

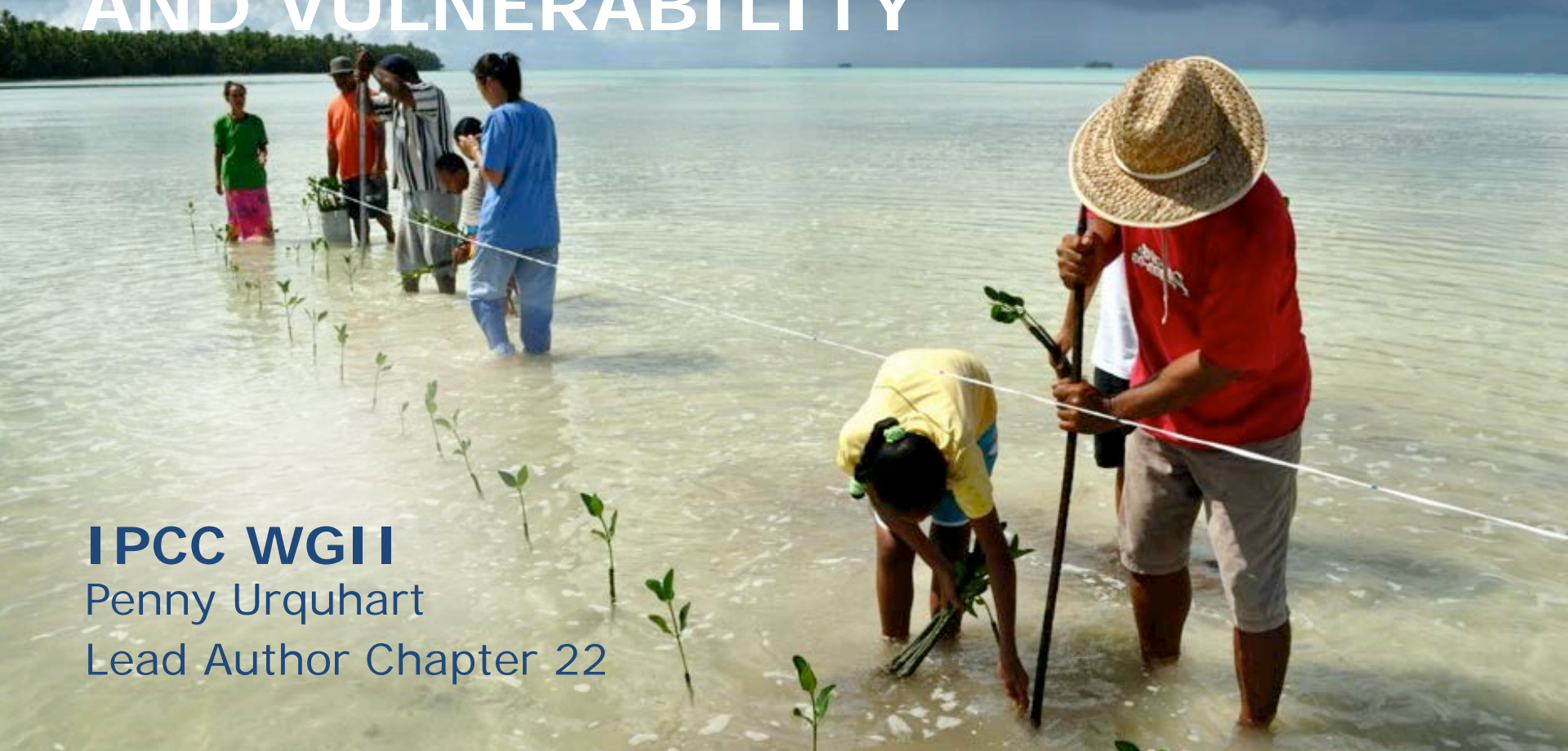
CLIMATE CHANGE 2014:

AFRICA: IMPACTS, ADAPTATION, AND VULNERABILITY

IPCC WGII

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Lead Author Chapter 22





Headline statements: Africa (1)

