



GHG Mitigation Briefs – October 2016

The IEA Greenhouse Gas R&D Programme (IEAGHG) is part of the IEA's Energy Technology Network. Its role is to assess the potential to mitigate greenhouse gas (GHG) emissions from the use of fossil fuels in the power, oil and gas and industry sectors. Further details of the activities of the IEA Greenhouse Gas R&D Programme can be found on our website: www.ieaghg.org.

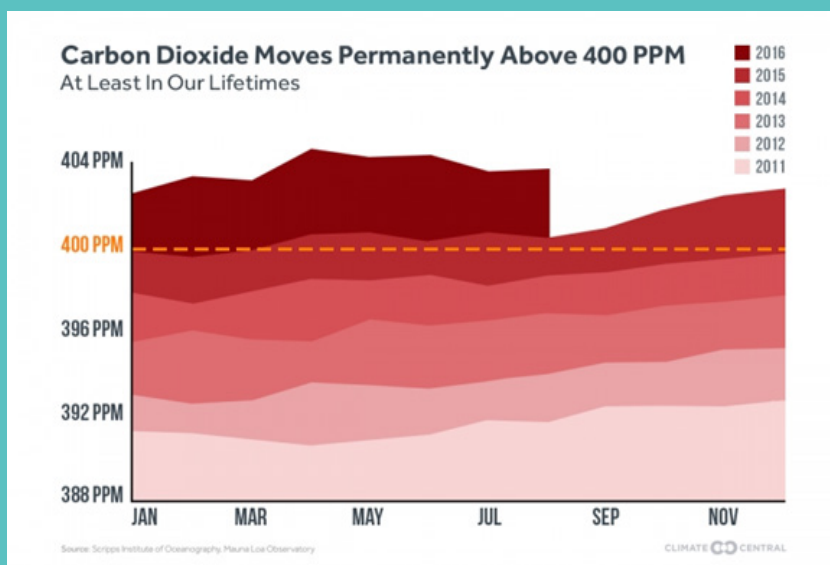
This GHG Mitigation Brief has been prepared to summarise key climate change science, policy and technology developments, identified by IEAGHG, in the last 6 months and aims to provide information for both its members and the broader community. For those requiring further information, the IEAGHG provides more detailed papers and webinars on key issues relating to greenhouse gas mitigation which can be found on its web site (www.ieaghg.org). Those directly relevant to this GHG Mitigation Brief some are referenced at the end of the document.

Paris Agreement – Ratified

On 5th October 2016, the threshold for entry into force of the Paris Agreement was achieved (55 countries representing 55% of global GHG emissions). The Paris Agreement will enter into force on 4th November 2016¹. The Paris Agreement set the challenge to limit global temperature rises to below 2 degree centigrade. The first session of the Meeting of the Parties to the Paris Agreement (CMA1), will take place in Marrakech in conjunction with COP 22.

1.5 Degrees – Meeting the Challenges of the Paris Agreement

The first conference to debate the challenge posed by the Paris Agreement was held in Oxford, UK in September 2016². The conference was timed to begin to feed into the planned IPCC Special Report on Meeting the 1.5°C Goal which is due out before the first stock take for the Paris Agreement takes place in 2018. A key conclusion from the event was that: achieving 1.5°C will need major transformation in every sector which will have to be aligned with sustainable development goals. They also conclude that for 1.5°C, zero-carbon systems will not be sufficient. Therefore, negative emission technologies (NETs) like bioenergy with CCS (Bio-CCS or BECCS) will be required.



In May 2016 atmospheric emissions of CO₂ reached the highest level recorded to date 408.9ppm. CO₂ levels after that then drop toward their annual minimum as spring triggers the collective inhale of trees and other plant life. This year CO₂ levels in September stayed above 400ppm for the first time. This resulted in many scientists speculating that it would not drop below 400ppm "within our lifetimes"³.

Climate Scientists suggest 1.5°C is inevitable

In a recently published peer reviewed paper "The Truth about Climate Change", climate scientists suggest that by 2015, global temperatures had risen by 1°C above pre-industrial levels. Further that it is certain to rise another half a degree by 2030 and will continue to rise to 2°C by 2050 unless drastic action is taken to reduce emissions⁴. Also, they note, this is only the average temperature and parts of Asia and the Middle East will warm considerably faster. The Arctic has already seen a 4°C increase? The scientists inform us that, to have any hope of solving the problem, the world needs to reach net zero emissions by 2060 to 2075. They conclude that renewables and afforestation alone will not be enough and CCS will be a very important technology to meet this target.



