

## Summary

# Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change: Mitigation of Climate Change

### *Approaches to climate change mitigation*

Sustainable development and equity are the basis upon which climate change policies should be assessed and demonstrate the importance of reducing the risk of climate change. However, “some mitigation efforts could undermine action on the right to promote sustainable development, and on the achievement of poverty eradication and equity” (IPCC, 2014:5). Instead of focusing on mitigation and adaptation, assessments of climate change policies should focus on development pathways.

Successful mitigation will not be achieved if individual actors act in their own interests independently. There is a significant role for international cooperation in developing, diffusing and transferring both knowledge and technology.

Mitigation and adaptation highlight issues of equity, justice and fairness. Countries have made different contributions to the level of GHGs in the atmosphere, face different challenges and have different capacities to undertake mitigation and adaptation action. Evidence indicates that more effective cooperation can result if the most equitable outcomes are chosen.

Policies to address climate change are interlinked with other policies – such as those to address human health, food security, energy access and sustainable development. Mitigation and adaptation policies can have both positive and negative impacts on these efforts. However, if well managed, synergies can be capitalized upon multiple-goal approaches can strengthen the basis for implementing climate change policies.

### *Trends in stocks and flows of greenhouse gases and their drivers*

From 1970 to 2010 there was a continual increases in total anthropogenic GHG emissions. Between 2000 and 2010 annual GHG emissions grew on average by 1.0 GtCO<sub>2</sub> or 2.2 percent a year compared with 0.4 GtCO<sub>2</sub> or 1.3 percent during the period 1970 to 2000. The breakdown of anthropogenic GHG emissions between 2000 and 2010 is as follows: energy supply (47 percent), industry (30 percent), transport (11 percent) and buildings (3 percent).

Between 2010 and 2011 fossil fuel-related CO<sub>2</sub> emissions increased by about 3 percent and by 1 to 2 percent from 2011 to 2012. In 2010 76 percent

of emissions were from CO<sub>2</sub>, 16 percent from methane (CH<sub>4</sub>), 6.2 percent from nitrous oxide (N<sub>2</sub>O) and 2 percent from fluorinated gases.

Growth in both economies and population growth are the most important drivers of global increases in CO<sub>2</sub> emissions from fossil fuel combustion. However, while population growth's contribution to emission levels has remained relatively constant, the contribution of economic growth has increased significantly (high confidence). The increased use of coal in relation to other energy sources has played a role in this trend and has also reversed the trend of decarbonization of the global energy supply.

Without additional efforts to reduce GHG emissions (beyond those in place today) emissions will continue to rise and could lead to global mean surface temperature rise of between 3.7 °C to 4.8 °C compared to pre-industrial levels (high confidence).

### ***Mitigation pathways and measures in the context of sustainable development***

Limited global temperature rise to below 2 °C by 2100 would require that anthropogenic GHG concentration levels in the atmosphere be kept below 450 ppm CO<sub>2</sub> eq. (high confidence). GHG concentration levels of 500 ppm CO<sub>2</sub> eq would more likely than not limit temperature rise to 2 °C relative to pre-industrial levels while GHG concentration levels of between 530 and 650 ppm CO<sub>2</sub>eq by 2100 are more unlikely than likely to keep temperature change below 2 °C relative to pre-industrial levels.

The levels of GHG emissions in the atmosphere in 2020 based on the Cancún Pledges are not consistent with cost effective long-term mitigation trajectories that are at least as likely as not to limit temperature change to 2 °C relative to pre-industrial levels (2100 concentrations of about 450 and about 500 ppm CO<sub>2</sub>eq), but they do not preclude the option to meet that goal (high confidence). Limiting global temperature rise

to below 2 °C would require further reductions beyond 2020. The Cancún Pledges are consistent with scenarios required to limit warming to below 3 °C relative to pre-industrial levels.

Delaying implementing additional mitigation activities to those in place today through 2030 will make it more difficult to transition to low long-term emission levels and will also narrow the range of options available to keep global temperature rise to below 2 °C relative to pre-industrial levels (high confidence).

Studies suggest that to limit global temperature rise to below 1.5 °C by 2100 relative to pre-industrial levels atmospheric concentrations of GHG emissions would need to stay to below 430 ppm CO<sub>2</sub>eq by 2100 (high confidence).

### ***Sectoral and cross sector pathways and measures***

Infrastructure that locks societies into GHG-intensive emission pathways may be difficult or costly to change, highlighting the importance of undertaking early and ambitious mitigation action (robust evidence, high agreement).

More efficient use of energy and behavioral changes to reduce energy demand, without compromising development, are important mitigation strategies for mitigation scenarios that would limit GHG emission levels to concentrations of between 450 and 500 ppm CO<sub>2</sub>eq by 2100 (robust evidence, high agreement).

### ***Mitigation policies and institutions***

Significant emission reductions will require changing investment patterns. Stabilizing atmospheric concentrations of GHGs to levels between 430 to 530 ppm CO<sub>2</sub>eq by 2100 would require substantial shifts in annual investment flows. Annual investment in conventional fossil fuel technologies associated with the electricity supply sector is project to decline by 20 percent while annual investment in low carbon electricity

---

supply is projected to rise by 100 percent (limited evidence, medium agreement).

It is estimated that between USD 343 billion and 385 billion is available to support efforts to address climate change annually, most of which goes to finance mitigation activities. In 2011/12 between USD 35 billion and 49 billion went to developing countries (medium confidence). It is estimated that developing countries receive between USD 10 billion and 72 billion per year (including FDI as equity) in international private climate finance and between USD 10 billion and 37 billion in loans for climate-related activities.

Some mitigation policies will cause energy prices to rise and could hinder the expansion of access to modern energy services for underserved populations (low confidence). Worldwide 1.3 billion people lack access to electricity and about 3 billion people depend on traditional fuels for cooking and heating which have significant impacts on health, ecosystems and development. Providing access to energy is an important sustainable development goal. The costs of providing nearly universal access to both electricity and clean cooking and heating fuels is projected to be between USD 72 billion to 95 billion.

### ***International cooperation***

The Kyoto Protocol offers lessons towards achieving the ultimate objective of the UNFCCC, particularly with respect to participation, implementation, flexibility mechanisms, and environmental effectiveness (medium evidence, low agreement).

### ***Reference:***

IPCC (2014) Summary for Policymakers. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Edenhofer, O., R. Pichs-Madruga, R., Sokona, Y., Farahani, E., Kadner, S., Seyboth, K., Adler, A., Baum, I., Brunner, S., Eickemeier, P., Kriemann, B., Savolainen, J., Schlmer, S., von Stechow, S., Zwickel, T. and J.C. Minx (eds.) Cambridge and New York: Cambridge University Press.