- **Climate Change**

  "Short_description": “Climate change refers to the long-term shifts in temperatures and weather patterns largely caused by human activities producing heat-trapping gases such as Carbon dioxide, Methane and Nitrous Oxide, mostly resulting from burning fossil fuels, raising livestock and using fertilisers. This warming up of the atmosphere results in the kinds of severe weather events we’re seeing more and more of: floods, heatwaves, forest fires and other catastrophes threatening lives and homes. Climate change is measured in terms of Global Warming Potential in kilograms of Carbon Dioxide (CO2) equivalent, or kg CO2 eq.”

  "Long_description": “Climate change refers to the long-term shifts in temperatures (aka. Global warming) and weather patterns largely caused by human activities producing heat-trapping gases. These gases trap heat in the atmosphere, hence the term “greenhouse gases” (GHG). Carbon dioxide is one such gas. We humans release it into the atmosphere by burning fossil fuels, for example fueling our cars with petrol. You’re probably also aware of Methane, which, amongst other processes, is released into the atmosphere by livestock doing what all animals inevitably have to do… their number ones and twos (and burps)! Turns out methane is around 35 times worse than CO2 when it comes to global warming. And the same goes for Nitrous oxide, mainly emitted from the use of chemical and organic (faeces) fertilisers. It might be lesser known but it is even more dangerous than CO2 in terms of warming potential: 298 times more to be precise! The warming up of the atmosphere results in the kinds of severe weather events you’re seeing more and more of on the news, floods, heatwaves, forest fires and other catastrophes threaten lives and homes. Climate change is measured in terms of Global Warming Potential in kilograms of Carbon Dioxide (CO2) equivalent, or kg CO2 eq.

- **Water Scarcity**

  "Short_description": “Water scarcity refers to the potential for actual water deprivation in a watershed, by looking at the net water used in production (how much is extracted minus how much is returned) relative to how much of it is left in that watershed. Every living thing needs water to survive, so it is critical we safeguard it!”

  "Long_description": “You've heard about carbon footprint, but what about water footprint? That’s the term being used to describe how water-intensive a product is to produce. Water scarcity refers to the potential for actual water deprivation in the area, by looking at the net water used in production (how much is taken out minus how much is returned) relative to how much of it is left in the ground. Water is precious. We need it to survive. In fact, the human body is made up of about 60% water. And we use it in many, many ways. We drink it, cook with it, use it to wash ourselves, to clean our homes, cars and other properties. We use it to irrigate crops, process ingredients, and transport the food. We’re basically totally dependent on access to it. Preserving fresh water resources is therefore necessary for sustainable human societies. And of course it’s not just about people. Virtually every living thing needs water to survive. Water scarcity is measured in terms of user deprivation potential (deprivation-weighted water consumption) in cubic metres (m3) world equivalent, or m3 world eq.”

- **Resource Use**

    - **Resource use, minerals & metals**

      "Short_description": “Without even realising it, humans consume enormous amounts of metals and minerals with every convenient food package, impressive building, and technological innovation from solar panels to cell phones. Those are all non-renewable resources, so it is important that recycling systems be put in place!”

      "Long_description": “We live in a material world, in that we rely on materials to make our lives better. Without even realising it, humans consume enormous amounts of metals and minerals with every convenient food package, impressive building, and technological innovation. These minerals and metals are used to make everything we consume: they fertilise the food we eat, they form the structures we live in, the roads we drive on, and the phones and laptops we use to communicate with one another. They even make up the batteries powering your clean electric vehicles which were invented to combat climate change in the first place. But unfortunately, those resources are finite. Once they are used up, there is no replacing them. However, the good news is, many can be recycled continuously. ‘Abiotic depletion’ is the scientific name given to using up resources at a rate beyond that of replacement, and this includes the use of non-biological resources like minerals and metal. The scarcer they get the more problematic their consumption becomes because the scarcity increases demand and this in turn increases the extraction rate of the resources through mining. Mining practices are by their very nature invasive. They pose significant environmental impacts by disturbing natural habitats and the plant and animal species they are home to. Minerals and metals resource use is measured in terms of abiotic resource depletion (ADP ultimate reserves) in kilograms of Antimony (Sb) equivalents, or kg Sb eq.

