



# Climate Change and the need for adaptation

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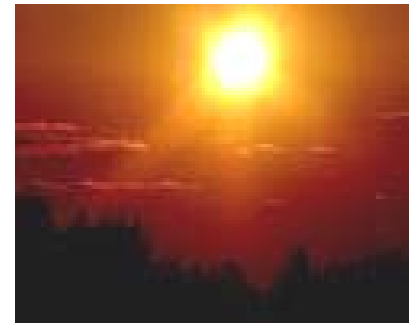
**I. Observed changes in climate**

**II. Projections**

**III. Key vulnerabilities**

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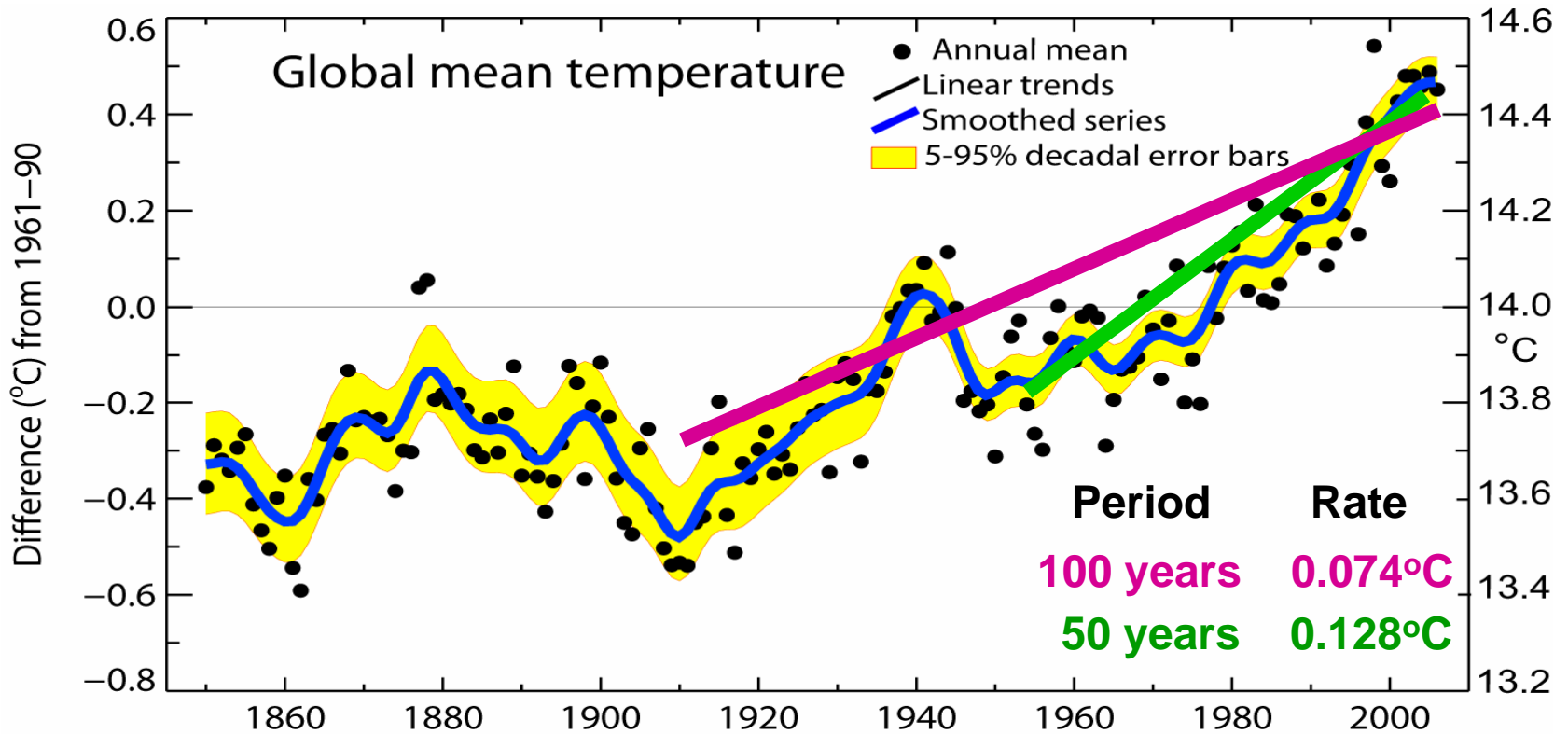


