

The history of sustainability

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Consensus is that sustainability is defined in the report *Our Common Future* also known as the *Brundtland report*, which was written by "The World Commission on Environment and Development" under the UN and published in 1987. A concept like this does arise from nothing and will also be interpreted in the future. Some people believe that the concept of sustainability is dated back to the time of the Greek natural philosophers, the time before Socrates, when some philosophers worked with a holistic understanding of nature. Others believe that Aristotle's concepts of phronesis and virtue ethics can be taken as a starting point.

There are probably many historical points of interest when it comes to sustainability. For the time until the late 60s I am inspired by text of Finn Arler in the Danish book *Bæredygtighed. Værdier, regler og metoder*¹.

In 1713 a German word is for the first time used in a context, which could be reminiscent of sustainability and used in a for saving something for the future, when Hans Carl von Carlowitz in his book *Sylvicultura oeconomica oder haußwirthliche Nachricht und Naturmäßige Anweisung zur wilden Baum-Zucht* used the German word *Nachhaltigkeit* (restraint) in connection with forestry.



Figure 1 - Hans Carl von Carlowitz

Von Carlowitz was a forester, tax auditor and administrator of some mines in Saxony, Germany. Von Carlowitz did not foresee the land collapsing more or less because of over-consumption or decline in biodiversity, his problem was that there would not be enough wood for his coal mines if one did not take care to cultivate and consume the forest in a sustainable way.

In the late 18th century, some economists were seeing problems in population growth. One of them was Thomas Malthus, whose father was supposed to be best friends with Rossau (the guy who argued for free child rearing), but as often happens, sons think the exact opposite of their father and so it was with Malthus.



Figure 2 - Thomas Malthus

Thomas Malthus publishes in 1798 "*An Essay on the Principle of Population*", where he claims that in a completely happy society the population growth will double every 25 years (1, 2, 4, 8, 16, a geometric row) while the food will only develop linear (1, 2, 3, 4, 5,... arithmetic series). A happy society will collapse if distress do not limit the growth. Malthus certainly did not think it was necessary to support the most disadvantaged, as this would only make the problem of population growth even worse.

Later David Ricardo generalized the point of Malthus to count all resources not only food.

History shows that it did not went as Malthus and Ricardo predicted. The population was not doubled every 25 years. Whether this is because the society was not completely happy, or whether it is not necessary to have many kids in a happy society is unknown. At the same time, due to industrialization of agriculture food supply was increased more than expected.

The philologist George Perkins Marsh, who is considered to be the first American environmentalist, published in 1864 the book *Man and Nature*. Unlike others, who believed that the Earth created the man, Marsh believes that the man created the earth. As a result, he warned that man can destroy himself and the earth if we do not maintain global resources and increase awareness of our actions. The first thoughts about the Anthropocene age (the man-made age) were shown.



Figure 3 - Georg Perkins Marsh

The paleontologist and geologist Nathaniel Southgate Shaler did also had thoughts about human influence on Earth, which he wrote about in his book *Nature and Man in America* from 1891. Shaler's arguments were based on flooded areas in the eastern United States and arid areas in the western United States. Shaler ended up as a professor at Harvard but did not (in modern perspective) seem to be a nice guy. His background was a slave-owning family and he defended slavery and believed that the Anglo-Saxon race was superior. To flatter himself with a professor at Harvard, he was declared an anti-Darwinist until he himself was well established at Harvard, where he then changed his mind.

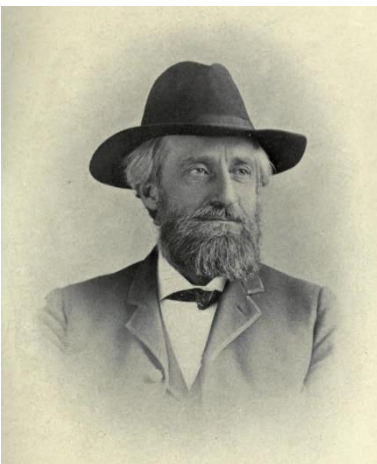


Figure 4 - Nathaniel Southgate Shaler

Both Marsh and Perkins argued that the quantity of resources could be increased by technological development and in this way save the world.

