Scientific and Technical Advisory Panel Report to the 66th Meeting of the GEF Council

Rosina Bierbaum, STAP Chair

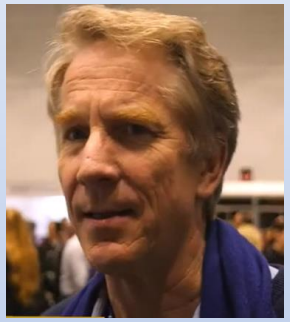
February 7, 2024

Photo: Ofer Levy

Scientific and Technical Advisory Panel

Rosina Bierbaum
Chair

Christopher Whaley
Advisor



Mark Stafford Smith
Advisor

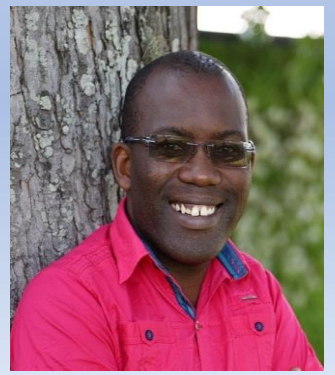
Blake Ratner
Risk Appetite

Edward Carr
Climate Adaptation

Miriam Diamond
Chemicals and Waste

John Donaldson
Biodiversity

Susanne Schmeier
International Waters



Ngonidzashe Chirinda
Climate Mitigation

Graciela Metternicht
Land Degradation

Presentation Order

New science

GEF Assembly, reports, and recent work

Future work

Observations on GEF work program

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New science

Tachypleus tridentatus, Philippines; Photo: Laurent Ballesta

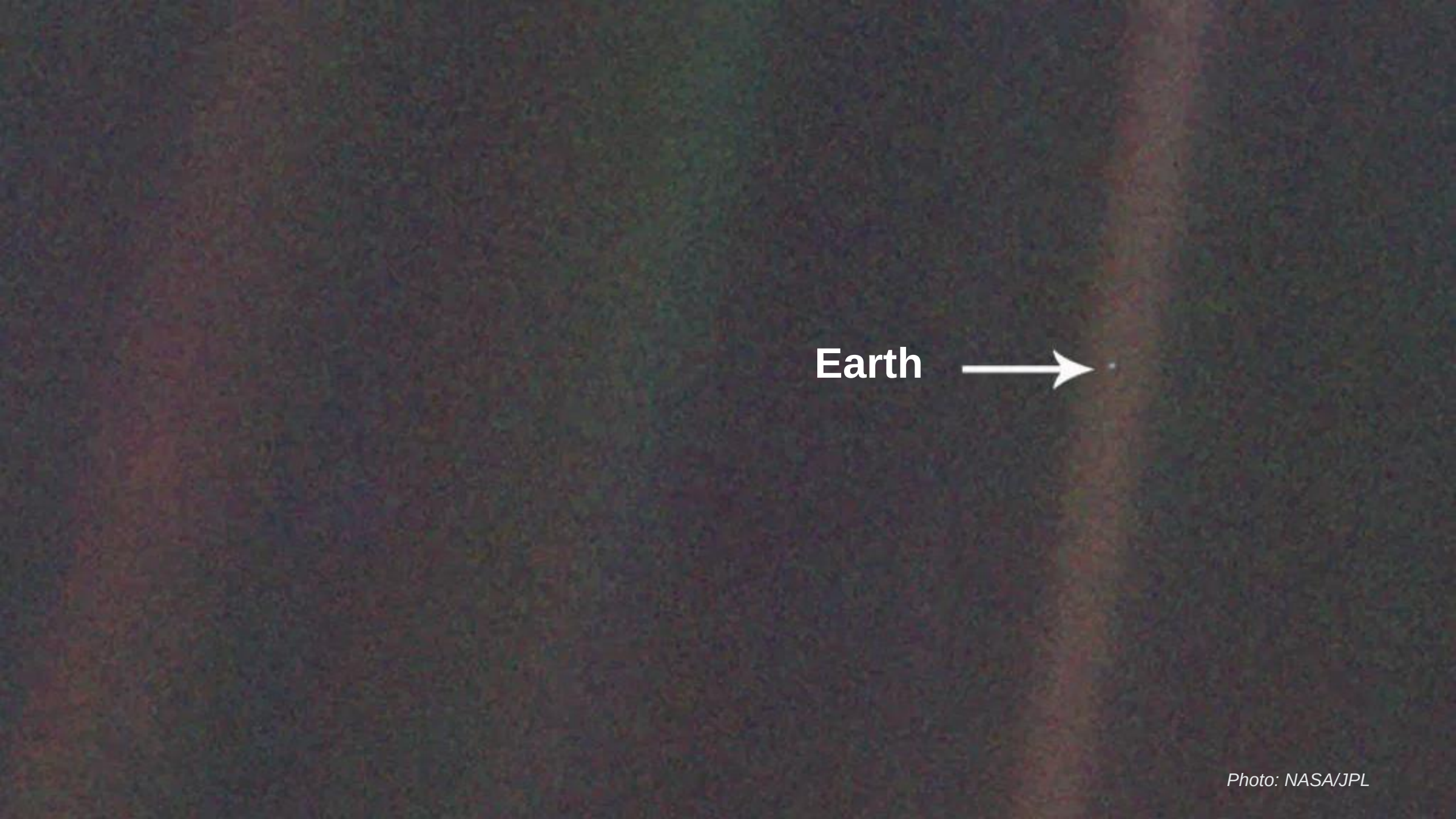

Photo: NASA/JPL

WEF Global Risks looking 10 years ahead

	1	2	3	4	5
2021	Extreme weather	Climate action failure	Human environment damage	Infectious diseases	Biodiversity loss
2022	Climate action failure	Extreme weather	Biodiversity loss	Social cohesion erosion	Livelihood crises
2023	Failure to mitigate climate change	Failure of climate change adaptation	Natural disasters	Biodiversity loss	Large-scale involuntary migration
2024	Extreme weather events	Critical change to Earth systems	Biodiversity loss and ecosystem collapse	Natural resource shortages	Misinformation and disinformation *Pollution #10

Source: [World Economic Forum Global Risks Report 2024]

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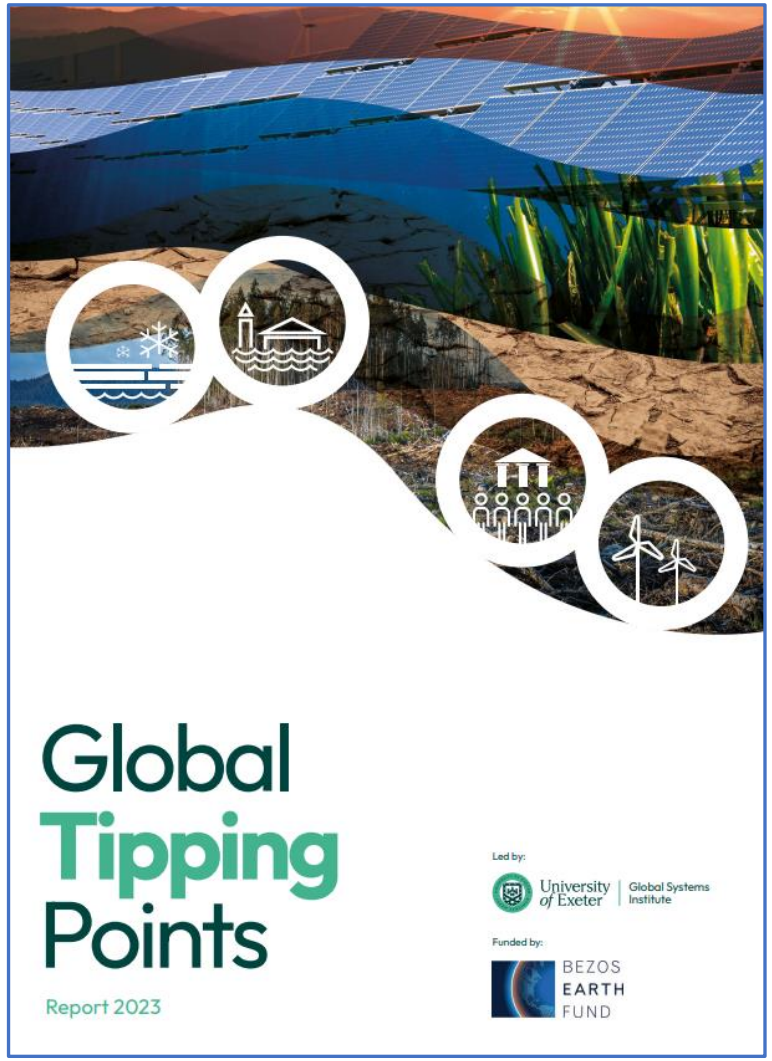
Earth systems and tipping points