# I. Observed changes in climate

**Warming of the climate system is unequivocal**, as is now evident from observations of increases in average air and ocean temperatures, widespread melting of snow and ice, and rising average sea level

# I. Observed changes in climate

## Changes in global average surface temperature



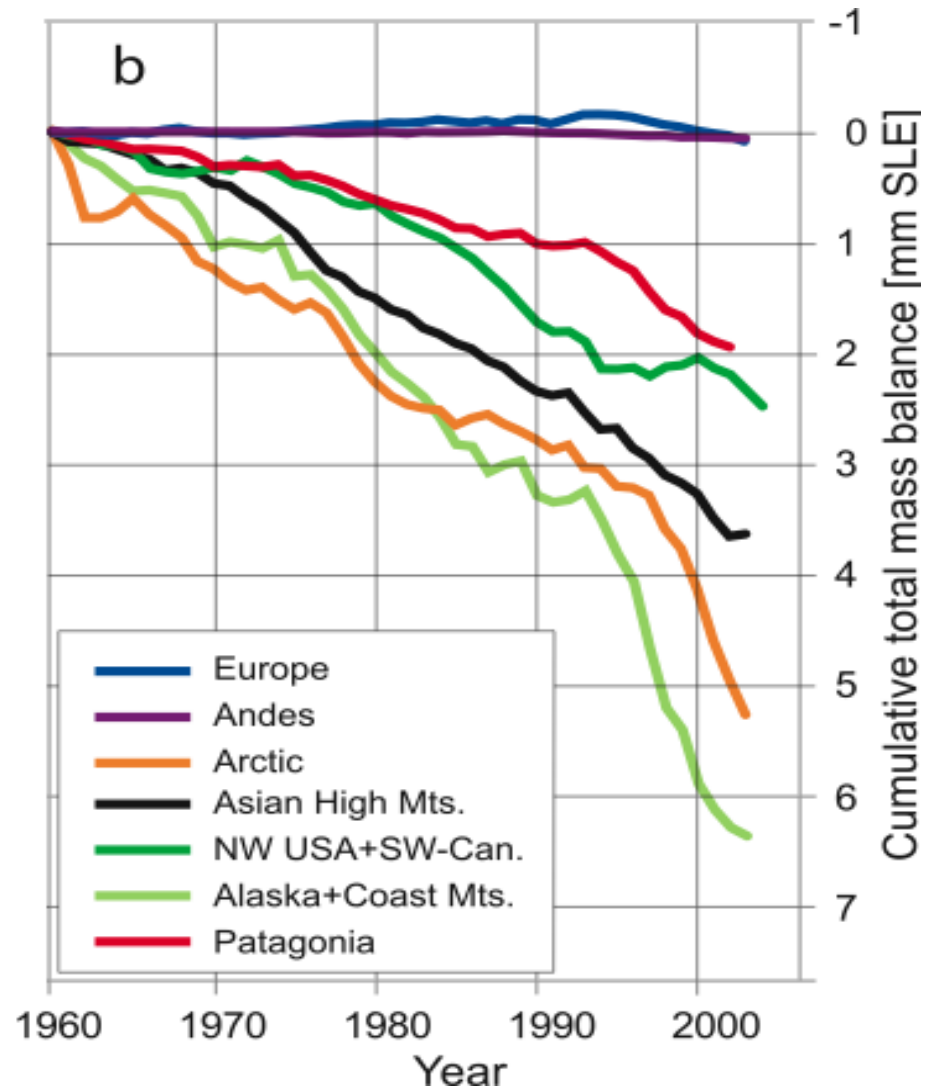
**Eleven of the last twelve years rank among the twelve warmest years in the instrumental record of global surface temperature**

