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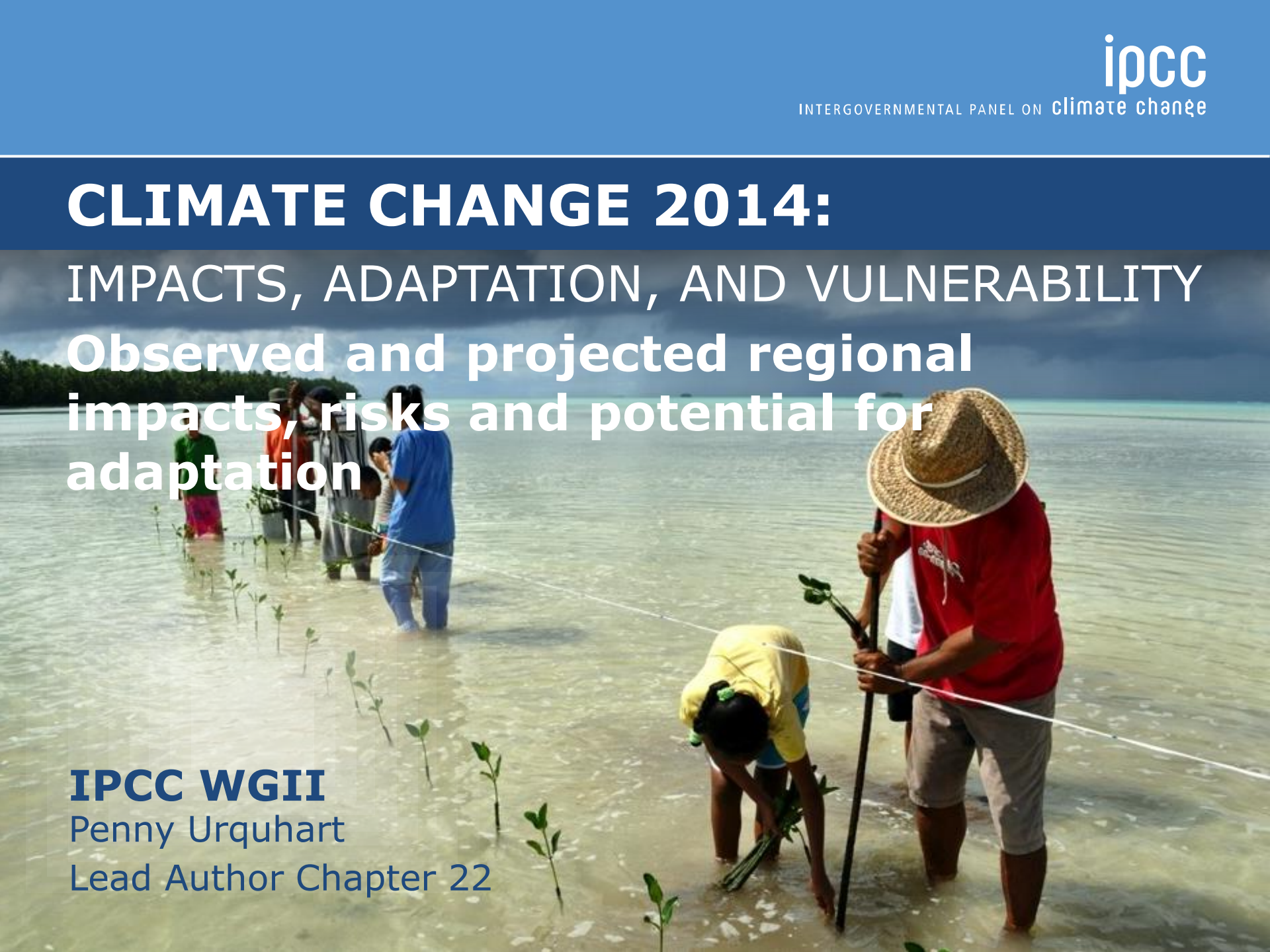
INTERGOVERNMENTAL PANEL ON climate change

CLIMATE CHANGE 2014:

IMPACTS, ADAPTATION, AND VULNERABILITY

Observed and projected regional impacts, risks and potential for adaptation



IPCC WGII
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Source for image: http://triplehelixblog.com/2011/03/pakistan-floods-an-analysis-of-revealed-weaknesses

