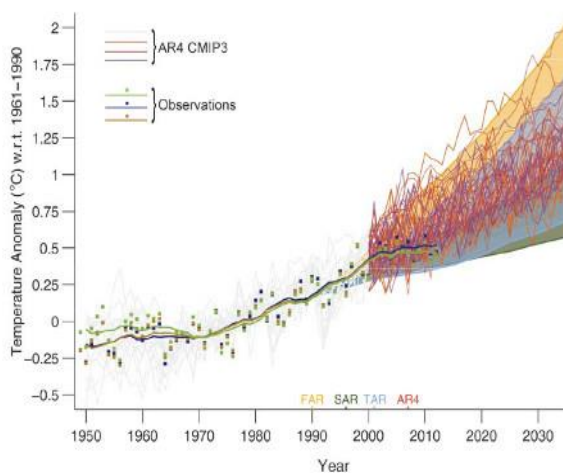


Climate Science Update May 2014

The Fifth International Panel on Climate Change Report (IPCC) was published in September 2013.

The International Panel is made of scientists from UN member states, who are nominated by governments and independently appointed.

The 5th Report says that 'Warming of the climate system is unequivocal.' This assessment is based on data collected since the 1850's and scientific evidence of climate patterns over 800 years.



Projections from IPCC 1990 are verified by the 5th assessment report 2013. The colored shading shows the projected range of surface warming in the IPCC First Assessment Report (yellow), Second (green), Third (blue), and Fourth (red) www.theguardian.com/environment/climate-consensus-97-per-cent/2013/oct/01/ipcc-global-warming-projections-accurate

Safe Limits?

Climate change is about pollution. It is caused by burning fossil fuels, especially oil and coal and discharging CO₂ into the air.

CO₂ is trapped in the atmosphere and warms the earth's surface. Warming has a cascade effect on oceans and ice which is destabilizing the climate.

The international community has agreed to work to limit temperature rise to 2°C above pre-industrial levels to limit the damage caused, although some argue that 1.5°C is more appropriate.

Warming is measured by parts per million of CO₂ in the atmosphere. In 1950 there was 315 ppm, in 1990 this rose to 350 ppm, and in 2013 there were 395.5 ppm CO₂ in the atmosphere.

This equates to a warming of .6 degrees.

Carbon burnt globally in 1990 was 21,500 metric tons; in 2013 this increased to 28,000 metric tons.

How much more Carbon can we burn to stay within 2° ?

We have a total of 269 billion tonnes of Carbon to burn to stay within the 2° limit.
This = 1000 billion tonnes of CO₂.

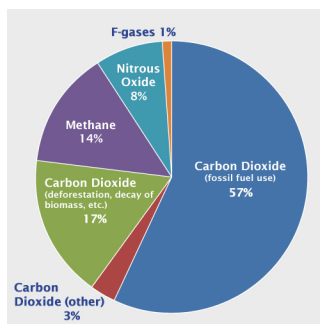
The current use of oil, coal, cement, and land use change is 9 billion tonnes of carbon per year.

One of the difficulties of interpreting climate science is that evidence is drawn from a range of time scales. Some measures date from the beginning of the Anthropocene, ten thousand years ago, when the climate stabilized. This allowed for the development of agriculture and towns.

More recent climate measures over several hundred years are broadly associated with industrial development. Multiple independent measures began to be collected in 1880. Regional trends began to be measured in 1901. Some information shows changes in recent decades with detailed evidence across a range of indicators, including CO₂, atmospheric temperature, oceans. In general the significance of global warming is more evident over longer time scales, while natural climate variability is more apparent in shorter 10 year spans.

Carbon and Chemical Cycles

Greenhouse gases are the primary cause of climate change, in particular CO₂. Sunlight warms the surface of the earth and heat radiates as infrared radiation which cannot escape because of too much CO₂ so infrared radiation becomes trapped and warms the atmosphere. Most of the increased CO₂ comes from fossil fuels which were laid down many thousands of years ago. Photosynthetic life) absorbs CO₂, but the destruction of forests alters the absorptive capacity and stabilizing effect of trees. CO₂ removal from the atmosphere shows a complex process with different systems of removal. More than half is absorbed by oceans and the rest is neutralized by geological process which can take thousands of years.

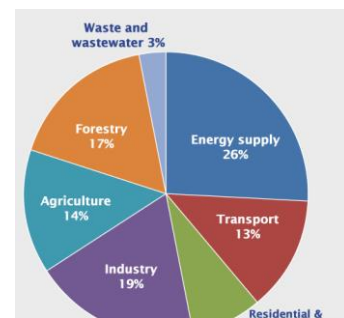


Global Greenhouse Gas Emissions IPCC 2007

In brief, between 2002 – 2011 annual CO₂ emissions from fossil fuel and cement production were 9.5 Gigatonnes of Carbon (GtC) per year, which is 54% above the 1990 level.

Since 1750 emissions from fossil fuels and cement have released 375 GtC into the atmosphere and emissions from deforestation are 180 GtC. Altogether this amounts to 555 GtC. Of these cumulative emissions 155 GtC have been absorbed by the oceans, 160 have accumulated in land systems, and 240 GtC are in the atmosphere.

<http://www.epa.gov/climatechange/ghgemissions/global.html>



Global Emissions by Source IPCC 2007

A Woven Universe: earth, air, oceans, gases, water, biodiversity including human life.

