**Key IPCC Quotes**

**Compiled by Peter Carter, February 2015**

**Already committed (locked-in) future climate change**

‘The commitment from constant greenhouse gas concentrations would correspond to approximately 2°C warming’. (AR5 WG1 12.5.4.2)

‘Many aspects of climate change will persist for centuries even if concentrations of greenhouse gases are stabilised. This represents a substantial multi-century commitment created by human activities today’. (AR5 WG1 SPM)

‘Global temperature equilibrium would be reached only after centuries to millennia if RF [radiative forcing or climate system heat] were stabilized’. (AR5 WG1 Chapter 12 Executive Summary)

**Risk of warming up to an unlivable 7.8°C by 2100**

‘Without additional efforts to reduce GHG emissions, global mean surface temperature increases in 2100 from 3.7 to 4.8°C with a range **to 7.8°C** when including climate uncertainty.’ (AR5 WG3 SPM p. 8) ["Uncertainties" include the large sources of amplifying feedbacks that are not included in the AR5 global warming projections; these feedbacks are actually certain.]

**Impacts unprecedented in hundreds of thousands of years**

‘Projected future climate change and other human-induced pressures are virtually certain to be unprecedented compared with the past several hundred millennia’. (AR4 WG2 Impacts 4.1 Key issues)

**Extreme increase of atmospheric greenhouse gases ‘**Multiple lines of evidence confirm that the long-lived greenhouse gases CO2, CH4, N2O all have increased substantially since 1750. There is very high confidencethat they now exceed by 30%, 125%, 8%, respectively, the range of variability recorded in ice core records during past 800,000 years’.

**Unprecedented increase in atmospheric CO2**

‘The recent rate of change [in atmospheric CO2] is dramatic and unprecedented; increases in CO2 never exceeded 30 ppm in 1 kyr – yet now CO2 has risen by 30 ppm in just the last 17 years’. (AR4 WG1 Science FAQ 7.1)

**Impacts to all continents and all oceans**

‘In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans’. (AR5 WG2 SPM p. 4)

**Climate change amplifies risks**

‘Climate change is projected to amplify existing climate-related risks and create new risks for natural and human systems. Some of these risks will be limited to a particular sector or region, and others will have cascading effects’. (WG2 SPM)

**Drinking-water impacts**

‘Freshwater-related risks of climate change increase significantly with increasing greenhouse gas concentrations. Climate change is projected to reduce raw water quality and pose risks to drinking water quality even with conventional treatment, due to interacting factors: increased temperature; increased sediment, nutrient, and pollutant loadings from heavy rainfall; increased concentration of pollutants during droughts; and disruption of treatment facilities during floods. The fraction of global population experiencing water scarcity and the fraction affected by major river floods increase with the level of warming in the 21st century’. (AR5 WG2 SPM)

**Urban populations**

‘Heat stress, extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, and water scarcity pose risks in urban areas for people, assets, economies, and ecosystems (very high confidence)’. (AR5 WG2 SPM)

**Increasing extreme events**

‘Impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability’. (AR5 WG2

SPM p. 6)

‘It is very likely that anthropogenic forcing has contributed to the observed changes in daily temperature extremes since the mid-20th century. […] Models project increases in the duration, intensity and spatial extent of heat-waves’. (AR5 WG1 SPM)

‘More severe and/or frequent extreme weather events and/or hazard types are projected to increase losses and loss variability in various regions and challenge insurance systems to offer affordable coverage’. (AR5 WG2 SPM)

**Unique and vulnerable ecosystems and cultures**

‘Some unique and threatened systems, including ecosystems and cultures, are already at risk from climate change and the number of such systems at risk of severe consequences is high at 1.6°C’. (AR5 WG2 SPM)

**Tipping points**

‘With increasing warming from today, some ecosystems may be at risk of abrupt and irreversible changes’. (AR5 WG2 SPM).

