

Key Findings of the AR6 Report on Impacts, Adaptation and Vulnerability

Part I: Impacts and Risks

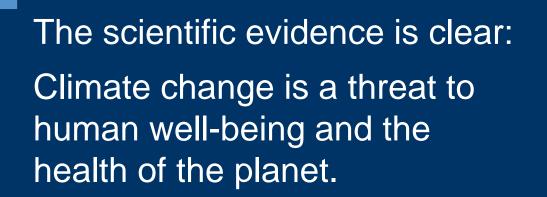
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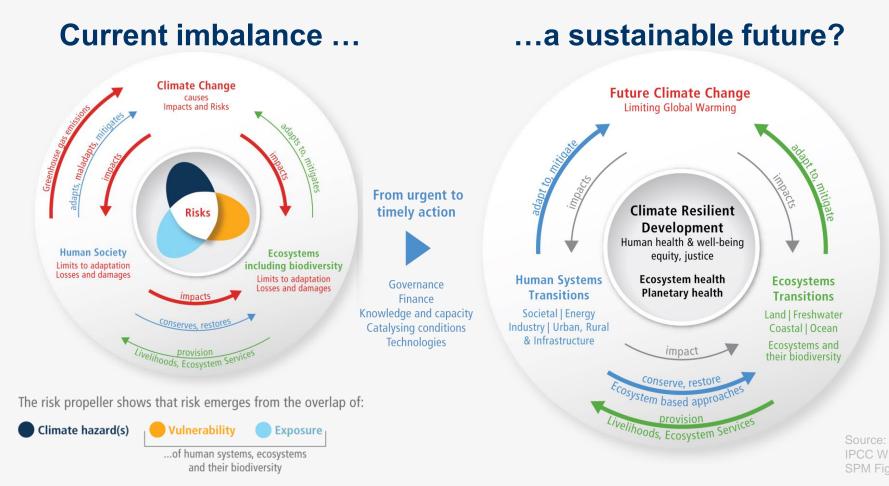
Climate Change 2022 Impacts, Adaptation and Vulnerability













Global warming has caused dangerous and widespread disruption in nature

... for example mass mortality of trees in this drought-stressed forest in California, USA.



Observed impacts of climate change on ecosystems







Climate change is affecting the lives of billions of people, despite efforts to adapt

... for example, through high intensity cyclones, sea level rise, heavy rainfall



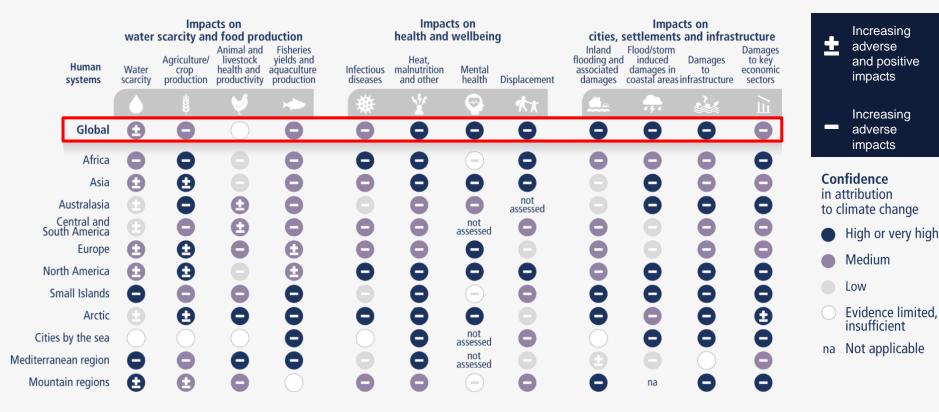
Impacts are magnified in cities where more than half the world's population lives

...for example, through urban heat islands and air pollution, or through extreme events impacting transport, water, sanitation and energy systems

