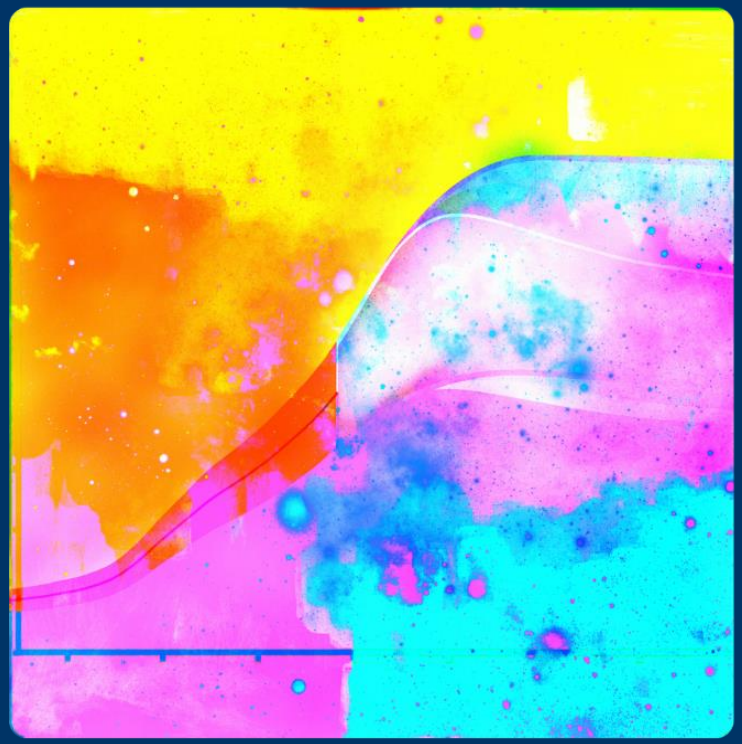
Priyadarshi Shukla, IPCC WGIII Co-Chair
Distinguished Professor
Global Center for Environment and Energy
Ahmedabad University



Emission Pathways and System Transitions in Asia:

Lessons from IPCC Special Report on 'Global Warming of 1.5°C'

Presented in:
Low Carbon Asia Research Network (LoCARNet)
7th Annual Meeting, Jakarta, Indonesia
November 21–22, 2018

Understanding Global Warming of 1.5°C

Ashley Cooper / Aurora Photos

Where are we now?

Since pre-industrial times, human activities have caused approximately 1°C of global warming.

- Already seeing consequences for people, nature and livelihoods
- At current rate, would reach 1.5°C between 2030 and 2052
- Past emissions alone do not commit the world to 1.5°C

Projected Climate Change, Potential Impacts and Associated Risks


Jason Florio / Aurora Photos

Impacts of global warming 1.5°C

At 1.5°C compared to 2°C:

- Less extreme weather where people live, including extreme heat and rainfall
- By 2100, global mean sea level rise will be around 10 cm lower but may continue to rise for centuries
- 10 million fewer people exposed to risk of rising seas
- Up to several hundred million fewer people exposed to climate-related risk and susceptible to poverty by 2050