- Under high emissions scenarios, much of Africa could exceed 2° C by mid-century, and reach between 3 and 6° C by 2100
- African ecosystems are already impacted by climate change and future impacts will be substantial
- Existing stress on water availability will be amplified
- All aspects of food security are potentially affected by climate change, including food access, utilization, and price stability
- Climate change multiplies existing health vulnerabilities; trigger for social conflict and migration


Headline statements: Africa (2)

- Governance systems for adaptation are being developed across the continent, but cannot yet effectively co-ordinate adaptation initiatives
- Climate change threatens to overwhelm the ability of people to cope and adapt, especially if the root causes of poverty and vulnerability are not addressed
- Significant financial resources, technological support and institutional and capacity development needed
- Wide range of data and research gaps constrain decisionmaking



Southern Africa impacts (1)

- Projected: Drying in SW, extending NE from desert areas of Namibia and Botswana; wetter in SE; delay in onset of summer rains; more intense rain
- Extreme events: Increased heat waves; hot days and hot nights; SW regions high risk of severe droughts; uncertainties in changes of tropical cyclones
- Impacts on water resources could be severe in water-stressed regions that are projected to become drier, e.g. northern Africa and parts of southern Africa
- All countries within the Zambezi River Basin could contend with increasing water shortages (A2 scenario); non-climate drivers (e.g., population & economic growth, expansion of irrigated agriculture) would strongly influence



Suitable agro-climatic zones for growing economically important perennial crops are estimated to significantly diminish, largely due to the effects of rising temperatures

Severe climate impacts on agriculture; changes in composition of farming systems; some studies show maize yields in SA and Zimbabwe could drop by 30% or more by 2050

Southern Africa impacts (2)

Areas receiving 200 - 500 mm per year:
projected declining groundwater
recharge → more frequent prolonged
drought & other precipitation
anomalies, especially in shallow aquifers

Saltwater intrusion into coastal aquifers
due to high rates of groundwater
extraction, plus saltwater ingression from
sea level rise

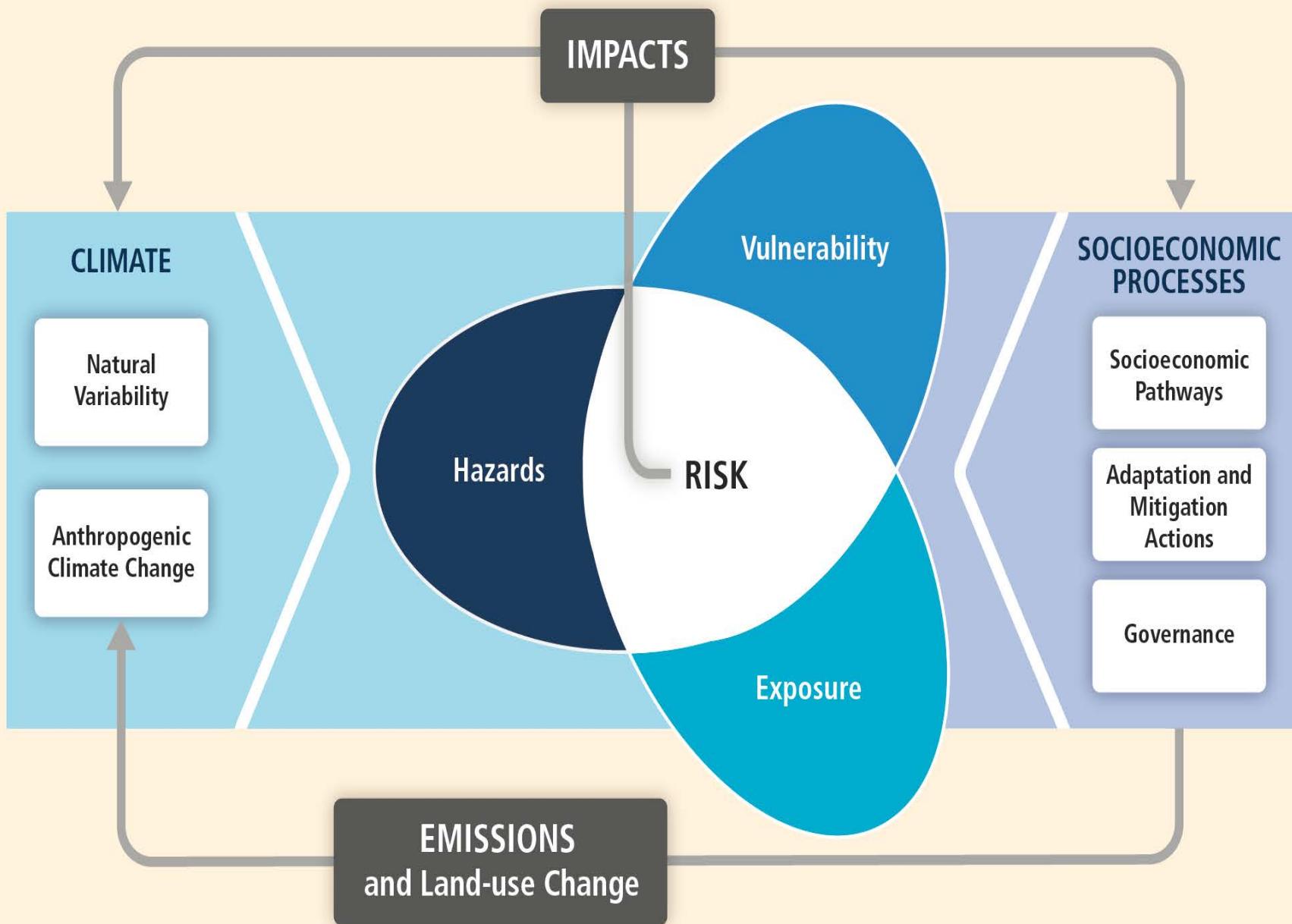
Intensification and spread of diseases, lowering
people's ability to survive other disasters; heat
stress and productivity