    - **Resource use, fossils**

      "Short_description": “Fossil resources like oil, coal and gas provide the vast majority of the world’s energy -about 86%. Besides the fact that their consumption contributes to air pollution, they are also finite, so once we use them up they’re gone forever. Thankfully renewable alternatives such as biomass, wind, wave and solar energy are available, although these too come at an environmental cost.",

      "Long_description": “Fossil resources like oil, coal and gas provide the vast majority of the world’s energy -about 86%. Besides the fact that their consumption contributes to air pollution, they are also finite, so once we use them up they’re gone forever. We need to use them sparingly - as in not relying on them to power 86% of the world’s energy! Thankfully renewable alternatives such as biomass, wind, wave and solar energy are available, although these too come at an environmental cost". And, they can even come with the added bonus of lower carbon outputs! ‘Abiotic depletion’ is

the scientific name given to using up resources at a rate beyond that of replacement. The scarcer they get the more problematic their consumption becomes because the scarcity increases demand and this in turn increases the extraction rate of the resources through mining. Mining practices are by their very nature invasive. They pose significant environmental impacts by disturbing natural habitats and the plant and animal species they are home to. Fossil resource use is measured in terms of abiotic resource depletion for fossil fuels (ADP-fossil), in MegaJoules (MJ)."

- **Land Use**

"Short_description": "Farmers need land to grow food. There's just no way out of that! But how they source the land, and how they work it, is a different story. Today, about half of the world's habitable area is used for agriculture (mostly livestock). The Land Use category assesses the environmental impacts of occupying, reshaping and managing land for human purposes, both in terms of how much and the quality of the land. Generally, we're talking about the decreasing availability and quality of natural habitats and potential decreasing diversity of wildlife species."

"Long_description": "Farmers need land to grow food. There's just no way out of that! But how they source the land, and how they work it, is a different story. Today, about half of the world's habitable area is used for agriculture. Land area used for livestock (pastures and producing crops for animal feed) represents 77% of that agricultural land, although livestock provides only 18% of the world's calorie intake and 37% of the world's protein intake. Cutting down forests to make way for agriculture is not great. Besides the release of greenhouse gases, this kind of activity negatively affects the quality of soils and threatens the survival of the biodiversity occupying that land. It's sad to think this could be done by something we put on our plates. The Land Use category assesses the environmental impacts of occupying, reshaping and managing land for human purposes, both in terms of how much and the quality of the land. . Generally, we're talking about the decreasing availability and quality of natural habitats and potential decreasing diversity of wildlife species. Healthy ecosystems are defined by stability and harmony. And so land use impact is typically measured as 'change'. For example, changes in soil quality such as biotic production, erosion resistance, and mechanical filtration. The land use impact category takes into account a number of things including the soil quality index, biotic production, erosion resistance, mechanical filtration and groundwater replenishment and as such the output is dimensionless, in points (pt)."

- **Human health**
    - **Ozone Depletion**

"Short_description": "We've all heard of the "hole in the ozone layer". This is caused by manufactured chemicals containing chlorine, fluorine or bromine that can deplete the ozone in the atmosphere. Ozone is vital for life because it prevents harmful ultraviolet radiation from reaching us, which could increase people's risk of skin cancers, eye cataracts, and other immune deficiency disorders."

