From a decade of coal to the century of renewables

Key findings of the IPCC WGIII report on mitigation and what they imply for action
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"This century started with a decade of coal but it will be known as the century of solar and wind. The IPCC finds that a fundamental transformation of our energy system is needed, where eventually, fossil fuel emissions are phased out to zero. This is a bold challenge but the breakthrough of clean and safe renewable energy is making it possible."

– Karsten Smid, Greenpeace Germany

The Intergovernmental Panel on Climate Change (IPCC) is the world's leading scientific body for the assessment of climate change. In 2013-2014 the Panel is launching its Fifth Assessment Report in four parts. The first two assessed the science and impacts of climate change, while the third part assesses solutions. This briefing summarises some key findings of the IPCC Working Group III report - from the Summary and the underlying 2000 page report – and draws conclusions for action. Direct citations supporting the findings are compiled in an attachment.

10 important findings – translated to plain English

1) Serious emission cuts haven't really started. Despite global agreements and national policies, emissions keep growing – mostly in emerging economies – while old industrialised countries' emissions remain at high levels. Global emissions grew *faster* in 2000-2010 than in the previous decades. Without further action, we're heading towards 4-5°C warming or even more.

2) 2000-2010 was the decade of coal. Almost 80% of the emissions growth during this period was caused by fossil fuel combustion, and in particular burning of coal.

3) It is not too late to limit warming to less than 2°C – or even 1.5°C with less certainty – the levels beyond which risks start to accelerate substantially. But we have to stay within a limited carbon budget that is shrinking fast. Scenarios that bring temperature back to 1.5°C imply 70-95% emission cuts by 2050 from 2010 levels, while 2°C scenarios imply at least 40-70 % cuts by 2050.

4) We need to head towards fossil fuel phase out and zero net emissions. Energy sector is the biggest source of emissions and that's where a fundamental transformation is needed, including a *"long-term phase-out of unabated fossil fuel conversion technologies"*. Global net CO2 emissions must decline toward zero. Rapid decarbonisation of the electricity system is a key component of cost-effective strategies, starting from conventional coal power plants.

5) Renewable energy is ready to go big and comes with most co-benefits. Renewable energy technologies have advanced substantially in performance and costs since the last IPCC report (AR4) and a growing number of them have achieved a level of technical and economic maturity to enable deployment at significant scale. The same can't be said for nuclear and carbon capture and storage (CCS)[i]. Out of the zero or low-carbon options assessed, which the report says must be tripled to nearly quadrupled by 2050 for below 2 degrees scenarios, renewables stand out as the easiest thing to do and are associated with many co-benefits.

6) Using energy more smartly plays a fundamental role in emission cuts. Near term reductions in energy demand are important for cost effective mitigation. The more is done on energy efficiency, the less pressure there is to rely on risky options on the energy supply side. Efficiency potential is large and deploying it would help avoid lock-in to carbon-intensive infrastructures while unleashing important co-benefits.

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7) Clean energy transition means fossil fuel divestment. Transitioning to a low-carbon world would imply large changes in investment patterns in the next 15 years, with major declines in fossil fuel extraction and power plant investments and major increases in energy efficiency and renewable energy. To stay below 2°C, only about a fifth of all fossil fuel reserves can be burned[ii]. Hence, climate policies may devalue fossil fuel assets. The effect on coal and oil exporters is expected to be largely negative.

8) Costs of action are tiny when put into context. Keeping below 2°C could reduce consumption growth by about 0.06 percentage points below baseline. In other words, instead of about 1.6-3 % annual growth in global consumption, we'd have 1.54 - 2.94 % growth over the century. These numbers ignore the benefits of avoided climate destruction as well as co-benefits of cutting pollution. In reality, the air quality co-benefits alone can often be of a similar order of magnitude as the mitigation costs themselves – or far exceed them.

9) Acting fast reduces costs and risks and avoids inconvenient measures. The longer we delay action, the higher the overall costs and the smaller our chances to prevent catastrophic warming. Delay reduces technology options, forcing us to rely increasingly on unproven and speculative technologies, such as carbon dioxide removal with bioenergy coupled with carbon capture and storage (BECCS), which entail many challenges and risks.

10) Global cooperation is needed and making it more fair could help. So far success in global cooperation on climate action has been limited, in terms of actual emission cuts, but addressing distributional equity and fairness could help the way forward. There are no universally agreed methods for fair effort sharing, but looking at all effort sharing frameworks together suggests that, if aim is to keep warming below 2°C, then in 2030 OECD1990 countries' emissions allowances would need to be approximately half of 2010 levels, with a large range, roughly two-thirds in the Economies in Transition (EIT), roughly at the 2010 emissions level or slightly below in Asia, slightly above the 2010 level in the Middle East and Africa, and well below the 2010 level in Latin America.

Finally, it is not just technology and policy that needs to change – nor just energy. Behaviour, lifestyle and culture have a considerable influence on energy use and emissions, with high reduction potential in some sectors. Changes in consumption patterns and dietary change and reduction in food wastes can substantially lower emissions. In the land-use sector, reducing deforestation is among the most cost effective mitigation options.

Conclusions for action

- **From a decade of coal to the century of renewables.** The problem is clear and so are solutions. Our energy system needs to undergo a fundamental transformation from fossil fuels to renewable and smart energy. In recent years, the transition has already started, but it must scale up and speed up.
- **From phase down to phase *out*.** It's not enough to cap emissions or to reduce their growth. What we need, eventually, is a phase *out* of fossil fuel technologies altogether. It will take decades, but to get there, change must start today. It means avoiding investments into new high-carbon infrastructure and shifting investments to energy efficiency across sectors and renewable energy in power in particular, where decarbonisation can be fastest. Clear and consistent long-term goals and policies play a crucial role.
- **Decision-makers are everywhere.** Climate change is too big an issue to be left to policymakers alone. Advancing a future powered by 100% renewables needs game changers at all levels, from financial regulators to investors; from CEOs to unions and from city councils to churches. Thanks to rapidly declining RE costs, individuals can increasingly take control of their own energy and become drivers of change.
- **Paris Treaty must mark the beginning of the end to the fossil fuel era.** United Nations climate negotiations are stuck in the past, seeing climate action as a burden. In reality, not acting is the burden. Smart energy, forest protection and climate resilient agriculture come with major co-benefits and increasingly are the most economic choice too. To be relevant, the Paris Treaty in 2015 needs to pave the way towards a 100% renewable energy future for all and start the count down of fossil fuel phase out.

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[i] While the IPCC recognizes that nuclear could play an increasing role in emission cuts it notes too that major barriers exist from safety to financial risks and that nuclear's share in world power generation has continued to decline. Excluding nuclear from mitigation options would not increase costs substantially. CCS, on the other hand, plays a larger role in mitigation scenarios – particularly in combination with biomass – but it still hasn't been applied at a scale to a large to a commercial fossil fuel plant. In addition, risks related to operational safety, long-term integrity of storage and CO2 transport remain; economics are not in favor of CCS and solving regulation related to short- and long-term responsibilities related to storage remains an open question.

[ii] According to IPCC AR5 WGIII. Chapter 7. Table 7.2 estimated total fossil fuel reserves are 1002 – 1940 GtC. According to the IPCC AR5 WG1. Table SPM.3, the cumulative CO2 emissions until 2100, allowed for a scenario RCP2.6 that keeps warming below 2°C with higher than 66% likelihood, are about 270 GtC.