**Student’s summary of the fifth IPCC Assessment Report – September 2013**

The findings of the fifth assessment report are based on direct measurements and remote sensing from satellites and other platforms as well as proxy records dating back hundreds of millions of years.

“*Warming of the climate system is unequivocal, and since 1950 many of the observed changes are unprecedented over decades to millennia” –* ***Page 2, Approved summary for policy makers****.*

**Findings relating to Atmosphere**

* Each of the last 3 decades have been successively warmer at the earth’s surface than any preceding decade since 1850.
* In the northern hemisphere 1983-2012 was likely the warmest 30 year period in 1400 years.
* Although temperatures observed during the Medieval Warm Period were as warm as those recorded during 20th century highs they were not as globally distributed.

**Findings relating to the Oceans**

* Ocean warming dominates the increase in energy stored in the climate system accounting for more than 90% of energy accumulated between 1971 and 2010.
* It is virtually certain the upper 700m of the ocean warmed between 1971 to 2010.
* Since 1950 it is very likely that regions of high salinity have become saltier and regions of high precipitation have become less salty.

**Findings relating to the Cryosphere**

* The average rate of ice loss from glaciers around the world was very likely 226 Gt yr-1 (gigatonnes per year!) over the period 1971-2009.
* With high confidence, the extent of northern hemisphere snow cover has decreased since the mid 20th century and average 1.6% per decade (period of March to April).
* Permafrost temperatures have increased in most regions since the 1980s. In Russia significant reductions in the thickness and extent of permafrost have been observed.

**Findings relating to sea level**

* The rate of sea level rise since the mid 19th century has been more than the mean rate of the previous two millennia.

**Findings relating to carbon and other chemical cycling**

* The atmospheric concentrations of CO2, CH4 and NO have increased to unprecedented levels covering an 800’000 year period.
* CO2 concentrations have increased by 40% since pre industrial times, primarily from industrial emissions.
* The ocean has absorbed 30% of emitted CO2, causing ocean acidification.

**Understanding the climate system and recent changes**

*“Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, observed warming and our understanding of the climate system”* - ***Approved summary for policy makers****.*

*“Human influence has been detected in the warming of the atmosphere and the ocean, in changes in the water cycle and in reductions in snow and ice, in changes in mean sea level and in some climate extremes. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid 20th century.”* - ***Approved summary for policy makers***

**Future Global and Regional Climate Change**

Continued emissions of GHGs will cause further warming and changes in all components of the climate system. Limiting this change will require substantial and sustained reduction of GHG emissions.

**Temperature –** Global surface temperature change for the end of the 21st century is likely to exceed 1.5 degrees centigrade. Warming will continue beyond 2100 under all calculated scenarios. The global ocean will continue to warm, penetrating the deep ocean and affecting thermohaline circulation.

**Water Cycle –** The contrast in precipitation between wet and dry regions and wet and dry seasons will increase, though there may be regional exceptions.

**Sea level –** Global sea level rise will continue during the 21st century and likely exceed that observed during 1971-2010.

**Cryosphere –** It is very likely that arctic sea ice cover will continue to shrink and thin and that global glacier volume will continue to decrease.

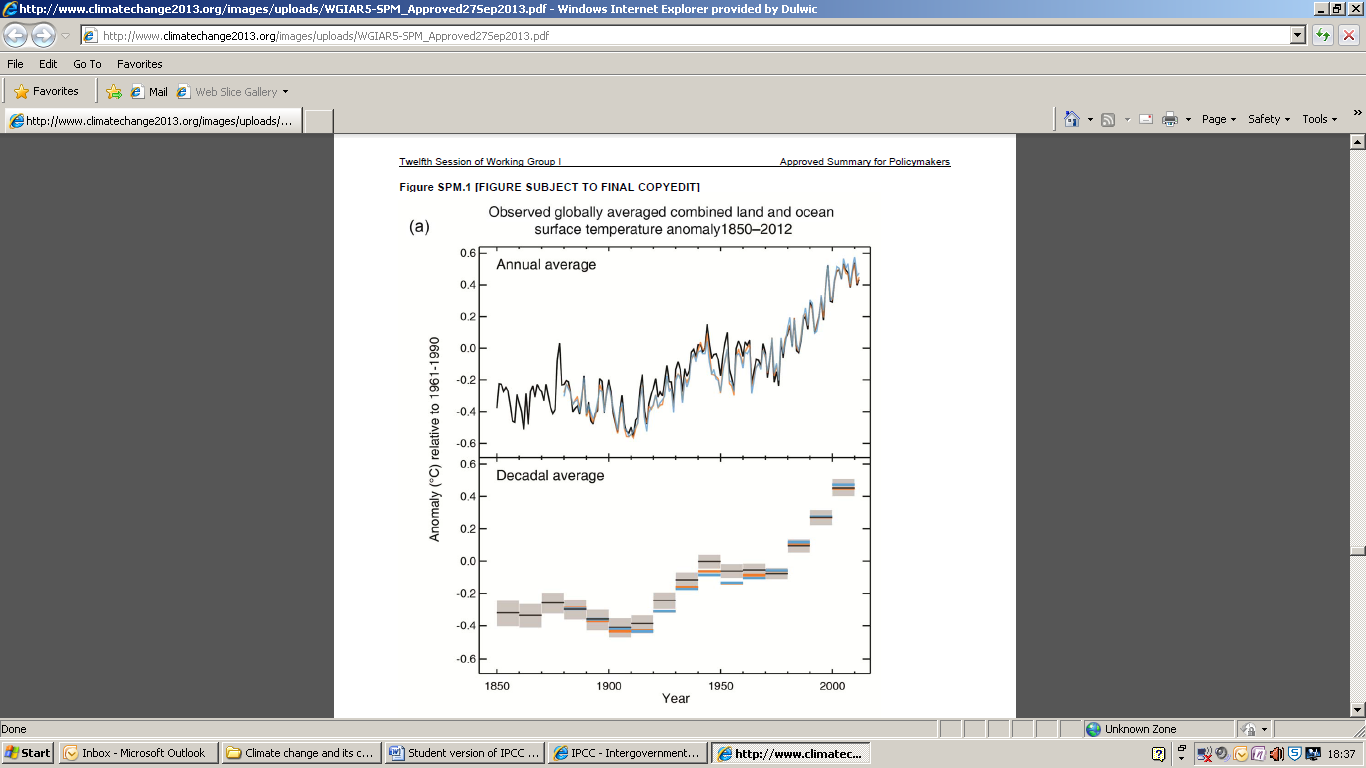
**Carbon and other chemical cycling –** Climate change will affect carbon cycle processes in a way that will exacerbate the increase of CO2 in the atmosphere, ocean acidification will continue.

**Climate stabilisation, Climate Change commitment and irreversibility**

*“Most aspects of climate change will persist for many centuries even if emissions of CO2 are stopped. This represents a substantial multi century climate change commitment created by past, present and future emissions of CO2”*

The full approved summary for policy makers can be downloaded here - <http://www.ipcc.ch/report/ar5/wg1/>

**Figures**

****