# I. Observed changes in climate

## Cumulative balance of glacier mass

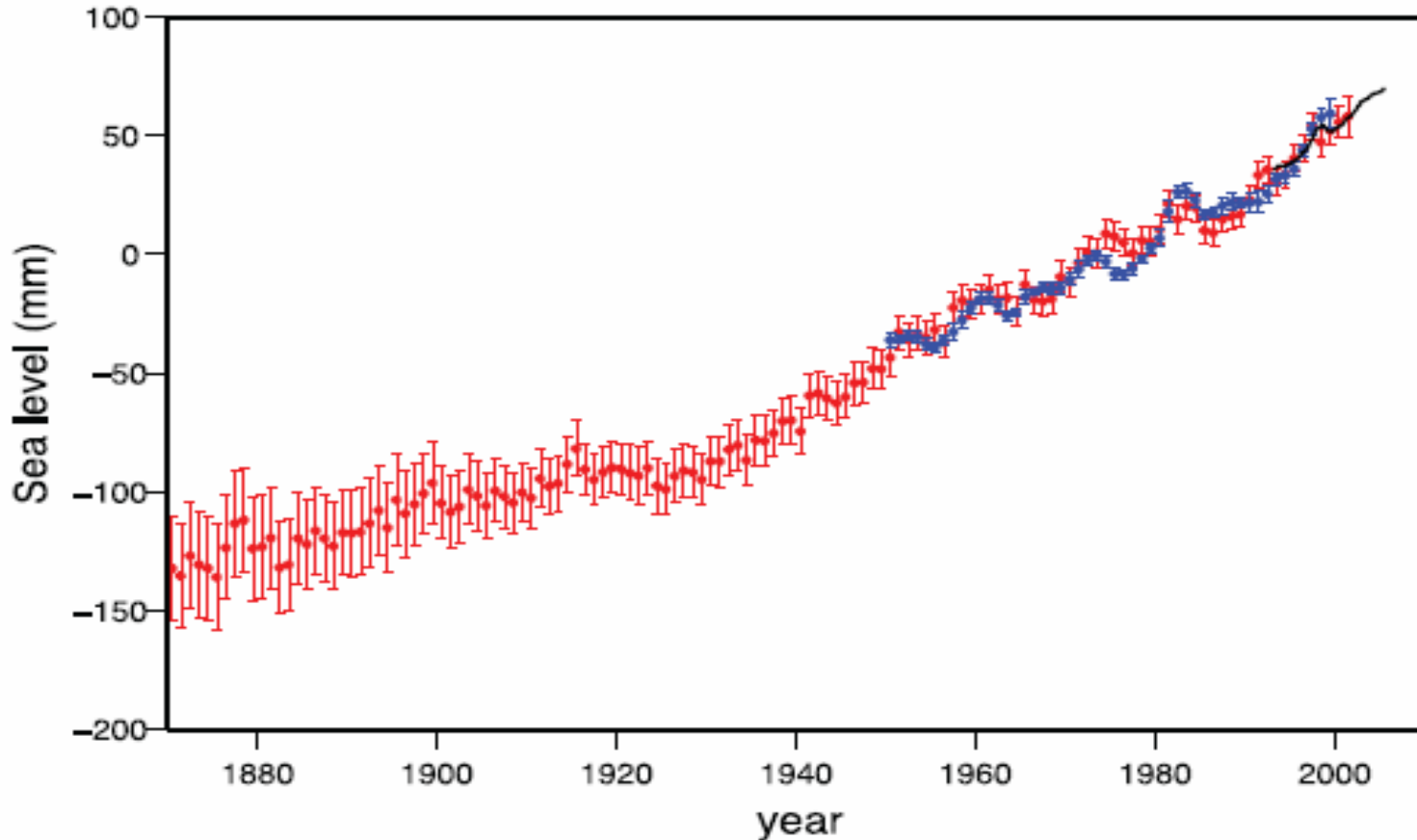
Water supplies stored in glaciers are projected to decline in the course of the century