Andre Seale / Aurora Photos

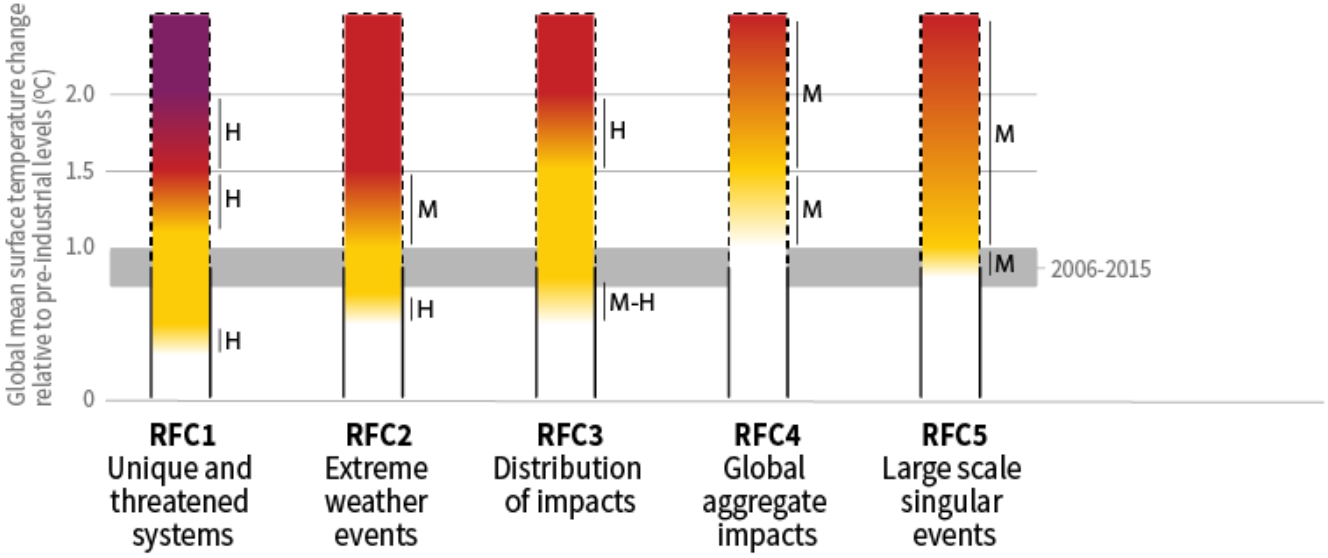
Impacts of global warming 1.5°C

At 1.5°C compared to 2°C:

- Lower impact on biodiversity and species
- Smaller reductions in yields of maize, rice, wheat
- Lower risk to fisheries and the livelihoods that depend on them
- Global population exposed to increased water shortages is up to 50% less

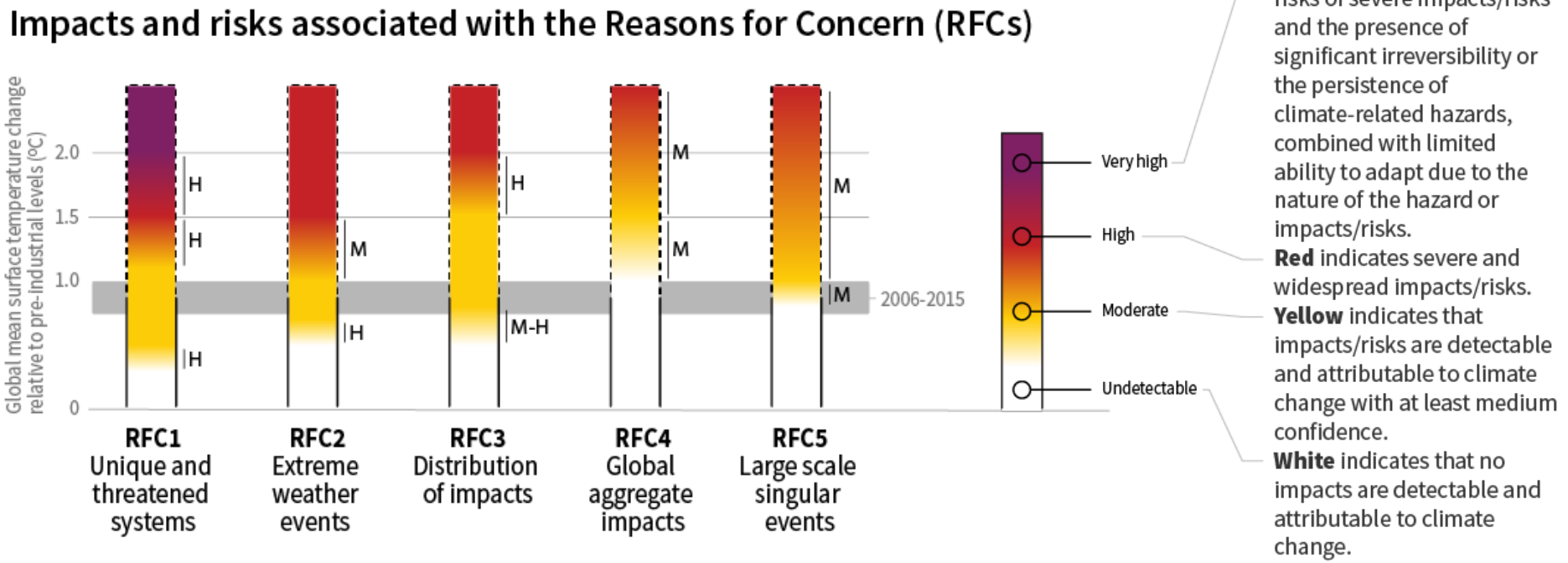
SPM2 | How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Impacts and risks associated with the Reasons for Concern (RFCs)



Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high

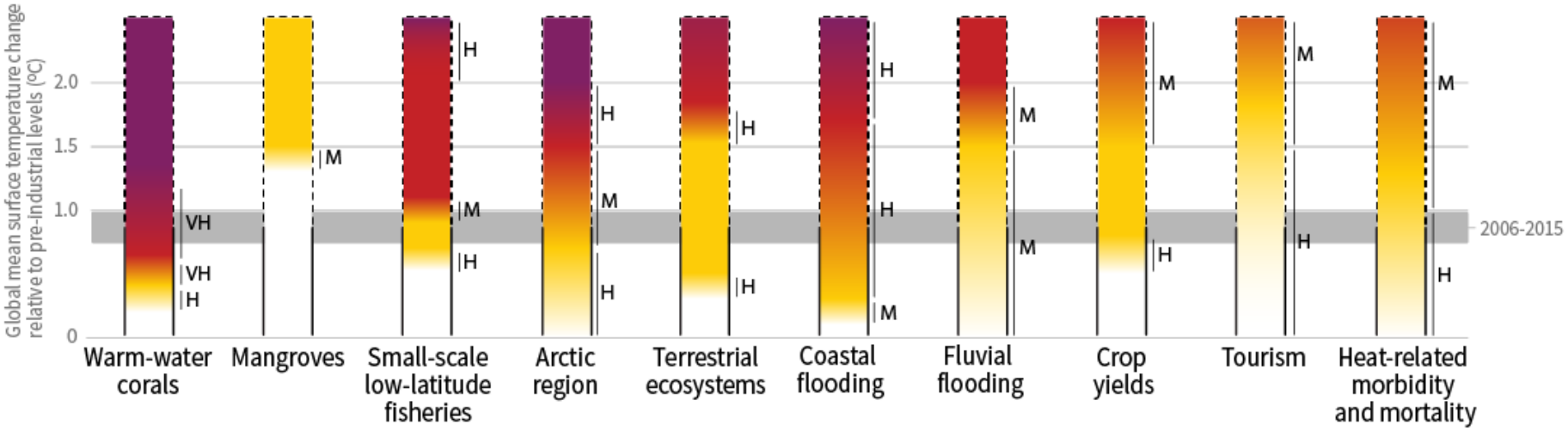
SPM2 | How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems



Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high

SPM2 | How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Impacts and risks for selected natural, managed and human systems



Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high

Emission Pathways and System Transitions Consistent with 1.5°C Global Warming

Carbon Budget (GtCO2)

- Using global mean surface temperature (GMST) methodology, the remaining carbon budget is **770 Gt CO2 for a 50% probability** of limiting warming to 1.5°C and **570 Gt CO2 for a 66% probability**
- The remaining carbon budget is being depleted by current emissions of **42±3 Gt** CO_2 per year.
- Additional carbon release from future permafrost thawing and methane release from wetlands would reduce budgets by up to **100 Gt CO_2**