Gifford Pinchot an American forester and politician publish the book *The Fight for Conservation* in 1910, in which the concept of sustainability we know today is more or less defined "unless we practice conservation, those who come after us will have to pay the price of misery, degradation and failure for the progress and prosperity of our day." Politically, Pinchot was at the beginning Republican, but later he switched to the progressive "Bull Moose Party," and he served as the Governor of Pennsylvania in the 20s and 30s.

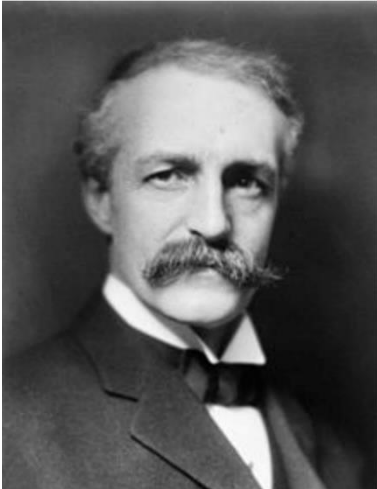


Figure 5 - Gifford Pinchot

After World War II, the issues of population growth are resumed by ecologist and zoologist William Vogt, director of Planned Parenthood and naturalist Henry Fairfield Osborn Jr.



Figure 6 - William Vogt

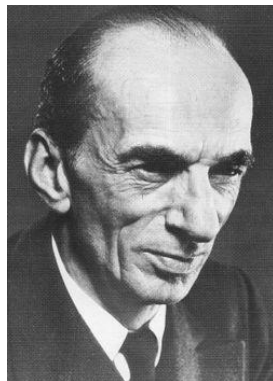


Figure 7 - Fairfield Osborn Jr.

In 1948 Vogt and Osborn are publishing the books *Road to Survival* and *Our Plundered Planet*. Vogt and Osborn believed that the size of the population should remain within a sustainable size and that the problems could not be solved technological. The problems are just postponed and will get bigger.

Sustainable wise nothing really happens in 50s and early 60s. We all might be more or less happy about the great advances that takes place for many people. We get lots of cars, refrigerators, and other consumer products.

In the year 1968 something new is happening again, as the biologist and educator, Stanford Professor Paul Ehrlich, and his wife the biologist Anne Ehrlich publish the book *The Population Bomb*, where they argued that the world's large population growth will destroy the environment and food availability. The same argument as Malthus just with the environment as an extra dimension. Unlike Malthus, however, the Ehrlich did not think, that the less well-off should simply perish. Paul Ehrlich believes that the United States, as the largest consumer, must take the lead in the fight against population growth and he "floated" the idea of adding "temporary sterilants" to the water supply or staple foods!



Figure 8 - Anne og Paul Ehrlich

In 1970, the I-PAT model was developed as the result of a debate between Paul Ehrlich and John Holdren on the one hand and Barry Commoner on the other. John Holdren, who is trained in aero, astro and plasma physics, was like Ehrlich affiliated with Stanford. Later in life, Holdren became President Barack Obama's adviser on science and technology. Barry Commoner was a biologist and professor at Washington University.

Ehrlich and Holdren believed that population growth was the most important factor, while Commoner believed that the most important factor was the pollution from the new production technologies developed after World War II.



Figure 9 - John Holdren og Barack Obama



Figure 10 - Barry Commoner

The I-PAT model was agreed, which states that the environmental **impact (I)** is the product of **population (P)**, **affluence (A)** and **technology (T)**.

$$I=P \cdot A \cdot T$$

In 1972, The Club of Rome published the report *The Limits to Growth*, written by Donella and Dennis Meadows in collaboration with the Norwegian Jørgen Randers, and William W. Behrens III all environmental and systems analysis researchers at the Massachusetts Institute of Technology (MIT).



Figure 11 – MIT researchers

The researchers from MIT developed the model named World3, in which the following 5 trends were analyzed: accelerated industrialization, rapid population growth, pronounced malnutrition, depletion of non-renewable resources and deterioration of the environment.

The main conclusion of the report:

1. With the current growth of population, industrialization, pollution, food production and depletion of non-renewable resources, the limit of growth will be reached within the next 100 years. The most likely outcome will be a sudden and uncontrolled decline in both population and industrial capacity.
2. It is possible to change growth trends and establish conditions for ecological and economic stability that is sustainable. The global equilibrium can be designed in a way where basic needs of every person on earth are met, and every person has equal opportunity to realize his individual human potential.