**Abrupt Change**

‘Several components or phenomena in the climate system could potentially exhibit abrupt or nonlinear changes, and some are known to have done so in the past’ (AR5 WG1 Chapter 12)

**Negative effect on most crops already**

 ‘Assessment of many studies covering a wide range of regions and crops shows that negative impacts of climate change on crop yields have been more common than positive impacts (high confidence). The smaller number of studies showing positive impacts relate mainly to high-latitude regions, though it is not yet clear whether the balance of impacts has been negative or positive in these regions (high confidence).’

(AR5 WG2 SPM p. 4, SYN Long-14)

**Above 1.0°C all crops in all regions decline** [the policy makers changed this in the Summary for Policymakers, making it confusing]
‘Temperature increases in excess of about 1 degree C above pre-industrial [are] projected to have negative effects on yields for the major crops (wheat, rice and maize) in both tropical and temperate regions’. (AR5 WG2 final science draft, Chapter 7, p.3)

**Severe pervasive irreversible impacts**
‘Increasing magnitudes of warming increase the likelihood of severe, pervasive, and irreversible impacts’. (AR5 WG2 SPM p. 14)

**The future this century:**

* **reduced economic growth**
* **increased poverty**
* **reduced food security & increased hunger**

‘Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger’. (AR5 WG2 SPM p. 20)

**Ocean acidification to be highly damaging to most marine life**

[For all scenarios but the best-case (RCP2.6) emissions scenario], ‘ocean acidification poses substantial risks to marine ecosystems, especially polar ecosystems and coral reefs, associated with impacts on the physiology, behavior, and population dynamics of individual species from phytoplankton to animals. […] Ocean acidification acts together with other global changes (e.g., warming, decreasing oxygen levels) and with local changes (e.g., pollution, eutrophication [algae overgrowth]) (high confidence)’. (AR5 WG2 SPM)

**Combined multiple damaging effects on the oceans**

‘Simultaneous drivers, such as warming and ocean acidification, can lead to interactive, complex, and amplified impacts for species and ecosystems’. (AR5 WG2 SPM)

[Another such damaging driver is that some ocean oxygen levels are declining and] ‘there is high agreement among modeling studies that O2 concentrations will continue to decrease in most parts of the Ocean due to the effect of temperature’. (AR5 WG2 Technical Summary)

**Increasing violent conflicts**

‘Climate change can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence by amplifying well-documented drivers of these conflicts such as poverty and economic shocks. Multiple lines of evidence relate climate variability to these forms of conflict’. (AR5 WG2 SPM p. 20)

**Considerable risks above 1.0°C ‘**Some risks of climate change are considerable at 1 or 2°C above preindustrial levels’. (AR5 WG2 SPM p. 14)

‘Risks from climate change impacts arise from the interaction between hazard (triggered by an event or trend related to climate change), vulnerability (susceptibility to harm), and exposure (people, assets or ecosystems at risk). Hazards include processes that range from brief events, such as severe storms, to slow trends, such as **multi-decade droughts** or multi-century sea-level rise’.(SYN long Box Introduction.1)

**Severe ecosystem impacts already**

‘Increases in the frequency or intensity of ecosystem disturbances such as droughts, wind-storms, fires, and pest outbreaks have been detected in many parts of the world and in some cases are attributed to climate change’ (AR5 SYN long 14)

**Severe impacts from increased extremes already**

‘Impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability (very high confidence). Impacts of such climate-related extremes include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, human morbidity and mortality, and consequences for mental health and human well-being’. (AR5 SYN Long 16)

‘Carbon stored in the terrestrial biosphere is susceptible to loss to the atmosphere as a result of climate change, deforestation, and ecosystem degradation (high confidence). The aspects of climate change with direct effects on stored terrestrial carbon include high temperatures, drought and windstorms; indirect effects include increased risk of fires, pest and disease outbreaks. Increased tree mortality and associated forest dieback is projected to occur in many regions over the 21st century (medium confidence), posing risks for carbon storage, biodiversity, wood production, water quality, amenity, and economic activity. There is a high risk of substantial carbon and methane emissions as a result of permafrost thawing.’ (AR5 SYN Long-27)