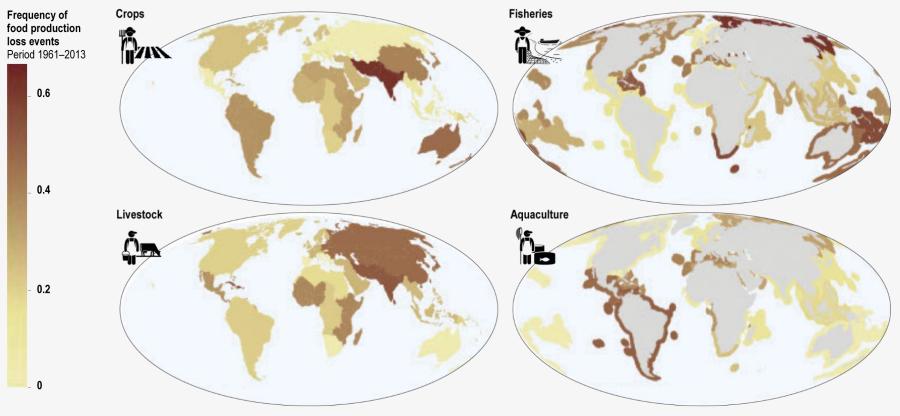
P. Nguyen / Unsplash



Observed impacts on human systems



Regional impacts on major crop yields and food production loss events



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Simultaneous extreme events compound risks

Multiple extreme events that compound the risks are more difficult to manage

... e.g. reductions in crop yields, made worse by heat stress among farm workers

. . .



Heat stress among farm workers Reduced productivity

Reduced household incomes Potentially global effects





Climate change combines with unsustainable use of natural resources, habitat destruction, growing urbanisation and inequity

... reducing the capacity to adapt.

Youssef Abdelwahab / Unsplash

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3.3–3.6 billion people live in hotspots of high vulnerability to climate change.

These are across large parts of Africa, as well as South Asia, Central and South America, small islands and the Arctic.

... due to overlapping challenges

- Limited access to water, sanitation and health services
- Climate-sensitive livelihoods
- High levels of poverty
- Weak leadership
- Lack of funding
- Lack of accountability and trust in government

D. Onyodi/KRCS CC BY-NC 2.0; M. Dormino UN Photo CC BY-NC-ND 2.0; M. Krisetya/Unsplash

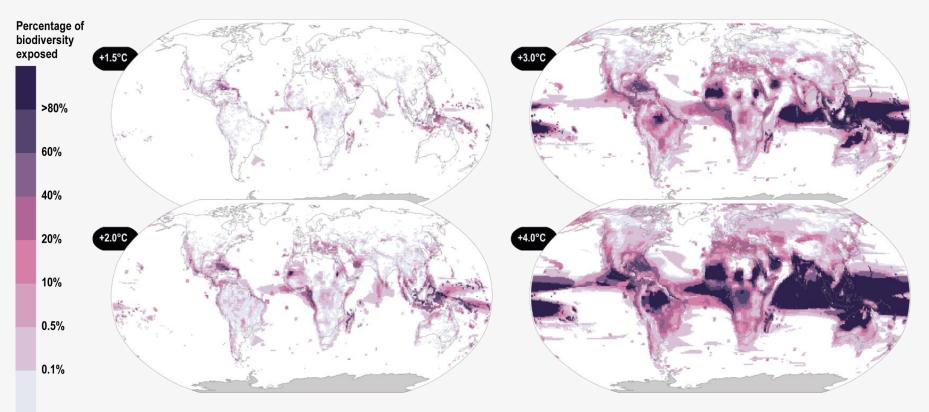


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Ocean Image Bank/The Ocean Agency