"Long_description": “We’ve all heard of the “hole in the ozone layer”, first detected over Antarctica in 1985. Stratospheric ozone, which is 90% of the total ozone in the atmosphere, is vital for life because it prevents harmful solar ultraviolet UV-B radiation from reaching the surface of the earth, where it can increase the risk of skin cancers, eye cataracts, cause premature ageing and other immune deficiency disorders. The main cause of ozone depletion and the ozone hole is manufactured chemicals, especially manufactured halocarbon refrigerants, solvents, propellants, and foam-blowing agents (chlorofluorocarbons (CFCs), HCFCs, halons). Ozone depletion is calculated in terms of Ozone Depletion Potential (ODP), in kilograms of Trichlorofluoromethane (CFC-11) equivalent Comparative Toxic Unit for human (CTUh), or kg CFC-11 eq CTUh.”

- **Human Toxicity, Cancer**

  "Short_description": “Chemicals can be emitted to the environment (air, water, soil, etc.) during all life cycle stages of products. The production of any one product may result in the emission of hundreds of chemicals, from protecting crops with herbicides, insecticides and more. Many of these chemicals will have the potential to cause toxic impacts on humans, including cancer effects, leading to damages on human health.”

  "Long_description": “Chemicals can be emitted to the environment (air, water, soil, etc.) during all life cycle stages of products. The production of any one product may result in the emission of hundreds of chemicals, mostly because of the herbicides, insecticides, and other crop protection chemicals applied, many of which will have the potential to cause toxic impacts on humans, including cancer effects, leading to damages on human health. The human toxicity (cancer) impact category accounts for the health impact on human beings caused by the intake of toxic chemicals through breathing, ingesting or skin penetration, so far as they are related to cancer. Cancerous Human Toxicity is measured in Comparative Toxic Unit for human (CTUh).”

- **Human Toxicity, non-cancer**

  "Short_description": “Chemicals can be emitted to the environment (air, water, soil, etc.) during all life cycle stages of products. The production of any one product may result in the emission of hundreds of chemicals, from protecting crops with herbicides, insecticides and more. Many of these chemicals will have the potential to cause toxic impacts on humans, including non-cancer effects, leading to damages on human health.“

  "Long_description": “Chemicals can be emitted to the environment (air, water, soil, etc.) during all life cycle stages of products. The production of any one product may result in the emission of hundreds of chemicals, mostly because of the herbicides, insecticides, and other crop protection chemicals applied, many of which will have the potential to cause toxic impacts on humans, including non-cancer effects, leading to damages on human health. The human toxicity (non-cancer) impact category accounts for the health impact on human beings caused by the intake of toxic chemicals through breathing, ingesting or skin penetration, so far as they affect our

health without having the potential to cause cancer. Non-Cancerous Human Toxicity is measured in Comparative Toxic Unit for human (CTUh).”

- **Ionising radiation, human health**

  "Short_description": “Radiation is permanently present throughout the environment - in the air, water, food, soil and in all living organisms - and we humans are exposed to it on a daily basis. In addition to natural sources, human-made sources such as X-ray machines also contribute to our exposure, which if maintained at high levels can cause serious damage to our health.”

  "Long_description": “Radiation is permanently present throughout the environment - in the air, water, food, soil and in all living organisms - and we humans are exposed to it on a daily basis. Few of us are aware that 80% of the annual dose of radiation that an average person receives is due to naturally occurring radiation sources such as Radon found in rock and soil, or cosmic rays, high-speed particles coming from outer space. This level of natural radiation varies depending on where you live with places like Orvieto in Italy, Ramsar in Iran or Kerala in India where natural radiation is 15 to 50 times the average levels found in the UK. In addition to these natural sources, human-made sources also contribute to our exposure with the most common source today being medical devices, including X-ray machines. Continuous exposure to high levels of radiation can cause permanent damage to our tissues, impair the function of vital organs and where extreme levels are at play, death may result. Ionising radiation is measured in terms of human exposure efficiency relative to Uranium-235 (U235) in kilobecquerel (kBq) of U235 equivalent, or kBq U235 eq.”

- **Photochemical ozone formation, human health**

  "Short_description": “Ozone in the air can harm our health. When inhaled, ozone can cause respiratory diseases. High levels of ozone in the air are a synonym of bad air quality, since ozone is formed from the reaction between Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOCs), both released from burning fuels.”