The World3 model has been criticized. In 1973, a group of researchers at the Science Policy Research Unit at the University of Sussex published *Thinking about the Future, A Critique of The Limits to Growth*. The Sussex group examined the structure and assumptions in the World3 model and concluded that the simulations were very sensitive to a few key assumptions, suggesting that the MIT assumptions were unnecessarily pessimistic. Some of the criticism was recognized as valid and improved in the overall understanding of dynamic models. In the article, the Sussex group thanked their sponsors, which included: BP, Imperial Chemical Industries (ICI) and the UK Atomic Energy Authority (UKAEA).

Several others have also criticized the World3 model for not matching the real world. Among other, energy and security analysts Amy Myers Jaffe and Robert A. Manning wrote in 2000 in the journal *Foreign Affairs* that, according to the 1972 report, the remaining oil reserves "would run out in 1990" and that this prediction, as we know, had turned out to be fundamentally wrong. In 2020 the Dane Bjørn Lomborg wrote in the magazine *Foreign Policy* under the headline "History's rubbish bin: Limits to growth" that "vital minerals such as gold, silver, copper, tungsten, zinc, mercury, lead, tin and oil should be depleted now. But they are not."

Also in 1972, the UN's Stockholm Conference was held, where an international environmental policy was formulated. It was probably mostly industrialized countries who had a problem, and they could see that if developing countries starts to behave like the industrialized countries with similar consumption, the problem would first become really big. Developing countries was only focusing on the environment and it all ended quite badly, best described by the Prime Minister of India Indira Gandhi's who said: *"Aren't poverty and need the most important pollutions? How can we talk to villagers and slum-dwellers of the need to protect the air, the ocean and rivers when their own life is contaminated? The environment cannot be improved in conditions of poverty."*



Figure 12 - Indira Gandhi

In a way it was the beginning of the social and ethical dimension of the concept of sustainability.

In 1980, the World Conservation Union, the UN and WWF published the report *World Conservation Strategy*, where the first lines of the foreword encountered the following text: *"Human beings, in their quest for economic development and enjoyment of the riches of nature, must come to terms with the reality of resource limitation and the carrying capacities of ecosystem, and must take account of the needs of future generations"*, which I think has been a great inspiration for the Brundtland Report's later definition of sustainable development.

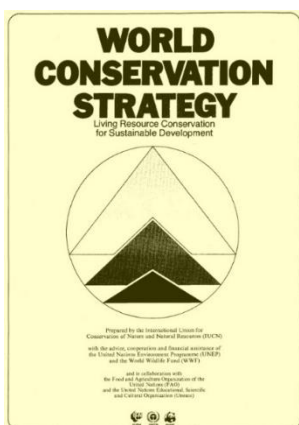


Figure 13 - World Conservation Strategy

UN established 3 years later in 1983 the World Commission on Environment and Development. The commission was manned by 21 international celebrities and led by former Norwegian Prime Minister Gro Harlem Brundtland. The report *Our Common Future*, also known as the *Brundtland Report*, was published in 1987 and included the famous definition of sustainable development: "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*"



Figure 14 - Gro Harlem Brundtland

As a follow-up on the Brundtland report, an international meeting was organized, where more concrete initiatives and goals should be identified. It took a long time to organize the meeting, so first 5 years later in 1992 that the Rio Conference was held, which ended up with the Agenda 21 report. Agenda 21 is a 300 pages plan for achieving sustainable development in the 21st century. Among other things the following was stated:

- As many of the issues and solutions addressed in Agenda 21 have their roots in local activities, the participation and cooperation of local authorities should play an important role in achieving the goals.
- Each local authority should enter a dialogue with its citizens, local organizations and private companies and adopt a 'local Agenda 21'.
- By 1996, most local authorities in each country should have initiated a consultative process with their peoples and agreed on a 'local Agenda 21' for local communities.
- The consultation process should increase each household's awareness of sustainable development issues.

Agenda 21 was apparently not something that appealed to the general population.

For a long period, nothing really happens, but in 2000 the UN launched their 2015 goals, which are about eradicating of extreme poverty and hunger, achieving universal primary education, promoting gender equality and empower women, reducing child mortality, improving maternal health, combating HIV/AIDS, malaria, and other diseases, ensuring environmental sustainability, and developing a global partnership for development.



Figure 15 – UN 2015 goals

From 2000 to 2010 the sustainability field was mainly about materials. In 2002, the German chemist Michael Braungart and the American architect William McDonough published the book *Cradle to Cradle*. Where a "technical" system was inspired by the biological system of the nature - "waste equals food".