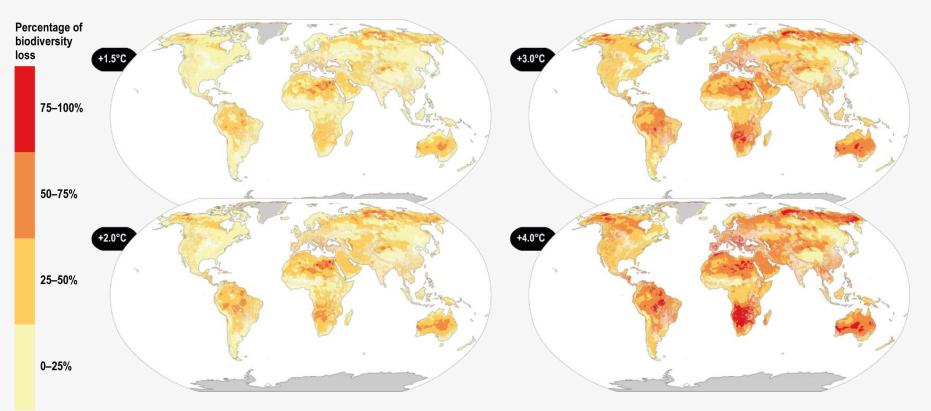


Species exposed to potentially dangerous climate conditions





Projected loss of terrestrial and freshwater biodiversity

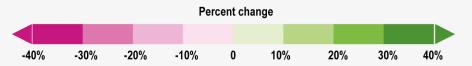




Projected change in marine fish biomass

Simulated change averaged over 2090–2099, relative to 1990–1999





IPCC WGII AR6 Report Figure AI.11, still subject to edits



Nature's crucial services at risk in a warming world



Pollination



Coastal Protection



Tourism/Recreation



Food Source



Health



Water filtration

Clean air

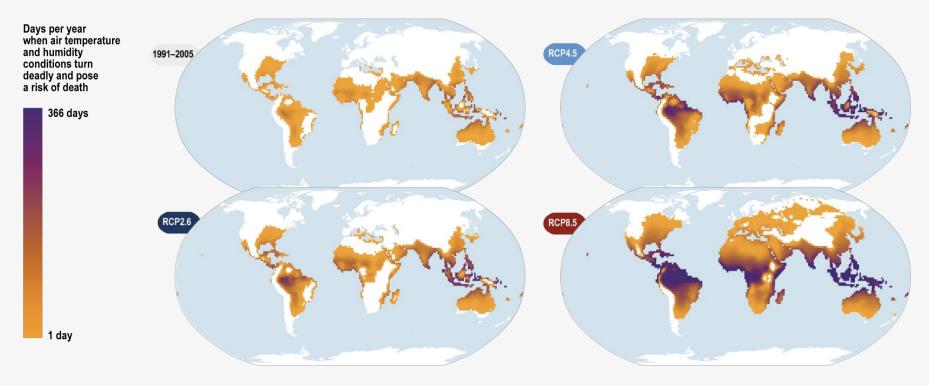


Climate regulation

Ocean Image Bank/ S. Wolfe, D. Poursanidis; FAO/K. Arrigo, Unsplash, A. Fassio/CIFOR CC BY-NC-ND 2.0



Global distribution of population exposed to hyperthermia from extreme heat and humidity. Concerning half to three-quarters of the population periodically by 2100.





Future global climate risks



Heat stress

Exposure to heat waves will continue to increase with additional warming ... affecting crops, ecosystems and people



Water scarcity

At 2°C, regions relying on snowmelt could experience **20% decline in water availability** for agriculture after 2050.



Food security

Climate change will increasingly undermine food security.



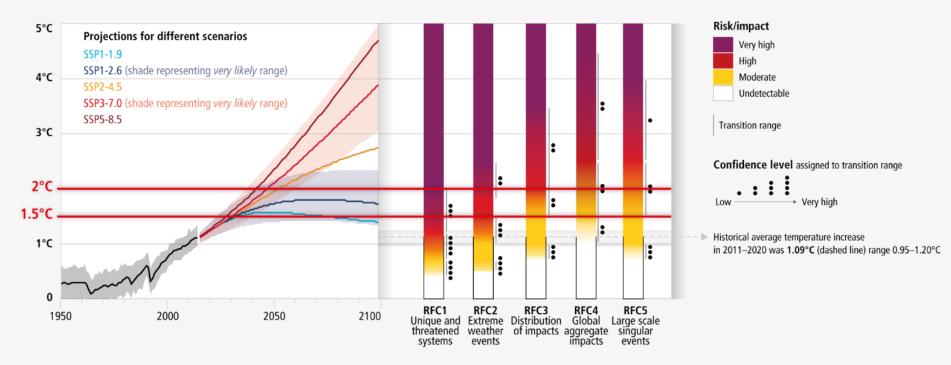
Flood risk

For about a billion people in low-lying cities by the sea and on Small Islands by mid-century



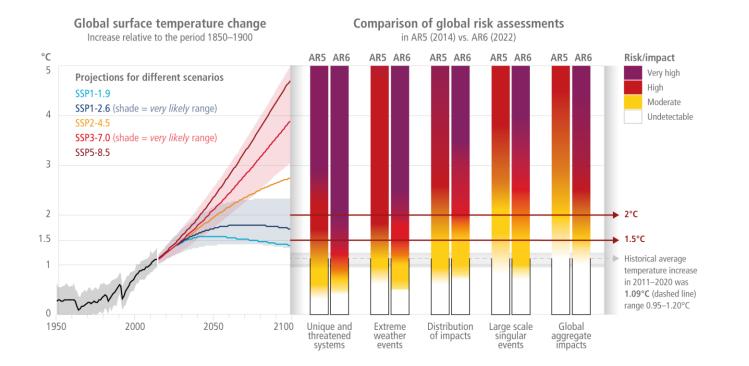
Global and regional risk

provide orientation for action (adaptation and mitigation)