  "Long_description": “Ozone in the air we breathe can harm our health, especially on hot sunny days when ozone can reach unhealthy levels. When inhaled, ozone comes into contact with the surface of our respiratory tract and can damage tissue and cause respiratory diseases. High levels of ozone in the air are a synonym of bad air quality, since ozone is formed from the reaction between Nitrogen Oxides (NOx), emitted during the combustion process, and Volatile Organic Compounds (VOCs), also released from burning fuel, and from solvents, paints, glues, and other products used at home or work. Ozone pollution is influenced by meteorological conditions because the reactions that create ozone require sunlight. THis is why in the summers, and especially during extreme heat waves, ozone can reach dangerous levels in cities and nearby rural areas. Photochemical ozone formation is measured in terms of tropospheric ozone concentration increase, in kilograms of non-methane volatile organic compounds (NMVOC) equivalent, or kg NMVOC eq.

- **Particulate Matter**

  "Short_description": “Particulate matter (PM) defines a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, can be seen with the naked eye. Others are so small they can only be detected using a microscope. Exposure to PM can affect lung function and worsen conditions such as asthma and heart disease.“

  "Long_description": “Particulate matter (PM), also called particle pollution, is a term used to define a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using a microscope. Some are emitted directly, from construction sites, unpaved roads, smokestacks or fires, and others form in the atmosphere as a result of complex reactions of chemicals such as those emitted by power plants, industries and automobiles. Exposure to PM can cause short-term health effects such as eye, nose, throat or lung irritation, coughing, or shortness of breath. It can also affect lung function and worsen medical conditions such as asthma and heart disease. The size of particles is directly linked to their potential for causing health problems. Small particles pose the greatest problems, because they can get deep into your lungs, and some may even get into your bloodstream. This is why you may often see PM10 and PM2.5 mentioned, referring to those less than 10 and 2.5 microns in diameter respectively. Particulate matter is measured in terms of impact on human health in disease incidence.

- **Damage to plants and animals**

  - **Eutrophication, marine**

    "Short_description": “Eutrophication refers to the gradual increase in the concentration of nitrogen coming from the air and water. For the marine environment, this excess may result in changes to the types of species that can thrive, algal blooms which block the sunlight needed for survival, and oxygen depletion near the bottom.”

    "Long_description": “Eutrophication refers to the gradual increase in the concentration of nitrogen coming from the air and water. For the marine environment, this may cause plants (mainly algae) to grow and multiply at an excessive rate with a number of consequences for the ecosystem including changes to the types of species that can thrive, algal blooms which block the sunlight needed for photosynthesis and for predatory fish to catch their preys, and oxygen depletion near the bottom, where dead algae deposit and degrade. All these consequences lead to a change in the species composition and of the function of the ecosystem. This nitrogen affecting marine systems comes from the air and water: from fertilisers and manure released into the water from agriculture, making its way into the ocean, and from manufacturing and transport emissions released in the air from burning fossil fuels such as Nitrogen Oxides (NOx) and later depositing into the bodies of water and increasing their potential for eutrophication. Marine eutrophication is measured in terms of the fraction

of nutrients reaching marine end compartment, in kilograms Nitrogen (N) equivalent, or kg N eq.”

- **Eutrophication, freshwater**

  "*Short_description*": “Eutrophication refers to the gradual increase in the concentration of phosphorus coming from water sources. For freshwater bodies (lakes and rivers), this excess may result in changes to the types of species that can thrive, algal blooms which block the sunlight needed for survival, and oxygen depletion near the bottom.”

  "*Long_description*": “Eutrophication refers to the gradual increase in the concentration of phosphorus coming from water sources. For freshwater bodies (lakes and rivers), this may cause plants (mainly algae) to grow and multiply at an excessive rate with a number of consequences for the ecosystem including changes to the types of species that can thrive, algal blooms which block the sunlight needed for photosynthesis and for predatory fish to catch their preys, and oxygen depletion near the bottom, where dead algae deposit and degrade. All these consequences can lead to a change in the species composition and of the function of the ecosystem. The phosphorus affecting freshwater bodies mainly comes from the water flowing into them: fertilisers and manure released into water from agriculture, water from manufacturing and transport, released into rivers and lakes. Freshwater eutrophication is measured in terms of the fraction of nutrients reaching freshwater end compartment, in kilograms Phosphorus (P) equivalent, or kg P eq.”

