

Some thoughts on sustainability

Claus Mølgaard, 2021

Unlike all modern communication, this text is not addressed to anyone in particular, it has no target group. In fact, I just wrote the text as a way to sort of my thoughts for myself. But you are welcome to read along. In the winter of 2020/2021 I was asked to give a series of talks about my views on sustainability. However, all the talks were cancelled due to the coronavirus pandemic. The text is based on my thoughts behind these talks, which never took place.

Sustainability, or, perhaps more precisely, sustainable development, has been a key focus for me for many years, although I have never quite managed to pin the concept down. In 1992, I embarked on my PhD project, which was part of what was then called the UMIP project (the development of environmentally friendly industrial products), a large-scale environmental project in collaboration with some of the biggest companies in the country and the Ministry of the Environment under Minister Svend Auken. My task was to develop methods for analysing the environmental impact of disposing of plastic. At the time (in 1995), I was simultaneously working on my final thesis for the HD programme (Graduate Diploma in Business Administration). My thesis was titled *Formulation Processes in Connection with New Strategies – Exemplified by the Introduction of Sustainable Production in a Danish Company*, with Bang & Olufsen as my business case. The sustainability concept was still in its inception then, and my work was interrupted by then CEO of Bang & Olufsen Anders Knutsen, who said (quoting from memory), *'this hippie project has to stop immediately!'* Ultimately, I was allowed to finish the project, provided Bang & Olufsen remained anonymous.

I often encounter people who interpret the sustainability concept in different ways, and I often hear something along the lines of *'... to me/us, a sustainable development means blah, blah, blah ...'*, naturally outlining an approach that fits into their particular context. What is interesting about sustainable development is that it was in fact very precisely defined in 1987 in Gro Harlem Brundtland's UN report, where it was summed up in one brief sentence¹:

'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'



Figure 1 – Gro Harlem Brundtland, 1987

This is the point of departure for my understanding of sustainability, or sustainable development. I find it interesting that it is a concept that was defined in written form from the outset. So many other concepts have taken shape over generations and will often have acquired multifaceted meaning. For example, the concept of democracy arose just over 2500 years ago in Athens, and today we have multiple understandings and definitions of the concept. In Norway, Arne Næss² conducted a study in 1956, which identified 311 different uses of the word ‘democracy’.

For some reason that I have never really traced the roots of, sustainable development is based on three pillars: social sustainability, environmental sustainability and economic sustainability. That is what is referred to as the ‘triple bottom line’. Some argue that all pillars are equally important, while others see the environment as pre-eminent, arguing that if the environment collapses, society and the economy will follow suit. With an ironic comment, one might point out that large-scale experiments have shown that classic planned economies reduce consumption considerably, and ultimately, overconsumption appears to be our biggest environmental problem. However, economic sustainability should be taken to mean the application of a long-term perspective rather than the pursuit of short-term profit.

When we read the sentence in the Brundtland report, we see that the focus is on meeting needs both today and in the future. But what are our actual needs? Here, we might turn to Maslow’s classic hierarchy of needs, often represented as a pyramid. I would argue that virtually all the needs relating to social and environmental sustainability belong at the bottom of the pyramid (see Figure 2). We need air, water, food and the security of property, health, employment, resources and morality. To a Westerner, this may seem trivial, since those are all things that we more or less take for granted. Surely, we should be able to push sustainability a few steps up the hierarchy, to incorporate art and culture and other aspects that are not directly vital to our basic survival.