Figure 16 - Michael Braungart og William McDonough

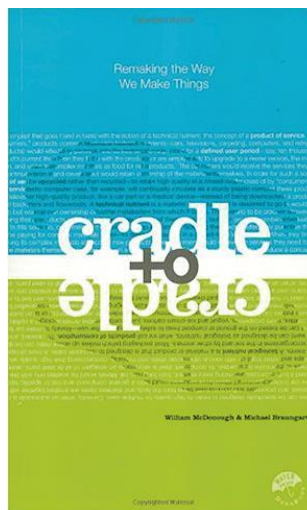


Figure 17 - Cradle to Cradle

In general, Braungart and McDonough work with the importance of recycling of materials and avoiding toxic chemicals, but they are not particularly concerned about the underlying energy system, that drives the entire system and cause climate change.

On 7th of February 2005 Ellen MacArthur broke the world record for the fastest solo circumnavigation of the globe with time 71 days, 14 hours, 18 minutes, and 33 seconds. On a long sailing trip, it is important to save resources, which should inspire MacArthur to idea of the circular economy.



Figure 18 - Ellen MacArthur

The circular economy is somehow launched in 2009, when the Ellen MacArthur Foundation is established. The "theory" behind the circular economy is developed by the management consulting company McKinsey and the first report *Towards the Circular Economy* was published in 2013, which includes the well-known butterfly diagram. Another well-known report on the fashion industry *A New Textiles Economy: Redesigning Fashion's Future* was published in 2017. However, there are things in the fashion report, which seem a little strange. Among other things, the share of CO2 emissions from fashion will increase from 2% in 2015 to 26% in 2050. But it is assumed that the fashion industry does not meet the requirements of the Paris Agreement's 2°C pathway, while everyone else does. It's a strange basis for comparison.

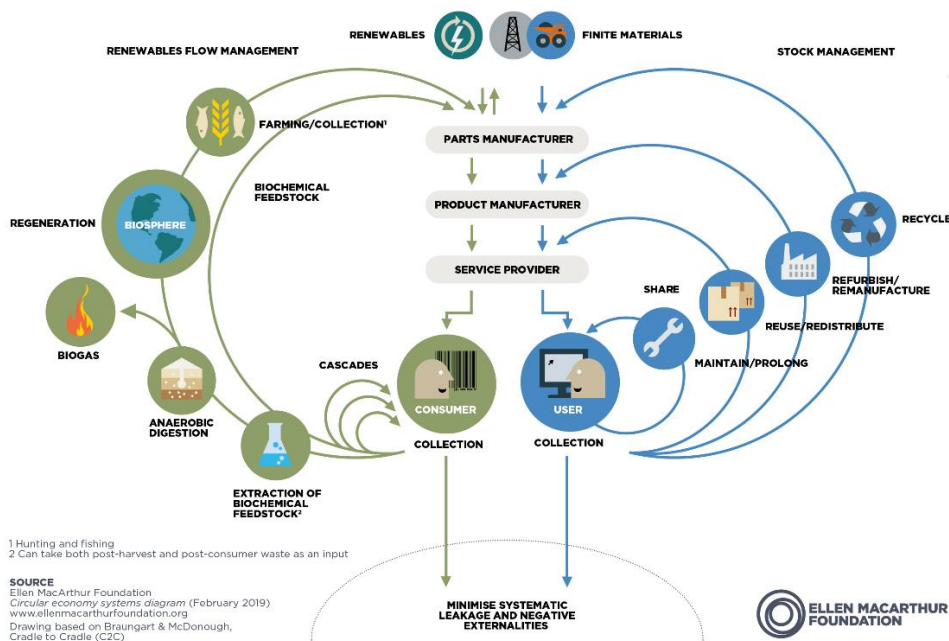


Figure 19 – Butterfly diagram

Just like Braungart and McDonough, the Ellen MacArthur Foundation is initially mainly focused on the flow of materials and not the underlying energy system. The problem is addressed years later in 2019 in the report *Completing the Picture: how the circular economy tackles climate change* was published. Unlike previous reports written by McKinsey, this new report is written by the Swedish management consulting firm Material Economics.