Decreases in glaciers have contributed about 28% of sea level rise since 1993



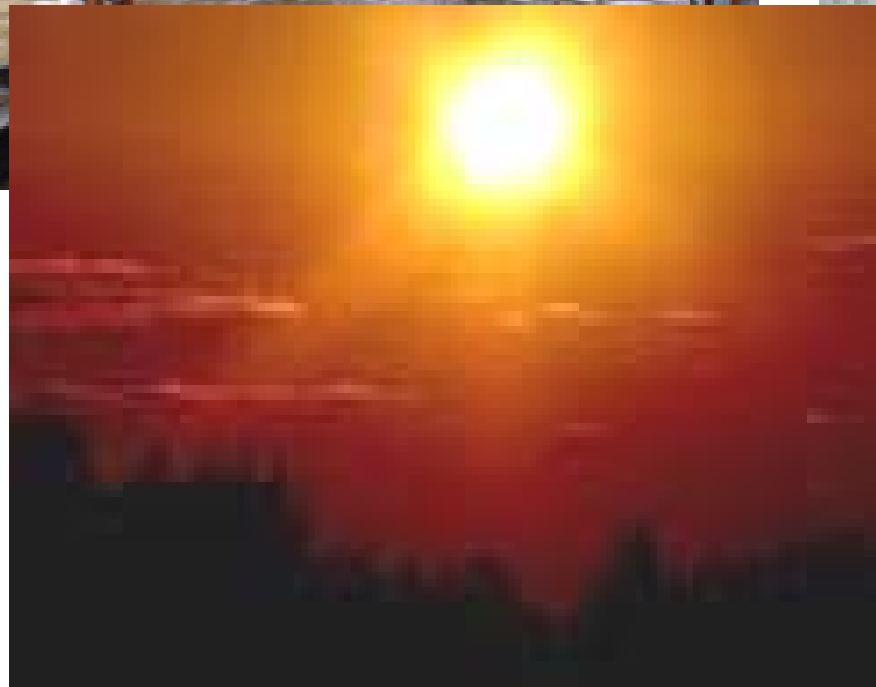
# I. Observed changes in climate

## Changes in