



WMO

# Climate change

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UNEP

## Challenges in Asia and Pakistan



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**13<sup>th</sup> January 2008**

**IPCC**

**Warming of the climate  
system is unequivocal**

# Observed changes

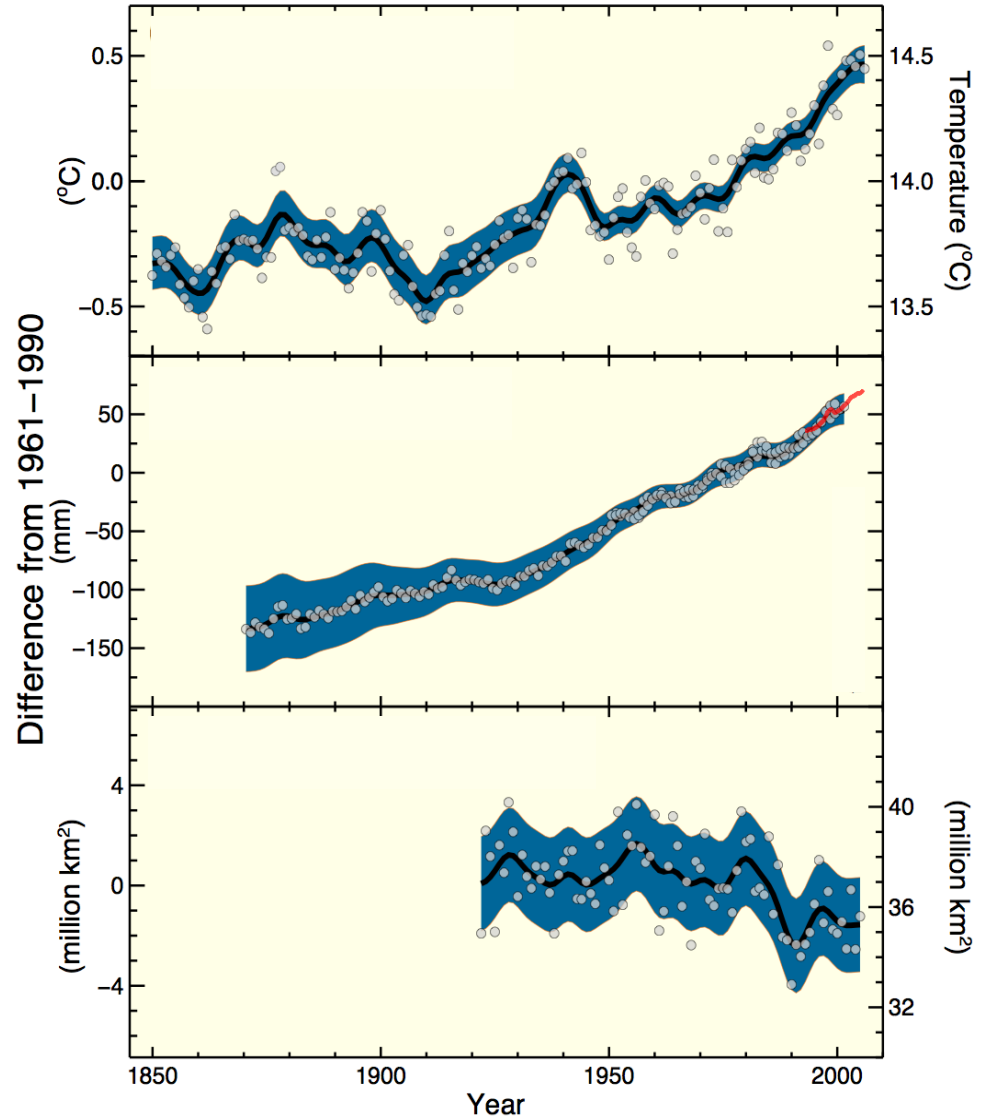
Global average temperature



Global average sea level



Northern hemisphere snow cover



Average arctic temperatures increased  
at almost twice the global average rate  
in the past 100 years