Combined
effects of
global warming
and ocean
acidification
lowering coral
reef
productivity
and resilience



Changes in African ecosystems

- Changed distribution and dynamics of all terrestrial ecosystems
- Primary current driver is land use change; *High agreement* that precipitation, temperature, and CO₂ changes *very likely* to drive important future changes in ecosystems throughout Africa
- Freshwater ecosystems: elevated surface water temperatures Lakes Kariba, Kivu, Tanganyika, Victoria, and Malawi; thermal stratification, reduced inflows, destabilisation of plankton dynamics
- Coastal: sea level rise, storm swells, flooding of river deltas; changes in upwelling intensity of Benguela system



Vulnerability and exposure to hot spells & heat waves

- Factors affecting exposure and vulnerability: age, pre-existing health status, outdoor activity, socio-economic factors (poverty, social isolation), access to cooling, urban infrastructure
- 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
- Heat exhaustion & work capacity loss: already observed loss of work productivity in hottest and wettest seasons in Africa



Climate-related drivers of impacts								Level of risk & potential for adaptation
Warming trend	Extreme temperature	Extreme precipitation	Precipitation	Damaging cyclone	Sea level	Ocean acidification	Sea surface temperature	<p>Potential for additional adaptation to reduce risk</p> <p>Risk level with high adaptation</p> <p>Risk level with current adaptation</p>

