of minerals is uneven throughout the world, resource access is politically sensitive and security of supply is a concern. See also: *scarcity*	General
Resource availability	Resource availability has to do with the amount of resources existing in reserves compared to the (typically growing) demands of society. See also: *scarcity*	General

Resource extraction	Resource extraction is the removal of primary ('virgin', 'native') resources or harvest from the natural environment for landscape modelling, and for extracting valuable raw materials (used and unused extraction) for subsequent processing.	General
Resource Use	Resource use of a country comprises resources used in production (both for domestic consumption and for exports).	General
Scale	Scale is "a spatial, temporal, quantitative, or analytic dimension used to measure or study a phenomenon" (Gibson et al. 2000), as with a ruler.	Metals
Scarcity	Scarcity involves limitations to the *availability* and/or *access* to natural resources. Scarcities of material resources (e.g. *critical metals*) on which economies or industries depend represent threats to *material security* of those economies or industries. Academic literature disagrees on whether resource scarcity or competition for scarce resources presents a fundamental problem or is easily solved by the market (e.g. evoking innovation) (UNEP 2010b).	General
Second-generation biofuels	Second-generation biofuels are produced from non-food sources, commonly from waste biomass, the stalks of wheat, corn stover, wood, and special energy or biomass crops. They are processed using biomass-to-liquid (BtL) technology, thermochemical conversion (mainly to produce biodiesel) or fermentation (e.g. to produce cellulosic ethanol). See also: *biofuels*	Biofuels
Soil erosion	Soil erosion is the process of soil removal and displacement caused naturally (wind, water) and/or by man—e.g. industrial agriculture has contributed to high rates of erosion. Erosion is one of the key issues that mines soils and contributes to desertification; it results in a redistribution of nutrients and a depreciation of land and soil quality.	Land & Soils
Stationary use of biofuels	Stationary use of biofuels means using biomass to generate power and heat. Generally, stationary use is generally more energy efficient than conversion to transport fuels (UNEP 2009).	Biofuels
Steady-stocks society	The steady-stocks society is one in which the inputs to the technosphere (stock of buildings and infrastructures) roughly balance with the outputs. It is a situation of flow equilibrium with no net addition to stock.	General
Substance flow Analysis (SFA)	SFA is aimed at specifying the flows of specific substances or groups of substances (like *metals*) in a system. It operates in the same way as (bulk) *material flow analysis*, only that it is focused more on identifying element flows. The Resource Panel typically refers to SFA in association with metal flows at the economy-wide level.	Metals
Substitution	Substitution is used by the Resource Panel to mean the replacement of certain materials for other materials.	General

Sustainable consumption and production (SCP)	The Norwegian Ministry of Environment defined sustainable consumption and production at the Oslo Symposium in 1994 as the "use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations".	General
Top-down approach	A top-down approach gathers data at a systems level in order to break it down to gain insights into the sub-system or components. It is the opposite of a *bottom-up* approach. In *anthropogenic stock* estimation, Top-down estimations take information regarding flows, and infer metal stocks in society by computing the cumulative difference between inflow and outflow.	Metals
Total Material Consumption (TMC)	TMC measures all primary material resources (besides water and air) used for domestic consumption. It is an indicator derived from economy-wide *material flow analysis*. TMC equals *TMR* minus exports and their indirect (=used and unused) flows.	General
Total Material Requirement (TMR)	TMR measures all primary material resources (besides water and air) used for domestic production. It is an indicator derived from economy-wide *material flow analysis*. It refers to the total 'material base' of an economic system as it measures the total mass (weight) of all materials required to support that system, including *unused domestic extraction* and *indirect flows*. As such, TMR is more comprehensive than *DMI*.	General
Traditional biomass	Traditional biomass is a term that refers to the un-processed use of biomass, including agricultural waste, forest products waste, collected fuel wood, and animal dung. It is burned in stoves or furnaces to provide heat energy for cooking, heating, or agricultural and industrial processing, especially in rural areas.	Biofuels
Unused extraction	Unused extraction is a term emerging from *material flow analysis* that describes the excavation of natural material in order to get access to more precious materials (e.g. overburden from mining activities), for infrastructure building and maintenance (e.g. soil and earth movements, dredging), and harvest losses in agriculture, forestry and fisheries (e.g. by-catch). While unused extraction is not considered in the indicator *Direct Material Input*, it is included in the *Total Material Requirement*.	General

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