Mekong Environmental Resilience Week

14 September 2023

Australian Government
Department of Foreign Affairs and Trade

SEI Stockholm Environment Institute

Chula Chulalongkorn University

The State of Climate Science and Policy: selected findings from the IPCC 6th Assessment

Building Climate Resilience in the Mekong Region: Bridging Science, Policy, and Practice

Mekong Environmental
Resilience Week

The State of Climate Science and Policy

Ms Charmaine Caparas
Communications Manager, SEI Asia
MODERATOR

Dr Francis X. Johnson
Senior Research Fellow, SEI Asia

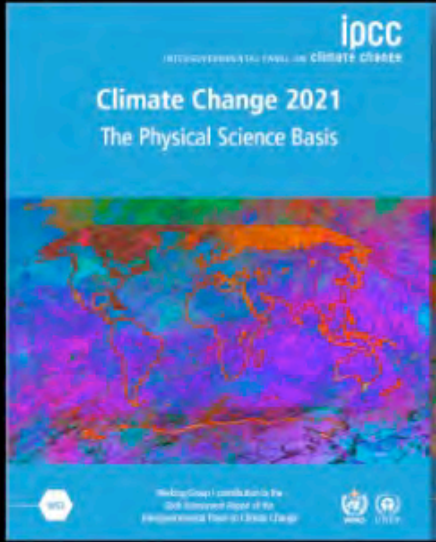
Dr Edvin Aldrian
IPCC WG1; BPPT Indonesia

Prof Yongyut Trisurat
IPCC WG2; Kasetsart University

Prof Joyashree Roy
IPCC WG3; Asian Institute of Technology

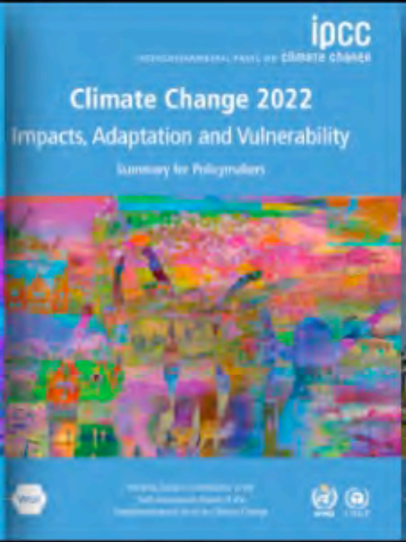
The State of Knowledge about Climate Change

WGI



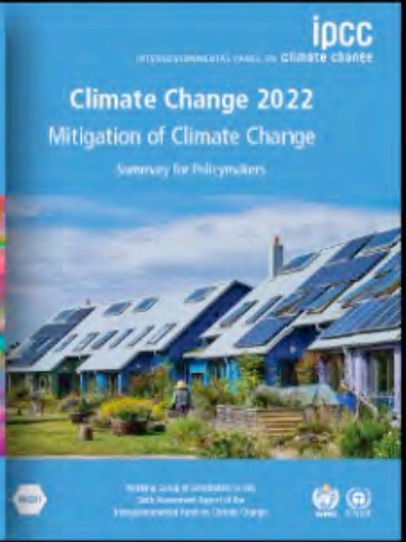
AR6 Climate Change 2021: The Physical Science Basis

WGII



Climate Change 2022: Impacts, Adaptation and Vulnerability

WGIII

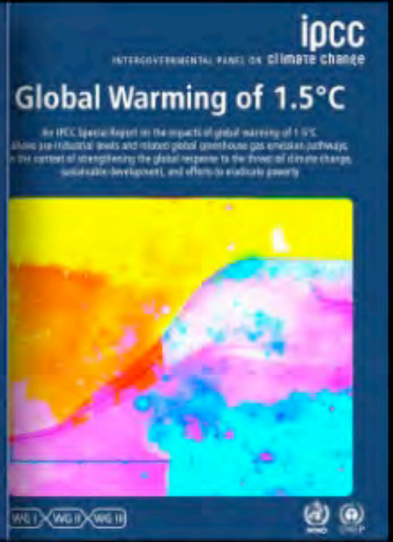


Climate Change 2022: Mitigation of Climate Change

Special Report

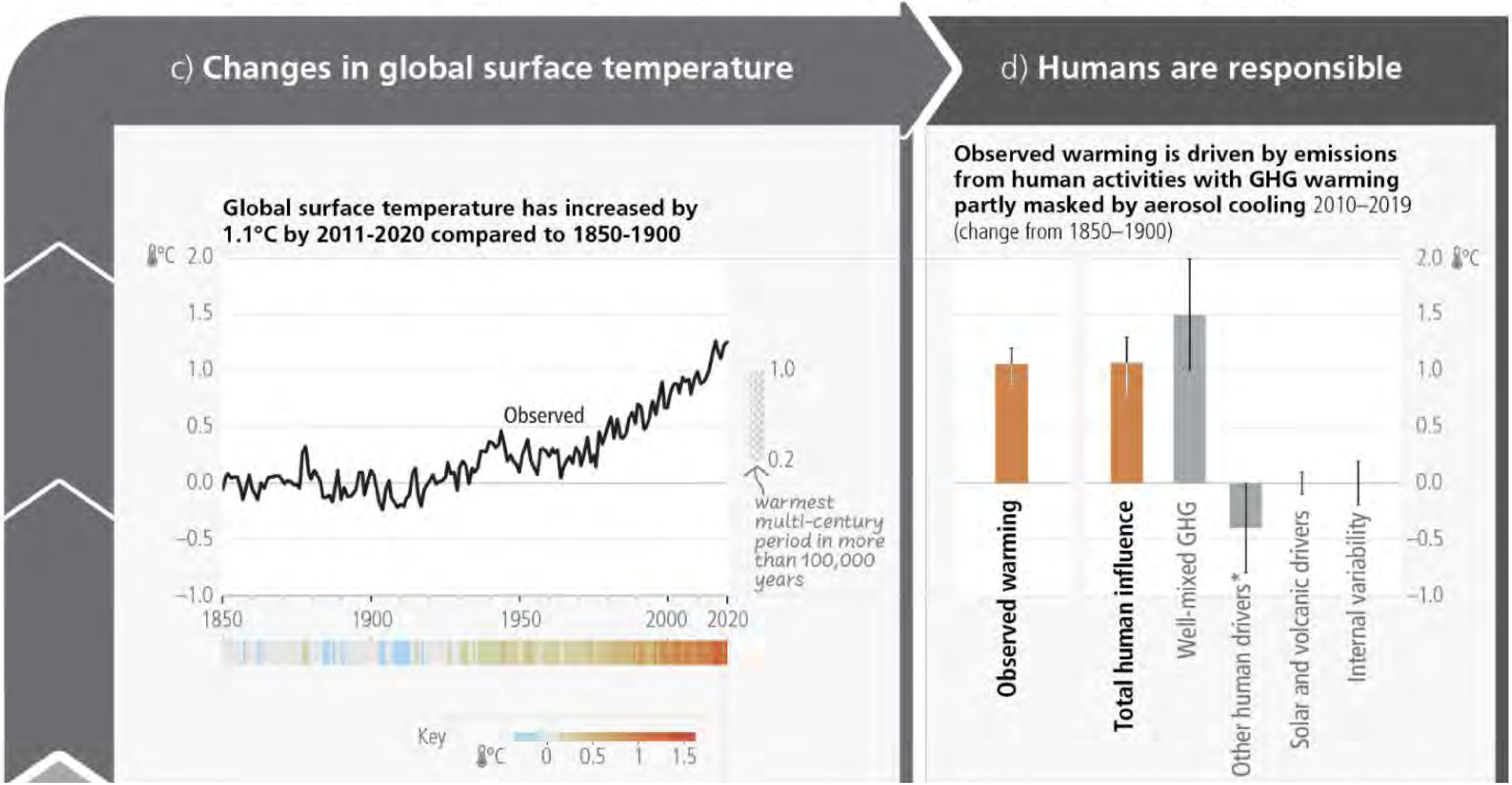
Ocean and Cryosphere in a Changing Climate

Climate Change and Land

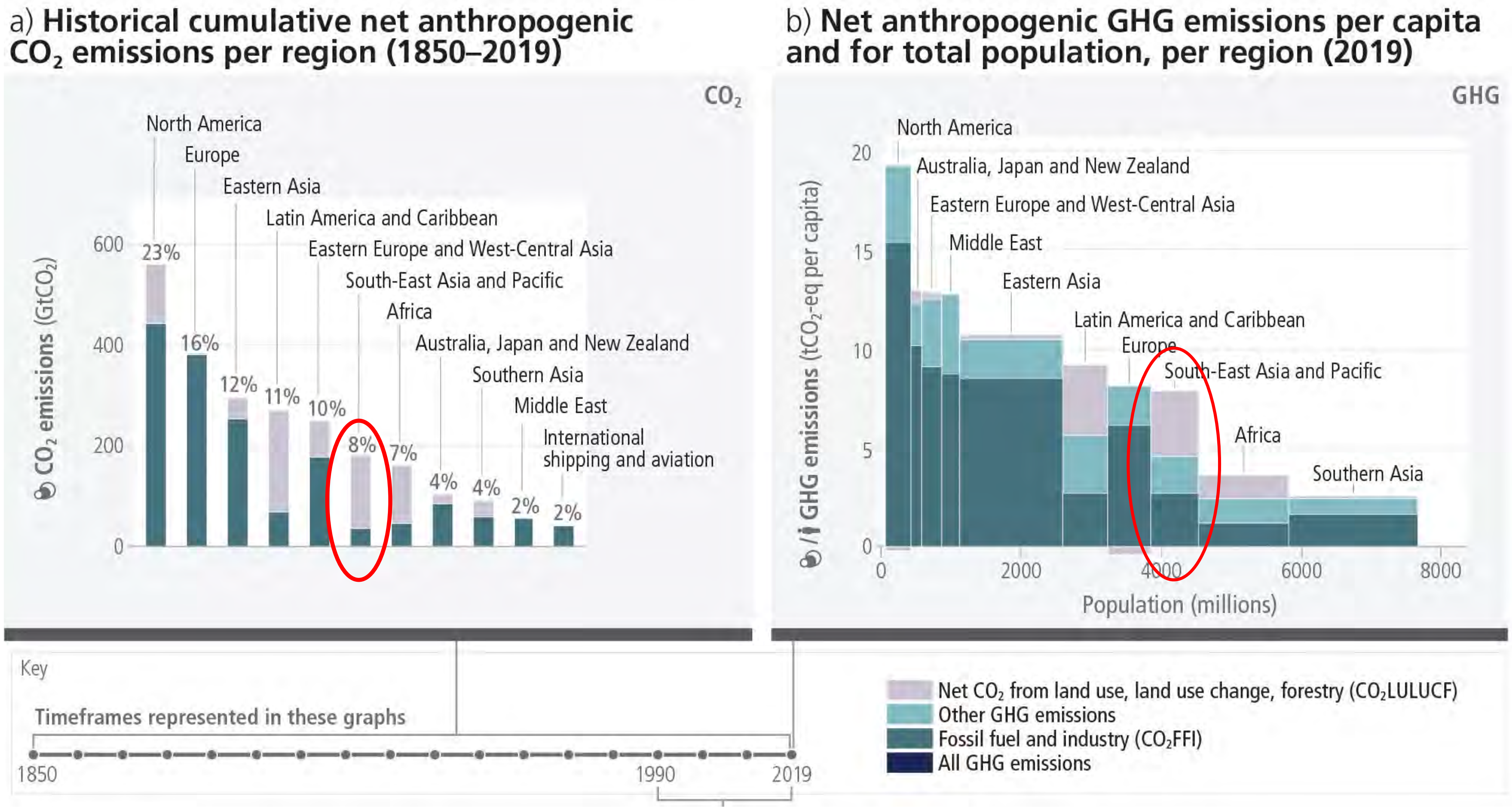


Global Warming of 1.5 °C

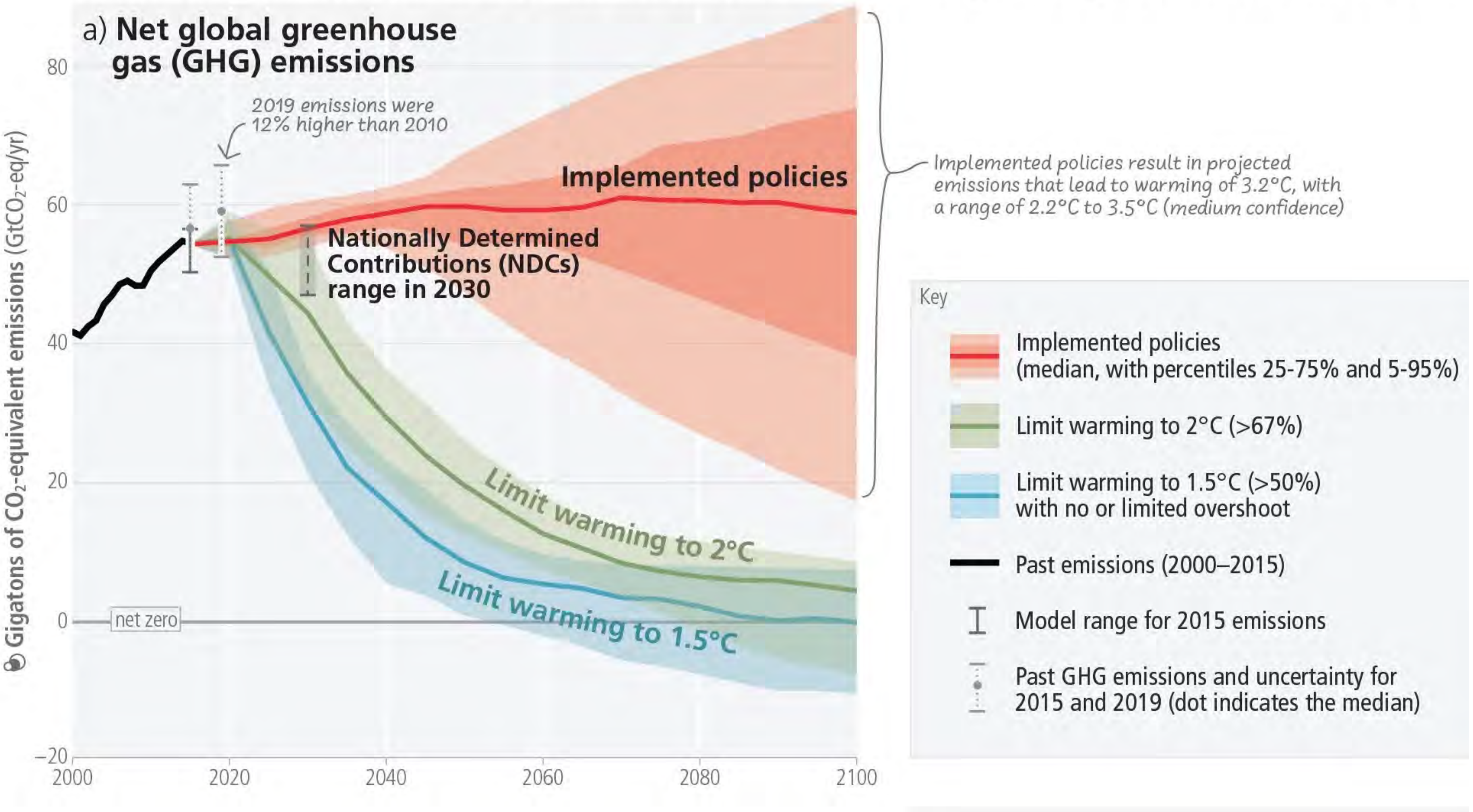
Human activities are responsible for global warming