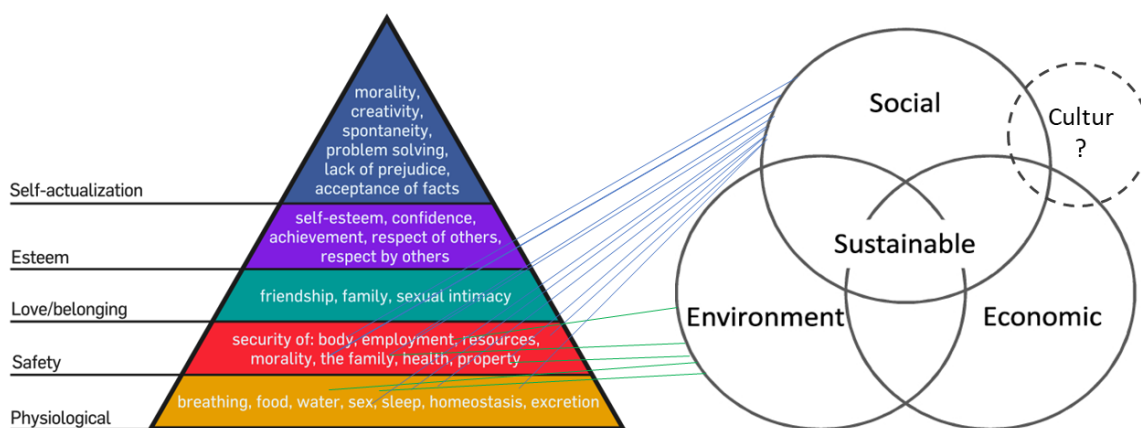


Figure 2 – Maslow’s hierarchy of needs and the sustainability pillars.

In my view, we need to consider all three pillars in order to achieve sustainability; we cannot simply pick what suits our agenda. I learned this lesson the hard way in 2013, when I was involved in developing the new SodaStream machine designed by Yves Béhar. The whole point of the machine and, not least, its marketing was that it would save a lot of plastic bottles and thus benefit the environment. This message was communicated in what was then the most expensive commercial ever run – 30 seconds during the Super Bowl at a cost of DKK 25 million (see Figure 3). Two days later, *The Guardian* and other media

published stories about how certain components of the machine was produced under unacceptable conditions in the occupied areas of the West Bank. Naturally, the story about SodaStream not having a good grasp of the social pillar spread like wildfire on social media, and as a result, first-year sales were close to zero. So, when you work with sustainability and want to use the concept in your profiling, you need to have your house in order!



Figure 3 – Still from SodaStream Super Bowl commercial 2013 – <https://www.youtube.com/watch?v=CYq0PivLVA8>

I recommend the Danish Consumer Ombudsman's *Guidance from the Consumer Ombudsman on the use of environmental and ethical claims, etc., in marketing*, which clearly defines what sustainability claims are legal (under Danish law) in marketing: <https://www.forbrugerombudsmanden.dk/media/49133/engelsk-version-af-miljoe-august-2014.pdf>.

Naturally, a sentence as well-rounded as the Brundtland report's definition of sustainable development cannot stand alone; it has to be operationalized. This was attempted in 1992 at the Rio Conference, which resulted in *Agenda 21*, a 300-page plan to attain sustainable development in the 21st century. Among the points in the report are the following (feel free to skip this part):

- Because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling its objectives.
- Each local authority should enter into a dialogue with its citizens, local organizations and private enterprises and adopt 'a local Agenda 21'.
- By 1996, most local authorities in each country should have undertaken a consultative process with their populations and achieved a consensus on 'a local Agenda 21' for the community.
- In Denmark, Agenda 21 is regulated by Sec. 33a+b of the Planning Act. At regular intervals, municipalities and regions shall draw up a strategy for contributing to sustainable development.

Well, that just makes me tired, and I don't think anyone has read the 300-page document since 1992.

Things improved slightly with the next attempt, in 2015, which produced the 17 Sustainable Development Goals (SDG). After all, they will fit on a single page in 17 individually coloured boxes.

However, the problem with the SDGs is that people tend to cherry-pick, which means there is no guarantee that all three pillars are addressed in their sustainability effort. Quite a few times, I have been contacted by potential clients who want to work with sustainability, who call me, asking, ‘... Er ... Claus ... we’d like to work with sustainability; which of the SDGs do you think we can check??’. I usually send them the Consumer Ombudsman’s memo, and then I usually never hear back from them.

Back to the three pillars – how do we approach them? The environmental and economic pillars are quantifiable. You can use life cycle assessments to calculate environmental impacts (carbon footprint etc.). The economic pillar is straightforward: what does the money side look like? The social dimension is different. Ethical accounts have made attempts to quantify the social dimension, but at some point, that leads to trying to quantify the value of life. And at that point, the process risks unravelling into an ethical mess. In fact, life cycle assessments suffer from a slightly similar problem, since at some point, one has to weigh the different environmental impacts against each other politically: which is worse – acid rain in Sweden, excessive UV radiation at the poles or rising sea levels at the Solomon Islands?

The social dimension can be addressed with the application of good moral virtues (from a Western point of view, of course). The *UN Global Compact*³, which addresses CSR (Corporate Social Responsibility), describes 10 principles that should be observed concerning human rights, labour, environment and anti-corruption.