- Tipping point - a small change leads to a rapid and irreversible transformation
- Global tipping points include melting of ice sheets, die-off of warm-water coral reefs, collapse of the North Atlantic Ocean circulation, intensification of El-Nino, and permafrost thawing
- Domino effect: the tipping of one element may trigger the tipping of another
- Most interactions are destabilizing interactions, for example, El-Nino intensification could lead to die-off of warm coral reef
- Climate change is pushing tipping elements past critical thresholds
- Could lose the capacity to grow major staple crops

https://global-tipping-points.org/; Rockström et al. 2023 and Wunderling et al. 2024

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Earth system and tipping points

https://global-tipping-points.org/

- Positive tipping points include:
  - *energy and power*: exponential uptake of renewable energy
  - *transport and mobility*: rapid growth in electric vehicles
  - *food and agriculture*: increasing shifts to plant-based diets and shift to regenerative agriculture.
  - *nature*: increased globalized efforts to restore nature
- Avoiding negative tipping points and accelerating positive ones requires:
  - phasing out fossil fuels and land-use emissions
  - strengthening adaptation governance
  - coordinating policy efforts to trigger positive tipping points

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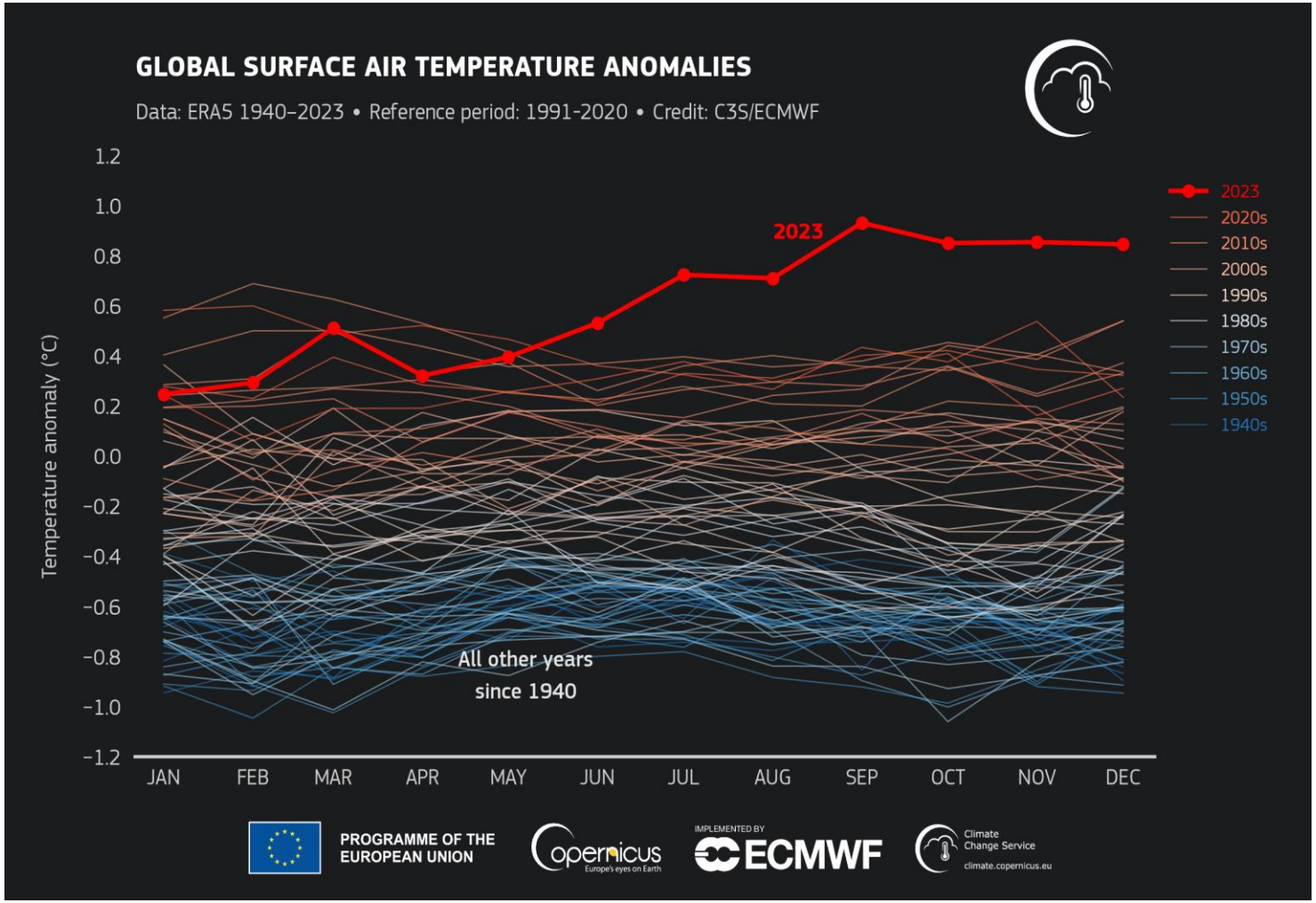
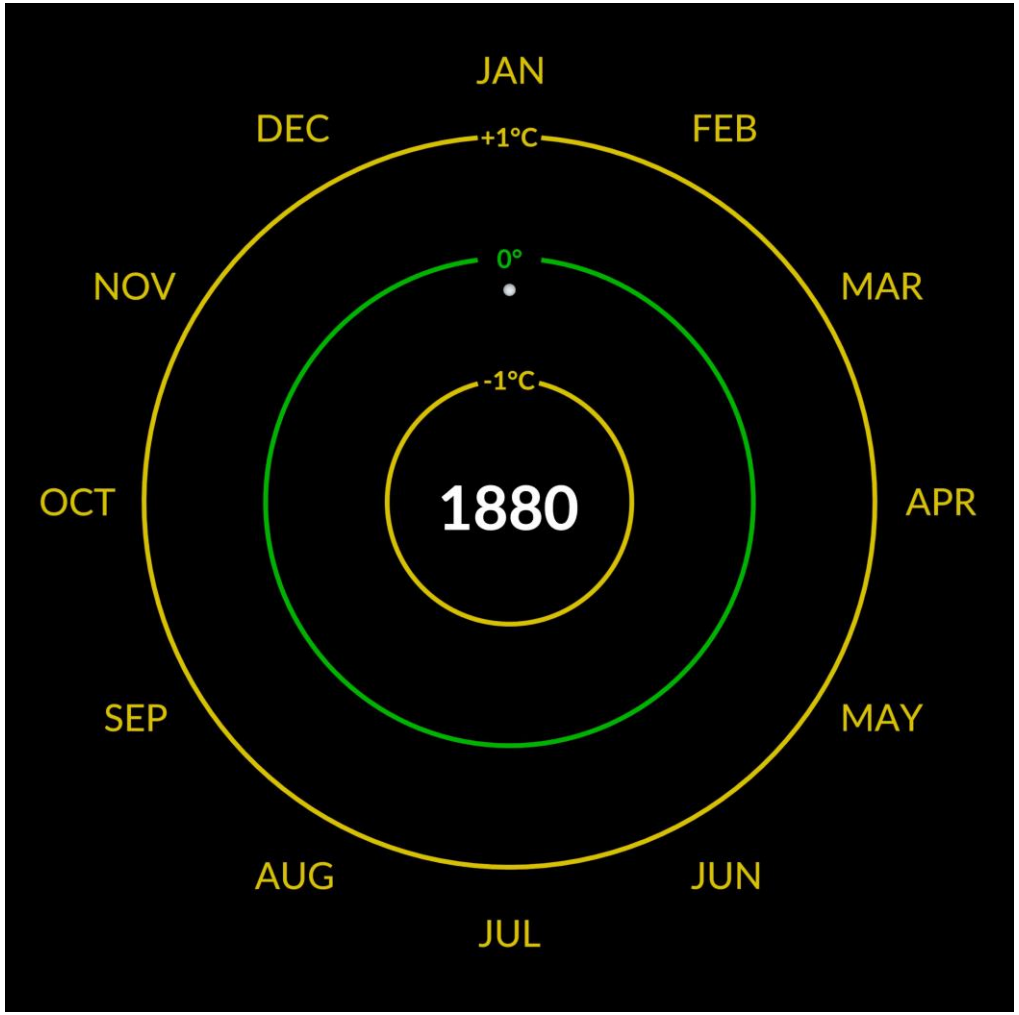
Climate change in 2023