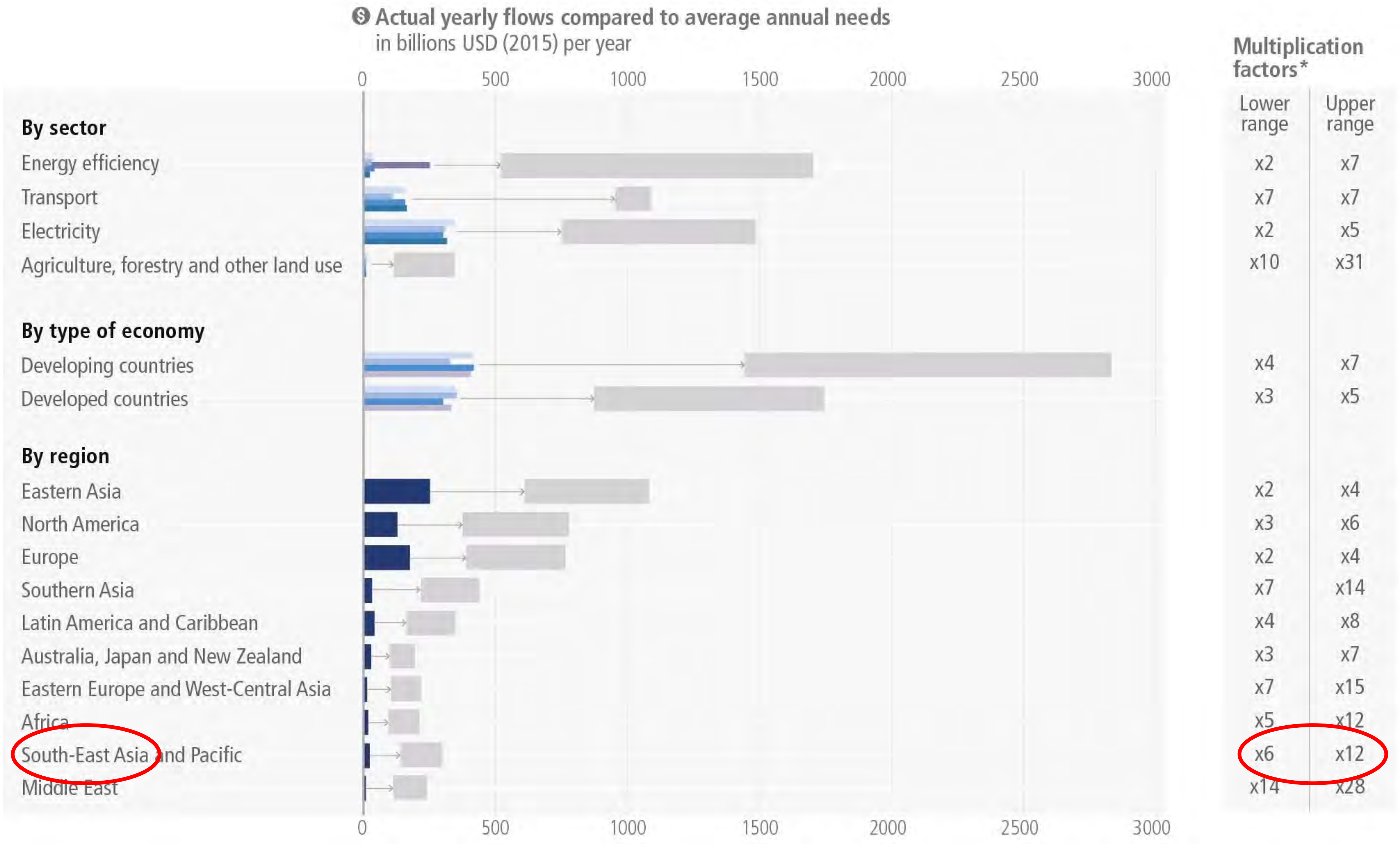


Emissions have grown in most regions but are distributed unevenly, both in the present day and cumulatively since 1850

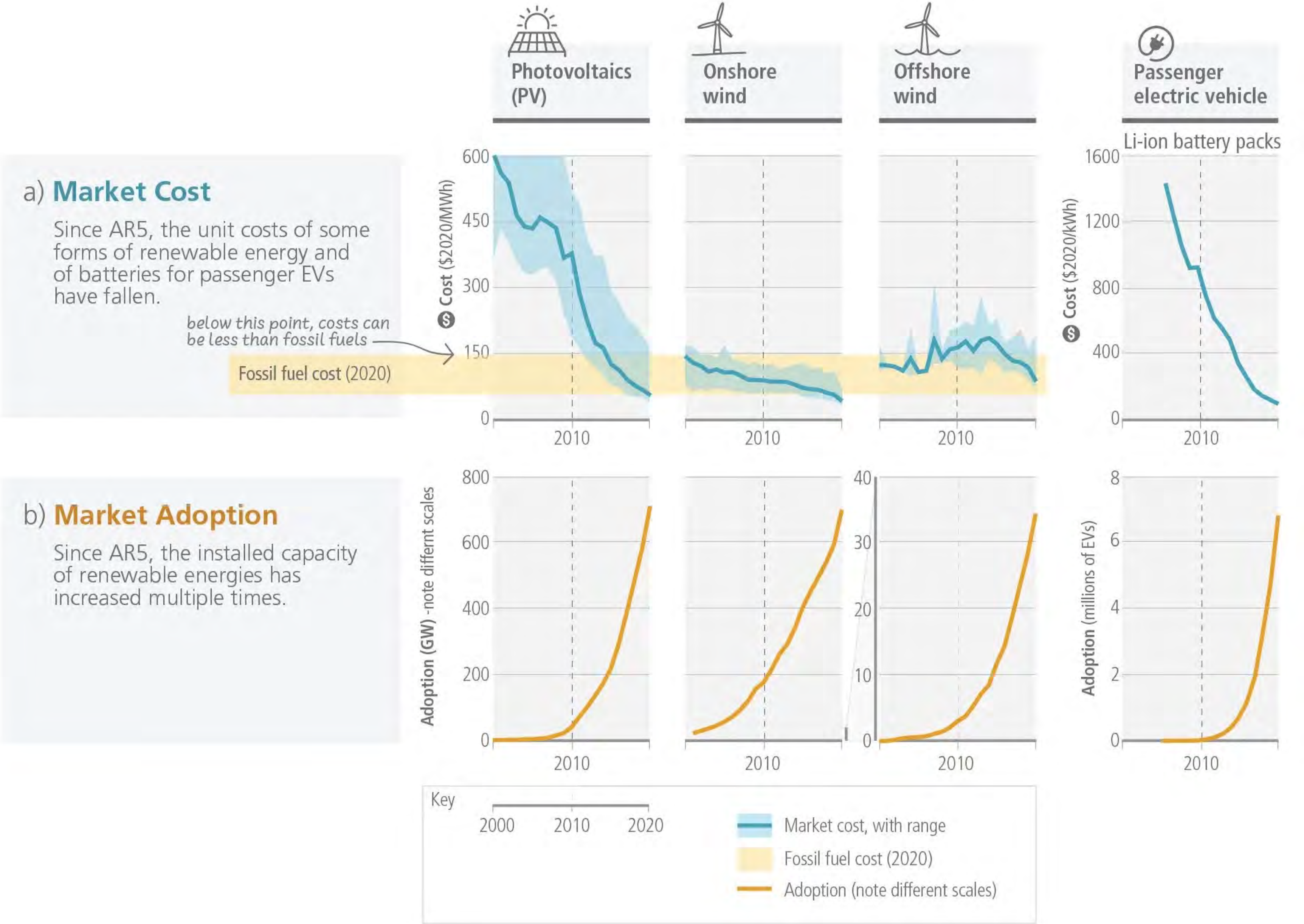


Limiting warming to 1.5 or 2C requires rapid, deep and sustained emissions reductions





The estimated Investment needs across different sectors and regions range from a doubling (2x) up to 31x the current averages



Some good news on renewable energy/electricity and electrification in transport:

Costs have gone down significantly in a short period of time and adoption rates are exponential

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Thanks for your attention

Francis X. Johnson
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IPCC AR6 Synthesis Report:
https://www.ipcc.ch/report/sixth-assessment-report-cycle/

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The IPCC AR6 and Special Report on the Ocean and Crysphere, What is it for southeast Asia (Mekong communities)

Prof Edvin Aldrian

Building Climate Resilience in the Mekong Region: Bridging Science, Policy, and Practice

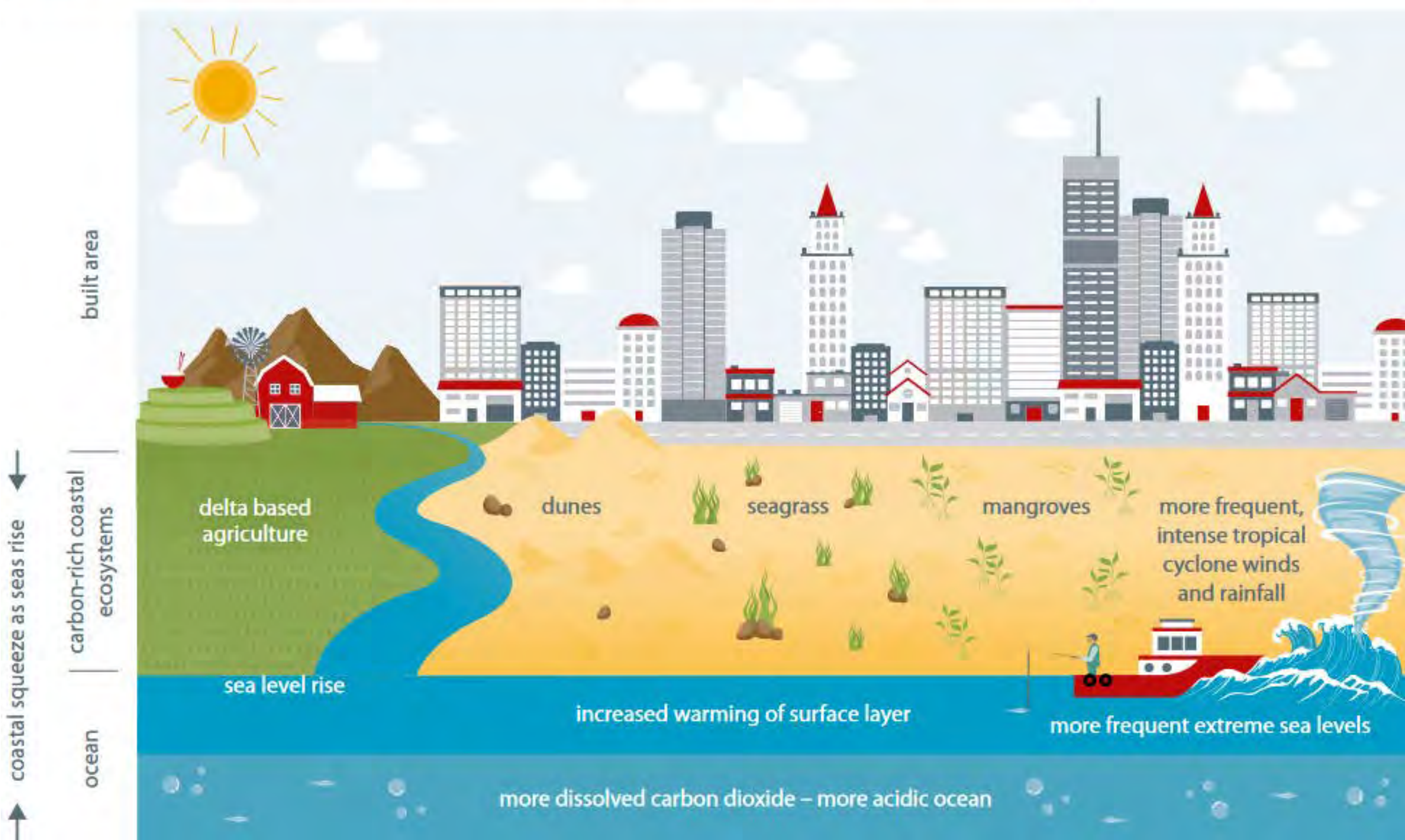
Himalaya as the third polar of the world

