Summary of testimony provided to the House Select Committee on Energy Independence and Global Warming, US Congress, Washington DC by R.K. Pachauri, Chairman, Intergovernmental Panel on Climate Change and Director General, The Energy and Resources Institute

The Intergovernmental Panel on Climate Change (IPCC)

The role of the Intergovernmental Panel on Climate Change (IPCC) is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding climate change, its potential impacts and options for adaptation and mitigation. The IPCC produces key scientific material that is of the highest relevance to policy-making, and is agreed word by word by all governments, from the most skeptical to the moat confident.

Over recent years the IPCC has effectively become the voice of the mainstream scientific community. It has been repeatedly vetted and endorsed by the National Academy of Science in the United States, its counterparts in other countries, and by the leading professional organizations like the American Meteorological Society, the American Geophysical Union, the American Association for the Advancement of Science.

Observed impacts of climate change

One major finding of the IPCC Fourth Assessment Report, which was completed in 2007, is that:

> "Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century".

Among the most significant impacts observed throughout the 20th century, the frequency of heavy precipitation events has increased over most land areas. Increased precipitation has been observed in eastern parts of North and South America, northern Europe and northern and central Asia. Drying has been observed in the Sahel, the Mediterranean, southern Africa and parts of southern Asia.

More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics.

Widespread changes in extreme temperatures have been observed over the last 50 years. Cold days, cold nights and frost have become less frequent, while hot days, hot nights and heat waves have become more frequent.

There is also evidence for an increase in intense tropical cyclone activity in the North Atlantic since about 1970, correlated with increases of tropical sea surface temperatures.

For a range of emissions scenarios that do not assume additional climate policies above current ones, best estimates for global average temperature increase range between 1.8° and 4.0°C by 2100 relative to 1980-1999 depending on emissions scenario. This range may be compared to the warming of about 0.74°C that the world has experienced over the past 100 years.

Impacts on poor regions

I would like to use this opportunity today to highlight the impacts of climate change in poor regions of the world. The poor and marginalised have historically been most at risk, and are most vulnerable to the impacts of climate change. Recent analyses in Africa, Asia and Latin America, for example, show that marginalised, primary resource-dependent livelihood groups are particularly vulnerable to climate change impacts if their natural resource base is severely stressed and degraded by overuse or if their governance systems are in or near a state of failure and hence not capable of responding effectively.

Water availability will significantly be affected for human consumption, agriculture and energy generation due to changes in precipitation patterns, increasing salinity of groundwater due to increases in sea level and over-exploitation, glaciers melting decreasing river flows.

The number of people exposed to increased water stress by 2020 is projected to include:

120 millions to 1.2 billion in Asia
75 to 250 millions in Africa
12 to 81 millions in Latin America

If coupled with increased demand, this will adversely affect livelihoods and exacerbate water-related problems.

Increases in the frequency of droughts and floods are projected to affect local crop production negatively, especially in subsistence sectors at low latitudes. It is projected that there could be a possible reduction in yields in agriculture of:

50% by 2020 in some African countries
30% by 2050 in Central and South Asia
30% by 2080 in Latin America

In Africa, crop net revenues could fall by as much as 90% by 2100, with small-scale farmers being the most affected.
This would further adversely affect food security and exacerbate malnutrition.

These consequences, associated with increased number of extreme events and sea level rise, could translate in large number of displaced people, as migration is a common response to calamities such as famines and floods. The impacts of climate change on the most vulnerable communities could prove extremely unsettling and threaten world security.

Abrupt or irreversible impacts

There is also the possibility of abrupt or irreversible impacts as a result of climate change, which could occur on account of partial loss of ice sheets on polar land implying several metres of sea level rise, major changes in coastlines and inundation of low-lying areas, with greatest effects in river deltas and low-lying islands. Such changes are projected to occur over millennial time scales, but more rapid sea level rise on century time scales cannot be excluded.

Also possible is the risk of extinction for 20-30% of the species assessed by the IPCC if increase in warming exceeds 1.5 to 2.5°C. As global average temperature increase exceeds about 3.5°C, model projections suggest significant extinctions (40-70% of species assessed) around the globe.