Source: https://climate.copernicus.eu/global-climate-highlights-2023



Source: https://svs.gsfc.nasa.gov/5190/

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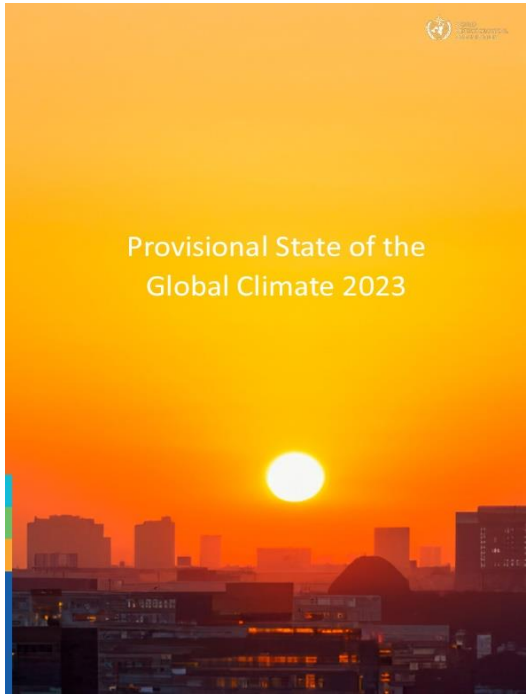
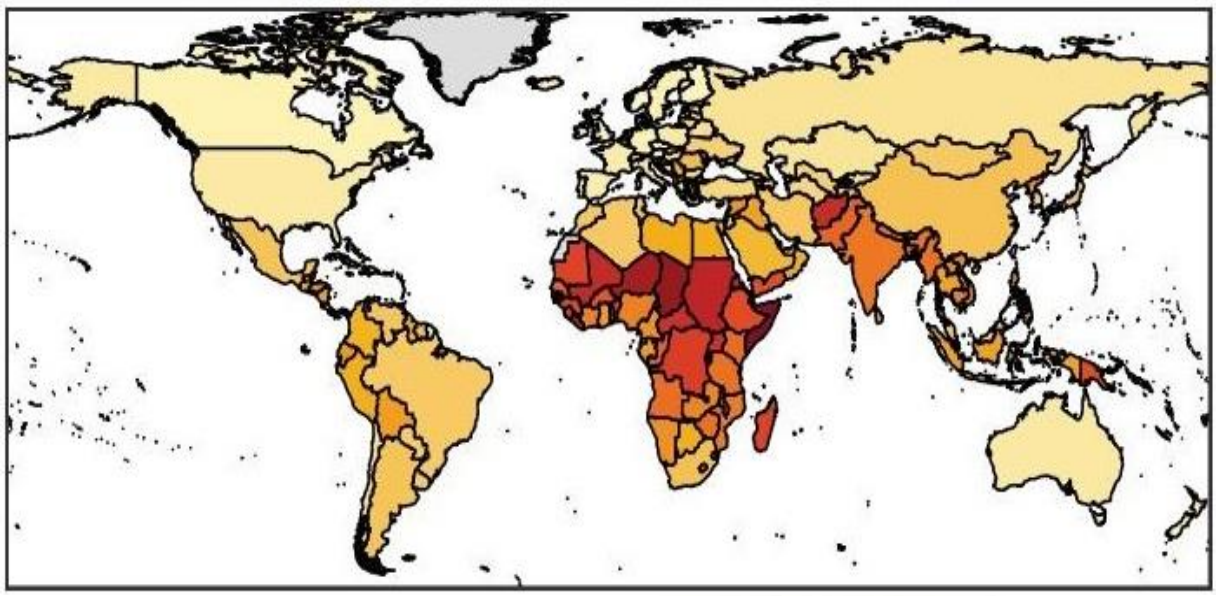
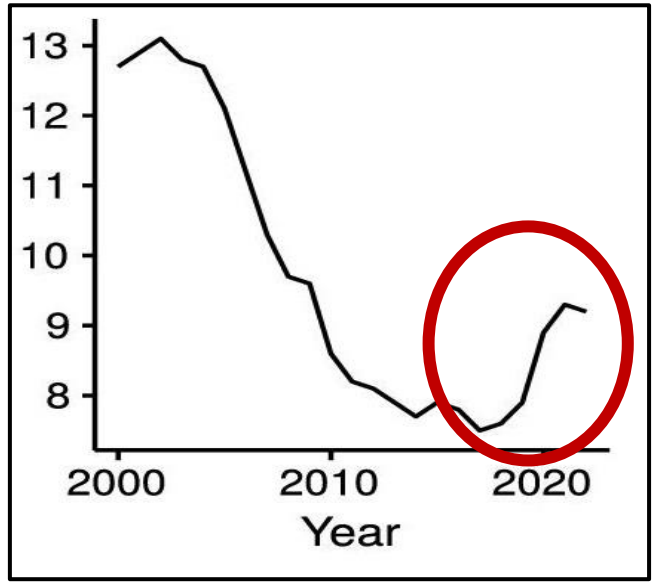
Climate impacts and justice



Source: https://wmo.int/publication-series/provisional-state-of-global-climate





Source: Ripple et al. 2023

- Climate change likely contributed to major extreme weather events and disasters, including in new and wider areas not typically prone to extremes in 2023
- Climate disasters, especially more severe in less wealthy nations with little contribution to emissions
- Rapidly accelerating climate impacts, e.g., the prevalence of undernourishment