- *Annual average arctic sea ice extent has  
shrunk by 2.7% per decade*



The frequency of heavy precipitation events has increased over most land areas

- *Rainfall in Mumbai (India), 2005:  
1 million people lost their homes*





Heat waves have become more frequent  
over most land areas

*- Heat wave in Europe, 2003: 35 000 deaths*

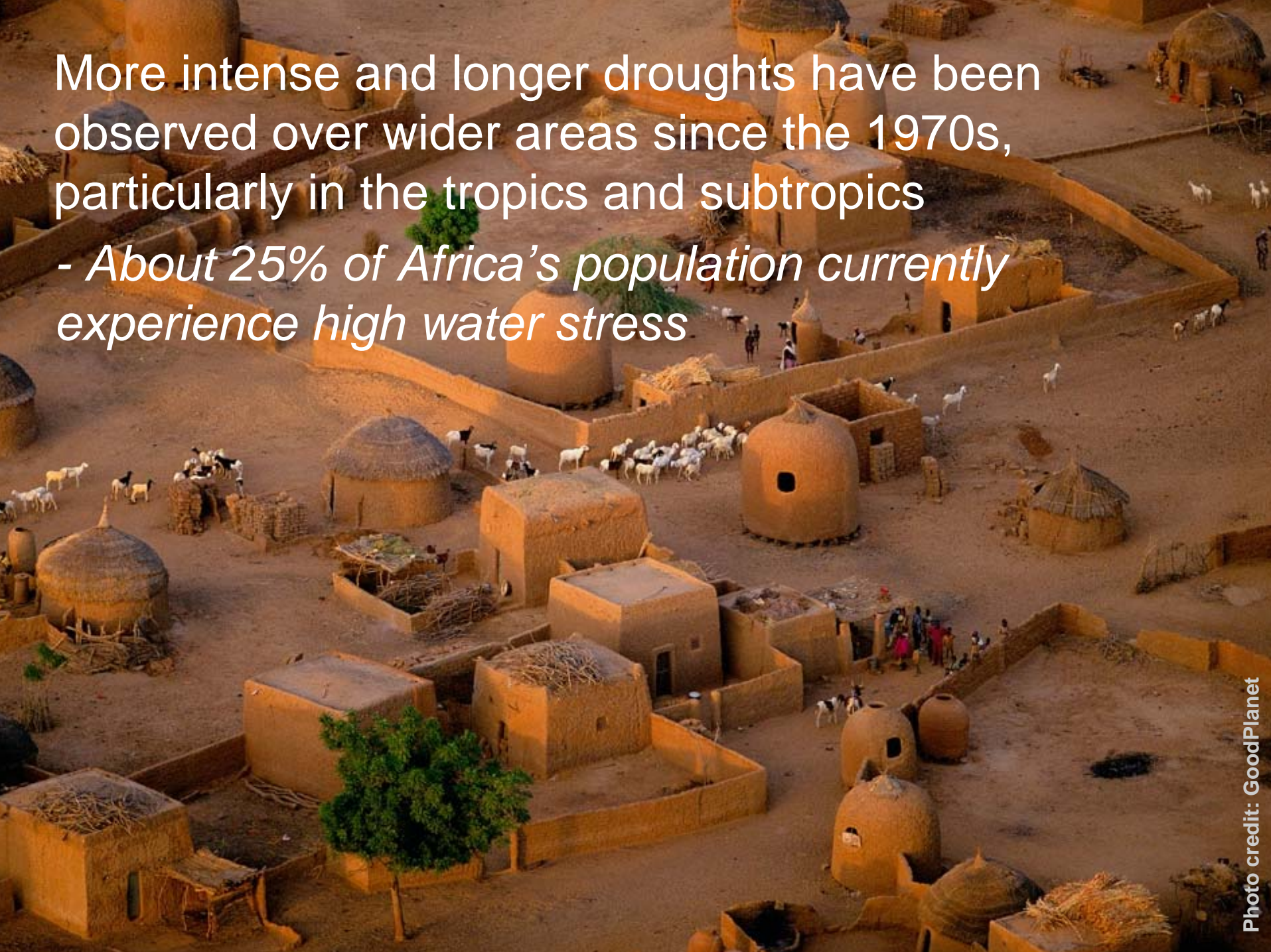


The proportion of tropical cyclones reaching higher intensity have increased over the past 3 decades