AR6 insight: Risks are developing sooner than assessed in AR5



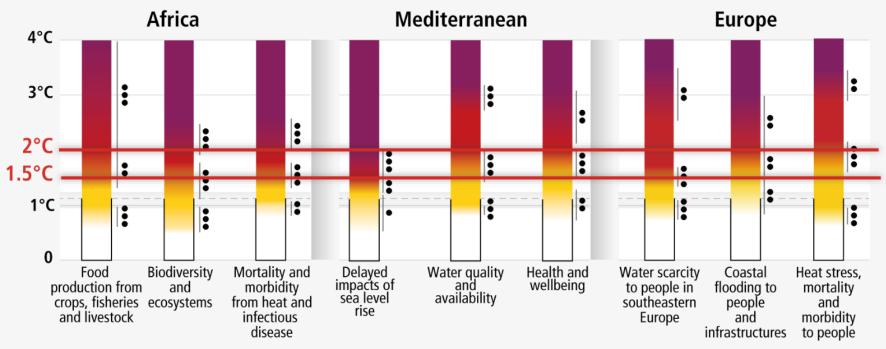
IPCC WGII AR6 SPM Figure 3 and AR5 Assessment Box SPM.1 Figure 1



Global and regional risk

provide orientation for action (adaptation and mitigation)

... minimising risk by keeping global warming below 1.5°C



IPCC WGII AR6 SPM Figure 3



Thank you! Now it is time for your questions

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Key Findings of the AR6 Report on Impacts, Adaptation and Vulnerablity

Part II: Adaptation

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Action on adaptation has increased but progress is uneven and we are not adapting fast enough.

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There are increasing gaps between adaptation action taken and what's needed.

These gaps are largest among lower income populations. They are expected to grow.







There are options we can take to reduce the risks to people and nature.

II Vagabiondo / Unsplash



Nature offers significant untapped potential

e.g. through agroforestry building resilience in forests with high biodiversity ... example: Nigerian rubber farmer, diversifying his business with food crops, fruit trees and bees ...

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Water management Options on farms:

- Irrigation
- Rainwater storage, water-saving technologies
- Moisture conservation in soils

Economic and ecological benefits; reduced vulnerability

Wider options:

- Securing drinking water
- Flood and drought risk management
- Working with nature, land-use planning

Effectiveness declines with increased warming

A. Öjdahl / IWMI CC BY-NC 2.0; A.Beliaikin / Unsplash; rodjonesphotography.co.uk CC BY 2.0

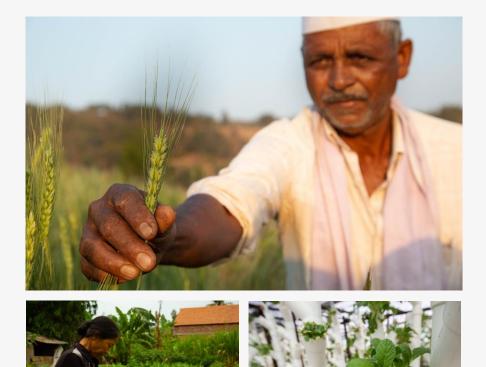
Improving food security

Effective options:

- Cultivar improvements
- Agroforestry
- Farm and landscape diversification
- Community-based adaptation
- Strengthening biodiversity

Wider benefits:

- Food security and nutrition
- Health and well-being
- Livelihoods





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Transforming cities

By 2050 urban areas could be home to twothirds of the world's population.

Effective options

- Nature-based and engineering approaches together
- Establishing green and blue spaces
- Urban agriculture
- Social-safety nets for disaster management

Wider benefits

- Public health improvements
- Ecosystem conservation

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Adapting informal settlements

Effective options:

- Local knowledge
- Adequate capacity (information, funding, tools)
- Engagement of policymakers
- Involvement of residents in decisionmaking
- Institutional change (accountability, commitment, transparency)







India Water Portal CC BY-NC-SA 2.0





Maladaptation

Adaptation that results in unintended consequences



The most disadvantaged groups are most affected by maladaptation.