If we take our point of departure in Brundtland’s definition – ‘*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*’ – it seems fair to claim that the needs of the present are met if we treat each other in accordance with the principles in the *UN Global Compact* concerning human rights, labour rights, environment and anti-corruption, while also having our basic needs met, according to Maslow’s hierarchy. To enable future generations to have their needs met, we need to make sure that they will also have access to air, water, food and resources. And obviously, if we use up all the resources today or make them difficult to access and destroy the conditions for food production, for example, by poisoning the soil and water, our conduct has not been sustainable. Naturally, we cannot predict the needs of future generations, but if we leave the planet in at least as good a state as we found it in, I suppose we will have done our bit.

Resources and CO₂

If we consider resources at an atomic level, they never disappear. No atoms actually leave the earth and its atmosphere. Thus, we will always have the atoms to play with. Of course, we alter some of them in nuclear fission, but the extent of that is so limited that we can probably leave that out of the equation. Of course, it is not without consequence what form the atoms occur in. For example, if carbon and oxygen are present as CO₂, they are not doing us much good, perhaps on the contrary. But there is nothing stopping us from splitting the CO₂ again and bringing the atoms into new connections that are beneficial to us. After all, plants do that every day through photosynthesis. It is harder to do industrially, and generally, it takes a lot of energy. Similarly, the earth’s minerals also do not vanish, but the way in which we use them can make them very difficult to retrieve, and it can take a great deal of energy to bring them back into a form that is useful. Thus, it is good housekeeping to try to keep track of where we keep our materials and to handle them with care. Naturally, we make things difficult for ourselves if we act mindlessly, for example by tossing plastic into the sea. The sea is vast and deep, so it is not easy to retrieve all the plastic and make it useful again, either in the form of plastic, as it is now, or as carbon atoms that can be used for a wide

variety of purposes. Of course, the difficulty of returning the materials to a useful form is one thing; what is much worse is their potential to wreck ecosystems and thus diminish our ability to generate food or other materials, now and in the future.

Regardless how smart and intelligent we are in our management of material flows, it always takes energy *to do something to something*. Even if we establish smart, sophisticated circular systems, whether at a product, component, material, molecular or atomic level, it always takes energy to operate a circular system. Looking at the big picture, working at a product or component level will often require less energy, but of course, that requires that the 'things' that come out of the circular system serve a purpose – that they have value.

I see many initiatives where people recycle (some even call it upcycling) by mixing waste with other, valuable materials and marketing the results as sustainable products. I would call it landfill incorporated into consumer products, like using plastic waste as a filler in road construction.

If we assume that the rising CO₂ level in the atmosphere will make it difficult for future generations to have their needs met, as climate changes make it harder for them to 'use' the planet, it is crucial that we create large amounts of non-polluting energy. Perhaps it will become impossible to grow sufficient amounts of food, perhaps the planet becomes too crowded because of flooding, or perhaps there will be intense social conflicts triggered by waves of migration.

CO₂ is not the only factor driving climate change. Many other gases also contribute to the greenhouse effect, with methane (CH₄) and nitrous oxide (N₂O) as the main culprits. All these gases are referred to as greenhouse gases, and their common unit of measurement is CO₂ equivalents, where methane has an impact that is 28 times that of CO₂, and nitrous oxide has an effect that is 310 times greater.

If we look at where the greenhouse gases come from (see Figure 4 on the next page), we find that pretty much every aspect of our life is involved⁴. Naturally, depending on the importance we attribute to the individual aspects: 17.5% of greenhouse gases come from energy use in buildings, heating, cooling, lighting and so forth. In principle, it seems fair that 17.5% come from one of our most fundamental needs – a dwelling that offers security.

Agriculture and forestry account for 21.1%. Methane accounts for 7.1% of greenhouse gases, with 5.8% coming from meat production (flatulence from cattle, sheep and other animals) and 1.3% from rice production. Nitrous oxide emissions from fields accounts for 4.1% of greenhouse gases. Here, carnivores could of course argue that the vegans are just as 'naughty', but it should be noted that about 70% of our fields are used to grow food for animals.

Food production itself, including processing, transportation and so forth, accounts for 26% of greenhouse gas emissions. Here too, it might be argued that it is reasonable that our fundamental need for food accounts for this share of greenhouse gases.