- *Cyclone Nargis in Myanmar, 2008:  
100 000 estimated deaths*

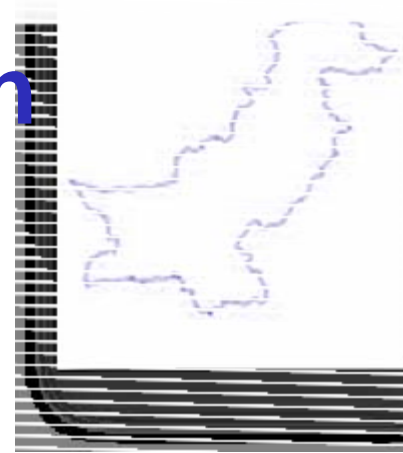
More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics

*- About 25% of Africa's population currently experience high water stress*





# Observed changes in Pakistan



## Rise in mean temperature

- 0.6 to 1.0°C in coastal areas since early 1900s

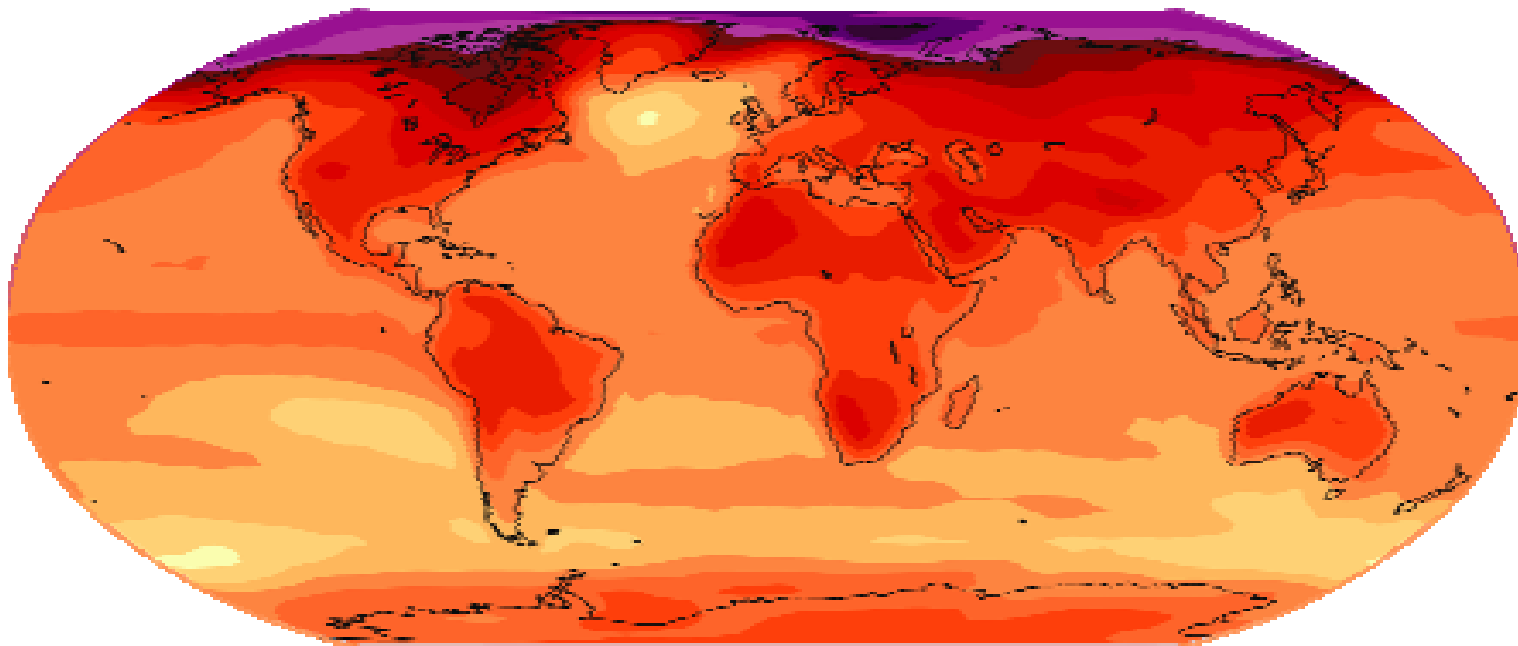
## Changes in precipitation

- 10 to 15% decrease in coastal belt and hyper arid plains over the last 40 years
- Increase in summer & winter precipitation in Northern Pakistan