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There are limits to adaptation

- Even effective adaptation cannot prevent all losses and damages
- Above 1.5°C some natural solutions may no longer work.
- Above 1.5°C, lack of fresh water could mean that people living on small islands and those dependent on glaciers and snowmelt can no longer adapt.
- By 2°C it will be challenging to farm multiple staple crops in many current growing areas.

Financial constraints

- Current global financial flows are insufficient
- Most finance targets emissions reductions rather than adaptation
- Climate impacts can slow down economic growth through losses and damages









Five System Transitions in Adaptation





Land, ocean, coastal and freshwater ecosystems Urban, rural and infrastructure



Energy



Industry



Society

- Make possible the adaption required for human health and well being; economic and social resilience; ecosystem health and planetary health
- Are important for achieving the low global warming levels that would avoid many limits to adaptation

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The Feasibility of Adaptation measures: overview

transition key risks and adaptation options feasibility intigation Economic logical tutional Social mental physical metal physical physical physical physical physical physical physical physical	System	Representative	Climate responses ¹	✓ Potential	Synergies with	22	<mark>າ))</mark> ຼ Techno-	nsti-	/t̂∗tt	Environ	Geo-	Dimensions of potential feasibility
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Energy system Critical infrastructure, networks and services Resilient power systems Energy reliability Image: Networks and services intervent in the systems adaptation in the systems adaptation. Image: Networks and services in the systems adaptation. Footnotes: Human health Health and health systems adaptation / / // <td< th=""><th>infrastructure</th><th>infrastructure, networks</th><th>Sustainable land use and urban planning</th><th>-</th><th></th><th>••••</th><th></th><th>•</th><th>•••••</th><th></th><th>•</th><th></th></td<>	infrastructure	infrastructure, networks	Sustainable land use and urban planning	-		••••		•	•••••		•	
Critical infrastructure, networks and services Resilient power systems In ot applicable In ot applicable Image: networks and services Energy reliability In ot applicable In ot applicable In ot applicable Human health Health and health systems adaptation Image: networks and equity Livelihood diversification Image: networks and equity Imag		Water security	Improve water use efficiency						1			
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Cross-sectoral Peace and human mobility Planned relocation and resettlement Human migration ³ Other cross-cutting risks Disaster risk management Climate services, including Early Warning Systems Social safety nets Image: Climate services, including Early Warning Systems Social safety nets		Livelihood diversification		•		•	•	•	•		•	³ Migration, when voluntary, safe and orderly, allows reduction of risks to climatic
cross-cutting risks Climate services, including Early Warning Systems Social safety nets					•	•	•	•	•	•	•	
Kisk spreading and sharing		cross-cutting Climate services, including Early Warning Systems		•	, ,	•		•	•			



The Feasibility of Adaptation measures: Land and ocean ecosystems

						Dimensions of potential feasibility						
System transitions	Representative key risks Coastal socio- ecological systems		Climate responses ¹ and adaptation options	Potential feasibility	Synergies with mitigation not assessed	Economic	»)) Techno- logical □ ■	Insti- tutional	Å ¥ †† Social ■	Environ- mental	Geo- physical	
			Coastal defence and hardening Integrated coastal zone management								•	
Land and ocean ecosystems	Terrestrial and ocean ecosystem services Biodiversity r		Forest-based adaptation ² Sustainable aquaculture and fisheries Agroforestry management and ecosystem connectivity			•	•••••••••••••••••••••••••••••••••••••••	•	•••••	•	••••	
	Water security	Water use ef	ficiency and water resource management	•	•					•	•	
	Food security		Improved cropland management Efficient livestock systems	•			•	•	•	8	•	
	Confidence le	e vel in potent	ial feasibility and in synergies with mitigati	on	Feasibility level and synergies with mitigation							
	Low	Medium	High		\circ Low		lium	🔵 High	/ 1	nsufficient	evidence	

Footnotes:

¹ The term response is used here instead of adaptation because some responses, such as retreat, may or may not be considered to be adaptation.

² Including sustainable forest management, forest conservation and restoration, reforestation and afforestation.