Differential vulnerability to key regional risks

- Risks will vary through time across regions and populations, dependent on myriad factors including differences in exposure and vulnerability, and the extent of adaptation and mitigation
- Many key risks constitute particular challenges for **the least developed countries and for vulnerable communities**
- Vulnerability is linked to multidimensional inequalities often produced by uneven development processes
- For example, few **small-scale farmers across Africa** are able to adapt to climatic changes, while others are restricted by a suite of overlapping barriers
- Other vulnerable groups include Indigenous Aymara farmers in Bolivia (more vulnerable livelihood trajectories due to water shortages) and Arctic indigenous people

Climate-related decreases in **food security** and increased **malnutrition** are rated as **high or very high risks** in Africa, Asia, Central and South America under current levels of adaptation, should global mean temperature increase by 4°C

Differential distribution of flooding risks

- **By 2100, due to climate change and development patterns and without adaptation, hundreds of millions of people will be affected by coastal flooding and displaced due to land loss (*high confidence). The majority*** affected will be in East, Southeast, and South Asia. (TS)
- Since the mid-20th century, socioeconomic losses from flooding have increased mainly due to greater exposure and vulnerability (*high confidence)* (TS)
- The population and assets projected to be exposed to coastal risks as well as human pressures on coastal ecosystems will increase significantly in the coming decades due to population growth, economic development, and urbanization (*high confidence)*

Vulnerability and exposure to hot spells & heat waves: trends

- Factors affecting exposure and vulnerability to heat waves include age, pre-existing health status, outdoor activity, socio-economic factors including poverty and social isolation, access to and use of cooling, urban infrastructure
- Regionally: *likely* that heat wave frequency has increased since 1950 in large parts of **Europe, Australia and Asia**; insufficient evidence/spatially varying trends for **South America** and most of **Africa**
- *Likely* that by 2100, under RCP8.5, a 20-year high temperature event will at least double its frequency and in many regions occur every 2 years or annually

Regional adaptation trends (1)

- In **Africa**, national governments initiating adaptation governance systems; approaches include disaster risk management, technologies and infrastructure, ecosystem-based approaches, public health measures, and livelihood diversification
- In **Europe**, adaptation policy has been developed across all levels of government; some adaptation planning integrated into coastal and water management, environmental protection and land planning, and disaster risk management
- In **Asia**, mainstreaming climate adaptation action into subnational development planning in some areas, early warning systems, integrated water resources management, agroforestry, and coastal reforestation of mangroves
- In **Australasia**, planning for sea-level rise, and in southern Australia for reduced water availability, is becoming adopted widely
- In **North America**, governments are engaging in incremental adaptation planning, particularly at the municipal level; some proactive protection of energy & infrastructure investments
- In **Central and South America**, ecosystem-based adaptation including protected areas, conservation agreements, and community management; some integrated water resources management in agriculture

Regional adaptation trends (2)

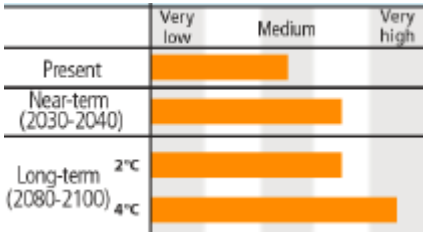
- In the **Arctic**, some communities have begun to deploy adaptive co-management strategies and communications infrastructure, combining traditional and scientific knowledge
- In **small islands**, with their diverse physical and human attributes, community-based adaptation generates larger benefits when delivered with other development activities
- Common to **Asia, Africa and Central and South America**: ecosystem based adaptation; resilient crop varieties; expansion of agro-ecological approaches; climate forecasts; early warning systems
- **These regions plus the Arctic and small islands**: growing experience with combining traditional and scientific knowledge, and community-based adaptation
- **Most adaptation in developing regions – for example, in sub-Saharan Africa, remains autonomous, reactive and unsupported, and not at scale**
- **Deeper development of adaptation governance systems, more capacity, experience and resources at the municipal level in Europe and North America**

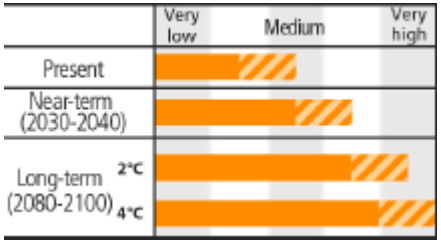
While some regional risks can be reduced through adaptation, others may prove intractable

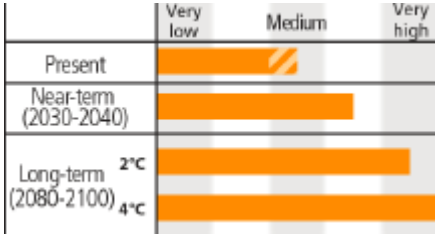
Freshwater, terrestrial and marine ecosystems in **Polar regions** – due to changes in snow cover, ice, permafost, affecting species habitat quality, range, and the dependent economies

