IPCC report calls for urgent behavioural change and carbon removal technologies

The latest edition of the IPCC report stresses the need for urgent technological and behavioural reform to fight climate change. Gerben Hieminga and Coco Zhang examined the 3,000-page report and have provided their insights

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Running out of time

Despite an exceptional drop in global greenhouse gas emissions in 2020 due to the Covid-19 pandemic, emissions rebounded and climbed to a record high in 2021. While the Paris Agreement's goal is to limit global warming to 1.5-2 degrees Celsius above pre-industrial levels, pressure is mounting to use the lower limit of 1.5 degrees as a target.

According to the Physical Science Basis report by the UN's Intergovernmental Panel on Climate Change (IPCC), reaching the 1.5 degrees target with a 67% chance requires global emissions to peak by 2025 and leaves a carbon budget of just 400 gigatons of carbon dioxide (CO2). With global carbon emissions of more than 50 gigatons per year, the budget will be used in less than eight years' time if carbon emissions are not reduced drastically.

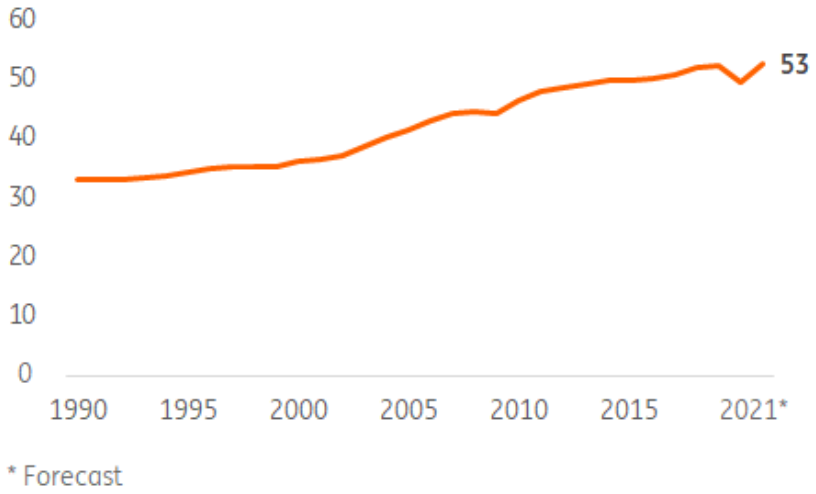
The budget for the 2 degrees target is about 1.150 gigatons of CO2, which will be exhausted in 22

years if emissions stay at current levels. This inconvenient truth makes mitigation policies of utmost importance in the fight against climate change and that's why this IPCC report on mitigation efforts is so welcome.

Put differently: the high and increasing level of yearly carbon emissions pays an increasing toll on the remaining carbon budget as it is cumulative emissions that matter. Cumulative emissions trended higher every decade and now exceed the remaining carbon budget of 400 gigatons to limit global warming to 1.5 degrees Celsius.

Carbon emissions have been trending upwards and now stand at 53 gigatons

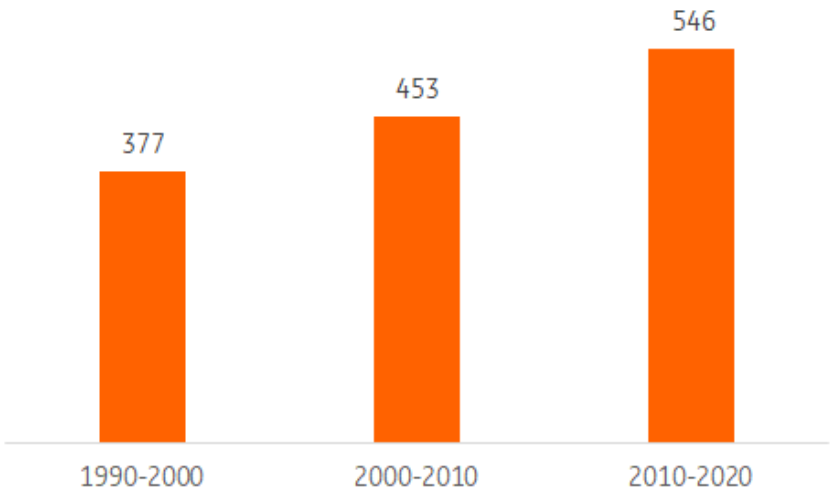
Global carbon emissions in gigatons of CO2-equivalents, excluding emissions from Land Use, Land Use Change and Forestry (LULUCF)



Source: ING Research based on PBL, UN and IEA

Cumulative emissions have trended higher every decade

Cumulative global carbon emissions in gigatonnes of CO2 equivalents, excluding emissions from Land Use, Land Use Change and Forestry (LULUCF)