Source: C1.3 SPM

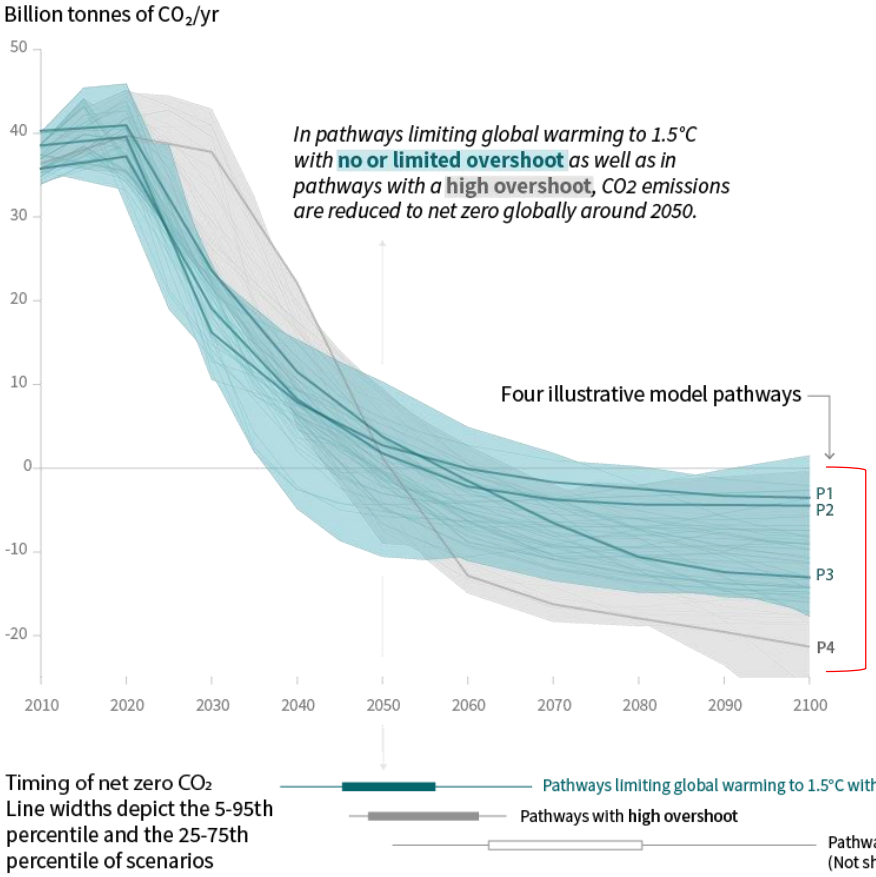
Greenhouse gas emissions pathways

- To limit warming to 1.5°C, CO_2 emissions fall by about 45% by 2030 (from 2010 levels)
  - ↳ Compared to 20% for 2°C
- To limit warming to 1.5°C, CO_2 emissions would need to reach 'net zero' around 2050
  - ↳ Compared to around 2075 for 2°C
- Reducing non-CO_2 emissions would have direct and immediate health benefits

Source: C1 SPM

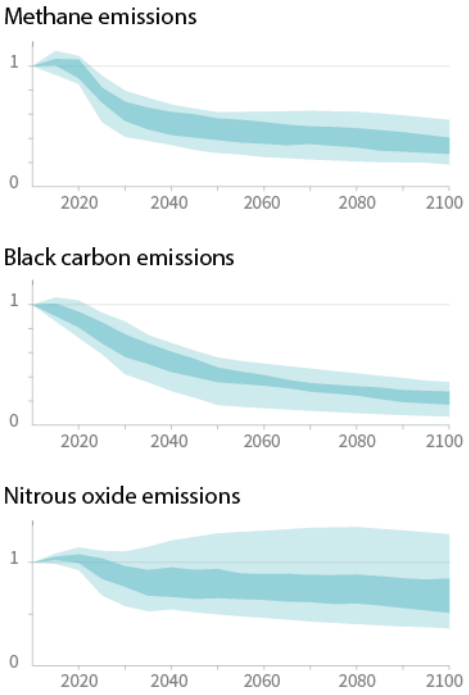
SPM3a | Global emissions pathway characteristics