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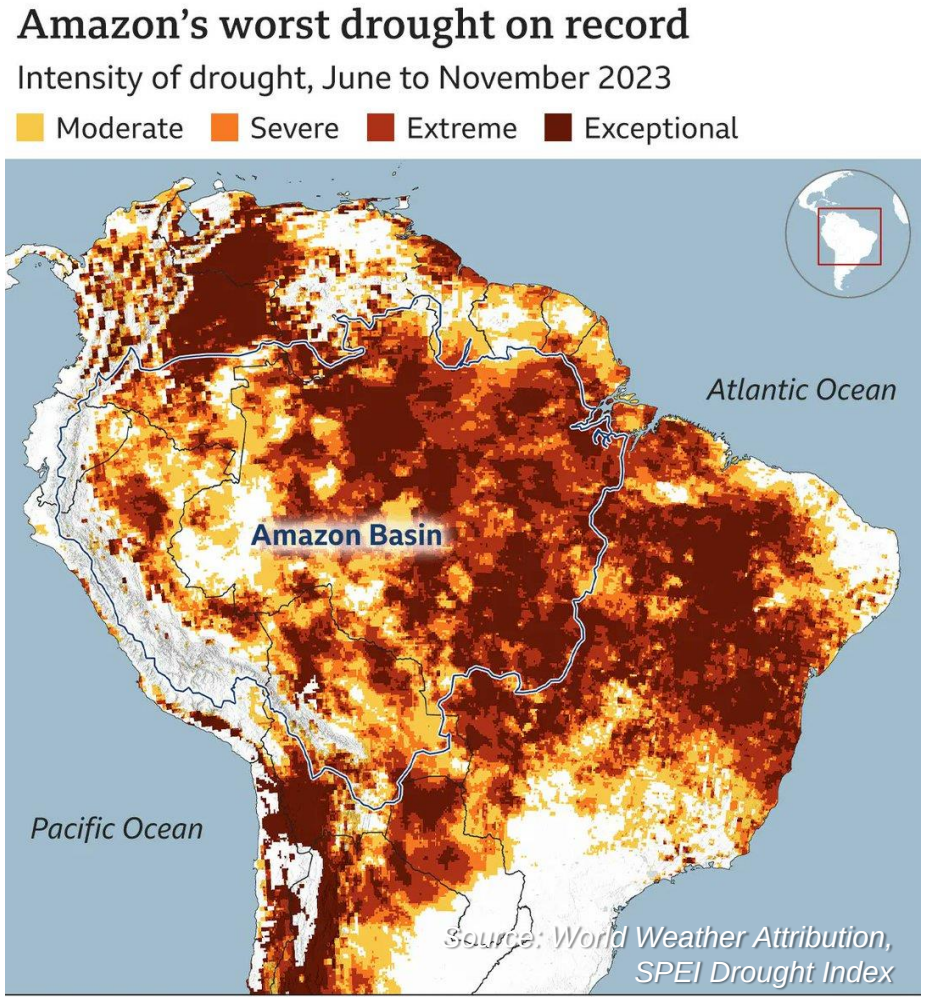
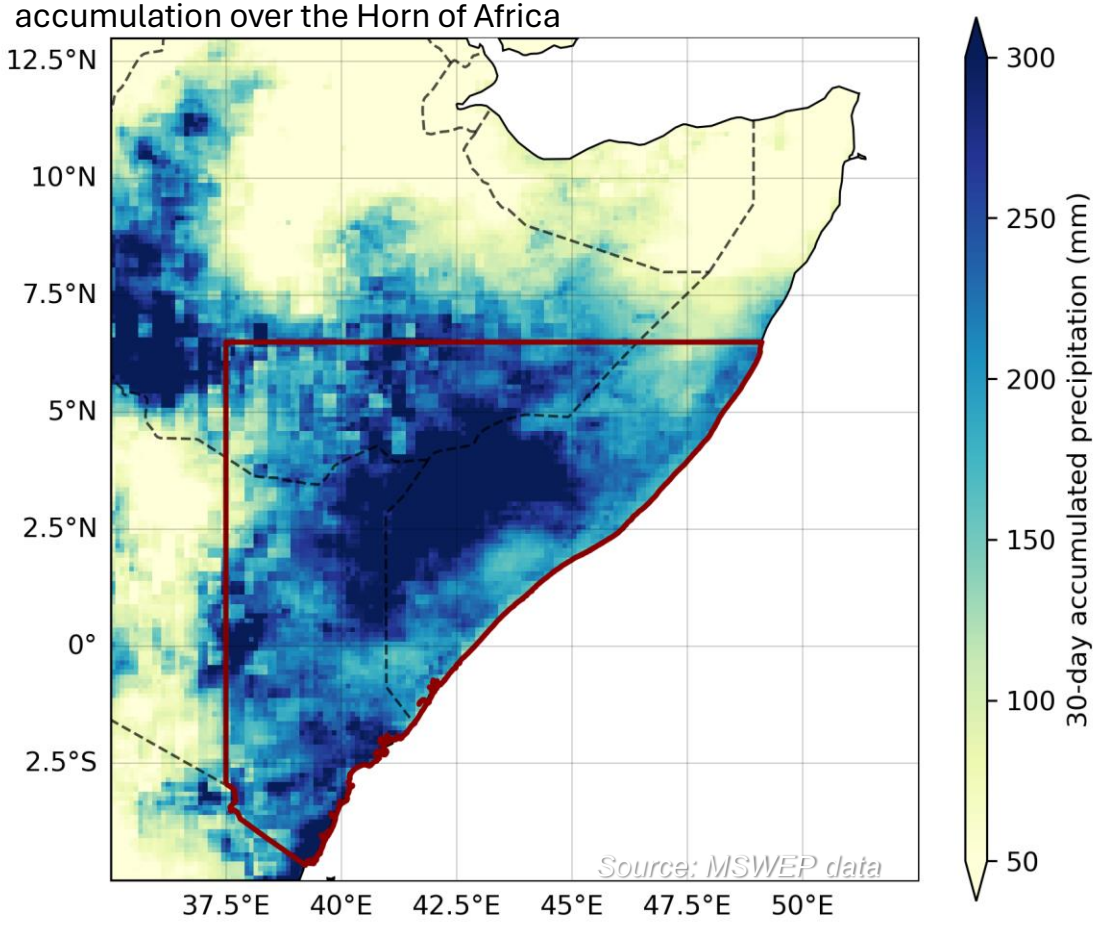
Climate change, drought, and floods



Source: [Clarke et al. 2024]

Horn of Africa floods

October-November 30-day rainfall accumulation over the Horn of Africa



Source: [Kimutai et al. 2023]

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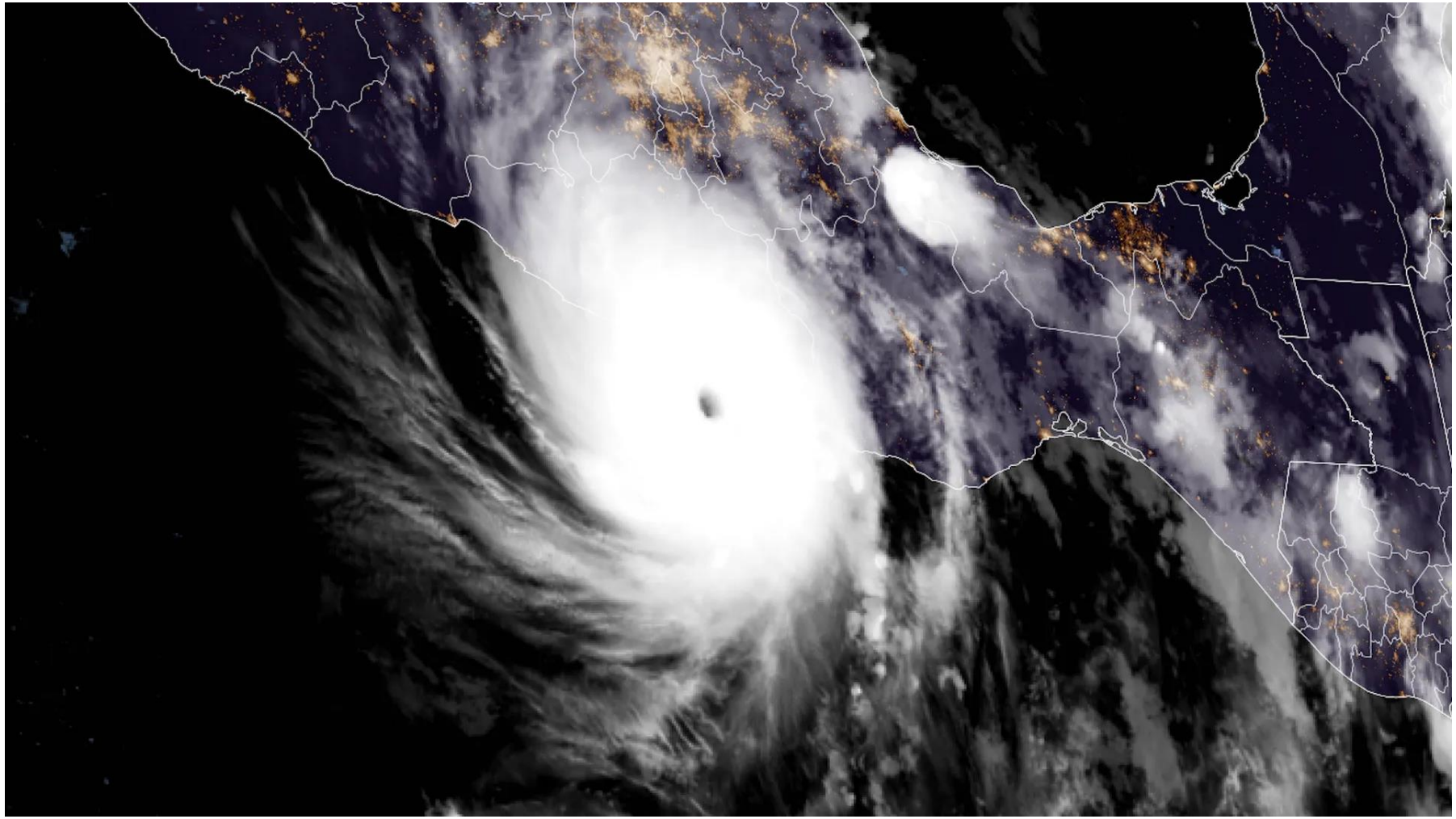
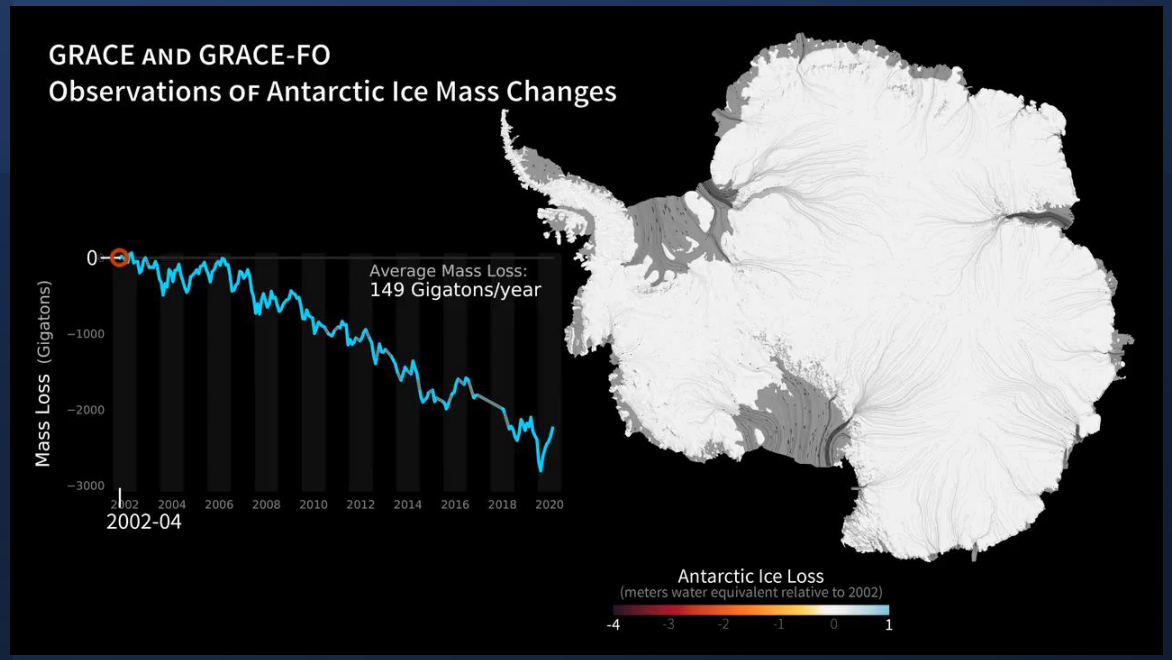
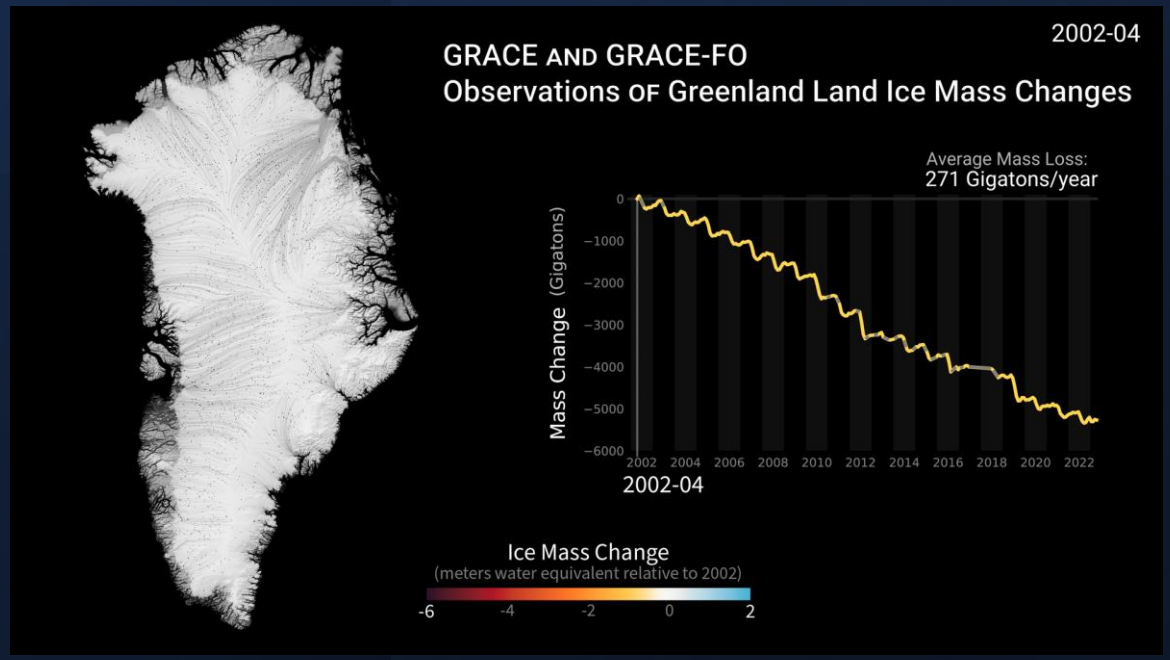
Hurricane wind scale in a warming world