The world has three Polars, the Antartics, the Greenland and the Himalayan. The Himalayas are one of the regions in the world where climate change impacts are more intense than other regions [1]. The region is a biodiversity hotspot and provides ecosystem services to billions of people across the world. The Himalayan region has been reviewed and synthesized in terms of climate change studies, and it was found that there has been an exponential increase in climate change studies since 2005 [1]. Among the subject types, maximum climate change impact was studied on water resources/glacier retreat (141 studies) followed by agriculture (113) and forests/biodiversity (86) [1]. Increasing temperature, frequent drought spells, erratic rainfall, and declining snowfall are commonly reported indicators of climate change. For instance, temperature is reported to increase by 1.5°C in the Himalayas than an average increase of 0.74°C globally in the last century; however, it varied in eastern (0.1°C per decade) and western Himalayas (0.09°C per decade). An increase in temperature between 0.28 and 0.80°C per decade was reported for North-western Himalaya and 0.20–1.00°C per decade for Eastern Himalaya [1]. Many glaciers were reported to be retreating in both eastern and western Himalayas [1]. Heavy rainfall is becoming very common in the region, often accompanied by cloudbursts that aggravate flood situations many times [1]

Sea level rise

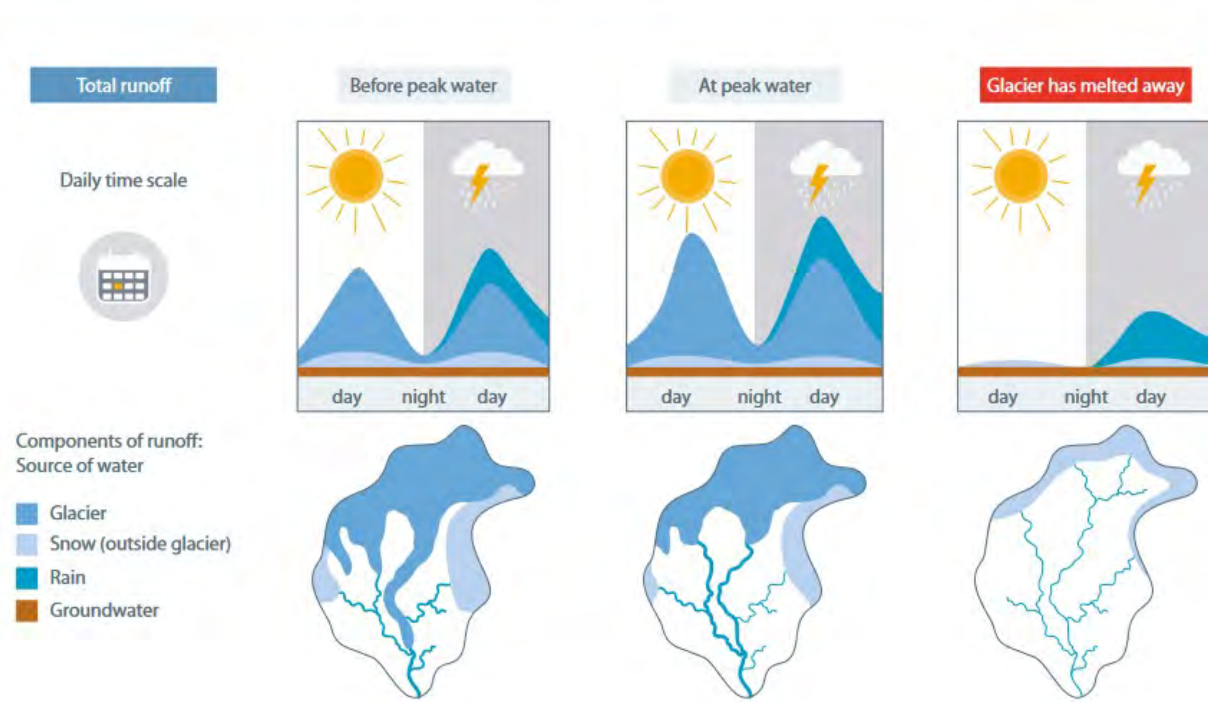
Globally, sea level is now rising at a rate of 3.6 mm per year. That is more than twice as fast as it rose in the 20th century. 23 The acceleration in the rate of sea level rise in recent decades is a global phenomenon, driven by increasing rates of ice loss from the Greenland and Antarctic ice sheets. 24

Figure 3: Rising seas and coastal development put a 'squeeze' on coastal ecosystems



Sea level rise

Figure 5: A simplified picture of how runoff changes in a river basin when a glacier melts[71]



HI-AWARE was a research project to enhance the adaptive capacities and climate resilience of the poor and vulnerable women, men, and children living in the mountains and flood plains of the Indus, Ganges, and Brahmaputra River basins. The HI-AWARE consortium was led by the International Centre for Integrated Mountain Development (ICIMOD). Investigation by project scientists found that: The Indus, Ganges and Brahmaputra river basins are extremely susceptible to temperature increase. Under a 1.5°C global warming scenario, these river basins would warm up by more than 2°C on average by the end of this century.

At higher altitudes this warming will be even more marked, due to elevation- dependent warming. A 2°C global warming scenario could lead to a warming of around 2.7°C in these glaciated river basins.

Currently, more likely climate change scenarios, specific for these river basins, suggest regional temperature increases between 3.5°C and 6°C by 2100. There will be significant losses in glacier volume, from 36% to 64%, depending on the warming scenario. The majority of the climate projections also indicate wetter conditions in the future overall, and increases in extreme rainfall events. Overall, an increase in water supply is expected for the coming decades as a result of increases in meltwater an

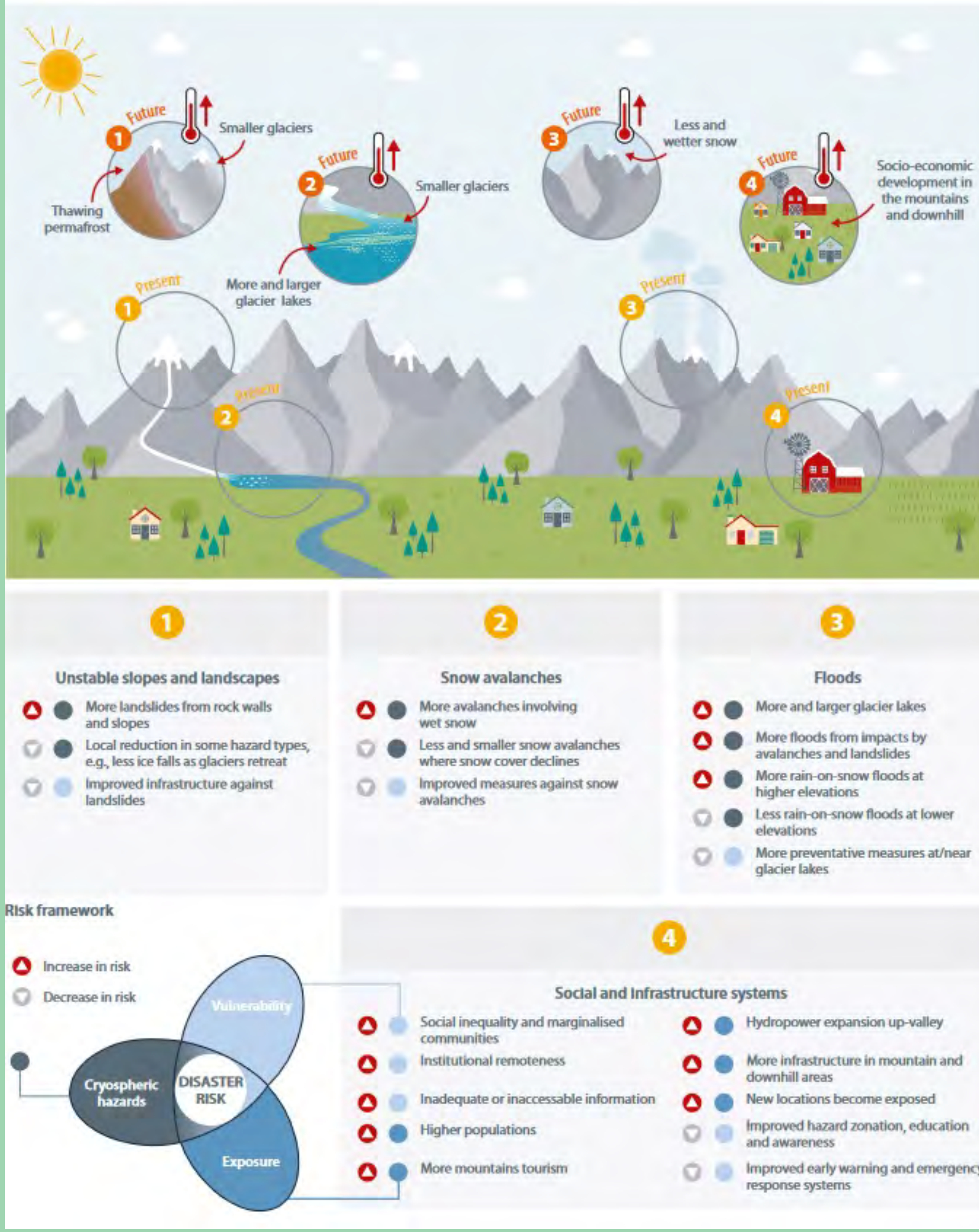
Ice melt to the ocean

1 Unstable slopes and landscapes
More land slide from rock walls and slopes
Local reduction in some hazard types e.g less ice falls as glaciers retreat
Improved infrastructure against landslides

2. Snow avalanches
More avalanches involving wet snow
Less and smaller snow avalanches where snow cover declines
Improved measures against snow avalanches

3. Floods
More and larger glacier lakes
More floods from impacts by avalanches and landslides
More rain on snow floods at higher elevations
Less rain on snow floods at lower elevations
More preventative measures at/near glacier lakes

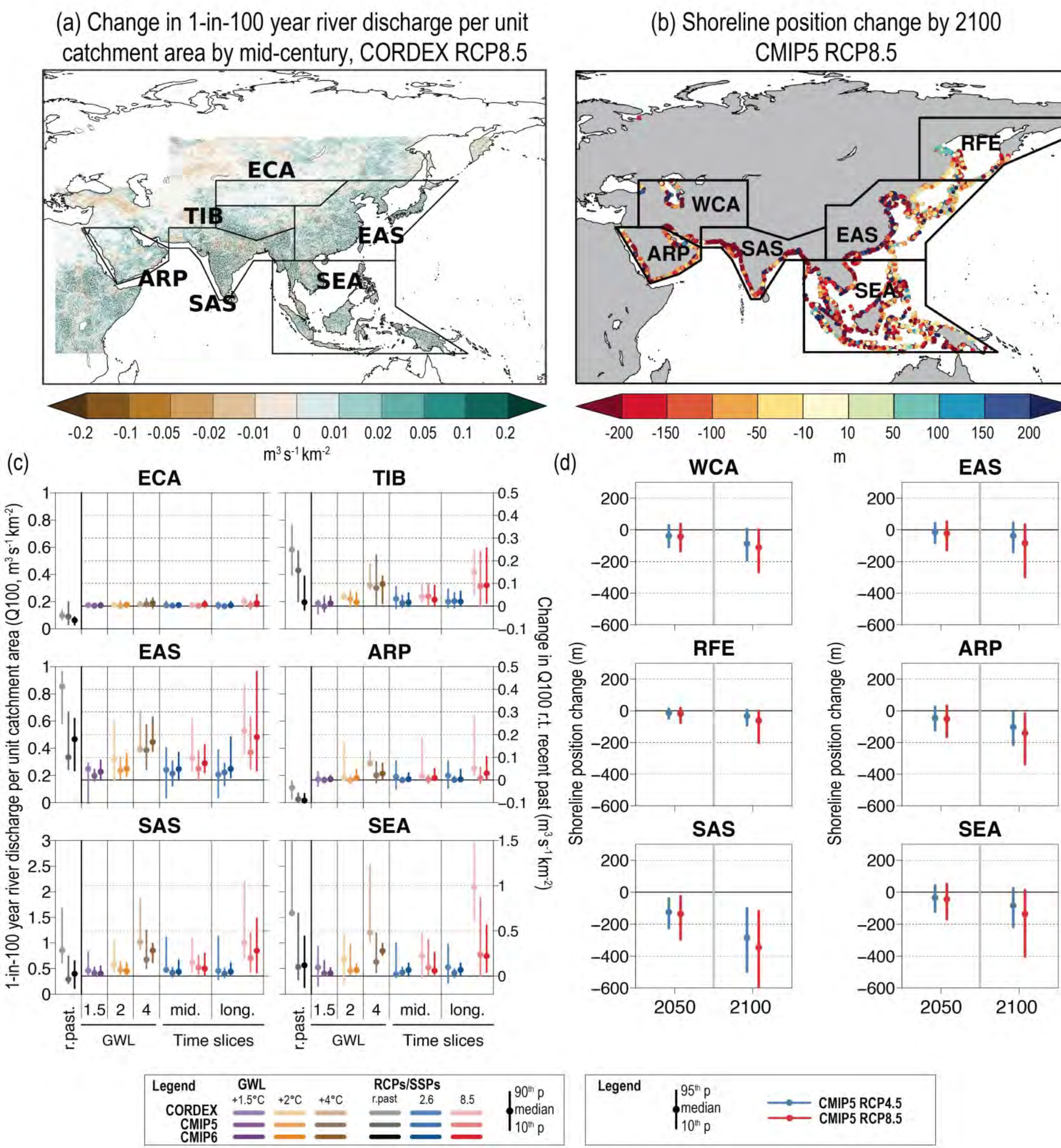
4, Social and Infrastucture systems
Social inequality and marginalised communities
Institutional remoteness
Inadequate or inaccessable information
Higher populations
Hydropower expansion up valley
More infrastucture in mountain and downhill areas
New loction become exposed
Improved erly warning and emergency response systems



Regional Simulation Solutions

Projected changes in selected climatic impact-driver indices for Asia. (a) Mean change in 1-in-100-year river discharge per unit catchment area (Q100, $m^3s^{-1}km^{-2}$) from CORDEX models for the West, South East, Southeast, and East Asia domains for 2041–2060 relative to 1995–2014 for RCP8.5. (b) Shoreline position change along sandy coasts by the year 2100 relative to 2010 for RCP8.5 (metres; negative values indicate shoreline retreat) from the CMIP5-based dataset presented by [Vousdoukas et al. (2020b)](). (c) Bar plots for Q100 ($m^3s^{-1}km^{-2}$) averaged over land areas for the AR6 WGI Reference Regions (defined in Chapter 1). The left-hand column within each panel (associated with the left-hand y-axis) shows the 'recent past' (1995–2014) Q100 absolute values in grey shades.