A group of 26 of the world's leading environmental and climate scientists, led by Swedish Johan Rockström, came together in 2009 and identified the processes crucial for the global ecosystem. The group listed nine key processes: climate change, ocean acidification, stratospheric ozone depletion, biogeochemical (nitrogen and phosphorus), freshwater use, changing land use, biodiversity loss, atmospheric aerosol loading, chemical pollution. The nine key processes are today best known as the planetary boundaries.

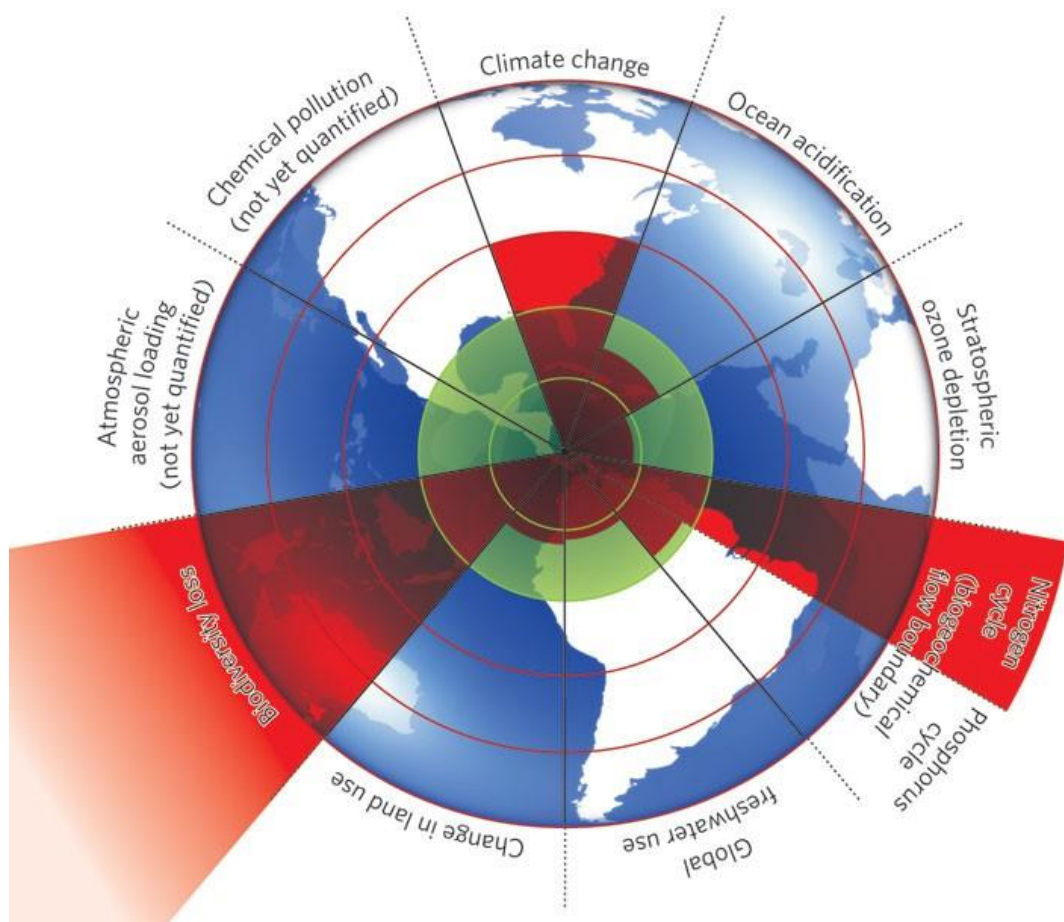


Figure 20 - Planetary boundaries - 2020 data

In 2015, the 8 UN 2015 goals should be renewed and were extended to the UN's 17 goals or SDGs (Sustainable Development Goals) as we know them today. The SDGs are 17 concrete goals and a total number of 169 sub-goals with associated measurable indicators. The SDGs are signed by the leaders of all 193 UN member states. An effort to agree about this.



Figure 21 – UN- SDGs

The SDGs are an UN and countries matter. It is the members (countries) of UN that have committed each other to meet the goals by 2030. Companies can also use the SDGs as inspiration for new businesses.

The Science Based Target initiative was launched in 2015, as a partnership between CDP, UN Global Compact, World Resources Institute and WWF.



Figure 22 - Science Based Target

Science Based Target is based on the IPCC research of climate changes. Based on numbers of reports, the IPCC has statistically calculated the remaining carbon budget, which indicates how much CO₂e we can emit into the atmosphere if the increase in temperature should be kept below 1.5°C, well below 2°C or below 2°C in 2100.