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The Feasibility of Adaptation measures: Urban and infrastructure systems

		- 1	\checkmark	Synergies		J))	Ì	ħ ŧ ŤŤ	Â	
System transitions	Representative key risks	Climate responses ¹ and adaptation options	Potential feasibility	with mitigation	Economic	Techno- logical	Insti- tutional	Social	Environ- mental	Geo- physical
Urban and infrastructure systems	Critical infrastructure, networks and services	Green infrastructure and ecosystem services Sustainable land use and urban planning Sustainable urban water management	•		•		•	•		



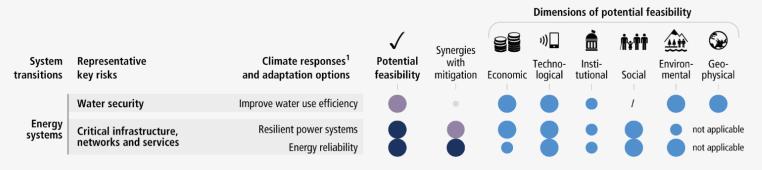
Footnotes:

¹ The term response is used here instead of adaptation because some responses, such as retreat, may or may not be considered to be adaptation.

² Including sustainable forest management, forest conservation and restoration, reforestation and afforestation.



The Feasibility of Adaptation measures: Energy systems





Footnotes:

¹ The term response is used here instead of adaptation because some responses, such as retreat, may or may not be considered to be adaptation.

² Including sustainable forest management, forest conservation and restoration, reforestation and afforestation.



The Feasibility of Adaptation measures: Cross-sectoral

Dimensions of notontial facelbility

							Dimensi	ons of po	tential fe	ential feasibility		
System	Representative		Climate responses ¹	√ Potential	Synergies with	88	າ))	الله Insti-	ħ ŧ ŤŤ	Environ-	Geo-	
transitions	key risks		and adaptation options	feasibility	mitigation	Economic		tutional	Social	mental	physical	
	Human health	Неа	Ith and health systems adaptation					•			1	
	Living standard	ls and equity	Livelihood diversification					•			•	
Cross- sectoral	Peace and human mobility		anned relocation and resettlement	•	•	•	•	•	•	•	•	
Sectoral			Human migration ³		•					•		
	Other cross-cutting risks		Disaster risk management					•				
		Climate services	, including Early Warning Systems		1							
			Social safety nets		•							
			Risk spreading and sharing		•							
	Confidence leve	l in potential feas	ibility and in synergies with mitigati	on	Feasibili	ity level an	d synerg	ies with n	nitigatio	n		
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Footnotes:

¹ The term response is used here instead of adaptation because some responses, such as retreat, may or may not be considered to be adaptation.

² Including sustainable forest management, forest conservation and restoration, reforestation and afforestation.

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The wider benefits of adaptation









Restored and connected habitats can provide corridors for vulnerable species Green buildings, green spaces, clean water, renewable energy, sustainable transport – in cities

For more than 3.4 billion people in rural areas: improved roads, reliable energy, clean water, food security

SDG 10: Reduced inequality

Policies that increase youth access to land, credit, knowledge and skills can support agri-food employment

SDG 14/15: Life on land & below water

SDG 1: No poverty

SDG 3: Good health and wellbeing

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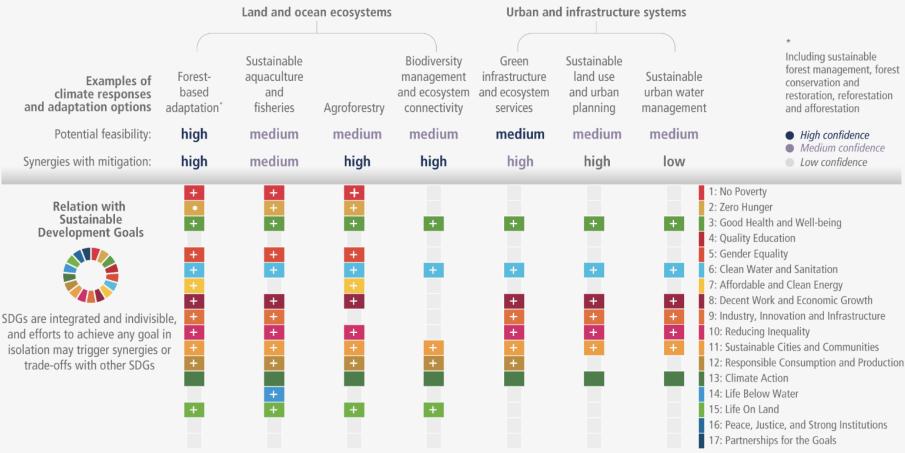
Mitigation and SDG co-benefits, e.g., forests