Global total net CO_2 emissions



Non-CO_2 emissions relative to 2010

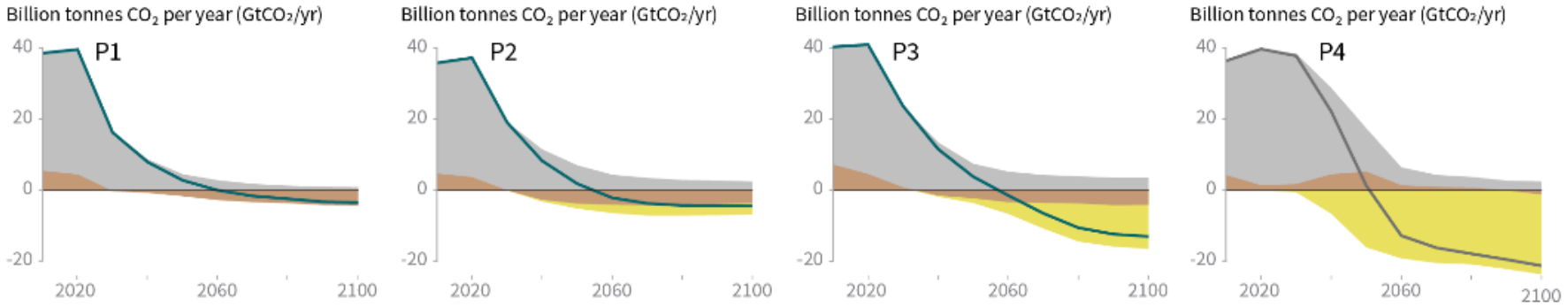
Emissions of non-CO_2 forcers are also reduced or limited in pathways limiting global warming to 1.5°C with no or limited overshoot, but they do not reach zero globally.



SPM3b | Characteristics of four illustrative model pathways

Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways

Fossil fuel and industry AFOLU BECCS



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

Andre Seale / Aurora Photos

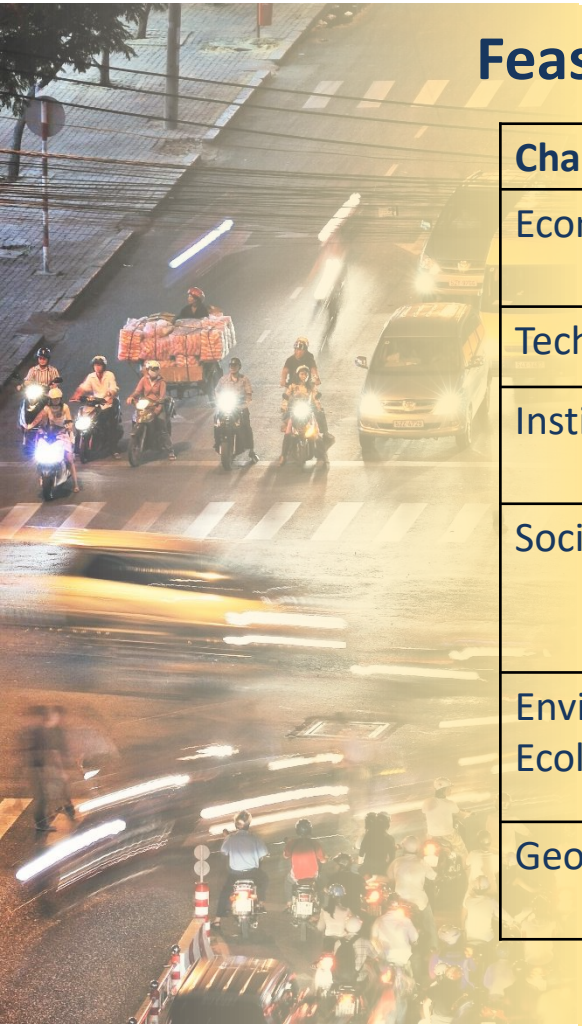
Systemic Changes for 1.5 °C-Consistent Pathways

- Energy System Transitions
- Land and Ecosystem Transitions
- Urban and Infrastructure System Transitions
- Industrial System Transitions
- Adaption Options for Transitions
- Short-lived Climate Forcers
- Carbon Dioxide Removal (CDR)
- Solar Radiation Modification (SRM)