Impacts in North America

Impacts of climate change on North America could include:

- Warming in western mountains, which is projected to cause decreased snowpack and reduced summer flows, exacerbating competition for over-allocated water resources.
- Major challenges for crops that are near the warm end of their suitable range or which depend on highly utilized water resources.
- Increased number, intensity and duration of heat waves, which have potential for adverse health impacts.
- Coastal communities and habitats becoming increasingly stressed by climate change impacts interacting with development and pollution.

Defining mitigation targets

Mitigation of climate change has to deal with the inertia of the climate system because even if concentrations of greenhouse gases were held constant, a further warming trend would occur in the next two decades at a rate of about 0.1° C per decade. A delay in reduction of emissions would lead to investments that lock in more emission intensive infrastructure and development pathways.

Choices about the scale and timing of greenhouse gas mitigation would involve balancing costs of emissions reductions against risks of delay. Delayed emission reductions significantly constrain the opportunities to achieve lower stabilisation levels and increase the risk of more severe climate change impacts. All in all, the costs of unmitigated climate change could be far larger than the cost of mitigation.

Some of the stabilization scenarios assessed by the IPCC

With one particular scenario, assessed by the IPCC, which would stabilize concentration of greenhouse gases between 445-490 ppm of CO_2 equivalent, the requirement would be for CO_2 emissions to peak no later than 2015. This scenario implies a global mean temperature increase of 2.0-2.4° C at equilibrium above pre-industrial levels.

However, even with this mitigation scenario global sea level rise above pre-industrial levels from thermal expansion alone would be 0.4-1.4 metres at equilibrium. The long time scales of thermal expansion and ice sheet response to warming imply that stabilisation of greenhouse gases concentrations at or above present levels would not stabilise sea level for many centuries. The eventual contributions from Greenland ice sheet loss could be several metres, and larger than from thermal expansion, should warming in excess of 1.9-4.6°C above pre-industrial be sustained over many centuries.

There are also major co-benefits from mitigation, which include increased energy security, higher health benefits from reduced air pollution and greater rural employment. There would also be benefits in the nature of increased agricultural production and reduced pressure on natural ecosystems. Such co-benefits of mitigation action offset mitigation costs and provide the opportunity for no-regrets policies.

The costs and technologies for mitigation

Even if co-benefits were not included the cost of mitigation measures assessed generally in keeping with the scenario described above would amount to less than 0.12% of GDP annually. By 2030 this would amount to 3% decrease of GDP in that year.

A wide range of mitigation options are currently available or projected to be available by 2030 in all sectors, with the economic mitigation potential at costs that range from net negative up to 100 US$/t$CO_2$-equivalent, sufficient to offset the projected growth of global emissions or to reduce emissions to below current levels in 2030.

All stabilization levels assessed can be achieved by deployment of a portfolio of technologies that are currently available or expected to be commercialised in coming decades.

This will only happen if the right policy framework is in place. Investment flows, technology transfer and incentives are essential to ensure the development, acquisition, deployment and diffusion of these technologies and to address related barriers.

It is important to note that the assessment of the costs and economic potential of mitigation assumes the implementation of climate policies to address barriers and provide incentives to those who can take action on mitigation. The market potential of currently known technologies is smaller than the economic potential; if we want to make full use of the economic potential for mitigation, adequate policies have to be put in place. A wide range of policies is available, with advantages and disadvantages depending on specific circumstances; generally a portfolio approach is likely to be most effective. An effective price on carbon is generally believed to be an essential component of such a portfolio to create incentives for producers and consumers to significantly invest in low-emissions products, technologies and processes.

The long-term perspective

If one was to take a forward looking perspective, companies and businesses that move in the direction of deep cuts in greenhouse gases emissions would be both responsible and successful. Those that lag behind would suffer from losses in the market place and loss of reputation. The same prospect would apply to nations. There would be a dramatic loss of political power and influence for nations that stand unmoved by the growing global consensus for urgent "deep cuts" in emissions of greenhouse gases.

An active role by the US in mitigation measures would enable the achievement of global stabilization targets, as the US currently account for 22% of global greenhouse gases emissions. US leadership would also prompt other large emitters to take action. It would ensure the competitiveness of US companies in world markets dominated by low carbon products. It would finally re-establish confidence in US leadership on critical global issues.

Within a larger global context it would be useful to be reminded of the words of Chief Seattle, which are "Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself". Urgent action to mitigate greenhouse gases emissions is not only a moral issue to preserve Creation, it is also the inevitable path if we want to avoid the serious, disruptive impacts that unabated climate change could impose on human society.