German Environment Agency

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UBA Position on Carbon Dioxide Removal[1]

1. UBA is committed to limiting anthropogenic global warming to 1.5°C.

We welcome that in the Paris Agreement the global community not only set the objective of limiting global warming to well below 2°C, but also agreed to pursue efforts for limiting warming to 1.5°C. The recent IPCC Special Report on 1.5°C global warming[2] dramatically conveys that between 1.5°C and 2°C of warming, risks for humans and the environment increase more drastically than previously assessed. According to the special report, limiting warming to 1.5°C is still possible. All climate protection measures necessary for achieving this must be socially, economically and environmentally sound and in line with the principles of sustainability. Climate protection can only be successful on the long term if it is consistent with the precautionary principle as well as the sustainable development goals.

2. To limit warming to 1.5°C it is necessary to reduce global CO_2 emissions to net-zero by 2050. Therefore, decarbonisation of our economy and way of life is of greatest priority. A phase-out of fossil energy is indispensable.

Decarbonisation is necessary in all sectors and is understood as achieving a climate friendly economy and way of life characterized by ceasing use of fossil energy and resources. In addition forest and soil conservation are necessary to prevent the release of stored carbon. Fossil based energy is the largest source of global greenhouse gas emissions. Phasing out fossil energy is unavoidable for sustainable development and can be achieved comparably quickly. The more quickly and consistently greenhouse gas reductions are achieved, the more likely targets for limiting global warming remain feasible und the less their realization depends on Carbon Dioxide Removal (CDR).

3. Reducing greenhouse gas emissions is the main priority. However, complementary measures for sustainable Carbon Dioxide Removal are also necessary.

The potential for CDR is however limited and can't be determined solely based on technical factors. The social, economic and environmental sustainability must be addressed when assessing the potential. Additionally, CDR measures can't replace a comprehensive reduction of greenhouse gas emissions.

[1] Often the term ***negative emissions*** is used. We understand ***negative emissions*** as carbon dioxide (CO_2) removal from the atmosphere. We consider the term to be a separate concept from GHG-mitigation or adaptation to climate change, even if in some cases specific underlying measures can result in achieving two or even all three of the concepts (e.g. reforestation).

[2] IPCC 2018: Global Warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.

4. UBA therefore supports sustainable land use measures as an approach to Carbon Dioxide Removal and sees an urgent need to create appropriate framework conditions, e.g. provision of financial support, technology transfer and capacity building by developed countries.

Sustainable land use measures (soil conservation, wetland protection, restoration, grassland conservation or reforestation) are already available today. They offer the possibility to enhance natural carbon sinks to remove a limited yet significant amount of CO_2 from the atmosphere. Sustainable land use also contributes to climate change adaptation as well as achieving the sustainable development goals (SDGs)[3].

5. The use of CO_2 removal and storage technologies must be subject to a comprehensive assessment based on the principles of sustainability.

This assessment should weigh between:

- The environmental and societal impacts of accelerating reductions in fossil resource use in our economy and way of life without CO_2 removal and storage.
- The ecologic, economic and social impacts of CO_2 removal and storage technologies.
- The impacts of 1.5°C and higher temperature increase on ecologic, economic and social systems.

6. UBA considers it risky to rely on partly unexplored and untested CO_2 removal and storage technologies.

Current state of knowledge suggests most CDR technologies (e.g. ocean fertilization, BECCS[4], etc.) encompass potential risks for sustainable development and the environment. For example, ocean fertilization may have negative impacts on marine ecosystems, possibly leading to eutrophication or other, perhaps unforeseen, consequences. Large scale implementation of BECCS would increase competition with food production for agricultural land. It therefore poses risks for global food security and also generally bears negative impacts for ecosystems, water balance as well as soil and water quality. Depending on the site, geological CO_2storage also comprises potential risks, for example acidification of ground water or generating local seismic activity. Most CDR methods still require further research and testing before it is possible to apply them. Closing gaps in knowledge is of great urgency. Research is needed to obtain reliable estimates of the techno-economic potential of different CDR-methods and to make possible their evaluation against ecologic, social and economic requirements. However this research must not come at the expense of research related to reducing greenhouse gas emissions or adaptation to climate change.

[3] Sustainable Development Goals, especially **SDG 15**: „Life on Land“ (ensure conservation, restoration and sustainable use of terrestrial ecosystems, halt deforestation, sustainably manage forests, combat desertification, restore degraded land and halt the loss of biodiversity) and **SDG 13**: “Climate Action” (take urgent action to combat climate change and its impacts).
[4] Bioenergy Carbon Capture and Storage.