Changes at Unprecedented Scale

- Limiting warming to 1.5°C would require changes on an unprecedented scale
  - Rapid and far-reaching transitions all sectors
  - A range of technologies
  - Behavioural changes
  - Increased investment in low carbon options

Source: C3 SPM



Feasibility Indicators for '1.5°C' Consistent Pathways

Characteristics	Indicators to Assess Feasibility of Mitigation Options
Economic	Cost-effectiveness; Absence of distributional effects; Employment & productivity, enhancement potential
Technological	Technical scalability; Maturity; Simplicity; Absence of risk
Institutional	Political acceptability; Legal & administrative feasibility Institutional capacity; Transparency & accountability potential
Socio-cultural	Social co-benefits (health, education); Public acceptance, Social & regional inclusiveness; Intergenerational equity, Human capabilities
Environmental/ Ecological	Reduction of air pollution; Reduction of toxic waste Reduction of water use; Improved biodiversity
Geophysical	Physical feasibility (physical potentials); Limited use of land; Limited use of scarce (geo)physical resources; Global spread

Source: Table 4.10

Aligning Ambition and Actions

- Progress in renewables would need to be mirrored in other sectors.
- The solutions required to limit warming to 1.5°C are available. What is required is to speed and scale up implementation.
- These solutions confer synergies with sustainable development


Jason Florio / Aurora Photos

Paris Agreement and 1.5°C Ambition

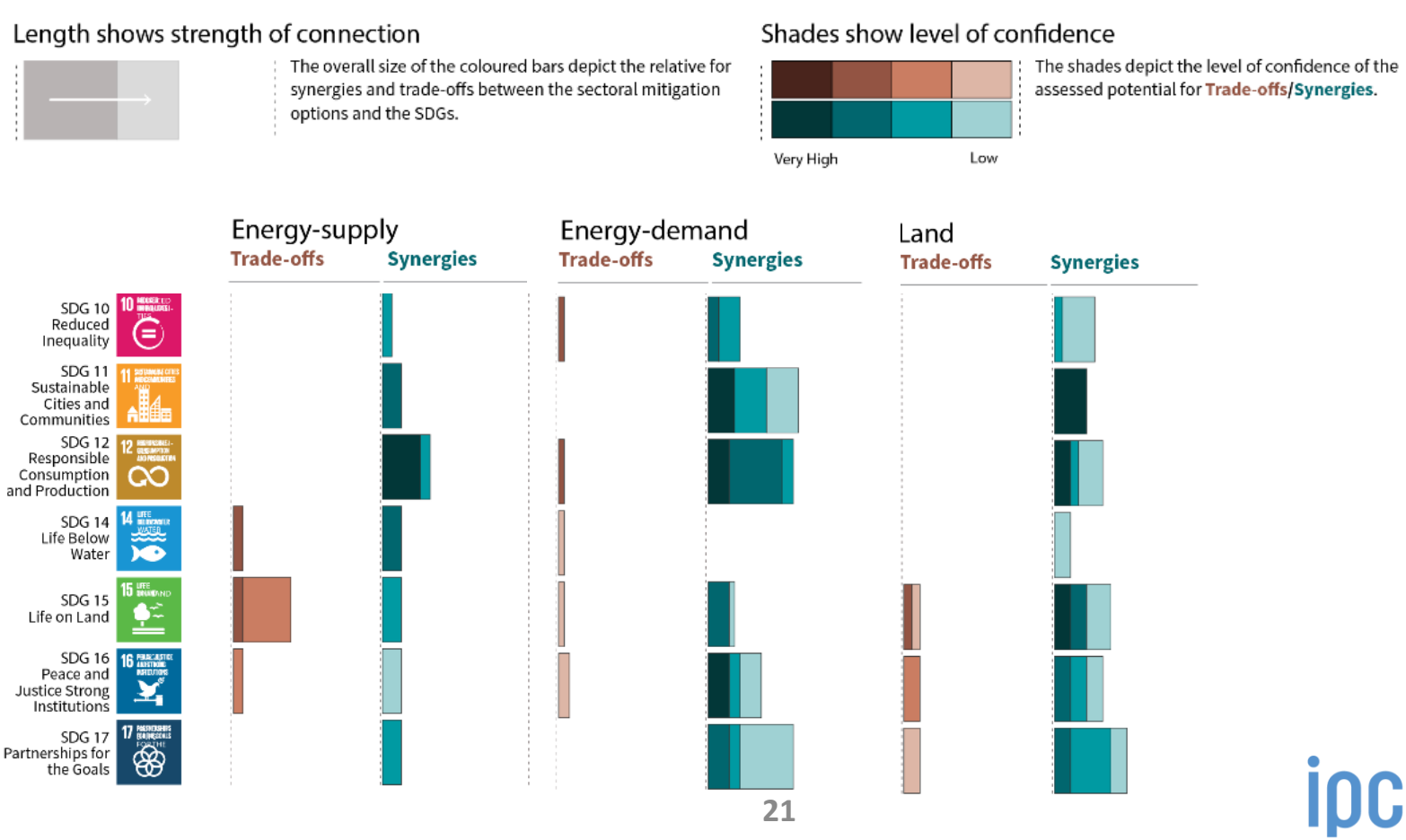
- Current national pledges on mitigation and adaptation are not enough to stay below the Paris Agreement temperature limits and achieve its adaptation goals.
- Transitions in energy efficiency, carbon intensity of fuels, electrification and land use change are underway in various countries.
- But limiting warming to 1.5°C will require a greater scale and pace of change to transform energy, land, urban and industrial systems globally.

