# Introduction to the AR4

By

Dr. R. K. Pachauri

Chairman, IPCC

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# The context

- Never has there been greater and more widespread appetite for knowledge on any subject as global climate change
- Major advance over TAR -
  - Substantial new research
  - Gaps addressed
  - Tighter estimates

# Major features

- Greater confidence, reduced uncertainties
- Improved observations and data sets
- Paleo-climate information
- Greater regional insights
- Structured treatment of risk and uncertainty
- Integrating treatment of mitigation and adaptation
- Embedding of climate change in framework of sustainable development
- Technology as a cross-cutting theme
- Dealing with Article 2 / Key vulnerabilities

# Direct observations of recent climate change

At continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed. These include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones

# A paleoclimatic perspective

Paleoclimate information supports the interpretation that the warmth of the last half century is unusual in at least the previous 1300 years. The last time the polar regions were significantly warmer than present for an extended period (about 125,000 years ago), reductions in polar ice volume led to 4 to 6 metres of sea level rise.

# Understanding and attributing climate change

Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations12. This is an advance since the TAR's conclusion that "most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations". Discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns

# Time scales

Anthropogenic warming and sea level rise would continue for centuries due to the timescales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized.

# Current knowledge about observed impacts of climate change on the natural and human environment

Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.

A global assessment of data since 1970 has shown it is likely that anthropogenic warming has had a discernible influence on many physical and biological systems.

# Current knowledge about future impacts

## Fresh water resources and their management

Drought-affected areas will likely increase in extent. Heavy precipitation events, which are very likely to increase in frequency, will augment flood risk.

## Ecosystems

Approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5-2.5$^{o}$C.

## Africa

In Africa by 2020, between 75 and 250 million people are projected to be exposed to an increase of water stress due to climate change. If coupled with increased demand, this will adversely affect livelihoods and exacerbate water-related problems.

# Current knowledge about future impacts and responding to climate change

Some large-scale climate events have the potential to cause very large impacts, especially after the 21st century.

Sustainable development can reduce vulnerability to climate change, and climate change could impede nations' abilities to achieve sustainable development pathways.

# Greenhouse gas emission trends and mitigation in the short and medium term (until 2030)

Global greenhouse gas (GHG) emissions have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.

Both bottom-up and top-down studies indicate that there is substantial economic potential for the mitigation of global GHG emissions over the coming decades, that could offset the projected growth of global emissions or reduce emissions below current levels (high agreement, much evidence).

# Mitigation costs

In 2030 macro-economic costs for multi-gas mitigation, consistent with emissions trajectories towards stabilization between 445 and 710 ppm $CO_2$-eq, are estimated at between a 3% decrease of global GDP and a small increase, compared to the baseline. However, regional costs may differ significantly from global averages.

# Lifestyles and consumption patterns

Changes in lifestyle and behaviour patterns can contribute to climate change mitigation across all sectors. Management practices can also have a positive role. (high agreement, medium evidence)

# Mitigation in the long term (until 2030)

In order to stabilize the concentration of GHGs in the atmosphere, emissions would need to peak and decline thereafter. The lower the stabilization level, the more quickly this peak and decline would need to occur. Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels

The range of stabilization levels assessed can be achieved by deployment of a portfolio of technologies that are currently available and those that are expected to be commercialised in coming decades. This assumes that appropriate and effective incentives are in place for development, acquisition, deployment and diffusion of technologies and for addressing related barriers

Policies that provide a real or implicit price of carbon could create incentives for producers and consumers to significantly invest in low-GHG products, technologies and processes. Such policies could include economic instruments, government funding and regulation