<p>Reduced crop productivity associated with heat and drought stress, with strong adverse effects on regional, national, and household livelihood and food security, also given increased pest and disease damage and flood impacts on food system infrastructure (<i>high confidence</i>)</p> <p>[22.3-4]</p>	<ul style="list-style-type: none"> • Technological adaptation responses (e.g., stress-tolerant crop varieties, irrigation, enhanced observation systems) • Enhancing smallholder access to credit and other critical production resources; Diversifying livelihoods • Strengthening institutions at local, national, and regional levels to support agriculture (including early warning systems) and gender-oriented policy • Agronomic adaptation responses (e.g., agroforestry, conservation agriculture) 		<table border="1"> <thead> <tr> <th></th> <th>Very low</th> <th>Medium</th> <th>Very high</th> </tr> </thead> <tbody> <tr> <td>Present</td> <td colspan="2">[Hatched bar]</td> <td></td> </tr> <tr> <td>Near term (2030 – 2040)</td> <td colspan="2">[Hatched bar]</td> <td></td> </tr> <tr> <td rowspan="2">Long term (2080 – 2100)</td> <td>2°C</td> <td colspan="2">[Hatched bar]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Hatched bar]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Hatched bar]			Near term (2030 – 2040)	[Hatched bar]			Long term (2080 – 2100)	2°C	[Hatched bar]		4°C	[Hatched bar]	
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<p>Adverse effects on livestock linked to temperature rise and precipitation changes that lead to increased heat and water stress, and shifts in the range of pests and diseases, with adverse impacts on pastoral livelihoods and rural poverty (<i>medium confidence</i>)</p> <p>[22.3.4.2, 22.4.5.2, 22.4.5.6, 22.4.5.8]</p>	<p>Addressing non-climate stressors facing pastoralists, including policy and governance features that perpetuate their marginalization, is critical for reducing vulnerability. Natural resource-based strategies such as reducing drought risk to pastoral livelihoods through use of forest goods and services hold potential, provided sufficient attention is paid to forest conservation and sustainable management.</p>		<table border="1"> <thead> <tr> <th></th> <th>Very low</th> <th>Medium</th> <th>Very high</th> </tr> </thead> <tbody> <tr> <td>Present</td> <td colspan="2">[Hatched bar]</td> <td></td> </tr> <tr> <td>Near term (2030 – 2040)</td> <td colspan="2">[Hatched bar]</td> <td></td> </tr> <tr> <td rowspan="2">Long term (2080 – 2100)</td> <td>2°C</td> <td colspan="2">[Hatched bar]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Hatched bar]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Hatched bar]			Near term (2030 – 2040)	[Hatched bar]			Long term (2080 – 2100)	2°C	[Hatched bar]		4°C	[Hatched bar]	
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<p>Changes in the incidence and geographic range of vector- and water-borne diseases due to changes in the mean and variability of temperature and precipitation, particularly along the edges of their distribution (<i>medium confidence</i>)</p> <p>[22.3]</p>	<ul style="list-style-type: none"> • Achieving development goals, particularly improved access to safe water and improved sanitation, and enhancement of public health functions such as surveillance • Vulnerability mapping and early warning systems • Coordination across sectors • Sustainable urban development 		<table border="1"> <thead> <tr> <th></th> <th>Very low</th> <th>Medium</th> <th>Very high</th> </tr> </thead> <tbody> <tr> <td>Present</td> <td colspan="2">[Hatched bar]</td> <td></td> </tr> <tr> <td>Near term (2030 – 2040)</td> <td colspan="2">[Hatched bar]</td> <td></td> </tr> <tr> <td rowspan="2">Long term (2080 – 2100)</td> <td>2°C</td> <td colspan="2">[Hatched bar]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Hatched bar]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Hatched bar]			Near term (2030 – 2040)	[Hatched bar]			Long term (2080 – 2100)	2°C	[Hatched bar]		4°C	[Hatched bar]	
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Adaptation Responses

- 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
- 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
- Most adaptation in developing regions – e.g. in **sub-Saharan Africa**, remains autonomous, reactive and unsupported, and not at scale

Farmer-managed natural regeneration, Maradi/Zinder region, southern Niger:
Since the late 1980s, this has resulted in large-scale increase in tree cover over 4.8 million hectares; And decreased the sensitivity of the production system to drought



Conservation agriculture: transforming degraded agricultural landscapes into productive, sustainable and resilient systems through agroforestry