## Increasing frequency and intensity of droughts

- Consecutive droughts in 1999 and 2000, leading to sharp decline in watertables
- Drying up of wetlands and severe degradation of ecosystems

# Projected surface temperature changes (2090-2099 relative to 1980-1999)



**Continued emissions would lead to further warming of 1.8°C to 4°C over the 21<sup>st</sup> century and induce many changes that would be larger than those observed during the 20<sup>th</sup> century**

# **Key vulnerabilities in Asia**

# Water availability

**Glacier melt** is projected to affect water resources in the next decades

- Rivers in the northern Indian plain could become seasonal in the near future



**Decreasing winter precipitation** over the Indian subcontinent would imply less groundwater storage

**Saltwater intrusion** in groundwater and estuaries is projected to be aggravated by sea-level rise

➔ **120 million to 1.2 billion people will experience increased water stress in South and South East Asia by the 2020s**

# Coastal areas



**Coastal erosion and inundation** of coastal lowland as sea level continues to rise, flooding the homes of millions of people living in low lying areas

Most conservative scenario: Sea level rise of 40 cm by the end of 21<sup>st</sup> century

➡ Increase the annual number of people flooded in coastal populations from 13 million to 94 million (60% in South Asia)

**Significant losses of coastal ecosystems**, affecting the aquaculture industry, particularly in heavily-populated mega-deltas

# Human health



Endemic morbidity and mortality due to **diarrhoeal disease** primarily associated with floods and droughts

Exacerbation of the abundance and toxicity of **cholera** due to increase in coastal water temperature

Increased **deaths, disease and injury** due to heat waves, floods, storms, fires and droughts

# Food production



**Crop yields** could increase up to 20% in East and Southeast Asia while they could decrease up to 30% in Central and South Asia by 2050

Future changes have the potential to substantially alter the abundance of **fish** populations in Asian waters

- ➡ **The risk of hunger is projected to remain very high in several developing countries**

# Implications for Pakistan

Pakistan is expected to witness increasing **pressure on the natural resources and the environment** as the demands for goods and services expand

- Population increase of 200 million expected over the next 50 years

**Climatic changes** would likely exacerbate present environmental conditions that give rise to land degradation, shortfalls in food production, rural poverty and urban unrest

Such changes would likely increase internal **migration**, and migration to other western countries



# Options for adaptation and mitigation

# Key adaptation strategies

Developing **knowledge** on impacts and vulnerabilities

**Integrating** adaptation in wider policies

Improving **disaster preparedness** and management

**Informing** and **educating** to enhance the level of awareness and understanding

Improving **health care** systems

Promoting **good governance** including responsible decision making and communities empowerment

# Role and limits of adaptation

Societies have a **long record** of adapting to the impacts of weather and climate

- ➡ But climate change poses **new risks** that will require new investments in adaptive responses

Adaptation is **necessary** to address impacts resulting from the warming that is already unavoidable due to past emissions

- ➡ **But adaptation alone is not expected to cope with all the projected effects of climate change**