**Climate change rate exceeds large extinctions in the past**
‘Natural global climate change at rates slower than current anthropogenic climate change caused significant ecosystem shifts and species extinctions during the past millions of years’. (AR5 WG2 p. 4)

**Large proportion of species are being committed to extinction**
‘A large fraction of both terrestrial and freshwater species faces increased extinction risk under projected climate change during and beyond the 21st century, especially as climate change interacts with other stressors. [CURRENT RATE OF EXTINCTION IS 100 x NATURAL BACKGROUND RATE: S. Pimm, *Science*, May 2014.] Extinction risk is increased under all RCP scenarios, with risk increasing with both magnitude and rate of climate change’. (AR5 WG2 SPM p. 14)

**Abrupt irreversible regional damage, by 2100, under all but the best-case emissions scenario (RCP2.6)**
‘Within this century, magnitudes and rates of climate change associated with medium- to high-emission scenarios (RCP4.5, 6.0,and 8.5) [i.e., all scenarios except the best-case RCP2.6] pose high risk of abrupt and irreversible regional-scale change in the composition, structure, and function of terrestrial and freshwater ecosystems, including wetlands.’ (AR5 WG2 SPM)

**Multiple large sources of amplifying feedback**

‘There is very high confidence that the Arctic region will warm most rapidly’. (AR5 WG1 SPM)

‘Examples that could lead to substantial impact on climate [i.e., amplifying carbon feedback] are the boreal-tundra Arctic system and the Amazon forest. Carbon stored in the terrestrial biosphere (e.g., in peatlands, permafrost, and forests) is susceptible to loss to the atmosphere [i.e amplifying carbon feedback] as a result of climate change, deforestation, and ecosystem degradation (high confidence). Increased tree mortality and associated forest dieback is projected to occur in many regions over the 21st century, due to increased temperatures and drought. Forest dieback poses risks for carbon storage and biodiversity.’ (AR5 WG2 SPM p. 15)

**Thawing permafrost could add another 1.5°C of global warming by 2100**

‘Until the year 2100, up to 250 PgC [picograms of carbon] could be released as CO2, and up to 5 Pg as CH4. Given methane's stronger greenhouse warming potential, that corresponds to a further 100 PgC of equivalent CO2 released until the year 2100 [so 350PgC and about 1.5°C].’ (AR5 WG1 FAQ 6.1)

**Methane emissions could increase dramatically this century**

‘Methane emissions, from Arctic thawing permafrost and subsea floor methane hydrates in the Arctic, could increase dramatically due to the rapid climate warming of the Arctic and these large carbon pools stored there.’ (AR5 WG1 FAQ 6.1)

**Arctic amplifying feedback runaway risk**

‘Should a sizeable fraction of this Arctic frozen carbon be released as methane and CO2, it would increase atmospheric concentrations, which would lead to higher atmospheric temperatures. That in turn would cause yet more methane and CO2 to be released, creating a positive feedback, which would further amplify global warming.’ (AR5 WG1 FAQ 6.1)

**Only scenario that may not exceed 2.0°C - best case emissions scenario RCP2.6**

‘Global mean surface temperature increase by 2081–2100, relative to 1986–2005 will likely be in the 5 to 95% range of 0.3°C to 1.7°C for RCP2.6 (mean 1.0°C)’. This is 0.9°C to 2.3°C (mean 1.6°C). (AR5 WG1 TS.5.5.1)

**Zero emissions required for mitigation**

‘Pathways that are likely to limit warming to below 2°C relative to pre-industrial levels…

would require substantial emissions reductions over the next few decades and near zero emissions of carbon dioxide and other long-lived greenhouse gases by the end of the century.’ (AR5 SYN SPM Headline Statements)

**CO2 lasts ‘for ever’**

‘The removal of all the human-emitted CO2 from the atmosphere by natural processes will take a few hundred thousand years (high confidence) ‘(AR5 Ch6 6.1.1.1.)