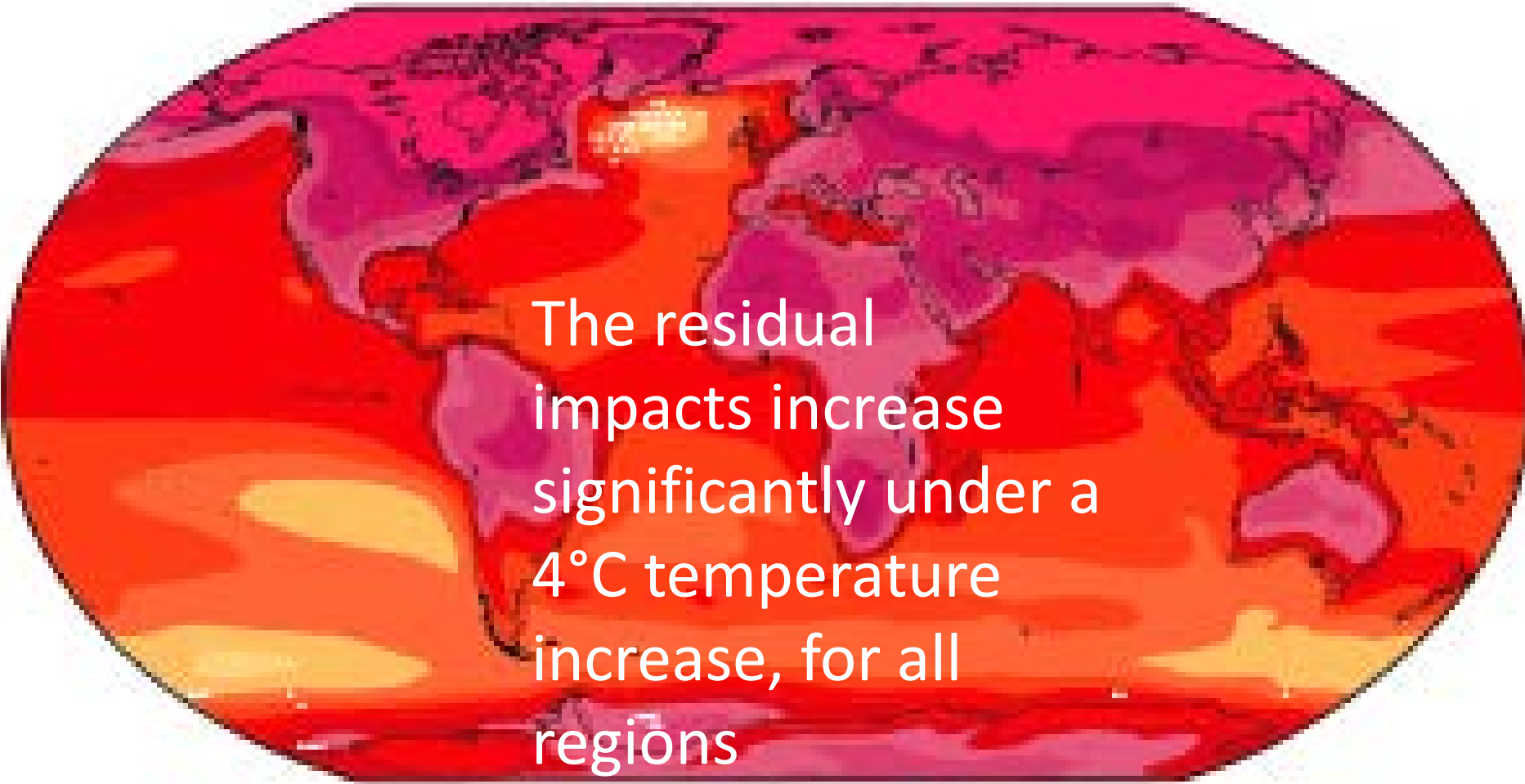


Under an emissions scenario leading to a long-term 2°C warming, all nine assessed risks for Africa remain **high** or **very high** under current levels of adaptation

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

RCP8.5 2081 - 2100

A world map showing residual impacts under the RCP8.5 2081-2100 scenario. The map is color-coded, with red and orange indicating significant increases in residual impacts across all regions. The text is overlaid on the map, stating: "The residual impacts increase significantly under a 4°C temperature increase, for all regions".

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