CORDEX SE Asia is adopted in IPCC simulation,



Conclusions

1. Climate change driven by human activity is changing the temperature and chemistry of the oceans.
2. These changes harm marine life and people who depend on it.
3. Sea level rise and other climate hazards increasingly affect South Asia.
4. The frozen lands in high mountain Asia are changing, with implications for society.
5. The best way to limit changes in the oceans and cryosphere is to mitigate climate change.
6. Need more understanding on the impact of change in the Himalayan to the Mekong riverine water.
7. Early action has potency to reduces climate risks and costs less than dealing with future damages.
8. Future-proofing coastal development will be essential.
9. Environmental governance and management must join up across scales and address social issues.
10. Communications, education and capacity building are critical.
11. Strengthening regional climate model capability

Thank you!

ขอบคุณ

https://id.wikipedia.org/wiki/Edvin_Aldrian

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Highlights of AR6 WGII Report and its implications to the Mekong region

Prof. Yongyut Trisurat
Kasetsart University, Thailand

Building Climate Resilience in the Mekong Region: Bridging Science, Policy, and Practice

Eastin Grand Hotel Sathorn Bangkok, Thailand

Australian Government
Department of Foreign Affairs and Trade
SEI Stockholm Environment Institute
Chula Chulalongkorn University

Contents of IPCC Ar6 WGII Report

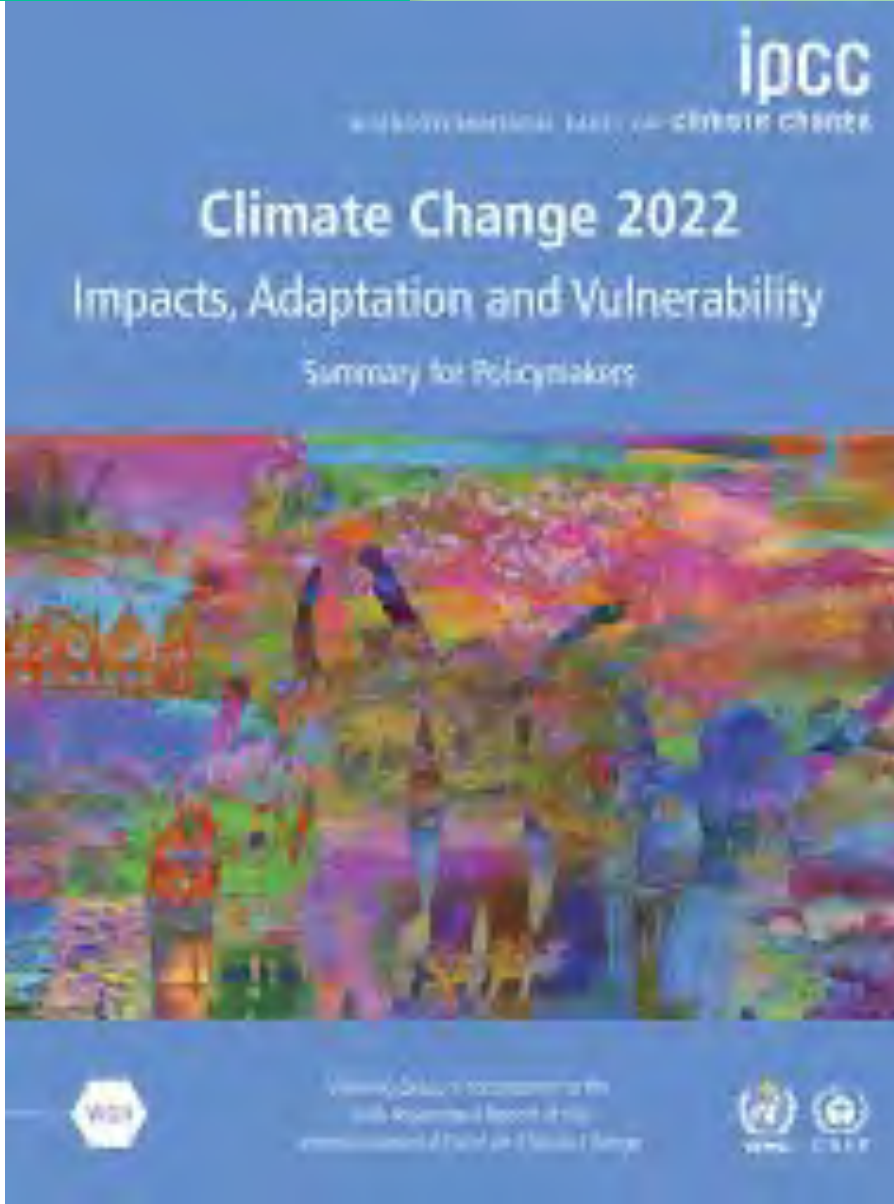
Sectoral chapters

1. **Terrestrial & freshwater Eco**.;
2. Oceans & coastal eEco.;
3. **Water**
4. **Food and fibre**;
5. Cities & settlements
6. Health & well-being;
7. Poverty & livelihoods

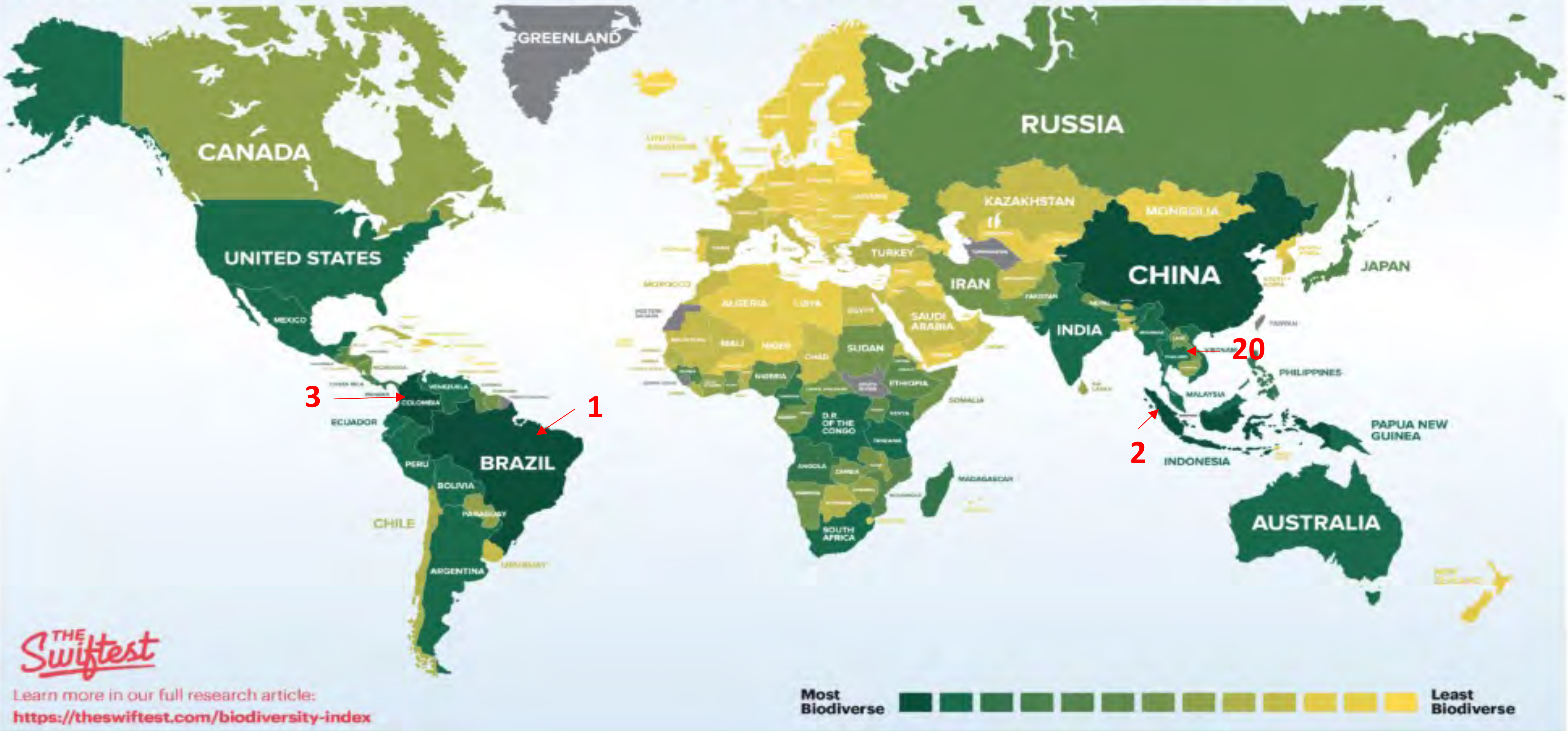
Regional chap. (**7** incl. **Asia**);

Cross-chapters (e.g., **Tropical forests**);

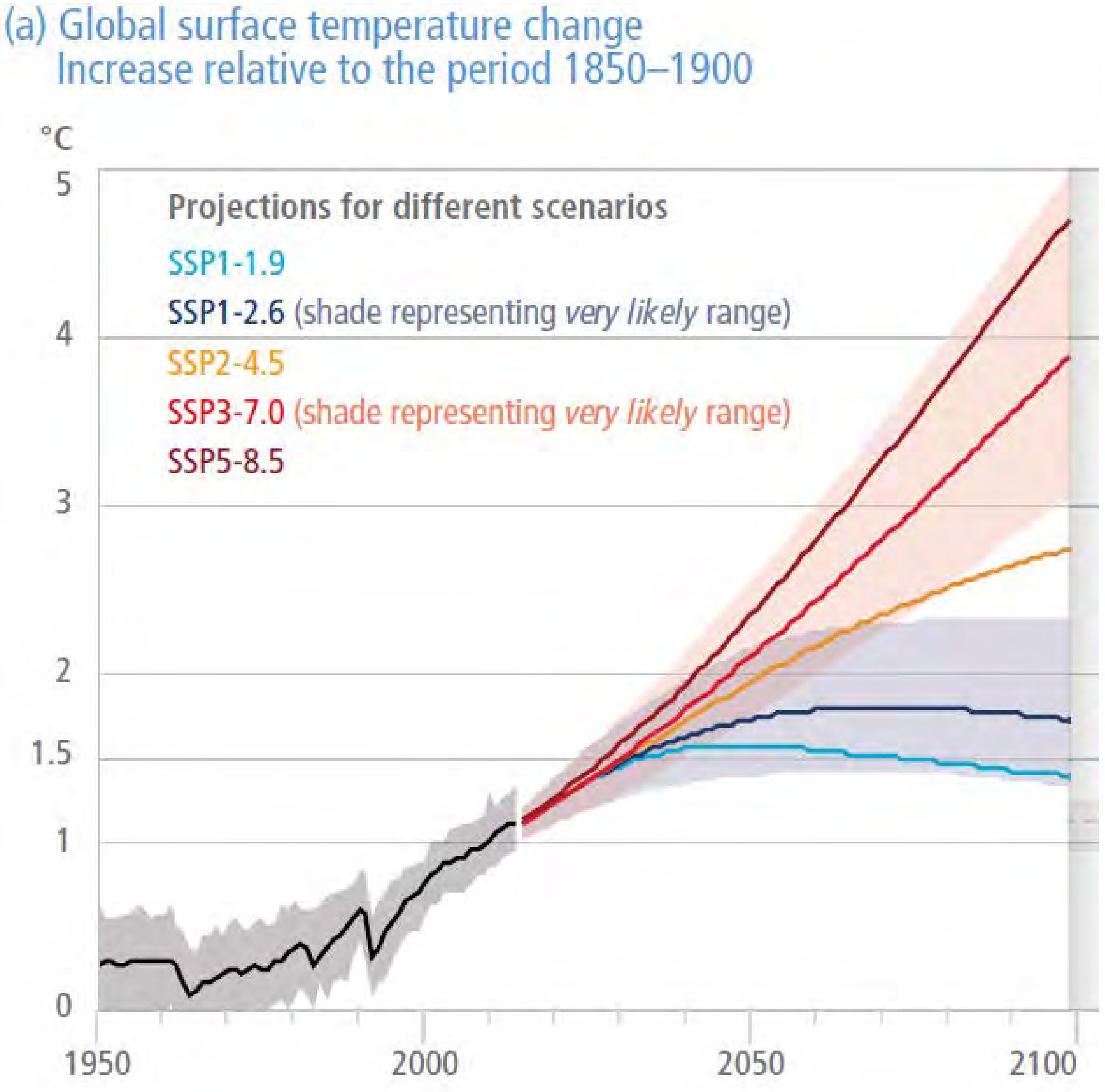
Synthesis chap. (3-sustainable devl. pathways