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Stern Review - 10 years on

Lord Stern the lead author on the influential Stern Review has given his verdict on developments in the ten years since the report came out⁵. In a recent lecture at the London School of Economics, he suggested that with 20 years of scientific evidence it is clear that the risks from climate change are immense and larger than previously thought. He suggested that over the last 10 years progress has been slow, but momentum is now building following the landmark Paris Agreement. He also suggests that there is a great opportunity to embark on new, attractive and sustainable path; but there are real dangers of a “lock-in” if action delayed.

Chinese and US CO₂ Emissions fall in 2015⁶

There is growing evidence that China's CO₂ emissions may peaked around 2014/15 which is earlier than previously suggested. The reasons for this are: China's economic growth has slowed significantly reducing coal demand and strengthened policies on air pollution and clean energy. Lowering coal use has been a critical component of measures to reduce emissions of pollutants like, SO_x, NO_x and particulates. Coupled with the fact that the USA's CO₂ emissions are also decreasing this means that the world's two largest greenhouse gas emitters are now showing downward trends. In the USA the main contributor to emissions reductions are reduced coal use and increased renewable energy generation.

Fossil Fuels Use and the Carbon Budget

There have been a number of published studies indicating that in order to meet the 2°C target, some amount of fossil fuel reserves should not be used to prevent the related greenhouse gas emissions from entering the atmosphere. This concept is usually referred to as ‘unburnable carbon’. None of these studies has looked specifically at the application of CCS, which is relevant since it is a technology that removes CO₂ from the atmosphere. IEAGHG has looked to address this gap in a recent study, commissioned to the Sustainable Gas Institute (SGI). The study has shown that up to 2100, 65% of the world's fossil reserves could be consumed under a 2°C scenario with CCS, compared to 33% without CCS⁷.

IEA Assessment on Renewables Deployment

In its medium term market report on renewables 2016 the IEA shows that Despite lower fossil fuel prices, renewable power expanded at its fastest-ever rate in 2015, thanks to supportive government policies and sharp cost reductions. Renewables accounted for more than half of the world's additional electricity capacity last year. However, the report suggests that only onshore wind and solar PV deployment are on track with long term 2°C pathways. To meet the new >2°C target will require stronger decarbonisation rates and accelerated penetration of renewables in the power, transport and heat sectors⁸.

Energy and Air Pollution are linked

The IEA in the World Energy Outlook 2016 report on Energy and Air Pollution⁹, informed us that around 6.5 million premature deaths each year can be attributed to air pollution and that energy production and use are by far the largest man-made sources of air pollutants. The IEA suggest that improved air quality and climate change can be co-benefits in many countries. The imperative of improving air quality is strong motivation for action that also has benefits for the climate i.e. a “win-win” situation.

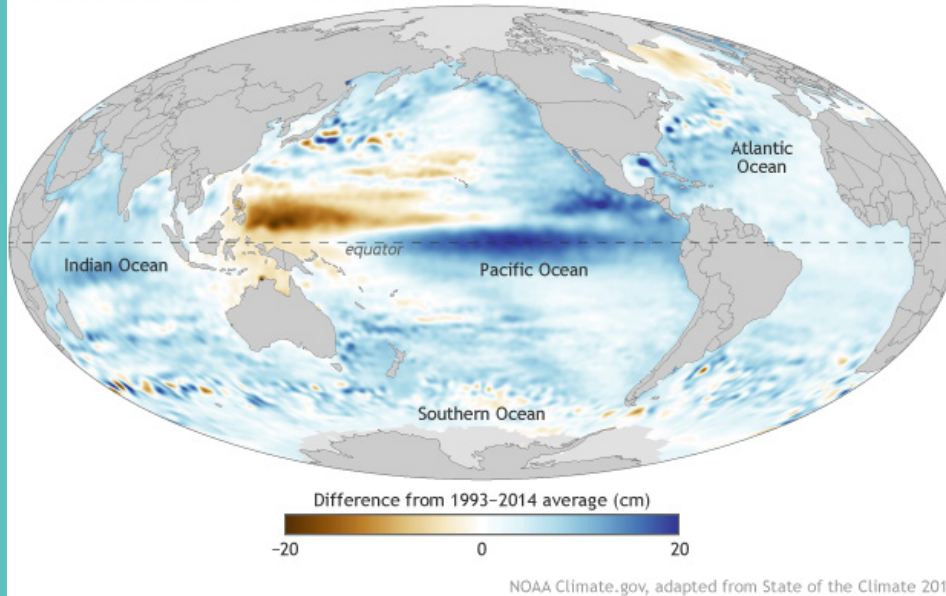
Montreal Protocol HFC Amendment

The parties to the Montreal Protocol on Substances that Deplete the Ozone Layer approved an amendment to the protocol before the 14th October 2016 to phase down hydrofluorocarbons (HFCs)¹⁰. An agreement to phase down HFCs under the Montreal Protocol would avoid an estimated 105 Gt CO₂e by 2050, and up to 0.4°C of global warming by the end of the century, while continuing to protect the ozone layer. This is a very important supporting measure help achieve the Paris Agreement target.