Thus, our most fundamental needs – housing and food – account for 43.5% of all greenhouse gas emissions. Measured in per cent, that seems reasonable, but still, the level is much too high to ensure sustainable development. Thus, we need to make an effort across the board, developing new, clean technology, organizing differently or 'economizing' our way out of the problem. Here, 'economizing' means minimizing consumption, transportation and so forth.

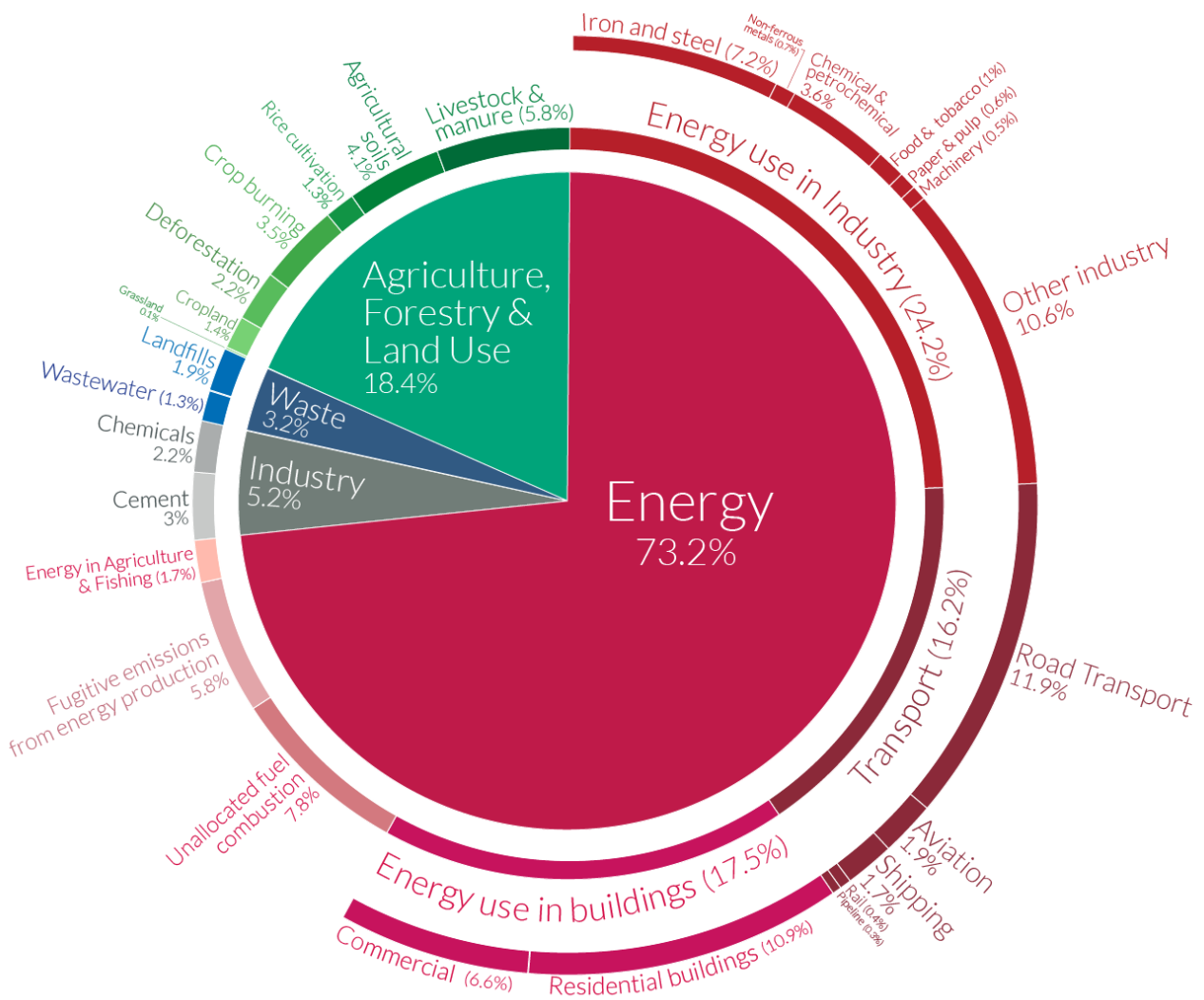


Figure 4 – Global greenhouse gas emissions by sector, shown for the year 2016 – Source: Our World in Data.