Companies can choose whether they want to follow the 1.5°C pathway or the well below 2°C pathway (1.5°C recommended). The CO₂e reduction targets for a company who commit to Science Based Target are evaluated by the Science Based Target initiative. Once the company has had its goal approved, it is listed on the Science Based Target initiative's website.

In 2017, Kate Raworth publishes her book *Doughnut Economics*, in which she reviews many older economic theories and is certainly not enthusiastic about the liberal economist Milton Friedmann. Ratworth argues that we must develop an economy, which ensures that we stay within the planetary boundaries, while ensuring the population food, health, education, income and work, peace and justice, political voice, social equality, gender equality, housing, networks, energy, and water.

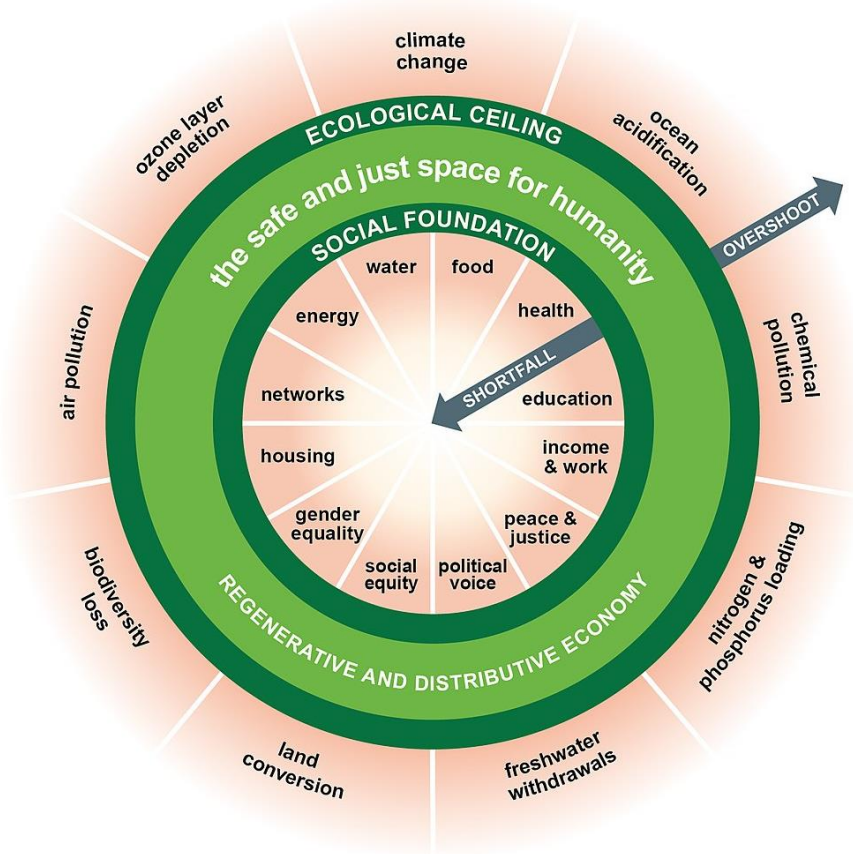


Figure 23 - Doughnut economics

Greta Thunberg starts her school strike for the climate in 2018, which brought her to speak at the UN in 2019 and the World Economic Forum in 2021. Thunberg just says, *“Hi adults, please be nice and listen to what scientists tell us.”*



Figure 24 - Greta Thunberg

The IPCC's 6th climate reports are published in 2021 and 2022. The reports examine, among other things, how a future increased temperature of 1°C, 1.5°C, 2°C and 4°C will affect: extreme temperatures over land, heavy rain over land, agriculture, and ecological drought in arid regions. The reports are very meticulous and there is now a reasonable support in the societies about the conclusions.