# Stabilisation scenarios

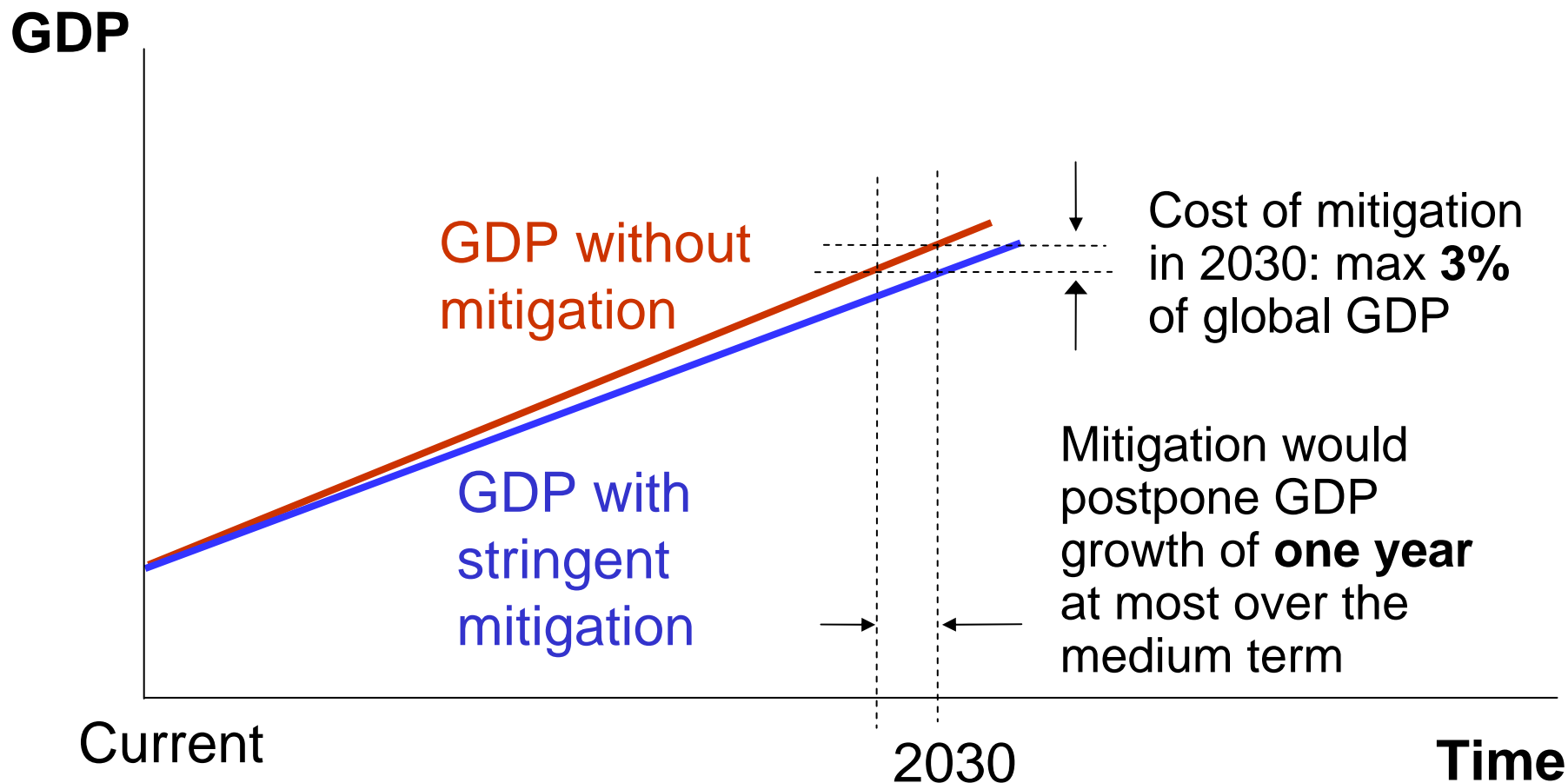
<b>Global mean temp. increase (°C)</b>	<b>Stabilization level (ppm CO<sub>2</sub>-eq)</b>	<b>Year CO<sub>2</sub> needs to peak</b>
<b>2.0 – 2.4</b>	<b>445 – 490</b>	<b>2000 – 2015</b>
<b>2.4 – 2.8</b>	<b>490 – 535</b>	<b>2000 – 2020</b>
<b>2.8 – 3.2</b>	<b>535 – 590</b>	<b>2010 – 2030</b>
<b>3.2 – 4.0</b>	<b>590 – 710</b>	<b>2020 – 2060</b>

# Costs of mitigation in 2030

<b>Stabilisation levels (ppm CO<sub>2</sub>-eq)</b>	<b>Range of GDP reduction (%)</b>	<b>Reduction of average annual GDP growth rates (percentage pts)</b>
<b>445 - 535</b>	<b>&lt; 3</b>	<b>&lt; 0.12</b>
<b>535 - 590</b>	<b>0.2 – 2.5</b>	<b>&lt; 0.1</b>
<b>590 - 710</b>	<b>-0.6 – 1.2</b>	<b>&lt; 0.06</b>