Source: [Wehner and Kossin 2024]

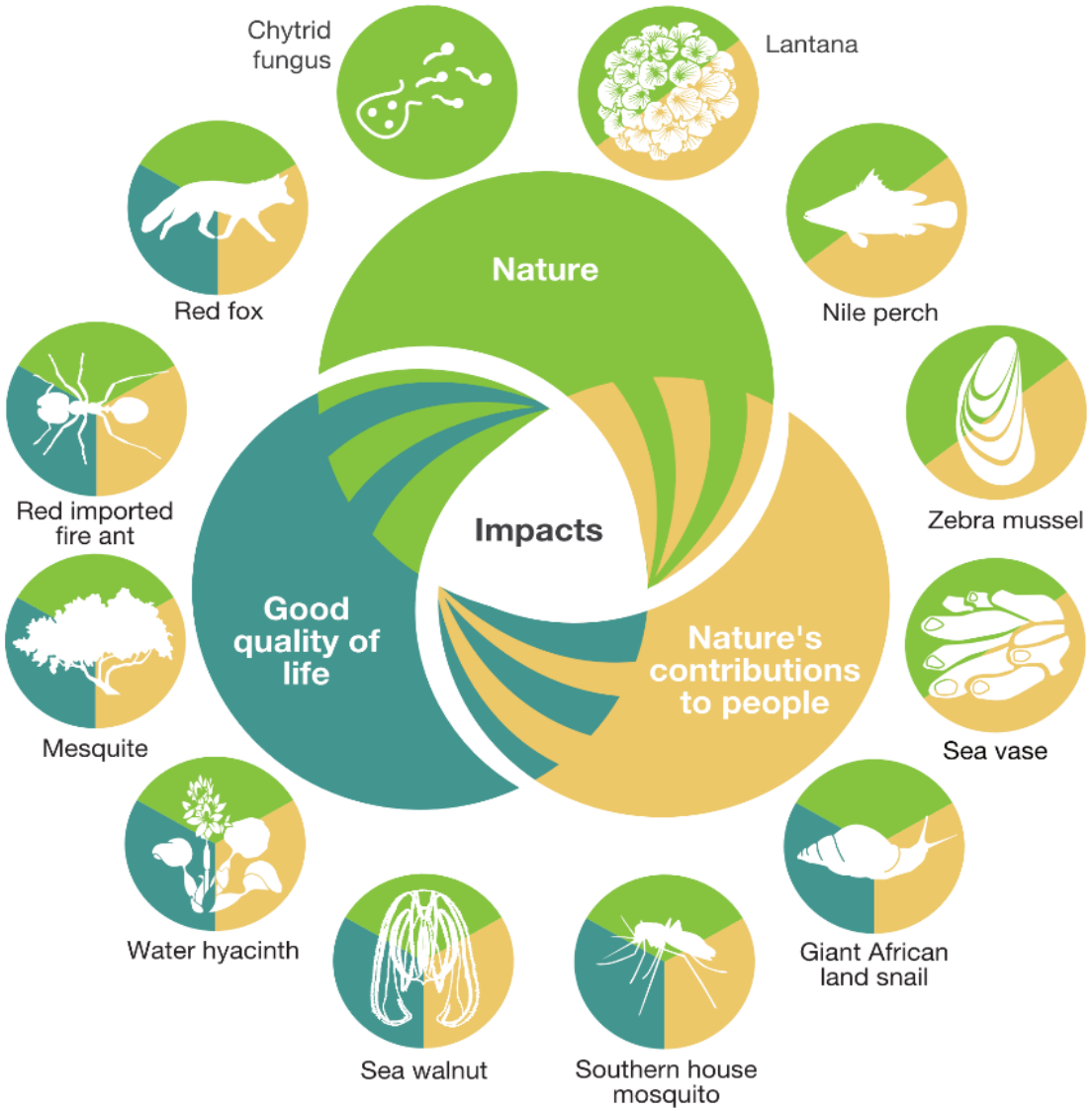
Loss of sea ice: Antarctica and Greenland





Source: NASA and JPL/Caltech

IPBES invasive alien species assessment



- More than 37,000 alien species globally
- Studies exist for 10% of these species, which show negative effects on nature and people; more than 2,300 of these are on Indigenous People's lands.
- Key role in 60% of global extinctions
- Estimated global annual cost in 2019: $423 billion
- Food loss is the most reported negative impact
- Climate change and land/sea use change will exacerbate
- Prevention and preparedness are the most cost-effective solution options