Threats to low-lying areas of **small islands** due to interaction of sea level rise and high water events

Reduced biodiversity, fisheries' production and coastal protection by coral reefs – **Australasia, east coast of Africa, small islands**







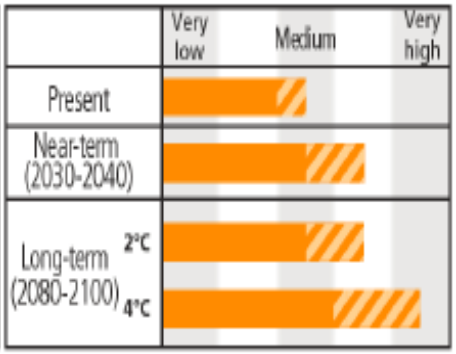
There are significant adaptation challenges that are distributed unevenly across and within regions. If we consider the risks related to **flooding**:

- For **Europe**, there is high confidence that adaptation can reduce most of the economic and human flood-related risks (near- and long-term) to **very low**; goes almost up to medium under 4°C rise
- This is not the case for **Asia** (riverine, coastal & urban flooding) at 2°C, which remains at medium risk; increases to high at 4°C rise
- Nor for **Central and South America** (flooding & landslides in urban & rural areas) at 2°C – high risk; approaches very high at 4°C rise
- Nor even for **North America** (urban floods in riverine & coastal areas) at 2°C – medium risk; high at 4°C rise
- At 4°C, the risk assessment does not indicate any reduced difference between the regions
- Risks become **more widespread with 4°C rise**:
  - Risks become significant for Australasia (flood damage to infrastructure, settlements & ecosystems) at 4°C too – medium risk

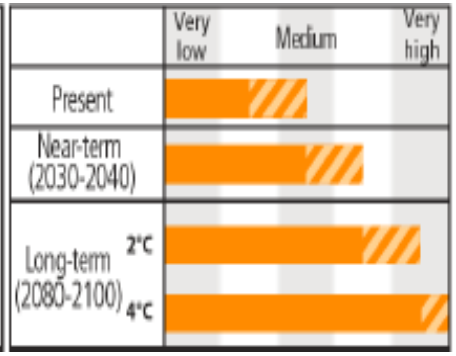

Even under high adaptation, some residual impacts across regions in a 2°C world would be significant

Residual impacts under high adaptation with 2°C temperature increase - examples

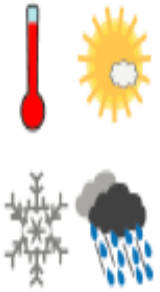
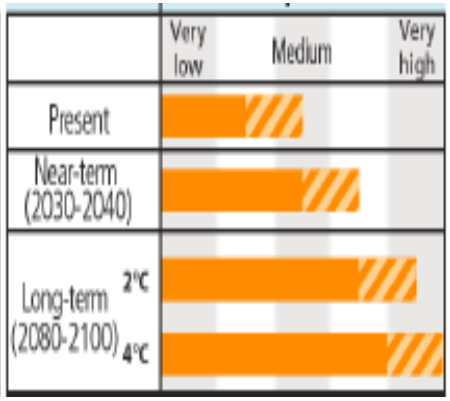
EUROPE

Increased economic losses and people affected by extreme heat events: impacts on health and well-being, labor productivity, crop production, air quality, and increasing risk of wildfires in southern Europe and in Russian boreal region (*medium confidence*) [23.3-7, Table 23-1]	• Implementation of warning systems • Adaptation of dwellings and workplaces and of transport and energy infrastructure • Reductions in emissions to improve air quality • Improved wildfire management • Development of insurance products against weather-related yield variations		

ASIA

Increased risk of heat-related mortality (*high confidence*) [24.4]	• Heat health warning systems • Urban planning to reduce heat islands; improvement of the built environment; development of sustainable cities • New work practices to avoid heat stress among outdoor workers		

C & S AMERICA

Water availability in semi-arid and glacier-melt-dependent regions and Central America; flooding and landslides in urban and rural areas due to extreme precipitation (*high confidence*) [27.3]	• Integrated water resource management • Urban and rural flood management (including infrastructure), early warning systems, better weather and runoff forecasts, and infectious disease control		

Under an emissions scenario leading to a long-term 2°C warming, all nine assessed risks for Africa remain **high** or **very high** under current levels of adaptation

Even under high adaptation, **residual impacts in a 2°C world would be significant -** only the migration risk is rated as being capable of reduction to low.