IPCC WGII AR6 SPM Figure 4b

Mitigation and SDG co-benefits, e.g., urban and green infrastructure



IPCC WGII AR6 SPM Figure 4b

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Key Findings of the AR6 Report on Impacts, Adaptation and Vulnerablity Part III: Climate Resilient Development

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Ocean Image Bank/M Curnock, S. Baldwin, CO BY-NC-ND 2.0; Y Ishida/UNDP T. Leste CO BY-NY 2.0 The impacts of climate change have already significantly affected the livelihoods and living conditions, especially of the poorest and most vulnerable, and will continue to undermine development during the coming century.



3.3 – 3.6 billion people live in hotspots of high vulnerability to climate change

These are across large parts of Africa, as well as South Asia, Central and South America, small islands and the Arctic.



D. Pandey/Unsplash



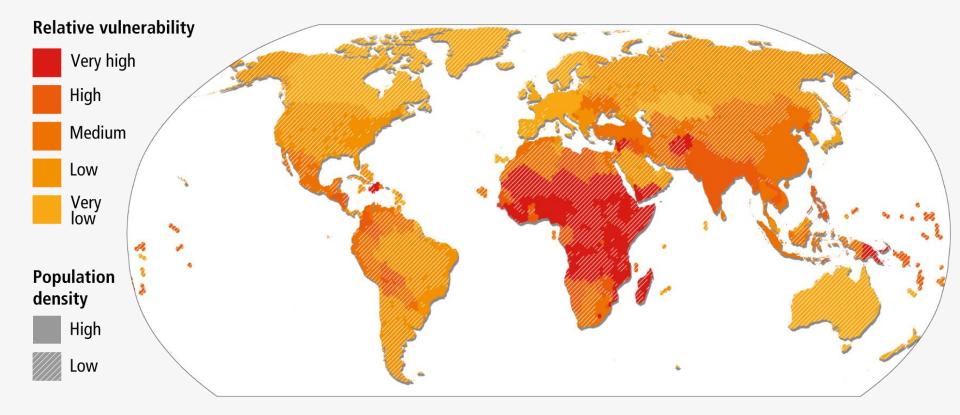


Climate Change and Vulnerability

- Adverse impacts of climate change, development deficits and inequality exacerbate each other.
- Existing vulnerabilities and inequalities intensify with adverse impacts of climate change
- These impacts disproportionately affect marginalised groups, amplifying inequalities and undermining sustainable development across all regions.
- Due to their socio-economic conditions and the broader development context, many poor communities, especially in regions with high levels of vulnerability and inequality, are less resilient to diverse climate impacts



Human vulnerability to climate change impacts





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Vulnerable population groups in most vulnerable regions have the most urgent need for adaptation Social and economic inequities linked to gender, poverty, race/ethnicity, religion, age, or geographic location compound vulnerability to climate change and have created and could further exacerbate injustices... It is critical to prioritize equity and justice in decision-making and investment.

INTERGOVERNMENTAL PANEL ON CLIMATE CHANE

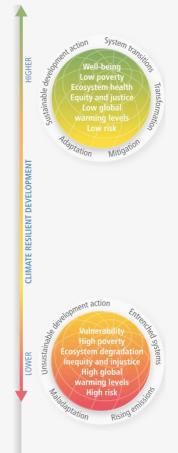


Our future?

- Reduced climate risks adaptation and mitigation
- Reduced greenhouse gas emissions mitigation
- Enhanced biodiversity
- Achieved the Sustainable Development Goals, e.g.: no poverty, zero hunger, good health and well-being, and access to clean water and sanitation.

This is Climate Resilient Development which is the solutions framework...