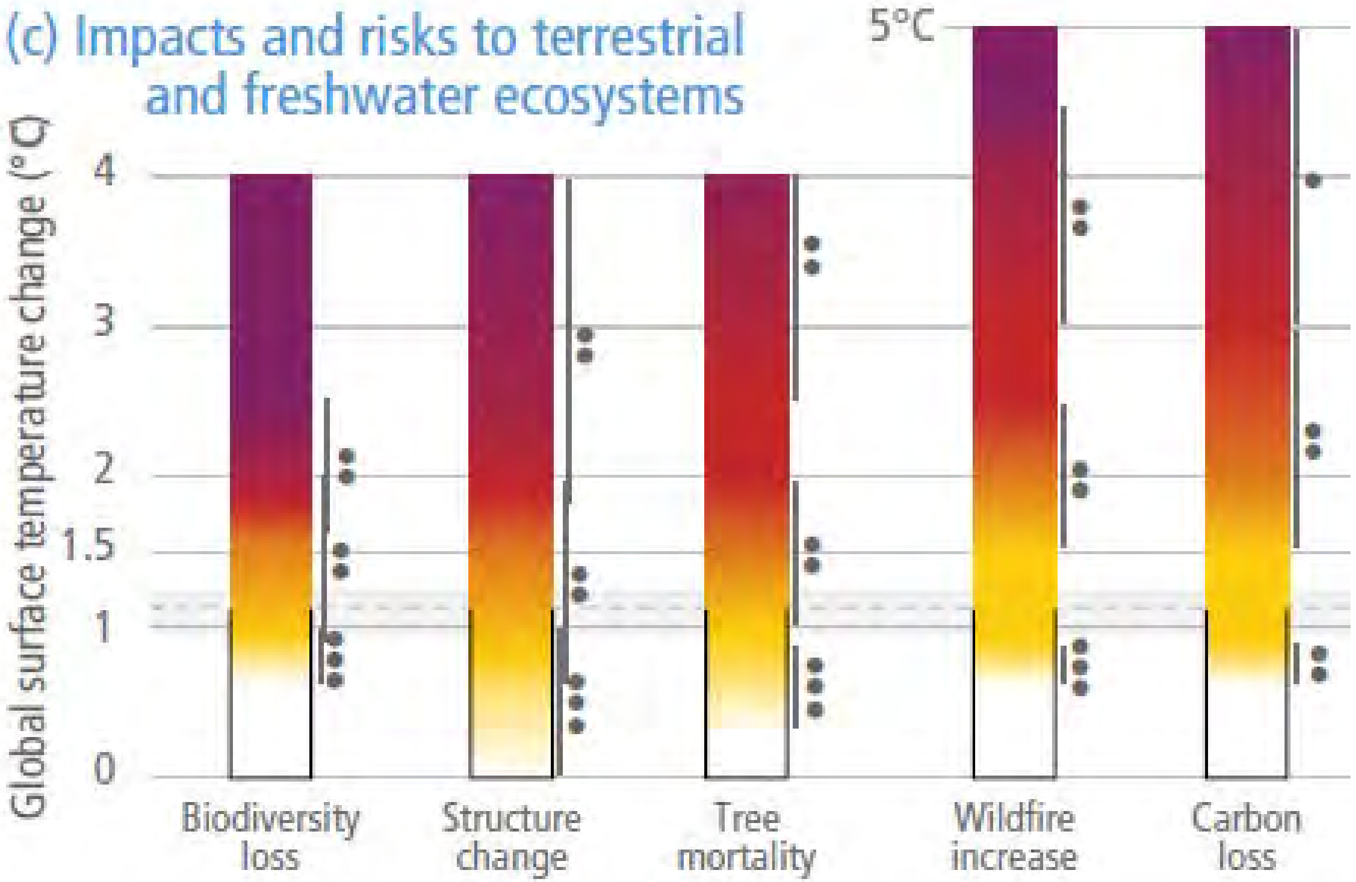


THE 201 MOST (AND LEAST) BIODIVERSE COUNTRIES IN 2022



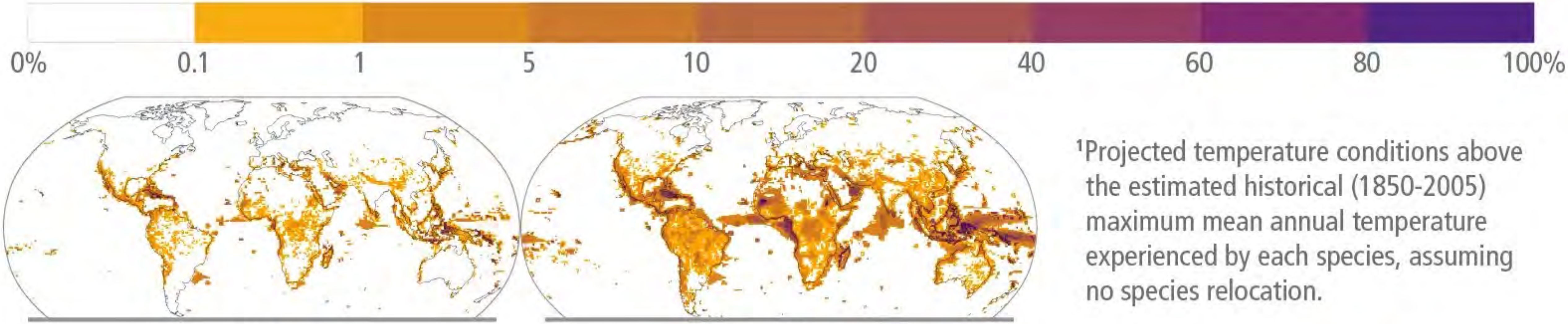
Temperature change and impacts on ecosystem





IPCC AR6 WGII Summary for Policymakers

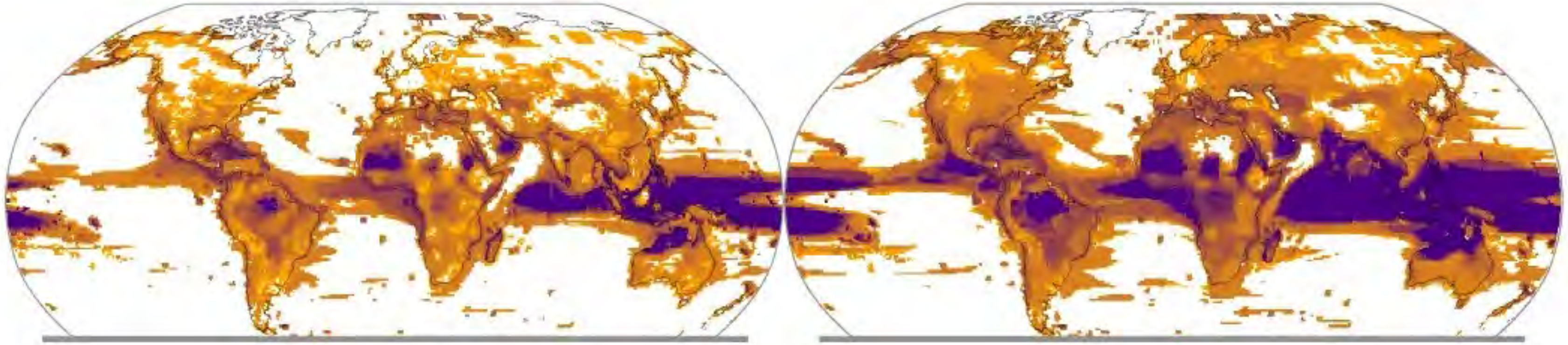
Species loss at high warming levels concentrated in low latitudes, including SE-Asia



1.5°C 9-14%

2.0°C 15%

Changes in **ecosystem structure** & **phenology** (2/3 spring phenology) and **species range shifts** (upward for alpine/tundra & northward for deciduous/boreal forest; woody encroachment in grassland) <***high confidence***>



3.0°C 13-39%

4.0°C 35%

5.0°C 60%

Tropics > temperate
Freshwater > marine

Synthesis Report of the Sixth Assessment Report

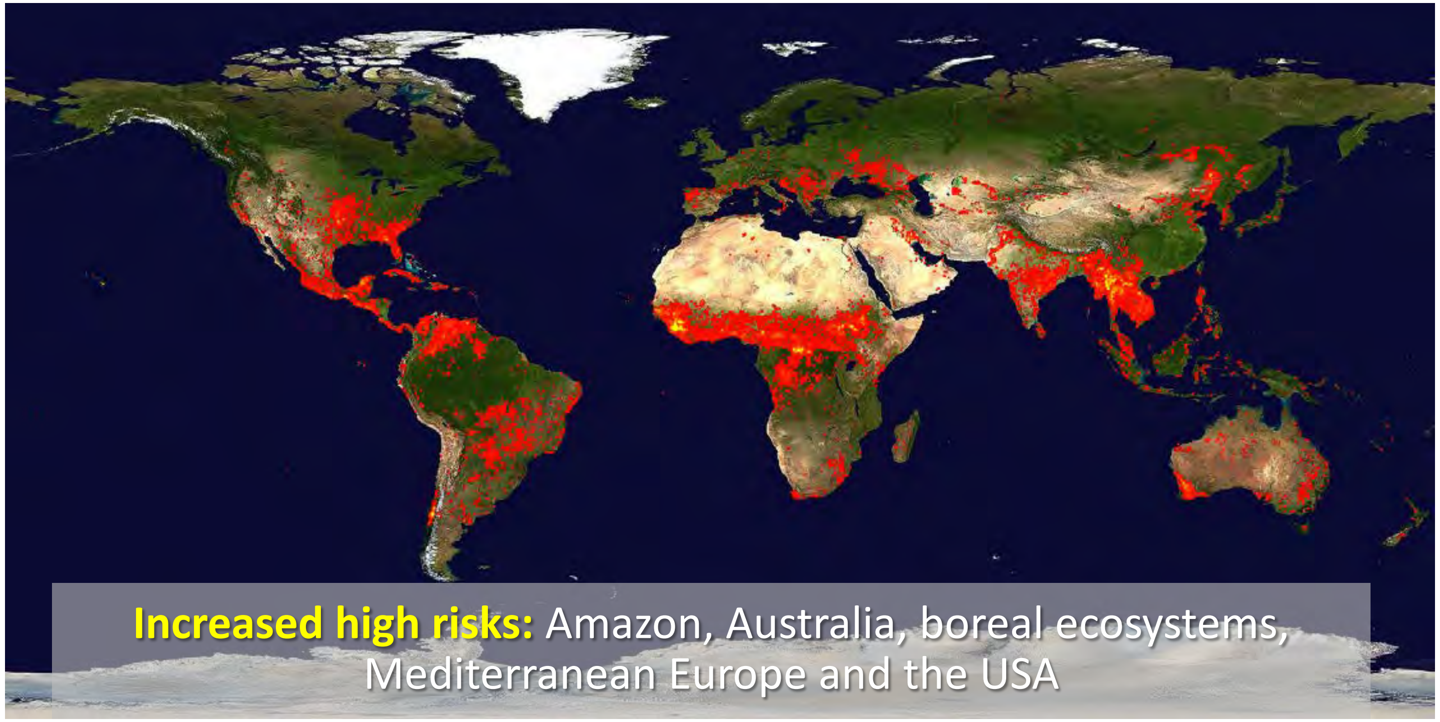
Wildlife and impacts on ecosystem

Increased in area burned by 35% at a global warming of 2°C global land area burned by wildfire.

Continued cc under high-emission scenarios that increase global temp. ~4°C by 2100 could increase global burned area by 50-70% and global mean fire frequency by ~30% (***medium confidence***).

IPCC AR6 WGII Full Report

Global Wildfire Map (NASA)

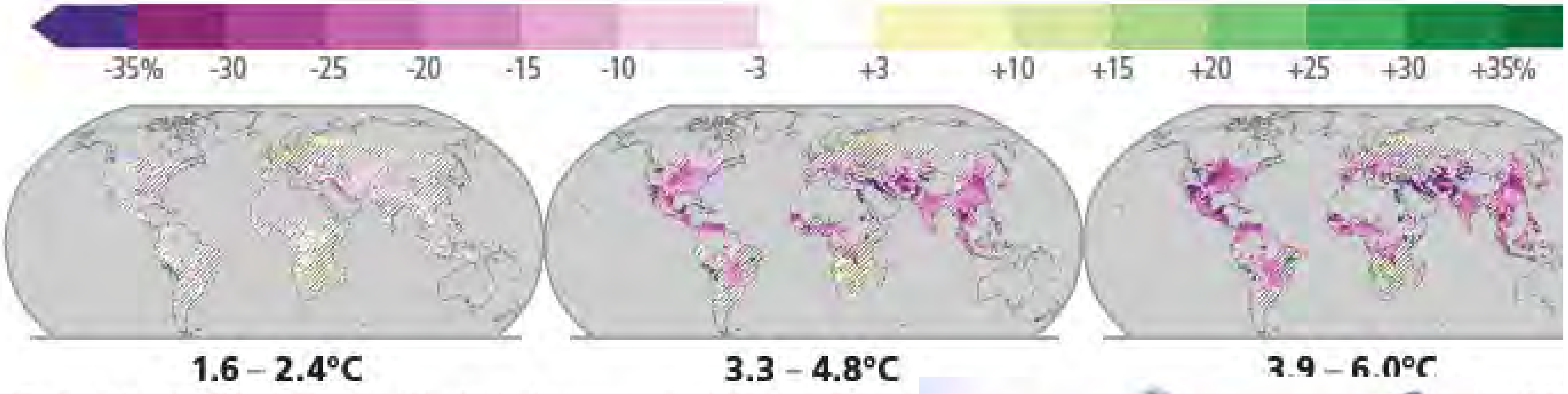


LULCCs emitted carbon at a rate of **1.6 ± 0.7 Gt yr-1**, of which wildfires and peat burning emitted 0.4 ± 0.2 Gt yr-1 (30%)

increase tree mortality rates by >600% above rates in non-burned areas, with the higher mortality persisting for up to a decade after a fire.