Opportunities for risk reduction through mitigation and adaptation lie in strengthening governance, reducing non-climate stressors, integrated land and water management, diversifying livelihoods, social protection, behavioural, technological and infrastructural responses, responses that integrate local/traditional and scientific knowledge

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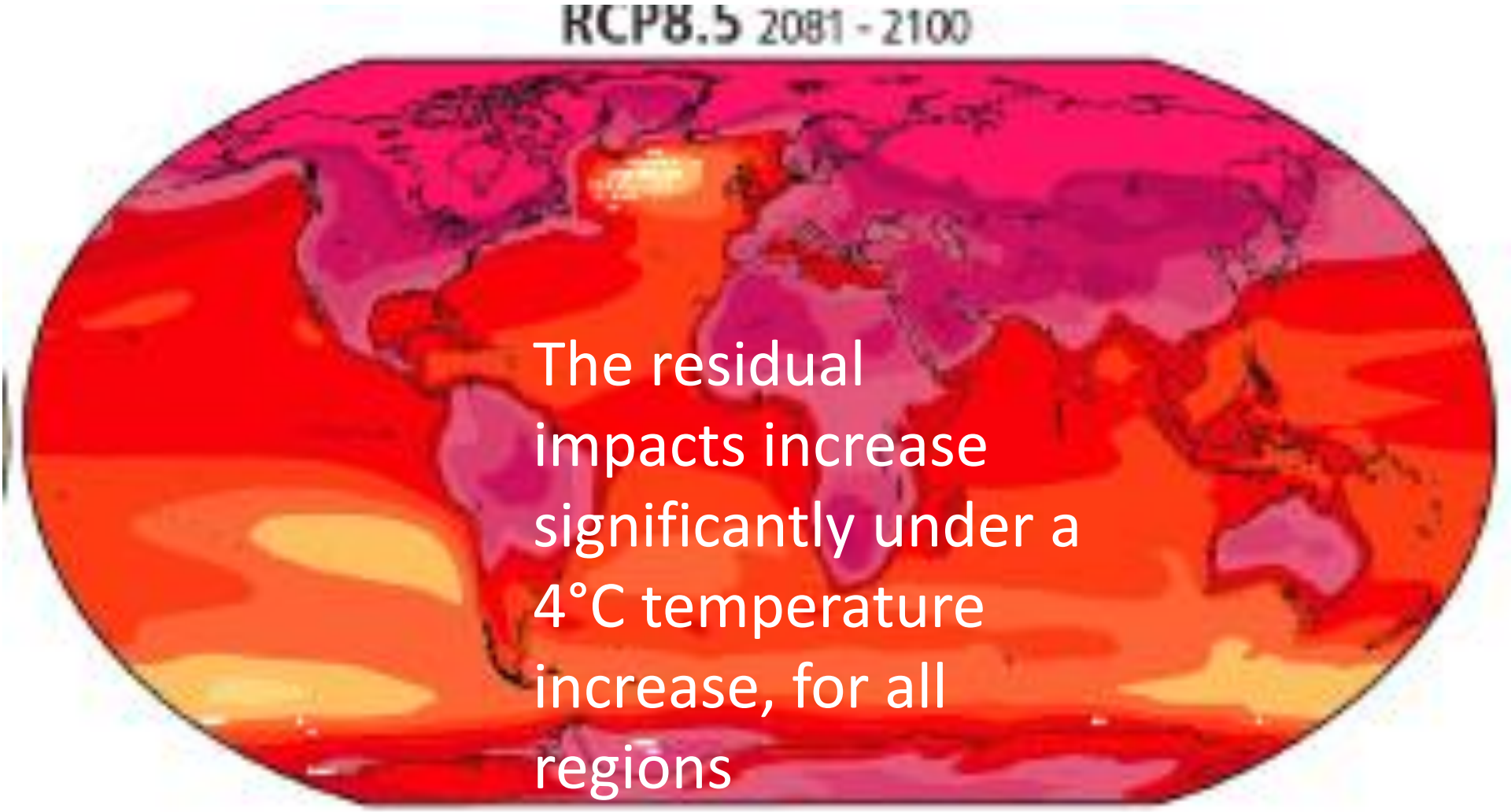
Final key messages

- There will be **many residual impacts across all regions under a 2°C temperature increase**, even under **high adaptation**
- The assessment indicates particular risks and impacts in **Africa, Asia, Central & South America** – exposure; **Polar Regions, small islands** – irreversibility



The residual impacts increase significantly under a 4°C temperature increase, for all regions