Source: ING Research based on PBL, UN and IEA

Carbon capture and removal technologies can buy the world some extra time

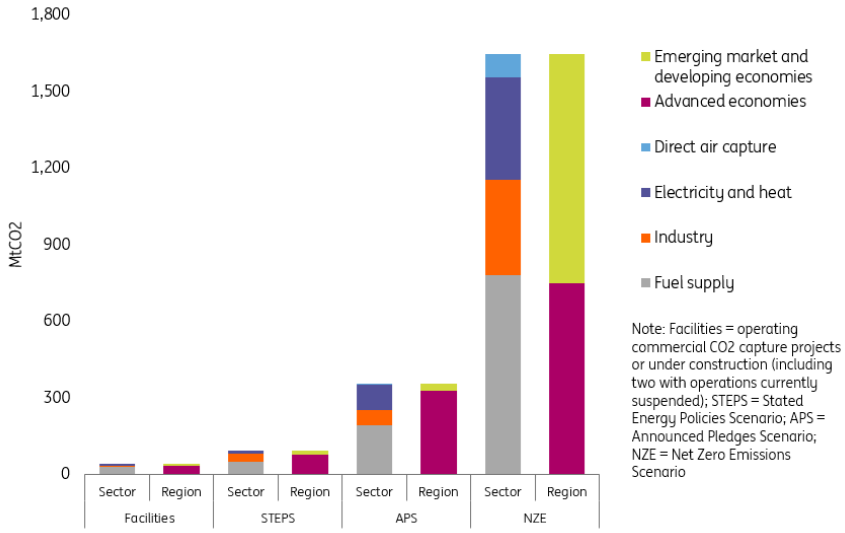
With the scarcity of time in the climate fight, this latest instalment of the IPCC report highlights the radical change needed both in technology and behaviour.

Technologies to completely phase out fossil fuels are likely to come too late. That's why the world needs to make fossil fuels cleaner by capturing and storing its emissions (CCS technology) in order to keep the 1.5-degree target alive. The IPCC's new report emphasises that CCS is key to reducing the residual emissions in the energy sector, and would be unavoidable in the hard-to-abate sectors if net-zero emissions are to be achieved. Estimated geological CO2 storage capacity is also in CCS' favour. It is forecast that total CO2 storage capacity, if well developed and managed, is higher than the amount of CO2 needed to be stored through to the year 2100 to keep global warming within 1.5 degrees Celsius of increase.

Luckily governments across the world are tempting corporates with CCS, but as of now only 40 megatons of CO2 globally is captured and stored annually (just 0.04 gigatons). That is still a long way short of the 1.7 Gt CO2 capture capacity that, according to the International Energy Agency, is needed in 2030 on a path toward a net-zero economy in 2050.

CO2 capture and storage need to increase drastically in a net zero economy that limits global warming to 1.5 degrees Celsius

CO2 capture capacity by project and scenario in 2030



Source: ING Research based on IEA

European governments are now taking their first steps to reduce their dependency on Russian gas, as a result of the Ukraine-Russia conflict. In doing so they find liquefied natural gas (LNG) and coal on the table which could even increase emissions, making CCS even more relevant.

Furthermore, the world needs to prepare for carbon dioxide removal (CDR) technologies – such as reforestation, CCS with bioenergy, and direct air capture (DAC) – that can actively take out carbon from the atmosphere and oceans. In fact, this is the first time that an IPCC report highlights that CDR is essential to achieving net-zero emissions.

Trees are nature's carbon-capturing machines. But all the forests in the world 'only' capture 7.6 gigatons of CO2 each year, which is seven times less than global carbon emissions.

So it is becoming increasingly likely that we also need machines to clean up carbon dioxide molecules. Such technology buys the world time, as it seems very unlikely that emissions will start to decline soon in all parts of the world to the extent that is needed for the 1.5 degrees pathway.

Emissions that exceed the carbon budget can then be removed at a later stage in order to stay within the limits of a 1.5 or 2-degree carbon budget. That's why the IPCC report stresses not only technologies to reduce carbon emissions like renewables and electric vehicles, but also geoengineering technologies to remove carbon from the air (direct air capture).

But this is far from easy and poses many tough questions. We can only rely on CDR technologies to an extent where they do not compensate for delayed emissions reduction efforts across sectors, and to an extent where the deployment of these technologies does not cause detrimental environmental and social effects. Think of land use for biomass production to generate energy and negative emissions (biomass energy with CCS also called BECCS) that destroy nature or competes

with land for food production.

And since some CDR technologies are far away from commercially viable, it would be hard to accurately project their impact until decades later. Moreover, we need strong global coordination to effective use CDR technologies, the achievement of which will likely meet substantial challenges.

It is clear that the IPCC and policymakers need to not only address the technicalities but also the practical and ethical trade-offs that come with negative emissions.

Behavioural change is equally important, but will it last?

The IPCC does not position itself among the tech-optimists that solely focus on innovation to combat climate change. It rightly points out that behavioural change is also crucial. As for technology, it devotes a whole chapter to it. These are the main takeaways:

1. Behavioural change has the potential to reduce global emissions by 40-70% by 2050.

2. Changes in lifestyle must happen at the systemic level across all aspects of the society. That includes, but not limited to, increased recycling, reduced air travel, lower meat consumption, and turning down thermostats, among others.

3. Demand-side solutions need to be backed by motivation and capacity, and social equity will enhance both. Motivation to behavioural change needs to be raised under the specific contexts of socio-economics, awareness, perceived risk, etc. Impartial governance, fair treatment across genders, and income equity will strengthen an economy's capacity to mitigate climate change.

The key question with behavioural change is: will it last? History shows that people return to normal once the urgency to do something subsides. People were quick to start travelling again and visiting bars and restaurants when Covid-19 lockdowns were lifted. Households and companies in Europe are now asked to lower their thermostats to save gas, but they are likely to turn their thermostats back on once energy prices reach normal levels again. Making behavioural change is a real challenge. This means that long-term, sustained policies and market design are needed to improve the economics of low-carbon lifestyles in a systemic way.

Author

Gerben Hieminga
Senior Sector Economist, Energy
gerben.hieminga@ing.com

Coco Zhang
ESG Research
coco.zhang@ing.com

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