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Accelerating adaptation

- Political commitment and follow-through across all levels of government
- Institutional framework: clear goals, priorities
 that define responsibilities
- Enhancing knowledge of impacts and risks improves responses
- Monitoring and evaluation of adaptation measures are essential to track progress
- Inclusive governance that prioritises equity and justice direct participation
- Overcoming financial constraints

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The solutions framework:

- Is considered across government and all of civil society
- Involves everyone forming partnerships



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The solutions framework:

Draws on wide-ranging knowledge (scientific, Indigenous, local, practical)



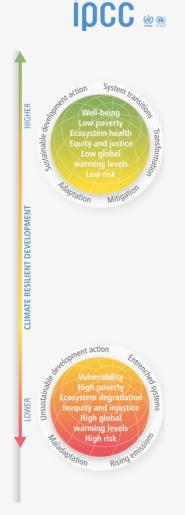
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The solutions framework:

- Involves marginalized groups
- Prioritises equity and justice
- Reconciles different interests, values and world views



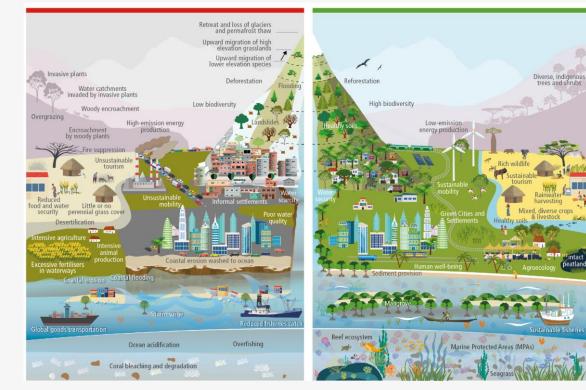


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Ecosystem health influences prospects for Climate Resilient Development

Human activities that degrade ecosystems also drive global warming and negatively impact nature and people



Human activities that protect, conserve and restore ecosystems contribute to climate resilient development

IPCC WGII AR6 Technical Summary

Ecosystem stewardship is key:

- Effective and equitable conservation and restoration of approximately 30-50% of land, freshwater and ocean ecosystems can help ensure a healthy planet
- Ecosystem-based adaptation and approaches to climate mitigation based on ecosystems are more effective at lower levels of global warming



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The solutions framework:

- regards the trend of urbanisation as critical opportunity
- Integrated, inclusive planning and investment in everyday decisionmaking about urban infrastructure, including social, ecological and grey/physical infrastructures, can significantly increase the adaptive capacity of urban and rural settlements.





EThekwini Municipality, D. Chavez/World Bank CC BY-NC-ND 2.0

The solutions framework:

• Requires scaled-up investment and international cooperation



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HIGHER

RESILIENT DEVELOPMEN

CLIMATE

LOWER

varming levels

Risin

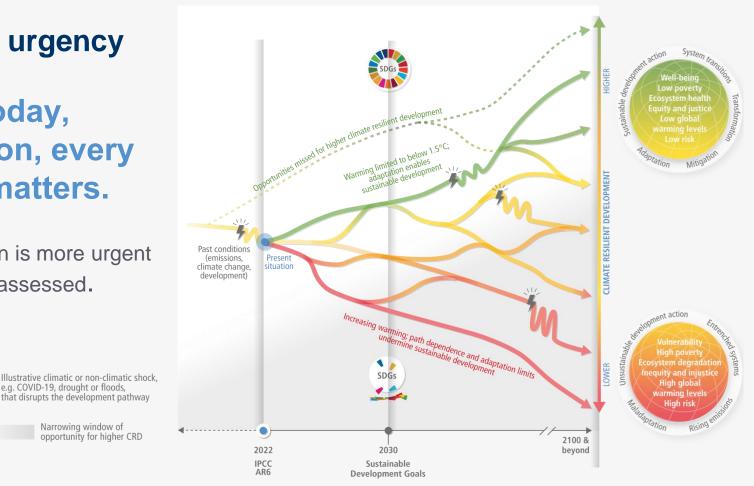
Increasing urgency

Starting today, every action, every decision matters.

Worldwide action is more urgent than previously assessed.

e.g. COVID-19, drought or floods, that disrupts the development pathway

Narrowing window of opportunity for higher CRD



Climate resilient development is already challenging at current global warming levels.
 The prospects will become further

limited if warming exceeds 1.5°C and may not be possible if warming exceeds 2°C.





Climate Change 2022 Impacts, Adaptation and Vulnerability



The science is clear.

Any further delay in concerted global action will miss a brief and rapidly closing window to secure a liveable future.

This report offers solutions to the world. It is over to you now!





Thank you! Now it is time for your questions

IPCC Working Group II Author Team









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