Changes (%) in food production (maize & rice)

Changes in maize yield by 2080-2099 relative to 1986-2005.



1.5-2°C warming: no or low levels of adaptation (***medium confidence***).

≥ 2 °C, malnutrition in Sub-Saharan Africa, South Asia, Central and South America and Small Islands (***high confidence***).

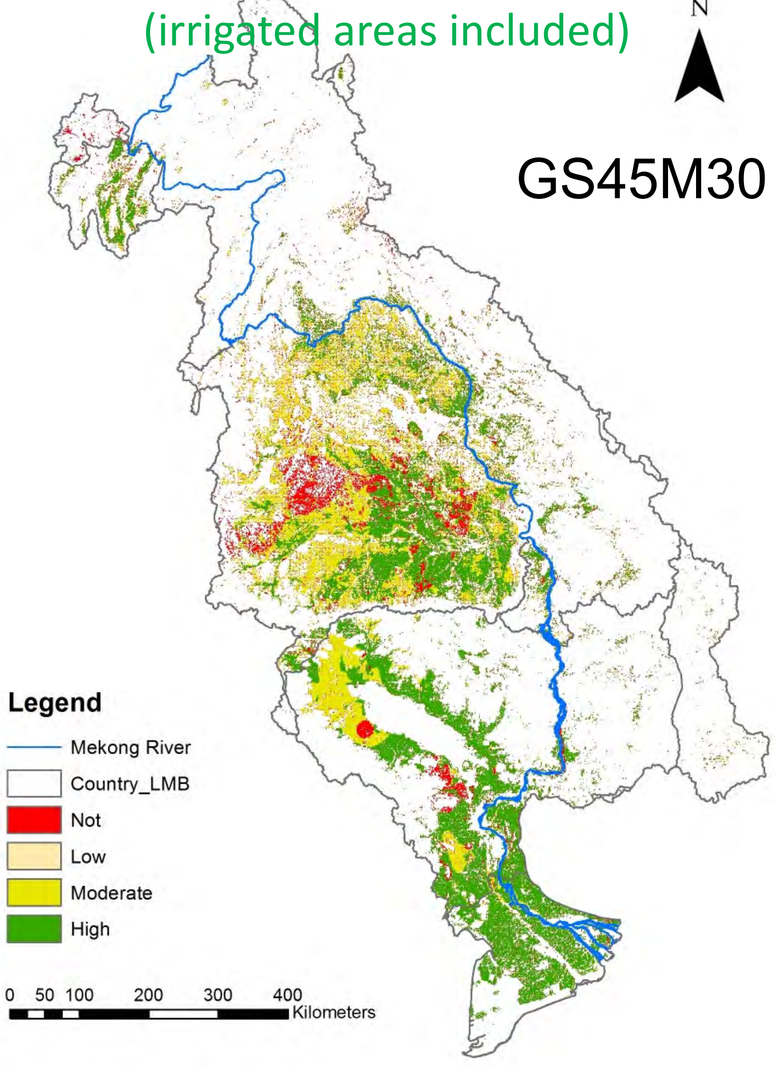
≥ 3°C exacerbating regional disparity in food security risks (***high confidence***).

AR6 WGII Summary for Policymakers

Substantial rice productions are required to **increase up to 50%** in the next 30 years to meet the demand for a growing population in the Mekong region (Cosslett et al., 2018; MRC, 2015)

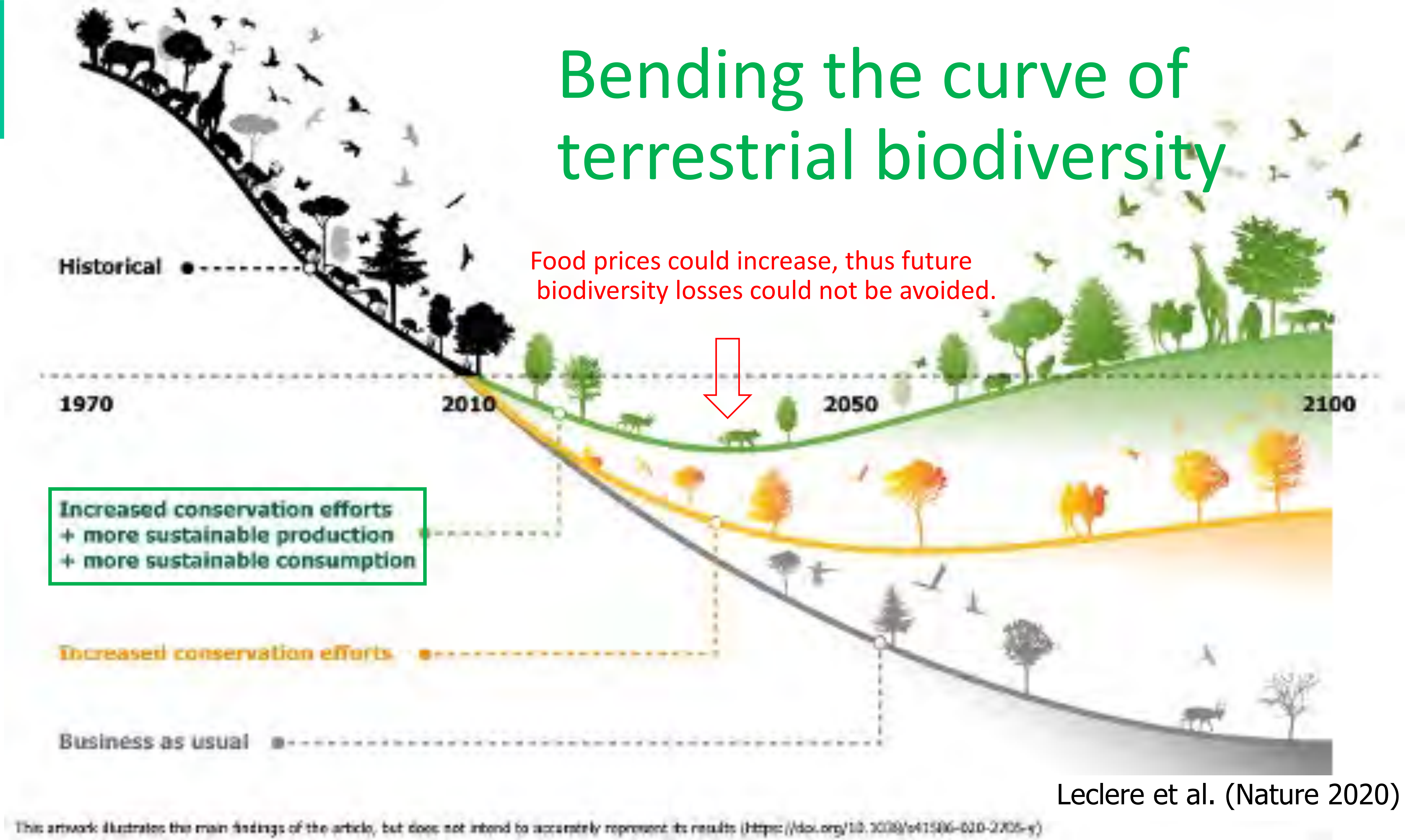
Suitability for rice production

(irrigated areas included)



Trisurat et al. (2018)

Bending the curve of terrestrial biodiversity



Food prices could increase, thus future biodiversity losses could not be avoided.

Leclere et al. (Nature 2020)

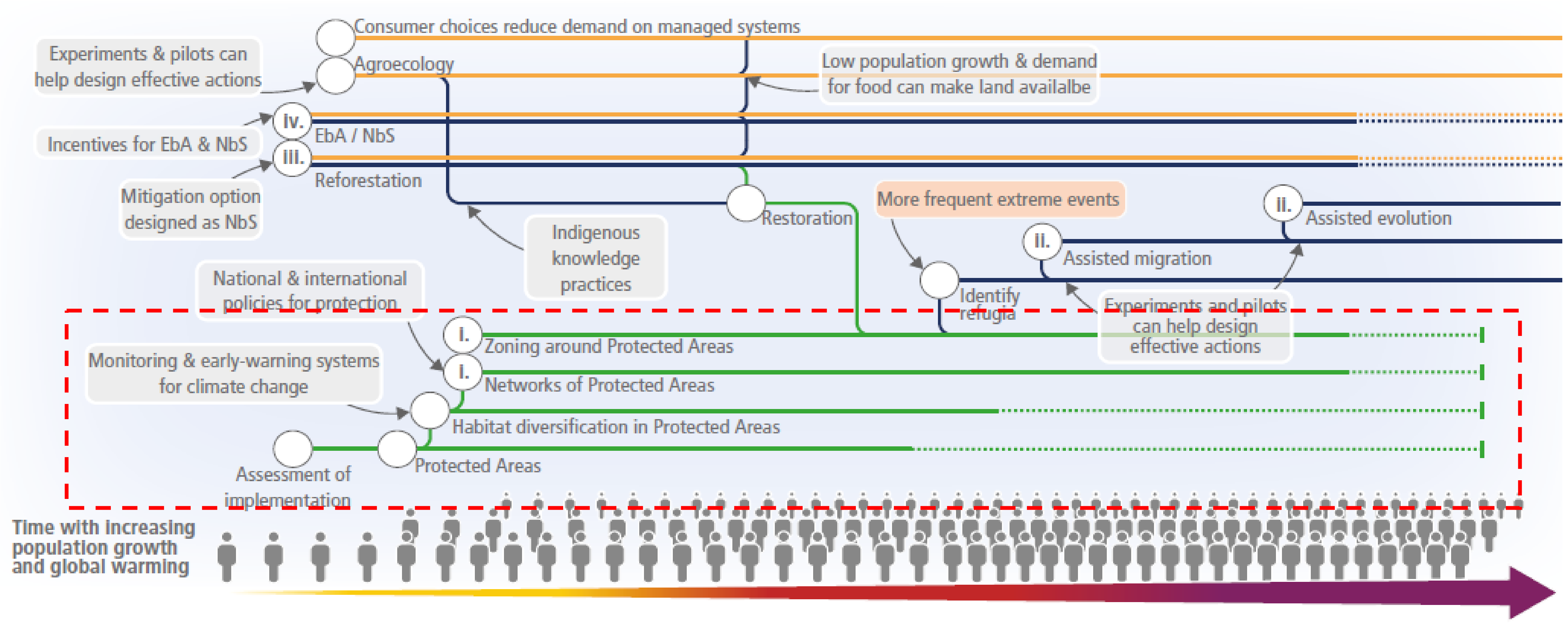
(d) Adaptation pathways for ecosystems.

Adaptation options can be facilitated by actions which increase the solution space such as consideration of local knowledge, new regulations and incentives but also decrease due to climatic and non-climatic stressors and maladaptation.

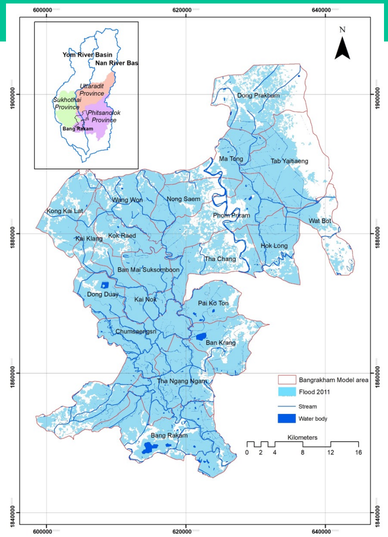
Strategies
- Protect
- Restore/migrate
- Sustainable use
- ...... Uncertainty in effectiveness with increasing pressures

Examples for actions
i. Networks of Protected Areas combined with zoning increase resilience.
ii. Assisted migration and evolution might reduce extirpation and extinction.
iii. Adaptation and mitigation increase space for nature and benefit society.
iv. Ecosystem-based Adaptation (EbA) and Nature-based Solutions (NbS).