Source: IPBES 2023

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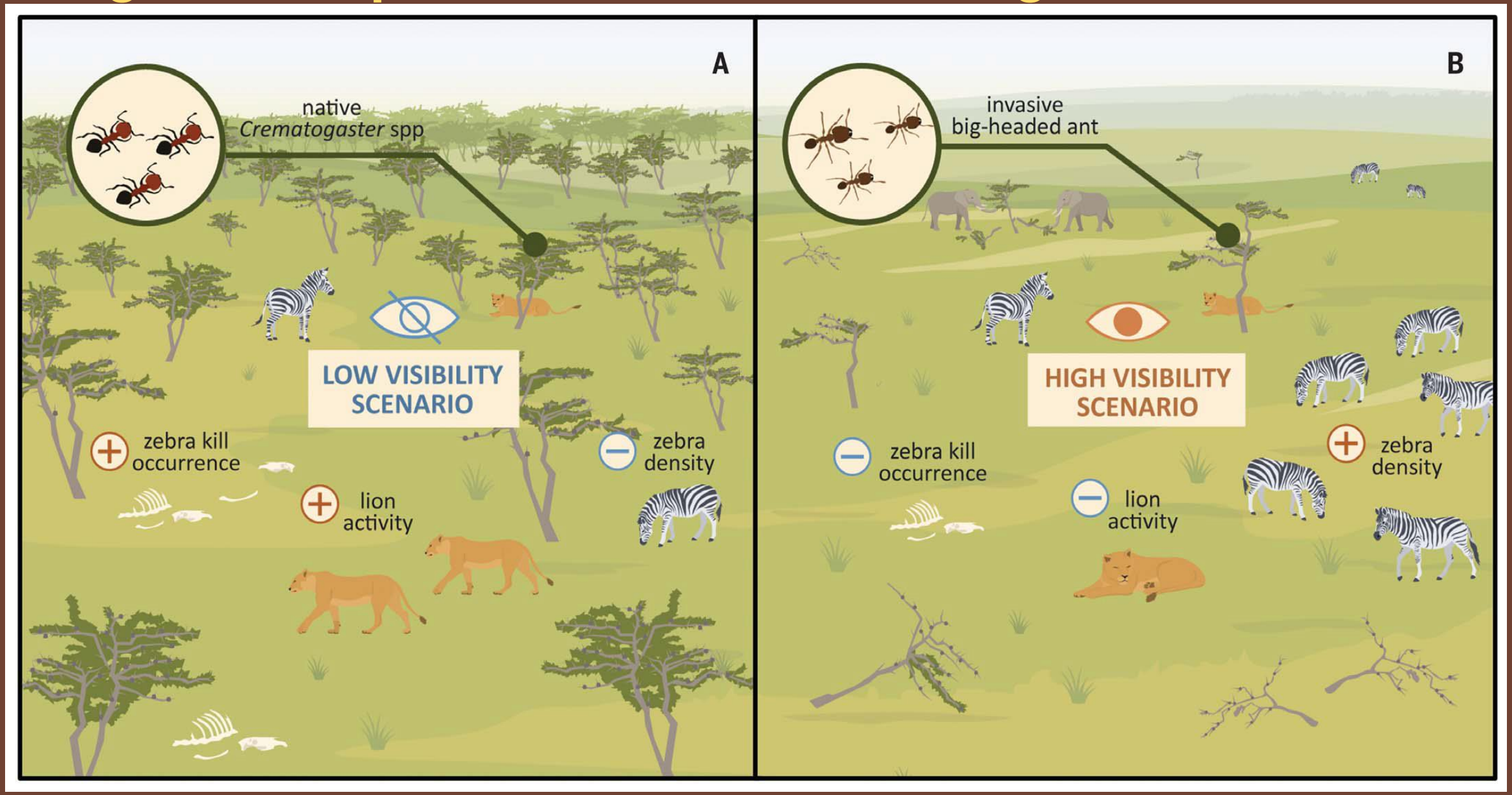
A big-headed problem drives an ecological chain reaction



Source: Kamaru, et al. 2024

Bioacoustics and AI for forest monitoring

Acoustic and AI technology was used to monitor the recovery of reforested areas in the tropical Chocó forest in northwestern Ecuador.

Able to characterize the changing composition of communities of birds, amphibians, mammals, and insects.

Light traps are used to capture nocturnal insects for DNA analysis

The AI models are being expanded to capture more species.

The technology could lower the cost of biodiversity monitoring and make it more transparent, accountable, and accessible.

It could be used for market-based conservation mechanisms, e.g., payments for ecosystem services

Source: Müller et al. 2024

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GEF Assembly, reports, and recent work

Damaliscus Korrigum (topi), Sue Chin

STAP Science Day at the GEF Assembly






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Why these six papers?

Agrivoltaics

Blended finance

Alternative livelihoods

Citizen science

Environmental security

Ecosystem-based Approaches

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Agrivoltaics


Fraunhofer ISE


Enel Green Power


Jack's Solar Farm – Photo by Werner Slocum: NREL

- **Combines agriculture** and **solar photovoltaics**
- **Benefits**: renewable energy; emissions reduction; water and land use efficiency; land restoration; biodiversity conservation; food security; diversified livelihood and income; SDGs
- **Implementation:** Japan, China, South Korea, Germany, Italy, France, India, USA

https://stapgef.org/resources/advisory-documents/agrivoltaics

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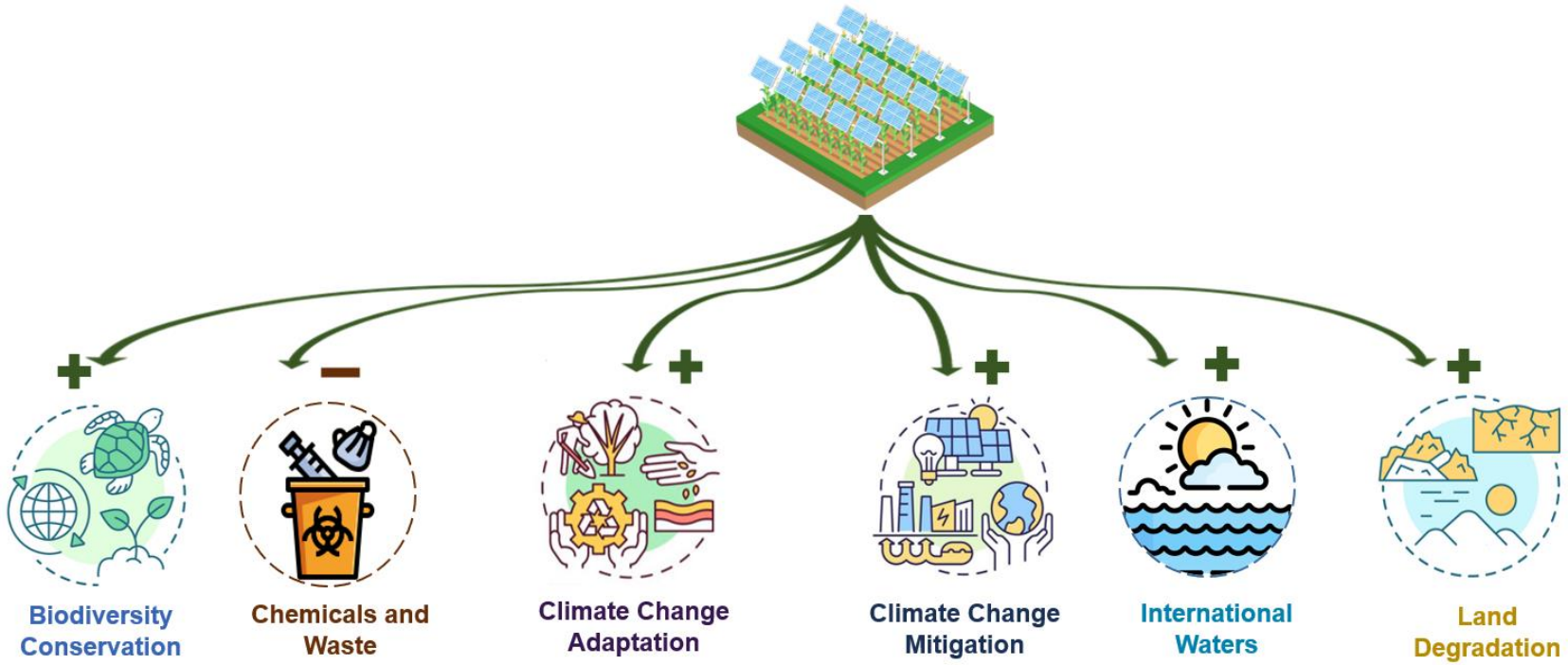
Agrivoltaics