global average sea level



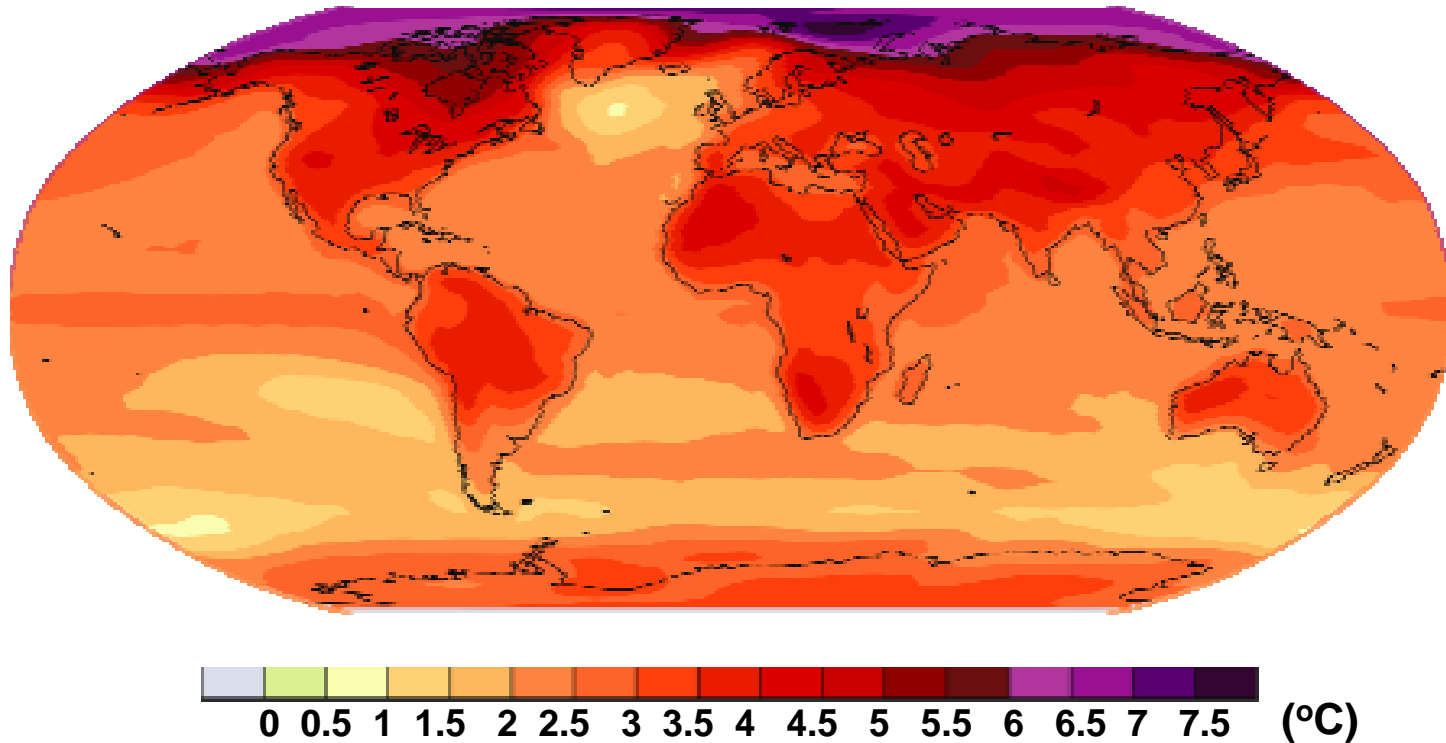
Global average sea level has risen since 1961 at an average rate of 1.8mm/yr and since 1993 at 3.1mm/yr