Supplementary Explanation

The Paris Agreement has established the global goal of limiting anthropogenic global warming to well below 2°C and pursuing a limit of 1.5°C. However, the global mean surface temperature has already increased by 1°C and, even if the currently planned Nationally Determined Contributions (NDC)[5] are fully implemented, greenhouse gas (GHG) emissions will continue to increase through 2030.

Therefore, we find priority should be set on dramatically improving efforts through 2030 to combat the cause of global warming. National, European and international emission reductions are essential. This includes the energy, transport, industry and building sectors and additionally requires sustainable agriculture and land use as well as the conservation of forests and wetlands.

However, reducing GHG-emissions will likely no longer be enough. Global temperature increase depends on the concentration of GHG in the atmosphere. This means that, once the associated budget is expended, a specific limit to global temperature increase can only be maintained by additionally removing CO_2 from the atmosphere– so called "negative emissions".

If fully implemented, the total contribution of all current NDCs would result in an emission level of approximately 52-58 $GtCO_2e$ in 2030. According to multiple scientific analyses (i.a. IPCC 2018), this would not be enough to limit global temperature increase to 1.5°C, even if after 2030 very ambitious emission reductions were to follow.

All 1.5°C compatible emission pathways in the scientific literature include radical reductions of CO_2 emissions, achieving net-zero-CO_2 emissions around mid-century. At the same time, these pathways include stringent reductions in other climate forcers particularly methane (CH_4). In addition to ambitious GHG-mitigation, the underlying 1.5°C-scenarios also require CDR. The scenarios with the most ambitious GHG reductions are able to limit CDR solely to land use measures (with focus on afforestation/reforestation), so that CDR technologies such as BECCS are not necessary. Even limiting warming to 2°C will only be possible with the assistance of CDR if there is not a further emission reduction of 11-13.5 $GtCO_2e$ in addition to the current NDCs by 2030[6]. Existing scenarios show, however, that much more ambitious climate change mitigation, integrated into a sustainable development, can greatly reduce dependence on CDR.

Nevertheless, measures must take into account the UN Sustainable Development Goals (SDGs). This is the only way a globally equitable climate policy and its acceptance can be ensured. Current understanding in the literature is that CDR-technologies discussed thus far pose risks for the environment and a sustainable development, especially when implemented on a large scale. Additionally, these approaches are based on technologies that are still in early stages of development and whose potential effectiveness is still disputed. Since the IPCC's 5th Assessment Report, researchers have increasingly been questioning the feasibility and sustainability of the scale to which CDR technologies like BECCS are often deployed in the GHG-emission scenarios. For example, according to IPCC (2018), for this group of scenarios, an additional area of 1 to 7 million km^2 would be required for the additional energy crops by 2050. If this were to occur on existing cropland, up to 50% of food and feed crops could be displaced.

In contrast, various measures of a sustainable land use offer the possibility to remove CO_2 from the atmosphere and at the same time contribute to adaptation to climate change as well as to multiple SDGs. Restoration and enhancement of natural carbon sinks such as wetland restoration, reforestation, grassland conservation, agroforestry or sustainable forest and soil

[5] Submitted by the Parties of the Paris Agreement in their nationally determined contributions - NDCs.
[6] UNEP 2017: The Emissions Gap Report 2017, United Nations Environment Programme (UNEP), Nairobi.

management removes CO_2, can protect biodiversity and our environment while contributing to sustainable development.

However the potential for such ecosystem based solutions to CDR is limited. Changes in consumption patterns and further demand side measures (e.g. reduced food waste, reduced meat and dairy consumption, higher energy efficiency, cascade use of biomass) are additionally necessary to reduce the pressure on natural resources, particularly on land area. This way competition for land and other resources use can be reduced (e.g. between food production and forest conservation). Thus, such measures offer additional co-benefits as well, particularly with respect to further SDGs (e.g. food security).

Against this backdrop, any further delay in phasing out fossil energy or weakening of emissions reductions at national, European or international level is irresponsible. What is required in the next thirty years is nothing less than a global transformation defined by a sustainable development which ensures the preservation of the Earth's ecological carrying capacity. The enhancement of natural carbon sinks must not become a replacement for a climate policy of ambitious GHG-reductions and thereby hinder societal transformation. Instead such sustainable measures are an additional requirement for reducing net emissions below zero and achieving the objectives of the Paris Agreement.