The potential contribution of agrivoltaics system to GEF's focal areas

- **Technical considerations:** crop types; land type; local climate
- **Barriers**: higher initial investment cost than conventional ground-mounted solar PVs; lack of supportive policies
- **Needed enablers**: integrated approach; supportive policies; capacity building; business and financing models.
- **GEF**: support countries in understanding the technological appropriateness; help put in place enablers; invest in demo projects; and help foster partnerships.

https://stapgef.org/resources/advisory-documents/agrivoltaics

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Blended finance

- Longer and more complex impact pathways to achieve GEBs usually
- Project design tends to concentrate more on the finance logic than on the environmental logic, or their interactions
- Blended finance for nature-positive outcomes is less mature than investments in energy technologies aimed at reducing greenhouse gas emissions
- Need for:
  - Clear theory of change for both finance and environmental logic and how they interact
  - Rapid learning to innovate, scale, and achieve GEBs

Image: The Ocean Agency


Image: Diego Baravelli/Greenpeace

https://stapgef.org/resources/information-note/stap-information-note-blended-finance

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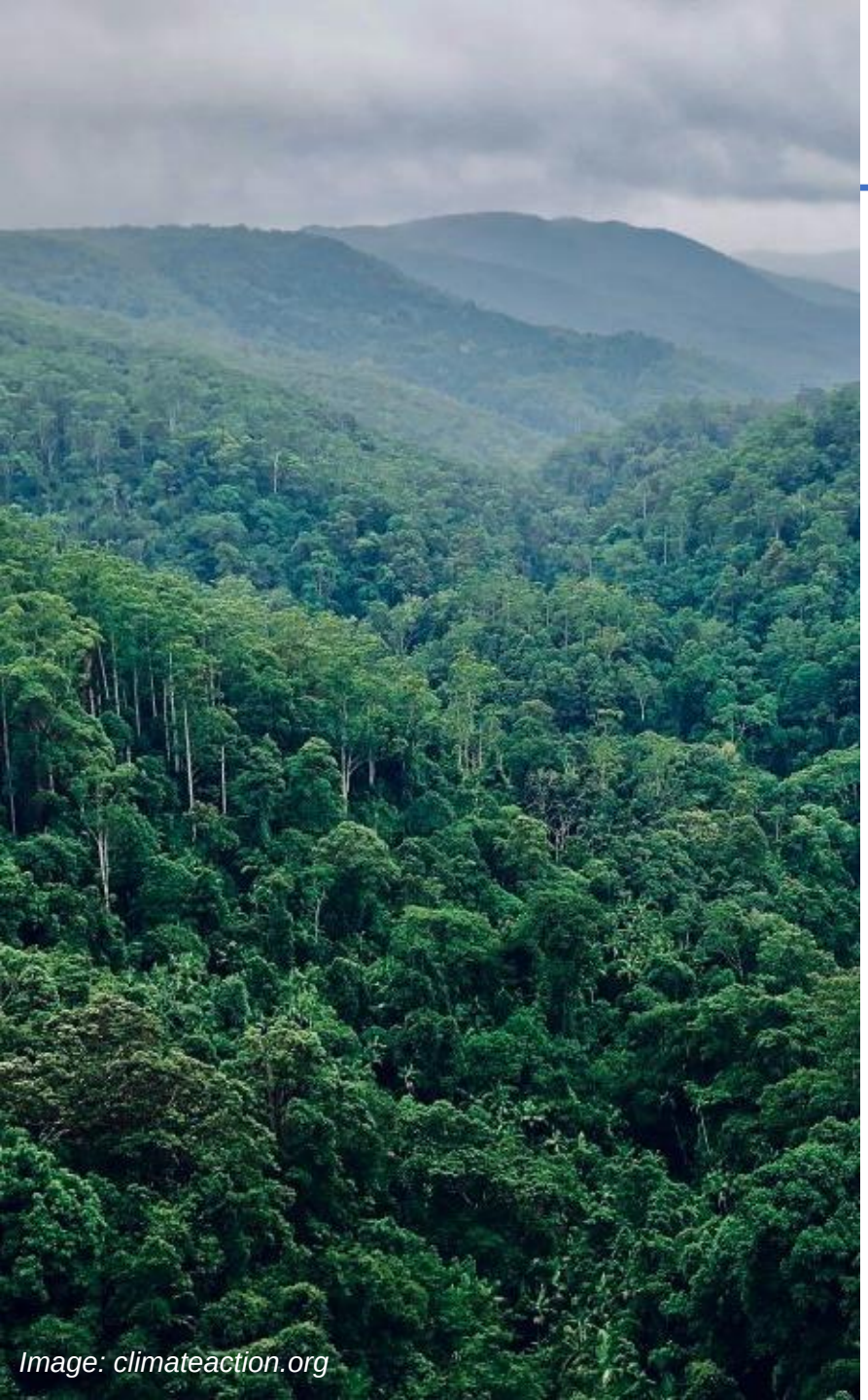

Image: climateaction.org

Blended finance

STAP suggests 4 issues for further inquiry:

1. Improve guidance on types of GEB interventions that are best served by different categories of BF instruments.
2. Improve advice about the detailed design of a selected blended finance instrument to ensure that it fits the intended GEB interventions and their context.
3. Advice on producing theories of change for GEB impacts in blended finance projects.
4. Elaborating GEF blended finance guidance to encourage learning.

https://stapgef.org/resources/information-note/stap-information-note-blended-finance

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Alternative livelihoods

- Alternative Livelihood interventions aim to reduce environmental harm through different occupations or resource extraction methods.
- Scientific and technical literature highlights a lack of reliable evidence about their effectiveness.
- Changing livelihoods is a complex endeavour involving behaviour change.


Source: https://jaresourcehub.org/

- GEF projects:
  - evaluate whether alternative livelihood is a suitable option
  - develop a ToC with explicit pathways for achieving desired outcomes
  - ensure local stakeholder understanding and support
  - strengthen long-term monitoring and evaluation

https://stapgef.org/resources/background-note/alternative-livelihoods

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Environmental security

Suggestions on how to increase the likelihood of achieving durable GEBs in fragile and conflict situations (FCS):

- Use systems thinking to untangle complexity
- Integrate FCS issues in future narratives
- Co-benefits for local stakeholders essential for durable GEBs
- Identify links between conflict risk and environmental outcomes in ToC
- Allow for flexibility, periodic review, and make contingency plans
- Effective stakeholder engagement is essential from the outset

Photo: Ashraf Shazly/AFP via Getty Images

https://stapgef.org/resources/policy-briefs/environmental-security-achieving-durable-outcomes-fragile-and-conflict

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Citizen science

- Global environmental challenges require ‘all of society’ approach
- Citizen science involves non-professionals and local communities in designing, implementing, monitoring, collecting data, and evaluating projects to generate usable information
- Applications in biodiversity conservation, climate mitigation and adaptation, forest management, and land restoration
- Contributes to achieving GEBs, increasing awareness, and better inclusion of indigenous, traditional, and local knowledge
- The paper makes some suggestions about how the GEF could support citizen science, e.g., including the term in the KM&L taxonomy and encouraging partnerships

Ricardo Moreno, head of the GEF-supported “Jaguares Panama” project, worked with citizen scientist Elsie Quintero to set up a camera trap to monitor jaguars as part of the project. Photo by Ginger Deason

https://stapgef.org/resources/background-note/citizen-science

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Ecosystem-based Approaches (EbA)

The IEO's evaluation of the lower Mekong River basin recommends that STAP provide technical advice on definitions and guidelines for the implementation of ecosystem-based conceptual approaches and management tools.