# I. Observed changes in climate



# II. Projections and impacts

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

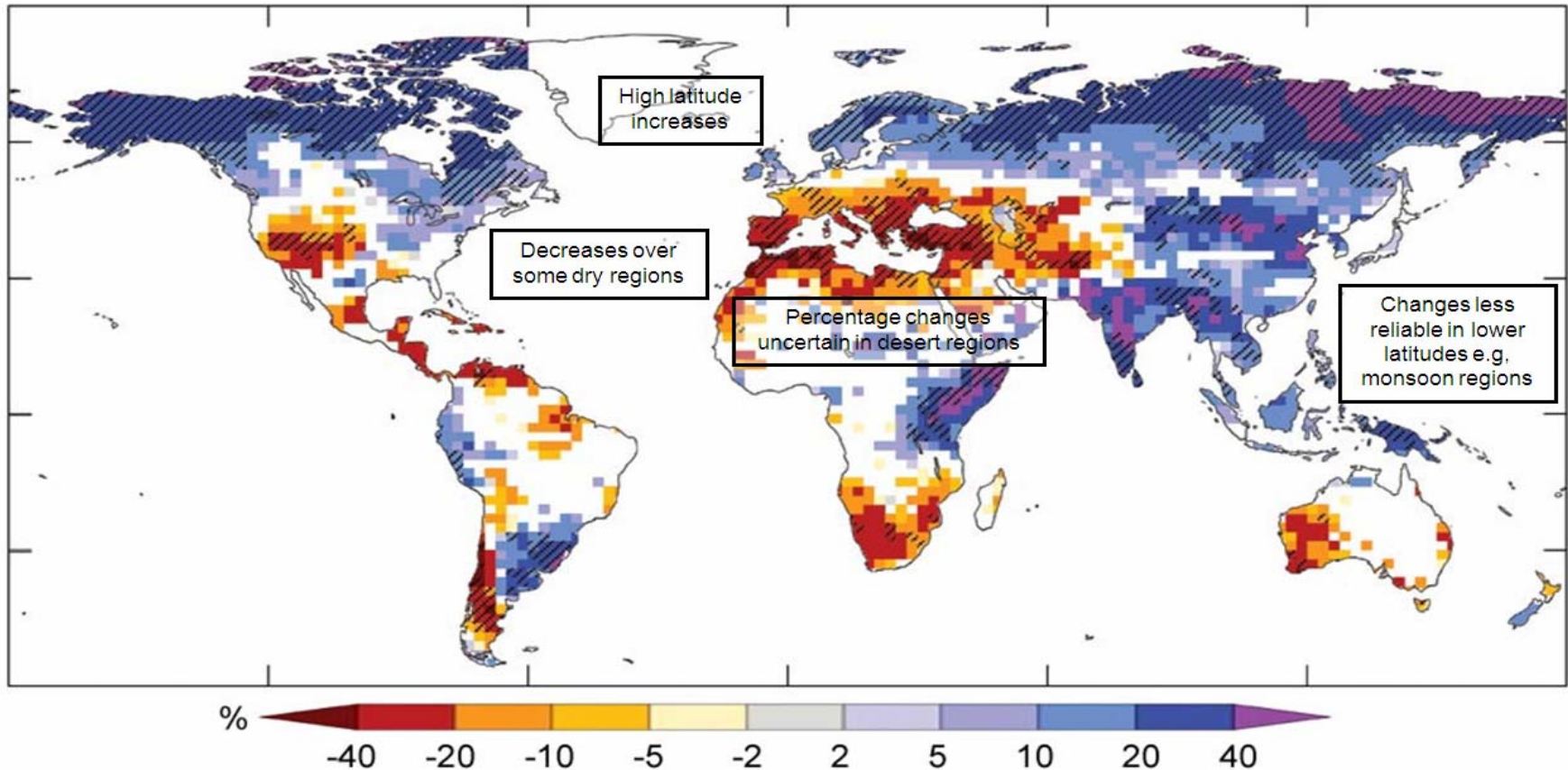


**Continued emissions would lead to further warming  
of 1.8°C to 4°C over the 21st century**



# II. Projections and impacts

## Change in annual runoff (2041-60 relative to 1900-70)



**The negative impacts of climate change on freshwater systems outweigh its benefits**

## II. Projections and impacts

Climate change could lead to some abrupt or irreversible impacts:



20-30% of species are likely to be at risk of **extinction** if increases in warming exceed 1.5-2.5°C



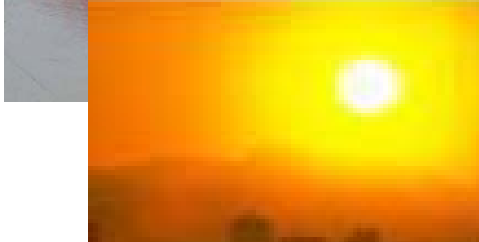
Partial **loss of ice sheets** on polar land could imply metres of sea level rise

# II. Projections and impacts

## Negative impacts in Europe



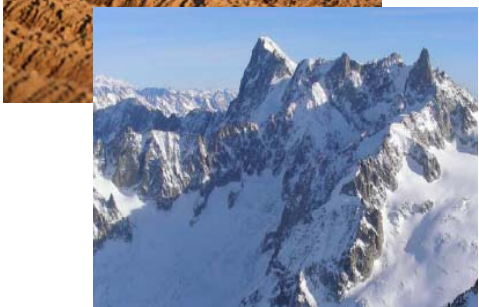
Inland and coastal flooding



Health risks due to heat-waves



Reduction of water availability and crop productivity in South Europe



Reduced snow cover in mountains

# III. Key vulnerabilities

## Coastal deltas



Coastal populations are expected to increase rapidly, while coastal settlements are at increased risk of sea-level rise