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EL NIÑO BOOSTS 2015 SEA LEVELS



The State of the Climate report series is the authoritative annual summary of the global climate¹¹. The 2015 report indicated that:

- Global surface temperature in 2015 easily beat the previous record holder,
- Sea level rise hit a new record high in 2015,
- Ocean heat storage has increased substantially since 1993, hitting a record high in 2015,
- Global CO₂ levels hit a new high in 2015,
- The area of the globe in severe drought increased from 8% at the end of 2014 to 14% by the end of 2015,
- Glaciers across the globe continued to shrink for the 36th consecutive year,
- Few areas of the globe were spared a record number of extremely warm days in 2015

Emissions reduction from Aviation

In a further historic development on GHG mitigation the UN Aviation Agency members agreed on a new global market-based measure to control CO₂ emissions from international aviation¹². It is designed to complement mitigation measures the air transport community is already pursuing to reduce CO₂ emissions from international aviation, such as: efficiency improvements and use of sustainable alternative fuels. Aviation emissions currently only represent 2% of global GHG emissions but are projected to grow significantly by 2030 at a time when other sector emissions are being cut.

Agriculture Must Play its Part

The International Institute for Applied Systems Analysis (IIASA) stress that agriculture must also play a strong role in reducing its emissions before 2030. We cannot rely on the energy sector and transportation alone¹³. Agriculture (not including land use change) contributes an average of 35% of emissions in developing countries and 12% in developed countries today. The agricultural sector must reduce non-CO₂ emissions by 1 billion metric tons per year by 2030. Currently known mitigation practises would only deliver between 21-40% of mitigation required.

Global Methane Emissions

Global methane emissions plateaued in 1999 then started to increase again in 2007 the cause of this increase has been hotly debated. In the most recent study, scientists have analysed the isotopic profiles of methane emissions and used the most extensive dataset to date to try and answer this question¹⁴. The study concludes that whilst methane emissions from the oil and gas sector in inventories have been underestimated by 20-60%, they are not the source of the increase. In fact the industry has reduced its emission intensity most probably as a result of increased regulatory measures like the Trilateral Agreement recently signed between the USA, Canada and Mexico which in part looks to reduce methane emissions in the oil and gas sector further by increased regulation¹⁵.

The actual cause is attributed to increased biological methane production from activities like; rice production and animals. Increased emissions from permafrost might be a direct consequence of global warming.



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Further Reading

1. http://unfccc.int/paris_agreement/items/9485.php
2. IEAGHG Information Paper 2016-IP41: 1.5 Degrees – Meeting the Challenges of the Paris Agreement,
3. <http://www.climatecentral.org/news/world-passes-400-ppm-threshold-permanently-20738>
4. IEAGHG Information Paper 2016-IP40: Climate Scientists say 1.5°C is inevitable,
5. IEAGHG Information Paper, 2016-IP45: The Stern Report 10 years on.
6. IEAGHG Information Paper 2016-IP31: Chinese CO₂ Emissions have peaked?
7. IEAGHG Report 2016/05, Can CO₂ Capture and Storage Unlock 'unburnable carbon'?, May 2016
8. IEAGHG Information Paper 2016-IP46, IEA Medium-Term Renewable Energy Market Report 2016
9. IEAGHG Information Paper: 2016-IP24; World Energy Outlook 2016 Special Report Energy and Air Pollution.
10. <http://www.ccacoalition.org/en/events/28th-meeting-parties-montreal-protocol>
11. IEAGHG Information Paper IP2016-28: International report confirms 2015 was Earth's warmest year on record,
12. IEAGHG Information Paper: 2016-IP37: Emissions from Aviation the Next Challenge?
13. IEAGHG Information Paper: 2016-IP14; Climate Targets for Agriculture in a post COP21 World,
14. IEAGHG Information Paper 2016-IP42: Latest Information on Global Methane Emissions,
15. IEAGHG Information Paper: 2016-IP23; New Trilateral Agreement on GHG Mitigation