Enablers **Barriers**



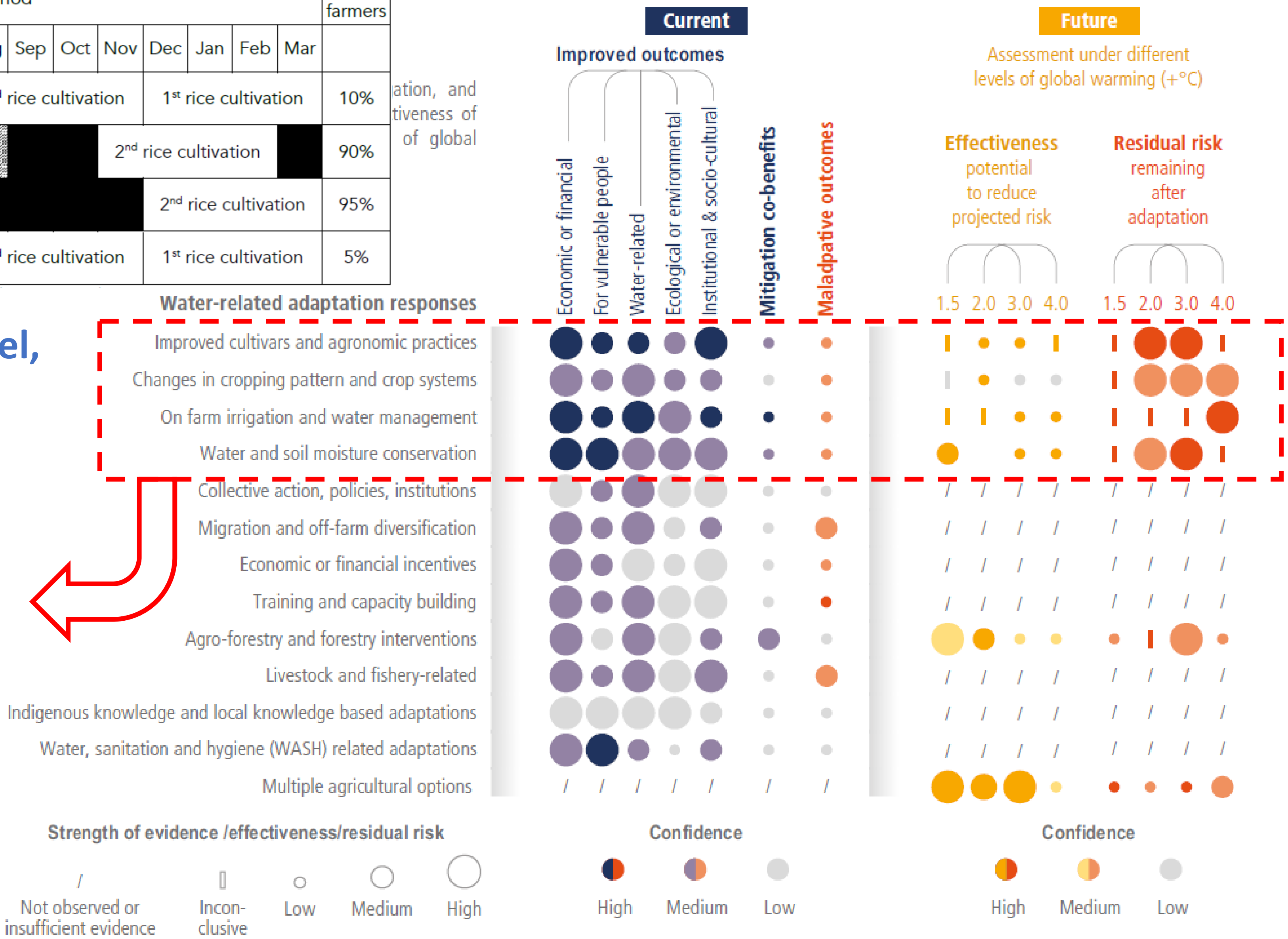
Water retention and modification of cultivation calendar



Rice period													% of farmers
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
3x harvest before BRM 60	2nd rice cultivation				3rd rice cultivation				1st rice cultivation				10%
2x harvest before BRM 60		1st rice cultivation						2nd rice cultivation					90%
2x harvest with BRM 60	1st rice cultivation								2nd rice cultivation				95%
3x harvest with BRM 60	2nd rice cultivation				3rd rice cultivation				1st rice cultivation				5%

Bang Rakham Model, Thailand

Irrigation is widely used and effective for yield stability, but with several negative outcomes, including), groundwater depletion (high confidence), increasing soil salinity (medium confidence), widening inequalities and loss of rural smallholder livelihoods with weak governance (medium confidence)



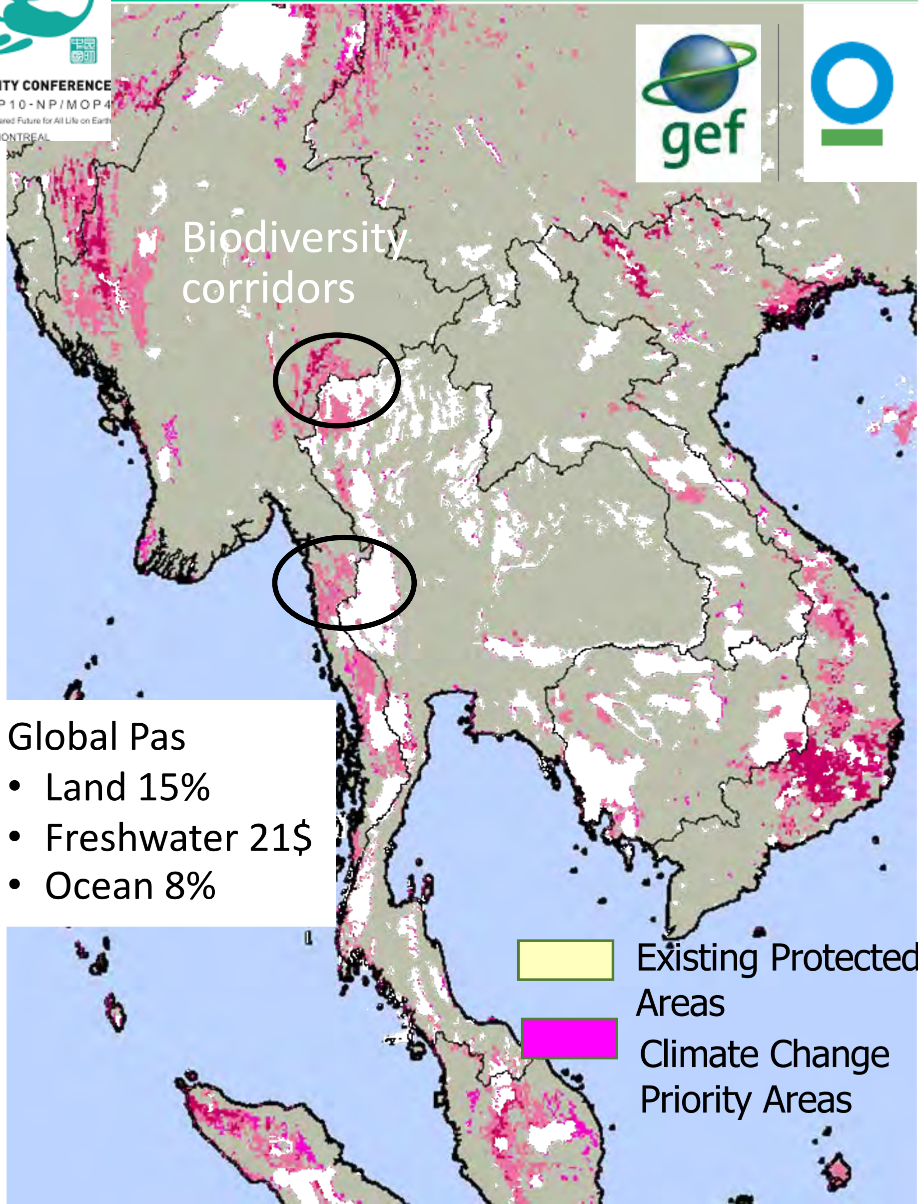
Kunming – Montreal Global Biodiversity Framework (GBF) by 2030

Target 1. All areas are planned or managed to bring loss of areas of high biodiversity importance close to zero
Manage under participatory, integrated and biodiversity inclusive spatial planning and/or effective management processes.

Target 2. 30% of degraded areas are under effective restoration
Effective (landscape) restoration to enhance biodiversity and ecosystem functions and services, and connectivity

Target 3. 30 per cent of areas are effectively conserved
Use OECMs/KBA criteria to guide designation and expansion of protected areas/ TBCA

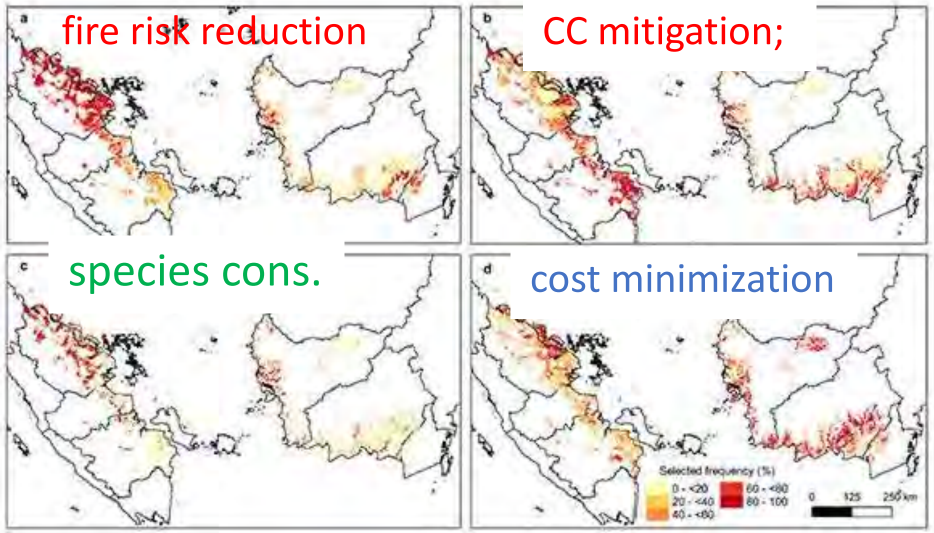
Revise NBSAPs by incorporating GBF



Limits to adaptation and maladaptation

Adaptation measures **cannot prevent** all losses and damages of CC **(with soft** <finance gov., policy capacity> **and hard limits (**esp for threatened & endemic spp. & vulnerable dev. countries> (*high confidence*)

Ecosystem-base Adaptation (EbA) and NbS can deliver climate change adaptation for people with multiple additional benefits, including for biodiversity.



NbS for peatland restoration in Indonesia

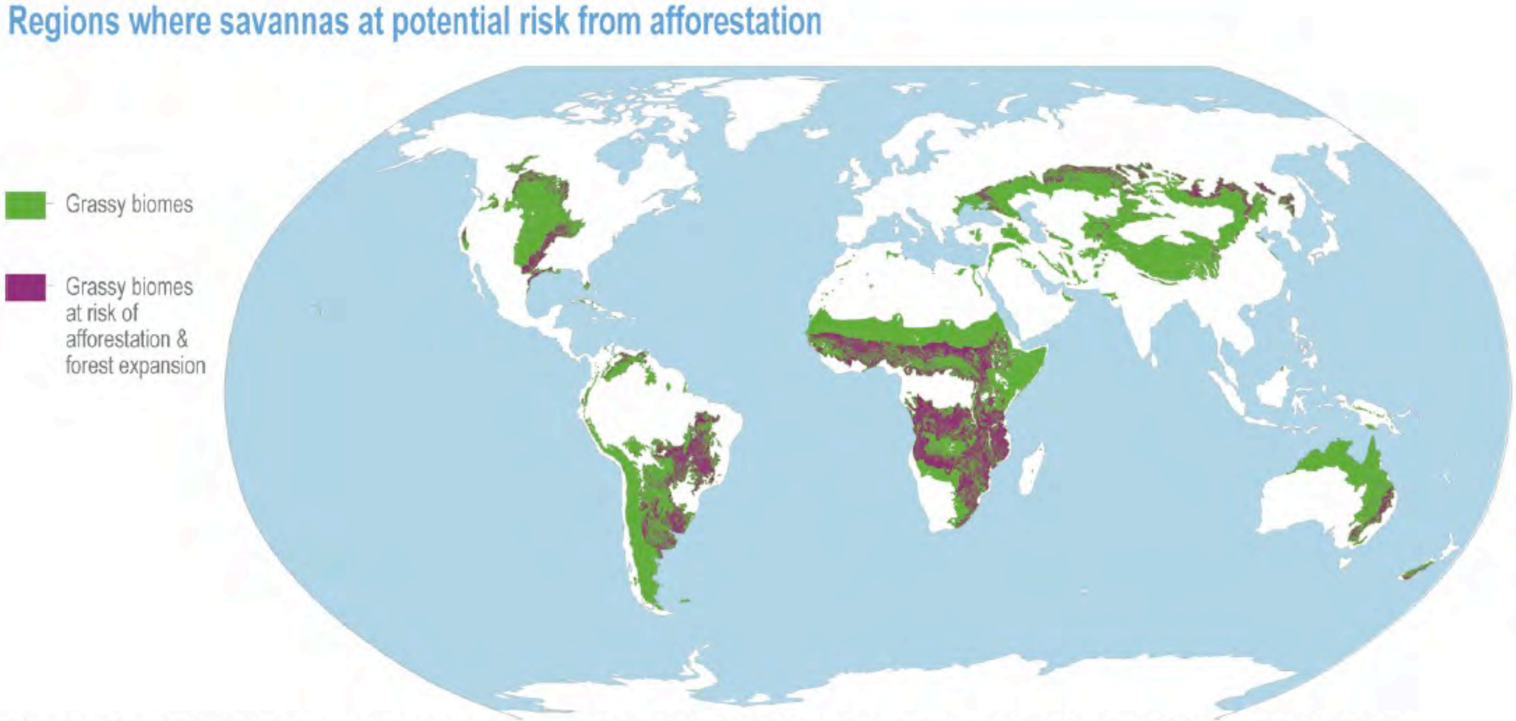


Figure Box 2.2.1: Regions where savannas at potential risk from afforestation. Based on (Veldman et al., 2015)

Maladaptation – Bioenergy with Carbon capture and Storage (BECCS) for bioenergy would lead to loss of biodiversity and poor climate change resilience.

Thank you!