- **Eutrophication, terrestrial**

  "*Short_description*": “Eutrophication refers to the gradual increase in the concentration of nutrients. When we consider terrestrial eutrophication, this mainly refers to nitrogen that deposits onto the ground from the air. This excess may result in changes to the type of vegetation that can grow, impacting the whole ecosystem including species that rely on plants to survive.”

  "*Long_description*": “Eutrophication refers to the gradual increase in the concentration of nitrogen. The addition of nitrogen may change the species composition of the vegetation by favouring those species which benefit from higher levels of nutrients to grow faster than others. This therefore changes the plant communities from nutrient-poor (e.g. heath lands, dunes and raised bogs) to nutrient-rich. This impact on plant communities leads to wider impacts on the entire ecosystem, affecting other species relying on those plants to survive. Terrestrial eutrophication is caused by chemicals released into the air which then deposit onto the ground. These chemicals are mainly nitrogen oxides (NOx) from combustion processes and ammonia (NH3) from agriculture. Terrestrial eutrophication is measured in terms of Accumulated Exceedance (AE), in mol of Nitrogen (N) equivalent, or mol N eq.

- **Acidification**

"*Short_description*": “Acidification refers literally to processes that increase the acidity of water and soil systems. It is caused by emissions released into the air from combustion processes and direct emissions from fertilisers and manure. Acidification impacts terrestrial, marine and freshwater species by reducing soil fertility, and decreasing carbonate levels in water, affecting biodiversity as a whole.”

"*Long_description*": “Acidification refers literally to processes that increase the acidity of water and soil systems by adding hydrogen ions. It is caused by atmospheric deposition of acidifying substances generated largely from emissions of nitrogen oxides (NOx) and sulphur dioxide (SO2) from combustion processes, and ammonia (NH3) from agriculture (fertilisers and manure), the latter contributing to acidification after it is nitrified (in the soil). Acidification of the soil results in a decrease in soil fertility, which may affect plant diversity and the ecosystems relying on them. Acidification of freshwater and the oceans will lead to a decline in biodiversity with many acid-sensitive species being lost. Since acidification results in less carbonate in water, calcifying organisms like corals and plankton in the oceans, or snails and crustaceans in freshwater bodies, will struggle to form their shells and skeletons, making them more vulnerable. Oceans have the specificity to have a highly variable pH, and a single organism can cope with fluctuations of different pH levels during its lifetime. The problem is the sustained nature of the change, as the risk comes from the lifetime exposure to lower pH levels. The rapid pace of acidification will influence the extent to which calcifying organisms will be able to adapt. Acidification is measured in terms of Accumulated Exceedance (AE), in mol of hydrogen ion (H+) equivalent, or mol H+ eq.”

- **Ecotoxicity, freshwater**

"*Short_description*": “Chemicals can be emitted to the environment (air, water, soil, etc.) during all life cycle stages of products. The production of any one product may result in the emission of hundreds of chemicals, of which many will have the potential to cause ecotoxic impacts on fish, leading to damages to ecosystem quality.”

"*Long_description*": “Chemicals can be emitted to the environment (air, water, soil, etc.) during all life cycle stages of products. The production of any one product may result in the emission of hundreds of chemicals, of which many will have the potential to cause ecotoxic impacts on fish, leading to damage to ecosystem quality. The ecotoxicity impact category accounts for the impacts on fish species (living in lakes and rivers) caused by the intake of toxic chemicals through ingesting or skin penetration. Freshwater ecotoxicity is measured in Comparative Toxic Unit for CTUe ecosystems (CTUe).