**Mitigation measures would induce 0.6% gain to 3% decrease of GDP in 2030**

# Impacts of mitigation on GDP growth



# Co-benefits of mitigation

**Common drivers** lie behind mitigation policies and policies addressing economic development, health, employment, energy security, and local environmental protection

**Linking policies** provides opportunities for no-regrets policies and reduces mitigation costs

- ✓ Such policy coherence is especially relevant for **developing countries**, where economic and social development is the top priority



All stabilisation 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 assumes appropriate and effective **incentives** are in place for their development, acquisition, deployment and diffusion





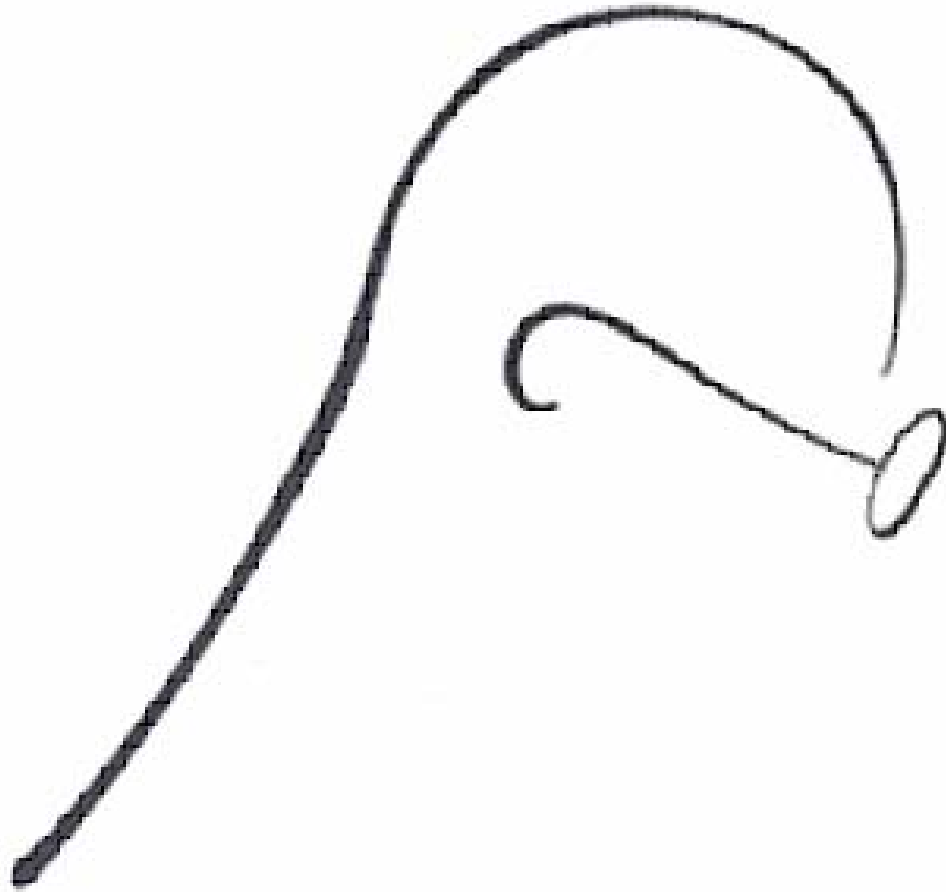
# Potential of renewable energy in Pakistan

There is substantial potential of renewables in the country for managing the present **energy crises** as well as meeting the future energy needs<sup>1</sup>

- Only 55% of the Pakistan's population has access to electricity
- Pakistan would need to add 2,000 MW of power generation every year during the period 2007-2015

Most promising **renewable energy sources** include<sup>2</sup>:

- Hydropower (38,000 MW)
- Solar (800 million MW)
- Wind
- Biomass



A technological society has two choices. First it can wait until catastrophic failures expose systemic deficiencies, distortion and self-deceptions...

Secondly, a culture can provide social checks and balances to correct for systemic distortion prior to catastrophic failures.