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Energy Transition and Equity

Joyashree Roy

Asian Institute of Technology

Coordinating Lead Author

IPCC, 6th Assessment Report

Building Climate Resilience in the Mekong Region: Bridging Science, Policy, and Practice

We are not on track to limit warming to 1.5 °C.

For stabilization of warming at 1.5C with no overshoot global CO_2 emissions need to reduce by

48% in 6 years

80% in 14 years

99% in 24 years

Good news is scientific assessment in IPCC AR6 report presents some new big opportunities: both demand side and supply side

changeframing.space

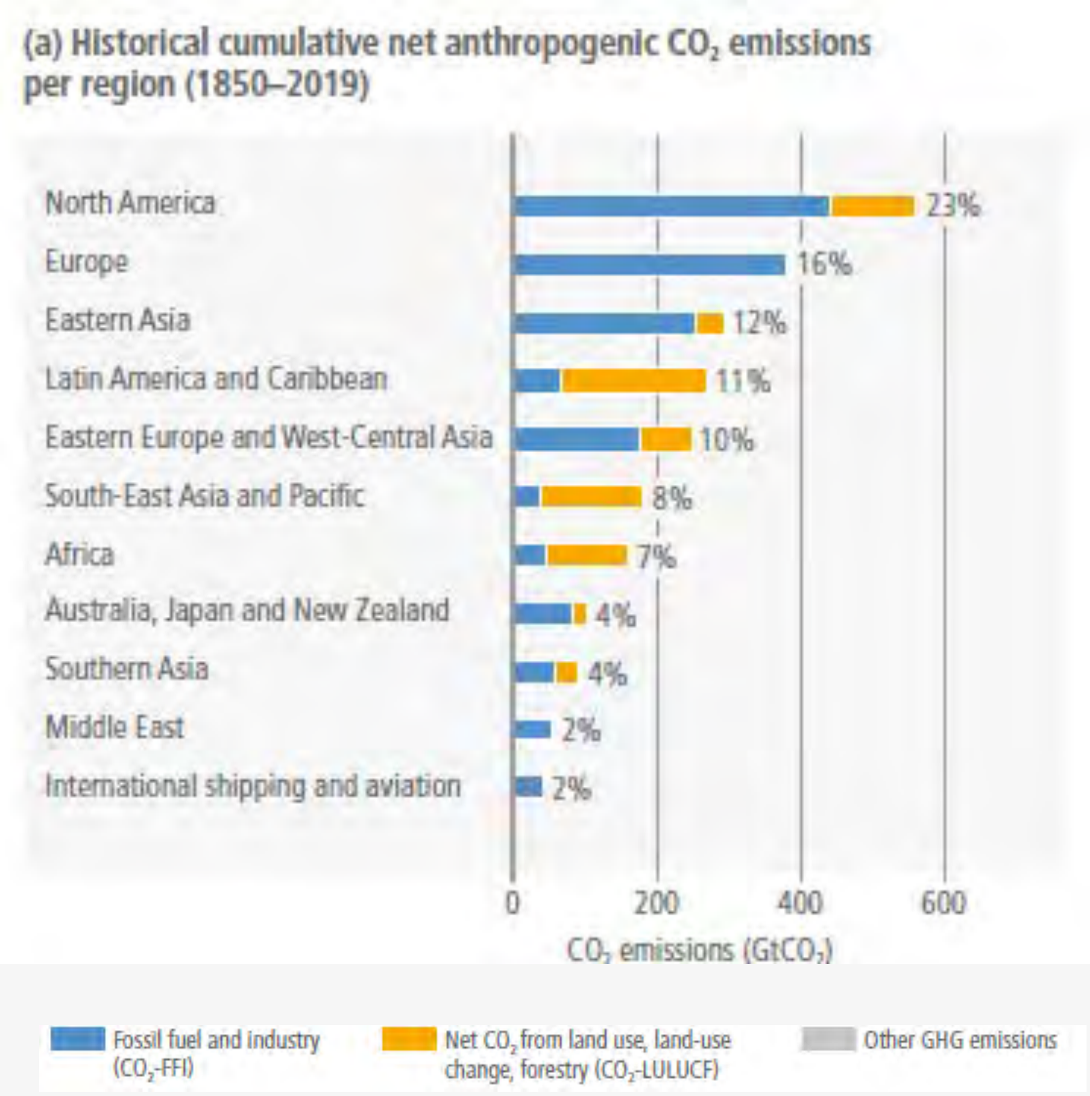
Joyashree Roy, Director of the SMARTS center and former Bangabandhu Chair Professor at Asian Institute of Technology, Thailand, Founder advisor to Global Change Programme Jadavpur University, Kolkata; Honorary Professor at CDMR , IIT Guwahati, India, National Fellow of the Indian Council of Social Sciences Research

There are options available now in every sector that can at least halve emissions by 2030

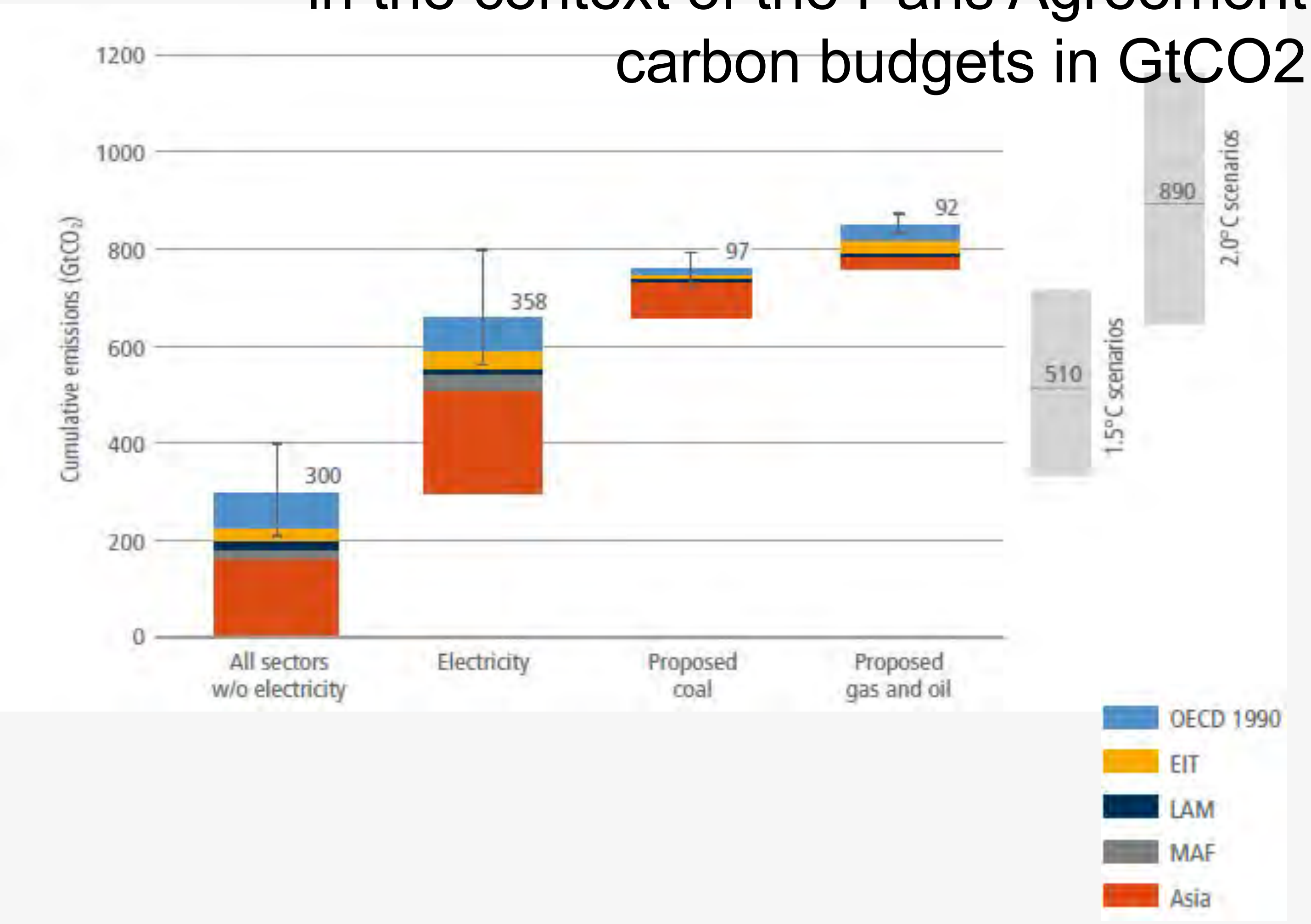
Demand-side measures can reduce burden of supply side decarbonisation need

Through infrastructure design, technology access, behavior change

Regional diversity in challenges



Future CO2 emissions from existing and currently planned fossil fuel infrastructure in the context of the Paris Agreement carbon budgets in GtCO2



Justice in Transition

To achieve net-zero would mean shifting employment from high- to low-carbon sectors, globally and even locally in carbon-intensive regions

Regional cooperation, new business, new infrastructure

changeframing.space

Joyashree Roy, Director of the SMARTS center and former Bangabandhu Chair Professor at Asian Institute of Technology, Thailand, Founder advisor to Global Change Programme Jadavpur University, Kolkata; Honorary Professor at CDMR , IIT Guwahati, India, National Fellow of the Indian Council of Social Sciences Research

Energy System Transition: challenge

"leave fossil fuel in the ground" and avoid burning it.
Growing pressure on oil and gas companies
Stranded asset /Uncertain CDR options

Job loss/Job switch/Job search
Income and revenue loss

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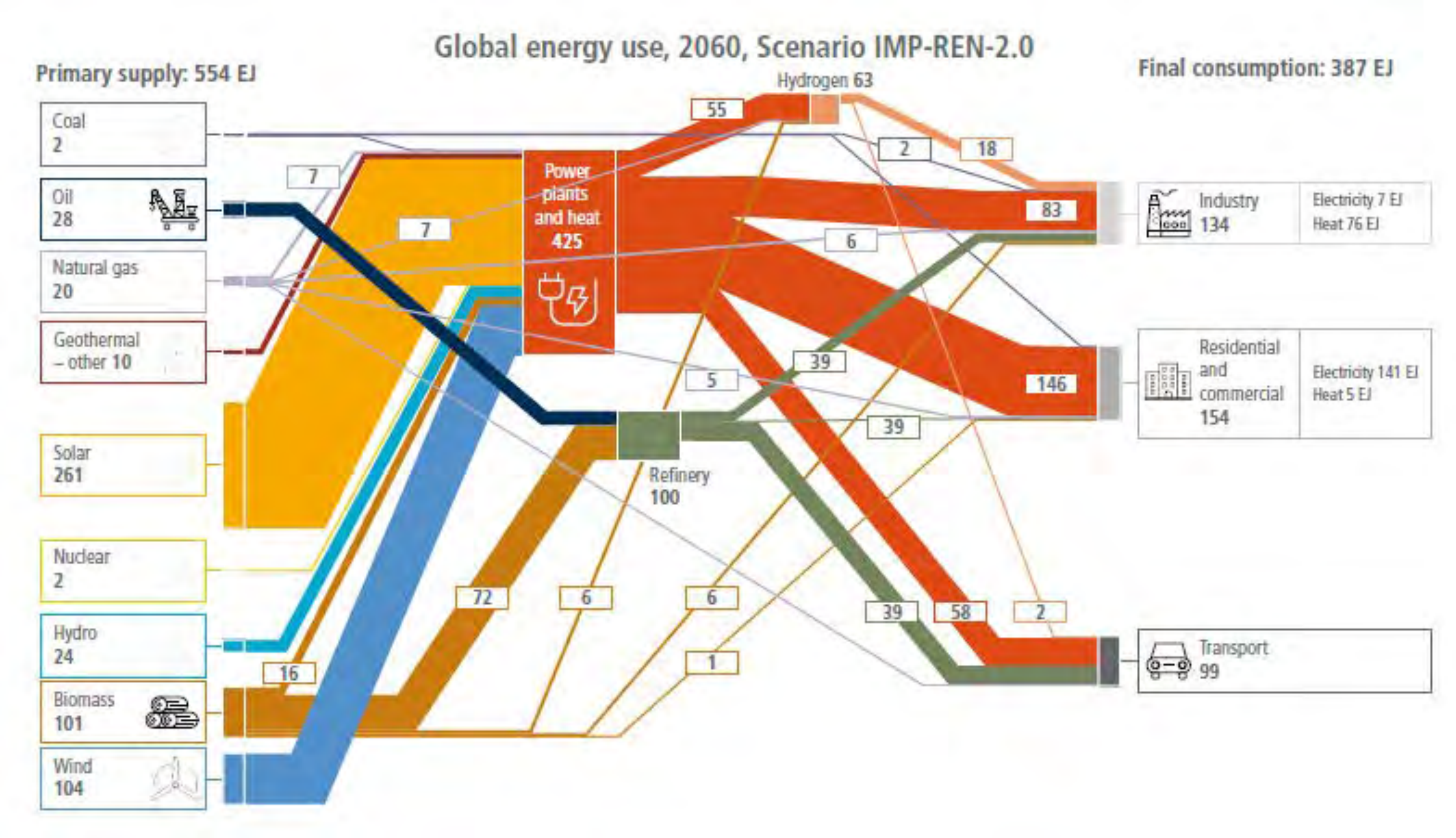

Global Energy flow within one of the illustrative future net-zero CO_2 emission global energy system: with high Renewables

How to maintain employment and decarbonize at the same time.

National just transition commissions or task forces, national policies, climate finance for just transition

A growing number of countries have cut emissions for more than 10 years while at the same time developing their economies, by moving to low or zero-carbon energy and reducing demand.

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Thank you!