I think that the earth’s population will easily be able to change to a life based on renewable energy sources. A life that relies much more on electric engines and much less on combustion engines. And if we do need to use combustion engines, they can run on fuel produced using Power-to-X technologies. In most cases, however, Power-to-X technologies are much less efficient than pure electric technology. An electric engine has an energy efficiency rate of about 95%, while a combustion engine normally has an energy efficiency rate of max 50%. In addition, there will be substantial losses every time we change ‘energy storage’ – converting electricity into fuel.

Generally, we have developed, or are on our way to developing, technologies that eliminate the CO₂ impact of energy production. That is significant, as CO₂ from energy production accounts for about 73% of greenhouse gas emissions. However, it is going to take huge investments and construction projects to shift the global energy production fully to renewable resources. At our current energy consumption level and with available technologies, we would need a row of wind turbines long enough to encircle the equator 19 times – or solar panels covering an area the size of France, Germany and Italy together, or 0.9% of the

earth's total landmass. It should not be impossible, however, since the influx of energy from the sun is about 6,375 times our energy consumption⁵.

Energy generated from wind and solar power does not have to remain electric energy. Using Power-to-X technologies, we can use the energy to produce Power-to-Ammonia, Power-to-Chemicals, Power-to-Fuel, Power-to-Gas, Power-to-Heat, Power-to-Hydrogen, Power-to-Liquid, Power-to-Methane, Power-to-Mobility, Power-to-Food, Power-to-Power and Power-to-Synthetic Gas (for example for plastic production).

The 18.4% of greenhouse gas emission that come from agriculture and forestry, much of which consists of methane and nitrous oxide, will probably prove much harder to convince people to address, since that implies more profound changes in the way we live, including our dietary habits.

Deforestation also contributes to greenhouse gas emissions. Biomass (trees, plants and so forth) bind huge amounts of carbon, which was generated via solar energy and photo synthesis. Based on that, one might think that biomass is CO₂-neutral. However, it is not that simple; in fact, biomass is a huge carbon store, and if the carbon is no longer bound in biomass, much of it will go into the atmosphere as CO₂. Hence, we should strive to maintain a constant amount of biomass on the planet. And obviously, big trees bind more carbon than smaller plants. And if the trees are used for timber in construction, the wood still binds the carbon, even though it is, in principle, dead.

How can we create sustainable dwellings and living?

One good way to address sustainability from a general point of view is the IPAT model, which was developed in a series of conversations between Barry Commoner, Paul R. Ehrlich and John Holdren in 1972⁶.

According to the model, the environmental impact is a function of population size, affluence and the technology that is used to generate affluence. To achieve an environmental impact of zero, at least one of the factors has to be zero: no people, no affluence or a technology that does not generate an environmental impact.

$$I = P \times A \times T$$

- I: Impact
- P: Population
- A: Affluence
- T: Technology used to generate affluence

'No people' would of course solve the problem, but that is probably not the most attractive option for humankind.

Another option would be to live entirely without affluence (in a Western sense), living, in principle, as hunter-gatherers. That is a tough life with an average life expectancy of, perhaps, 70 years – and only for those lucky enough to escape the relatively high infant mortality rate⁷. It is hard to see that as the ideal way to go, but of course, a less extreme variant might be to move out of the city to the country.

We probably need to find technologies and ways to organize our lives that do not generate an environmental impact. Naturally, it is easier to develop sufficient non-polluting technologies if the affluence (consumption) is modest.

A lot of forest has been felled and converted to farmland (especially in the Western, developed world). Of the total earth's surface, 29% is land, the rest is sea (see figure 5). Of the 29% of the earth's surface that is land, 71% is habitable, while the rest is covered by glaciers, deserts etc. Of the habitable land, 50% is taken up by agriculture, 37% is forested, 11% is shrub, 1% is lakes and rivers, and the final 1% is occupied by human infrastructure, such as cities, roads, airports etc. Thus, we live, produce and transport ourselves on about 1%, while we use 50% to grow the food we eat⁸.

