Climate Change 2022: Impacts, Adaptation and Vulnerability

Dr. Debora Ley
October 12th, 2022
Species exposed to potentially dangerous climate conditions

Percentage of biodiversity exposed:
- >80%
- 60%
- 40%
- 20%
- 10%
- 0.5%
- 0.1%

IPCC WGII AR6 Report Figure AI.15, still subject to edits
Global distribution of population exposed to hyperthermia from extreme heat and humidity - Projections for year 2100
Future global climate risks

**Heat stress**
Exposure to heat waves will continue to increase with additional warming.

**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**
About a billion people in low-lying cities by the sea and on Small Islands at risk from sea level rise by mid-century.
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

- Increasing heat and drought
- Reduced crop yield
- Increased food prices
- Local effects

- Heat stress among farm workers
- Reduced productivity
- Reduced household incomes
- Potentially global effects
Between 3.3 y 3.6 billion people live in places that are highly vulnerable to climate change.
These places face simultaneous challenges

- Limited access to basic services and infrastructure
- Climate sensitive income sources
- High levels of poverty and unequal income distribution
- Problems with governance
- Lack of financing sources
- Low levels of trust
Risk development and reduction under 3 adaptation scenarios:
human health

Scenario narratives

**Limited adaptation:** Failure to proactively adapt; low investment in health systems

**Incomplete adaptation:** Incomplete adaptation planning; moderate investment in health systems

**Proactive adaptation:** Proactive adaptive management; higher investment in health systems

* Mortality projections include demographic trends but do not include future efforts to improve air quality that reduce ozone concentrations.
Adaptation saves lives, reduces risks and has multiple benefits.
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.
Maladaptation

- Adaptation that has unintended consequences and exacerbates vulnerability, including shifting risk burdens now and over time, due to short-term actions, lack of attention to the most vulnerable, and lack of planning, amongst others.

The most disadvantaged groups are most affected by maladaptation.
Five System Transitions in Adaptation

- Land, ocean, coastal and freshwater ecosystems
- Urban, rural and infrastructure
- Energy
- Industry
- Society

- Make possible the adaptation 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

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**Confidence level in potential feasibility and in synergies with mitigation**

- Low
- Medium
- High

**Feasibility level and synergies with mitigation**

- Low
- Medium
- High
- Insufficient 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.

3. Migration, when voluntary, safe and orderly, allows reduction of risks to climatic and non-climatic stressors.
The Feasibility of Adaptation measures

**System transitions**

- **Representative key risks**
  - Water security
    - Improve water use efficiency
  - Critical infrastructure, networks and services
    - Resilient power systems
    - Energy reliability

**Climate responses**

- Potential feasibility
  - Synergies with mitigation
    - Economic
    - Technological
    - Institutional
    - Social
    - Environmental
    - Geophysical

**Dimensions of potential feasibility**

- Water security: Improve water use efficiency
- Critical infrastructure, networks and services: Resilient power systems, Energy reliability

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### Examples of climate responses and adaptation options

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### Relation with Sustainable Development Goals

SDGs are integrated and indivisible, and efforts to achieve any goal in isolation may trigger synergies or trade-offs with other SDGs.

|------|---------------|----------------|------------------------------|--------------------|------------------|----------------------|-------------------------------|----------------------------------|-----------------------------------|---------------------|------------------------------------------|-------------------------------|----------------|----------------|----------------|------------------------------------------------|
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
Climate resilient development

Adaptation: Reduced climate risks
Mitigation: Reduced greenhouse gas emissions
Interdependence with ecosystems: Enhanced biodiversity and Sustainable Development Goals

Shifting to a societal development that limits global warming and climate risk, and that advances sustainable development, is urgent
Climate resilient development:
- Adaptation supporting sustainable development
- Increasingly irreversible changes as we approach and exceed 1.5 degrees warming
- Limits to adaptation increase with warming
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Current development trajectories
- Adaptation gaps are increasing
- Inequities exacerbate vulnerability
- We are on course to 3.2 degrees warming by 2100
- Path dependence
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Current development trajectories
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The prospects to shift to pathways towards sustainable futures depend on action this decade

Development pathways result from continuous societal choices
Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement.

- Multiple government, private sector and civil society actors interact in different arenas of engagement, including *economic + financial*. 

Photo: shutterstock.com

Photo: Alex Fassio/CC BY-NC-ND 2.0/flickr
Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement

- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial, knowledge + technology
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- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial, knowledge + technology, ecological

**Arenas of engagement:**

- Ecological
- Knowledge + technology
- Economic + financial

*Photo: shutterstock.com
*Photo: Bruce Glavovic
Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement

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Societal choices are the result of multiple decisions made by multiple actors in diverse arenas of engagement

- Multiple government, private sector and civil society actors interact in different arenas of engagement, including economic + financial, knowledge + technology, ecological, political, socio-cultural and community arenas.
Key dimensions enable climate resilient development

- Dimensions that enable societal choices towards *higher* climate resilient development include knowledge diversity, ecosystem stewardship, equity and justice and inclusion.

- Dimensions that result in societal choices towards *lower* climate resilient development have been identified as *singular knowledge, ecosystem degradation, exclusion, and inequity and injustice*
Illustrative climatic or non-climatic shock, e.g. COVID-19, drought or floods, that disrupts the development pathway.
Key message I

- Since AR5, climate risks are appearing faster and will get more severe sooner.
- Impacts cascade through natural and human systems, often compounding with the impacts from other human activities.
Key message II

- For many locations on Earth, the capacity for adaptation is already significantly limited.
- The maintenance and recovery of natural and human systems will depend on the achievement of mitigation targets.
Key message III

- The magnitude of observed impacts and projected climate risks indicate the scale of decision-making, funding and investment needed over the next decade if climate resilient development is to be achieved.

- Available evidence on projected climate risks indicates that opportunities for adaptation to many climate risks will likely become constrained and have reduced effectiveness should 1.5°C global warming be exceeded...
The scientific evidence is unequivocal: climate change is a threat to human well-being and the health of the planet. Any further delay in concerted global action will miss the brief, rapidly closing window to secure a liveable and sustainable future for all. This report offers solutions to the world.
THANK YOU FOR YOUR ATTENTION!

Debora Ley

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