# III. Key vulnerabilities

## Vulnerable populations

The poor have **limited adaptive capacities** and are more dependent on **climate-sensitive resources**

Vulnerability in **Africa, Asia and Latin America** is aggravated by other multiple stresses

Within other areas, **the poor, marginalised communities and the elderly** are particularly at risk





# III. Key vulnerabilities

## Water availability

Water availability will be affected for consumption, agriculture and energy generation due to:



- Changes in precipitation patterns
- Increasing salinity of groundwater
- Glaciers melting decreasing river flows

Ranges of people exposed to increased water stress:



- 120 millions to 1.2 billion in Asia by 2020
- 75 to 250 millions in Africa by 2020
- 16 to 44 millions in Europe by 2070

# III. Key vulnerabilities

## Food supply

Agricultural productivity at low latitudes likely to suffer severe losses because of:



- high temperature
- drought
- flood conditions
- soil degradation

Possible yield reduction of:



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

# III. Key vulnerabilities

## Human health

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

Increased frequency of **cardio-respiratory diseases**

Increases in **malnutrition** and consequent disorders

Increased burden of **diarrhoeal disease**

Exacerbation of abundance and/or toxicity of **cholera**



# IV. Adaptation strategies

## Definition

**Adaptation** is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities

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

- Range of practices such as crop diversification, irrigation, water management, disaster risk management, insurance
- Policies, investments in infrastructure and technologies, behavioural change
- Consideration of scenarios of future climate change in design of infrastructure

# IV. Adaptation strategies

Adaptation capacity is **limited and uneven** across and within societies

Even **societies with high adaptive capacity** remain vulnerable to climate change

Climate change might go **beyond what traditional coping mechanisms** can handle

**Climate change poses new risks that will require new investments in adaptive responses**

# IV. Adaptation strategies

## Key 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

# IV. Adaptation strategies

## Water resources

### Protecting against floods



- Reservoirs and dykes
- Expanded floodplain areas
- Warning systems

### Preventing water scarcity



- Wastewater reuse and desalination
- Water conservation
- Water pricing

# IV. Adaptation strategies

## Agriculture and fisheries

### Adapting agriculture in southern Europe



- Changing crop species
- Changing the allocation of agricultural land
- Improving irrigation systems

### Adapting fish farming



- Selecting culture sites
- Integrating adaptation into comprehensive plans for managing coastal areas

# IV. Adaptation strategies

## Cooperation

Climate change will impede nations' abilities to achieve **sustainable development** pathways

**Poor regions** will suffer the most from the impacts of climate change and have limited adaptive capacity

**National policy making in developing countries remains a major challenge that can only be met with increased international funding for adaptation and disaster management**

# IV. Adaptation strategies

## French Adaptation Strategy

Strengthening **observation** systems

**Informing and training** all stakeholders

Promoting a **territorial-specific** approach

Developing **knowledge**

- Developing socio-economic scenarios

Contributing to **international cooperation**

- Developing involvement in the IPCC

# IV. Adaptation strategies

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

But **adaptation alone cannot cope** with all the projected impacts of climate change

**Need for a mix of strategies including adaptation and mitigation of GHG emissions**



# V. Mitigation options

## Characteristics of stabilisation scenarios

| Stabilization level (ppm CO <sub>2</sub> -eq) | Global mean temp. increase (°C) | Year CO <sub>2</sub> needs to peak | Global sea level rise above pre-industrial from thermal expansion (m) |
|---|---------------------------------|------------------------------------|---|
| 445 – 490                                     | 2.0 – 2.4                       | 2000 – 2015                        | 0.4 – 1.4   |
| 490 – 535                                     | 2.4 – 2.8                       | 2000 – 2020                        | 0.5 – 1.7   |
| 535 – 590                                     | 2.8 – 3.2                       | 2010 – 2030                        | 0.6 – 1.9   |
| 590 – 710                                     | 3.2 – 4.0                       | 2020 – 2060                        | 0.6 – 2.4   |

**Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilisation levels**

# V. Mitigation options

In 2050, global average **costs for mitigation** are between a 1% gain and 5.5% decrease of global GDP  
- less than 0.12 percentage points in annual GDP

Mitigation actions can result **co-benefits** that may offset a substantial fraction of mitigation costs

**Costs of impacts of climate change** will increase as temperatures increase

**Choices about the scale and timing of mitigation involve balancing the economic costs of more rapid emission reductions against the medium and long term risks of delay**

# V. Mitigation options



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 that **investment flows, technology transfer and incentives** are in place for technology development

# V. Mitigation options

## Key mitigation instruments, policies and practices



Regulations and standards

Taxes and charges



Effective carbon-price signal

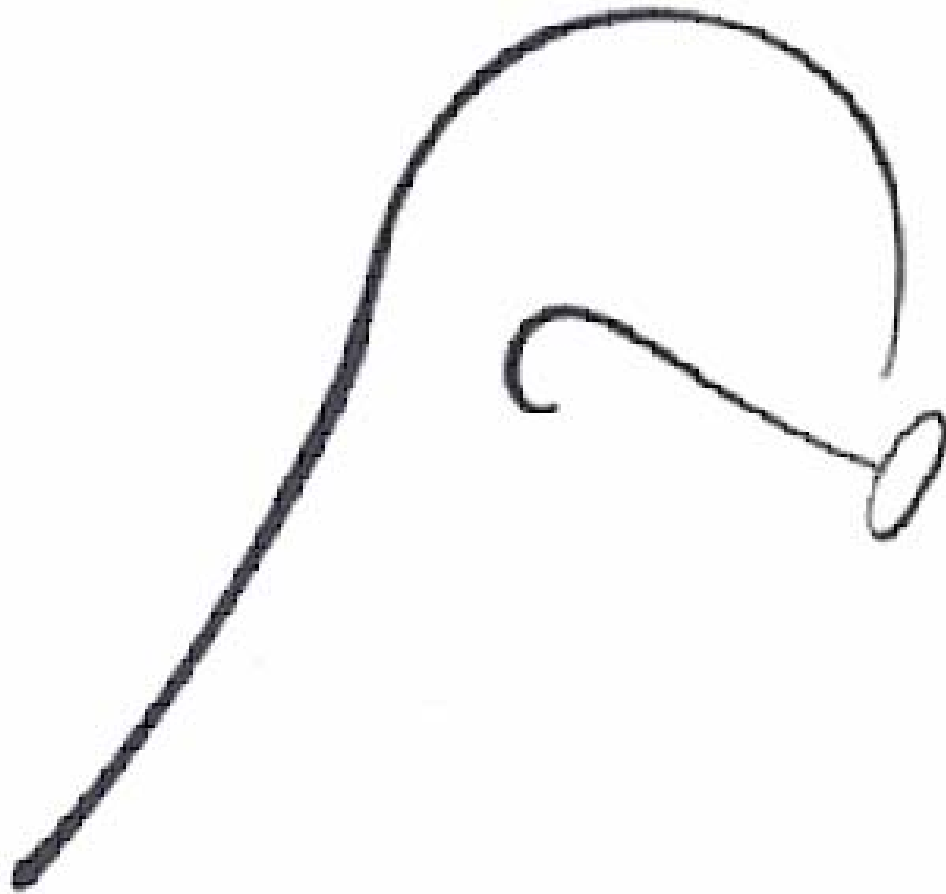
Appropriate energy infrastructure investments

Research, development and demonstration



International and regional cooperation

Changes in lifestyle & management practices



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.