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Background for IPCC 2013/2014

Working Group1 -The Science

Background

On 25 September 2013, the Intergovernmental Panel on Climate Change (IPCC) published its latest major, authoritative and comprehensive review of climate science¹. This report, from Working Group I, is the initial part of the IPCC's Fifth Assessment Report (AR5), and will be followed up in 2014 with further Working Group reports on impacts, adaptation and mitigation. **WWF Scotland is pleased to provide MSPs with a briefing on this report, the first in a series on the various IPCC reports in 2013 & 2014.**

The Scottish context

As Christiana Figueres, Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC), stated in January 2013, 'domestic legislation on climate is the absolutely critical, essential, linchpin between action at the national level and international agreements.' WWF believes it is important for policy makers and legislators around the world to be fully aware of the science, so as to be able to design and implement appropriate domestic climate legislation.

Scotland is leading the way with the passing of its 2009 Climate Change Act, and is now grappling with the challenge of implementing the necessary policies to reduce emissions and meet its targets. We hope this briefing will provide MSPs with the understanding of the severity of the climate change problem, and inject a renewed sense of the urgency with which it must be tackled, both at home and abroad.

Overview

AR5 provides more certainty in many respects, and a more detailed understanding of climate change than previous reports, rather than any single new finding. **What the report largely shows is that certainty over the causes and effects of climate change have increased.**

According to the report, scientists are now more certain than ever that human activity is responsible for the majority of global warming since 1951. The report also shows that:

¹ The summary for policy makers can be found at <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>

- sea level rise has accelerated;
- the rate of arctic sea ice retreat has doubled;
- the melting of glaciers and ice sheets is faster than before, and
- oceans are acidifying.

AR5 makes it clear that a rapid reduction of greenhouse pollution will help the world avert the worst of climate change, but without aggressive mitigation strategies, global temperature rise will likely exceed 2°C by 2100.

Key Findings:

Climate science has advanced considerably since the fourth assessment report in 2007. This report includes new data and modelling techniques, better measurements across the earth's surface and even significant advances in computing power. While these changes have largely brought greater certainty to the field, in some cases there is greater uncertainty now than previously thought. The following represent some of the key findings from AR5, or the most noteworthy items contained within the report.

1. **Scientists are now 95% to 100% certain that humans have caused the majority of climate change since the 1950's.** This is an increase in certainty from 2007 (90% to 100%) and a significant increase since 2001 when scientists were at least 66% certain.
2. Without an aggressive mitigation strategy that sees greenhouse gas emissions stabilise this century, **global temperature looks set to significantly exceed 2°C warming above pre-industrial levels by 2100** – crossing a threshold into catastrophic warming with considerable global consequences.
3. If we want a greater than two-third chance of limiting temperature rise to **less than 2°C**, then **we have already used up over half of our carbon budget globally.**
4. If we look at global warming in terms of decades, **the three most recent decades have all been warmer than all preceding decades** (since 1850).
5. The **period covering 1983 to 2012 was very likely the warmest 30-year period in 800 years** and likely the warmest of the past 1400 years.
6. Since 1950 **the atmosphere and the oceans have warmed**, the extent and volume of **snow and ice have diminished**, and **sea levels have risen**. Many of these changes are happening much more quickly than in the past.
7. The **melting of glaciers and ice sheets** in the last decade **has been several times faster than the melting during the 1990's.**
8. The area covered by **Arctic sea ice has shrunk in every season and every decade since 1979.** The climate models predict that with continuing high emissions, we can expect nearly ice-free Arctic summers by 2050.

9. **Sea level rise has accelerated**, rising almost twice as fast from 1993 to 2010 than it did from 1901 to 2010.
10. It is also very likely that **the rate of sea level rise during the 21st century will exceed the rate observed from 1971-2010** under all scenarios in AR5.
11. The **oceans are acidifying** and have been since the start of the industrial era.
12. **The top 700 meters of the oceans, which take up the vast majority of the heat trapped by greenhouse gases, have been warming since the 1970's.** This ocean warming may be contributing to the fact that during the last 15 years, surface temperatures - the air above land and the top of the ocean - have risen slowly compared to previous recent decades. Decades of slower warming are not unusual.
13. The **frequency and intensity of heavy precipitation events will increase** at the global scale.
14. There's **strong evidence that temperature extremes**, including warm days and heat waves, **have become more common since 1950.**
15. Scientists don't have enough data to make conclusive statements about an increase in flooding globally in the last few decades. However, when looked at regionally, the picture is more mixed. **Some regions are projected to experience an increase in flooding events**, such as parts of New Zealand, Australia, Central America, China, Mongolia, Northern Europe, and Western North America.
16. **In the case of droughts**, global trends are difficult to identify, however, regional trends are clearer and **some areas are experiencing more severe and more frequent droughts** (e.g., Mediterranean and West African regions).
17. In the case of tropical storms, recent data suggest that **the frequency of Category 4 and 5 storms are projected to increase** globally.
18. **AR5 slightly increases the range of climate sensitivity**, expanding it on the lower end of the range. Climate sensitivity refers to how much the planet would warm if the amount of atmospheric CO₂ doubled. In AR4 the best estimate for sensitivity from a doubling of CO₂ was 3 degrees Celsius and that is unchanged in AR5. A lower sensitivity means that warming of 1.5 C is now considered possible. But this best case scenario is deemed no more likely than the worst case scenario of 4.5 C warming, which would be catastrophic for people and planet. Regardless, based on current trends, emissions are on track to far exceed doubling, which would lead to dangerous temperature rise even in a low-sensitivity climate.

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