- The paper includes technical advice on:
  - Definitions of EbA, including
    - Nature-based solutions
    - Ecosystem-based management
    - Integrated coastal management
    - Integrated land-use planning
  - Guidelines and tools for implementing EbA
  - Examples of STAP guidance to support EbA


Photo: Khánh Phan

https://stapgef.org/resources/information-note/summary-definitions-guidelines-and-tools-ecosystem-based-approaches

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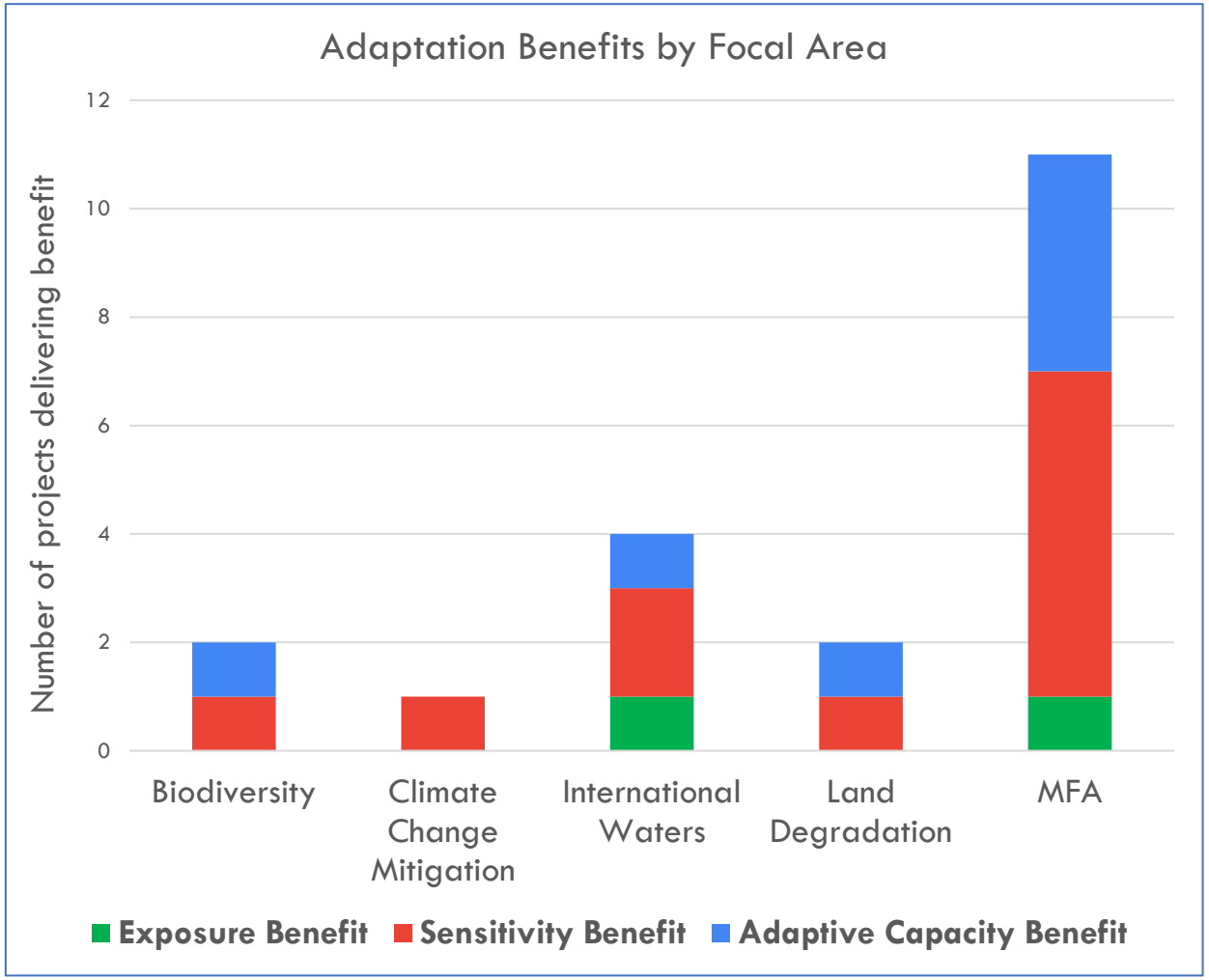
Climate adaptation benefits from GEF Trust Fund projects

- In a sample of 34 projects, STAP found:
  - About 40% were delivering adaptation benefits
  - More than half had the potential to deliver new or additional adaptation benefits
- Next steps:
  - Summarize results and suggest how to capture adaptation benefits more widely in the GEF portfolio



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Working groups and workshops

- Clean and Healthy Oceans IP design workshop
- Risk appetite working group
- GEF secretariat learning mission on Good Growth Partnership & FOLUR
- Three climate adaptation programming and strategy workshops
- Environmental security workshop

Future work program

Hippopotamus amphibius, South Africa; Photo: Mike Korostelev

STAP future work – near-term

- Further work on blended finance
- Further work on climate adaptation
- Working with the GEF secretariat on implementing:
  - knowledge management and learning strategy
  - risk appetite
  - policy coherence
  - community-based approaches

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STAP future work – GEF 9

- STAP's initial perspective on GEF-9 will be informed by a science convening
- Review of emerging signals and trends, and their relevance to the GEF
  - Societal changes
  - Economic and financial shifts
  - Science and technology, e.g.:
    - Environmental application of Artificial Intelligence, Internet of Things, and machine learning.
    - New energy systems – green hydrogen, more reliable batteries, smart energy systems.
    - Environmental DNA (eDNA)
    - 3D printing, biomaterials

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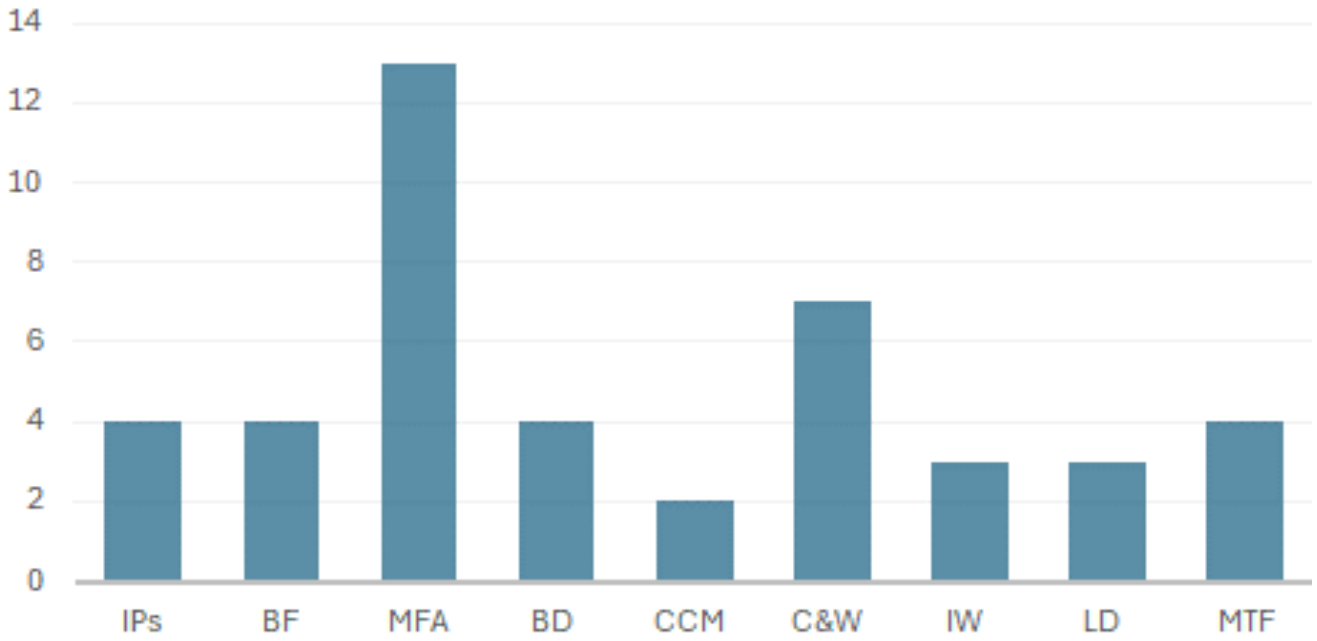
Observations on the GEF work program

Pleurosicya mossambica, Indonesia; Photo: Alex Mustard

Observations on GEF work program

STAP reviewed 44 proposals:

- 4 Integrated Programs
- 36 GEF Trust Fund full-size projects/programs
- 4 Multi-Trust Fund full-size projects



IP: Integrated Program; **BF**: Blended Finance; **MFA**: Multi-focal Area
BD: Biodiversity: **CCM**: Climate Change Mitigation; **IW**: International Waters
LD: Land Degradation; **MTF**: Multi-Trust Fund


Capra hircus; Mongolia; Photo: Gilles Sabrié

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Observations on GEF work program

Observations

- Length of PIFs noticeably shorter
- Clear and concise project rationale and description
- Theory of Change needs better assumptions
- Signs of policy coherence but limited assessment of gaps and contradictory policies

Capra hircus; Mongolia; Photo: Gilles Sabrié

Some exemplary projects

- NGI – IFC/GEF Green Global Supply Chain Decarbonization Platform, World Bank/IFC (#11326)
- Strengthening the System of Protected Areas and Financial Sustainability; Paraguay, CI(#11449)
- Reimagining National Parks for People and Nature; South Africa, WWF(#11347)

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Sascha Fonseca, Pantera Uncia, Snow Leopard