The science gives measures for climate across different indicators, including atmosphere, oceans, ice cover, and greenhouse gases. However the overall impacts are caused by the interaction of all these aspects. Warming of the atmosphere causes ice to melt including land ice, sea ice and glaciers. The melting of the Greenland and Antarctic ice sheets and the Arctic sea ice contributes to sea level rise. Water expands with heat, and this also causes sea level rise. Increased concentrations of the 'greenhouse gases' carbon dioxide, methane and nitrous oxide cause atmospheric warming.

Some of this heat is absorbed by oceans. It is not only temperature of the ocean that changes; the ocean absorbs greenhouse gases and thus the acidity of the oceans increases. The impacts of even low increases in acidity threaten the life of corals, and protective coral reefs, and reduced capacity of shell fish to form their shells. <http://www.ocean-acidification.net/FAQeco.html> The complex climate ecosystem is intrinsically connected to fish and sea life, to land ecosystems and biodiversity, and to human life.

The impacts of climate on human health shows that the benefits of warming are far outweighed by the changing patterns of diseases and susceptibility to new infections.



The expectations of severe food shortages will bring the most hardship to poor communities, in New Zealand and in other countries.

Communities are being destroyed by severe weather such as hurricanes, by sea level rising and the destruction of food crops. These impacts are making life more and more difficult in low lying and Island states.

Adaptation is a response of reducing vulnerability to inevitable changes www.oxfam.org.nz/what-we-do/issues/climate-change/adapting-to-climate-change

Human displacement from disasters, sea level rise and food shortages is forcing climate refugees to find new homes

www.unhcr.org/pages/49e4a5096.html New Zealand and Australia must consider what hospitality to offer to climate refugees as life becomes more and more untenable in Pacific countries. A Kiribati family sought recognition as climate refugees in New Zealand. We have no law to allow this status. www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11133700 We are indeed woven into the community of all of life.

Atmosphere

The combined land and ocean surface temperature show warming of .85°C from 1880 – 2012. Shorter, 10 – 15 year measures show natural variations, such as with El Nino (cooling effects) do not show long term climate trends.

Climate change is not only about overall warming. Extreme weather events have increased on a global scale from the 1950's. These are measured by the number of cold days and nights compared to warm days and nights. Significantly, heat waves have increased in Europe, Australia and Asia. Flooding has increased in North America and Europe, and other continents.

Oceans

Measures of ocean temperature have been taken since 1971. Ocean warming is caused by the absorption of heat (energy) from the atmosphere, with the most impact on the top 75 meter layer. On a global scale the surface warmed by .44 degrees over 40 years.

Oceans are affected by evaporation and precipitation (rain). Saltiness increases with evaporation, and sea water is diluted with rain – so the freshness of the water increases. Oceans

A question before us ?

Is there a superior norm, a transcendent ethic to express the common destiny of all of life?

And can it be given the force of law?

are mitigating (reducing) the impact of atmospheric warming by absorbing and storing more than 60% of the net energy increase in the climate system.

Ice (Cryosphere) See also www.ice2sea.eu

The average ice loss from glaciers around the world shows an accelerating increase in the rate of loss. From 1971 to 2009 the ice melt was 226 gigatonnes (Gt) of ice per year; from 1993 – 2009, it was 275 Gt per year.

Specific detail on the decreases of snow cover in the northern hemisphere and permafrost add to the overall profile of loss of ice cover and the decline in the stabilizing effect of the water that is captured in ice which not only regulates sea levels, but also atmospheric temperature.

Sea level

Although sea levels increased slowly from the mid nineteenth century, the rate of sea level rise increased in the 20th Century. To substantiate this, the average sea level rise was 1.7 mm per year between 1901 and 2010 (thus overall a rise of 17mm for the century). In contrast to this rate, since 1993 the rate changed to 3.2 mm per year; hence a 64 mm rise in 30 years. Sea level are expected to rise by .8 – 2 meters by 2100

What can we do to stop going beyond 2 degrees warming?

A 2°C rise in global temperature is the agreed limit for a stable climate. Adaptation is a way of reducing vulnerability to impacts such as extreme weather events and changing patterns of diseases, such as dengue fever in northern New Zealand.

Mitigation means reducing carbon emissions. This means reducing the use of oil and coal to produce energy, and in tandem, to innovate with low carbon technologies. Mitigation involves a raft of transitions to low carbon economies, and these include investment incentives, policy for market transformation and taxation strategies.

The transition to low carbon economies has to take account of the onus on high emitting developed states which have largely caused the problem and the needs of developing countries which are likely to suffer most. This places a particular responsibility on developed countries to constrain their emissions and finance mitigation and adaptation in developing countries. Many are reluctant to take these responsibilities Also, when the development interests of China and India are compared to those of Tonga, Samoa, Kiribati, Fiji and other Pacific Island developing states, the extreme differences in scale and risk become clear.

Climate negotiations have failed to turn the tide of carbon emissions, or to achieve commitments to scaling back fossil fuel to anywhere near the reduction that is needed. The capacity to negotiate for the planet is limited by State self-interest; and there is no form of overarching legal climate accountability to bring restraint to the climate impacts from the operations of multinational companies.



A question before us therefore is, is there an overarching ethic to express the common destiny of all of life? And can it be given the force of law?