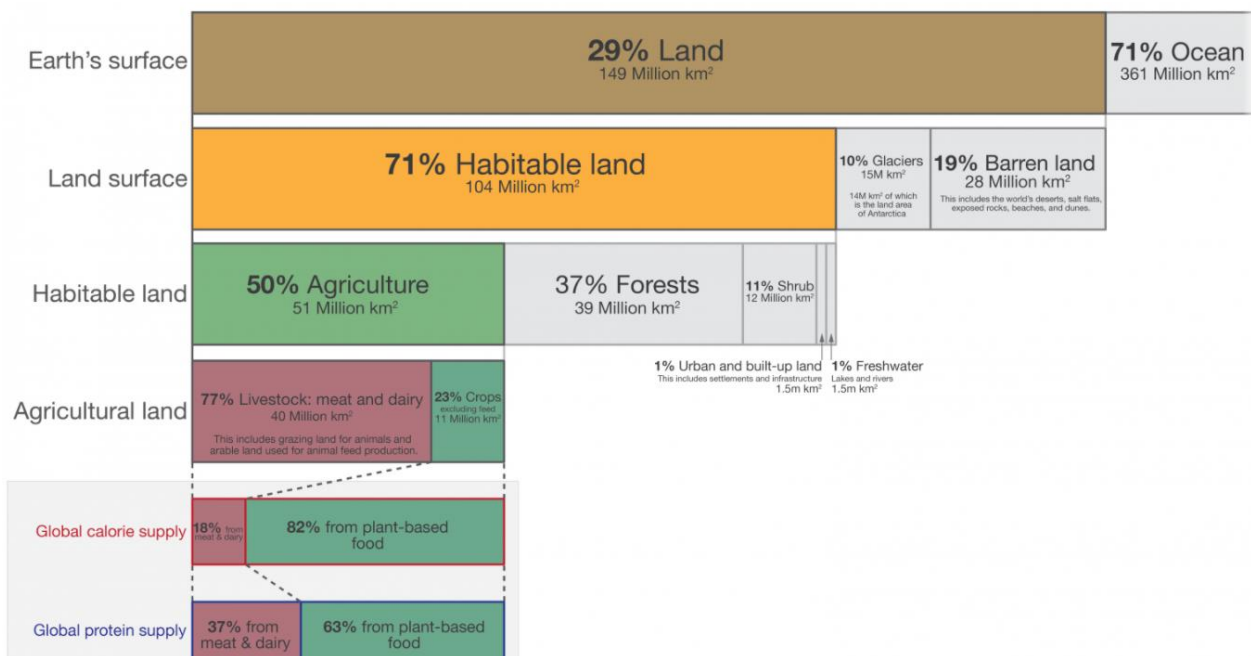


Figure 5 – Global land use for food production – Source: Our World in Data.

We might ask ourselves whether living in the country actually means living in tune with nature, since so much forest has been cleared to make room for agriculture. Would it be better for nature if we lived on our one per cent and grew much more of our food 'artificially', for example growing vegetables in 'vertical farms' or our steak from stem cells? Put another way, should we live the way our rural ancestors did, or should we live in a big, efficient city, as proposed by Peter Cook in *Archigram* no. 4 in 1964? A city he called Plug-in-City that would extend from Liverpool to London and on to Paris and Berlin.

Sustainability is not just about climate; other environmental impacts as well as economic sustainability and CSR are also important. A general sustainability strategy might be based on the following four principles:

1. We should generate energy that does not pollute.
2. We should not toss things where they do not belong: no plastic in the oceans, no toxins in the soil, no excess nutrients on the fields etc.
3. We should preserve the planet's biomass; that binds CO₂ as carbon and promotes biodiversity.
4. We should treat each other with decency: distributing resources fairly, avoiding exploiting each other.

And we should keep in mind that our development should be guided by Brundtland's statement:

'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

¹ Gro Harlem Brundtland et al. (1987). *Report of the World Commission on Environment and Development: Our common future*. United Nations through Oxford University Press.

² Arne Næss et al. (1956). *Democracy, ideology and objectivity*. University Press.

³ United Nations Global Compact, <https://www.unglobalcompact.org/>

⁴ Hannah Ritchie and Max Roser (2016). *Emissions by sector*. Our World in Data.

⁵ Claus Mølgaard (2020). *Jeg har synder*. Published on LinkedIn.

⁶ Oskar Gans and Frank Jöst (2005). *Decomposing the impact of population growth on environmental deterioration*. University of Heidelberg.

⁷ Vybarr Cregan-Reid (October 2018). *Hunter-gatherers live nearly as long as we do but with limited access to healthcare*. The Conversation.

⁸ Hannah Ritchie and Max Roser (2019). *Land use*. Our World in Data.