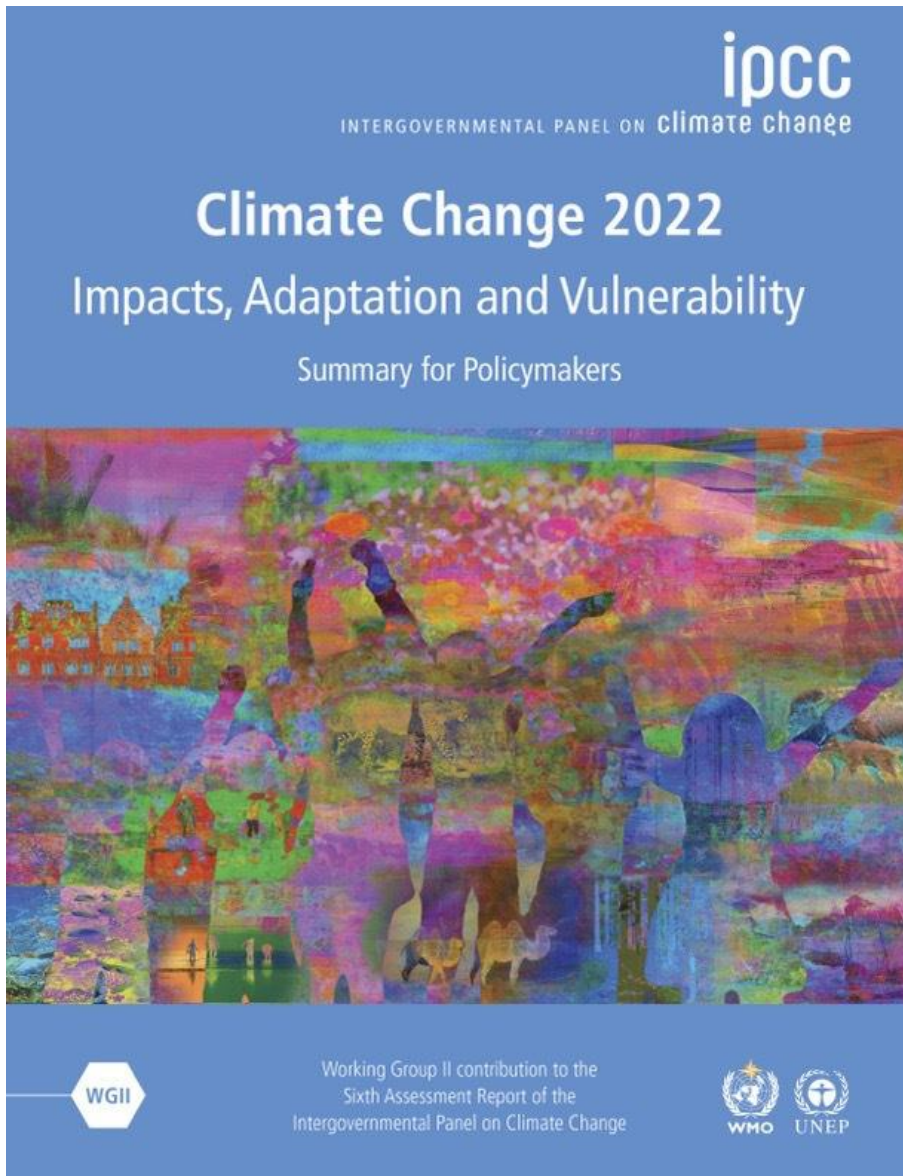


Figure 25 - IPCC, 6. Climate change report

In the recent years sustainability has become an important factor for many companies and more legislation in the field is prepared. Among other things, the EU has made a Taxonomy Regulation, which aims to create a common classification of what is climate- and environmentally sustainable economic activities. In this way, free capital should "flow" in a sustainable direction. From 2022, the taxonomy scheme is a legal requirement for financial market participants and large companies.

In 2021 the EU also made a proposal for a new sustainable reporting directive. According to the proposal, more detailed reporting must be provided, and the supply chain must be included. In addition, there will be audit requirements.

Sustainability is becoming an important part of many companies' business strategy which is seen in larger companies as Ørsted and Maersk. They both spend a lot of resources on documenting their sustainability and inform where they will be in sustainability terms in the future. Among other things, very serious climate goals are set. Ørsted publishes its first sustainability report as part of their 41 pages quality and safety report in 2005 where the 2021 documentation is a total of 88 pages including the sustainability report and the ESG report. Maersk publishes its first sustainability report of 21 pages in 2014 and the report from 2021 is 64 pages.



Figure 26 - Sustainability report from Ørsted og Maersk

ⁱ Finn Arler, Mette Mosgaard & Henrik Riisgaard (red.): Bæredygtighed. Værdier, regler og metoder. Aalborg Universitetsforlag, 2015