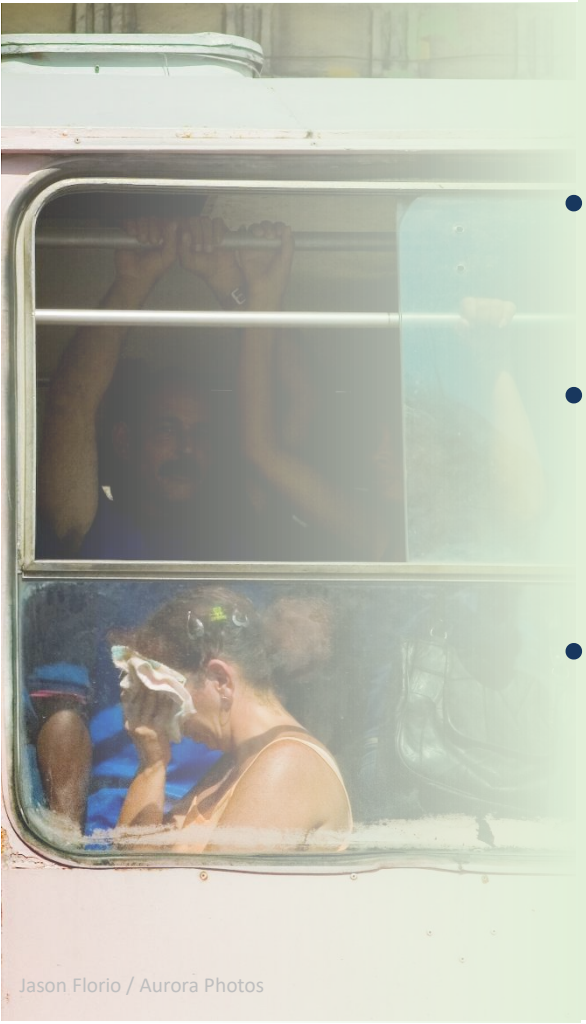

Jason Florio / Aurora Photos

Systemic Change & Sustainable Development

- Limiting warming to 1.5°C would require transformative systemic change, integrated with sustainable development.
- Such change would require the upscaling and acceleration of the implementation of far reaching, multi-level and cross-sectoral climate mitigation and addressing barriers.
- Systemic change would need to be linked to complementary adaptation actions, including transformational adaptation, especially for pathways that temporarily overshoot 1.5°C

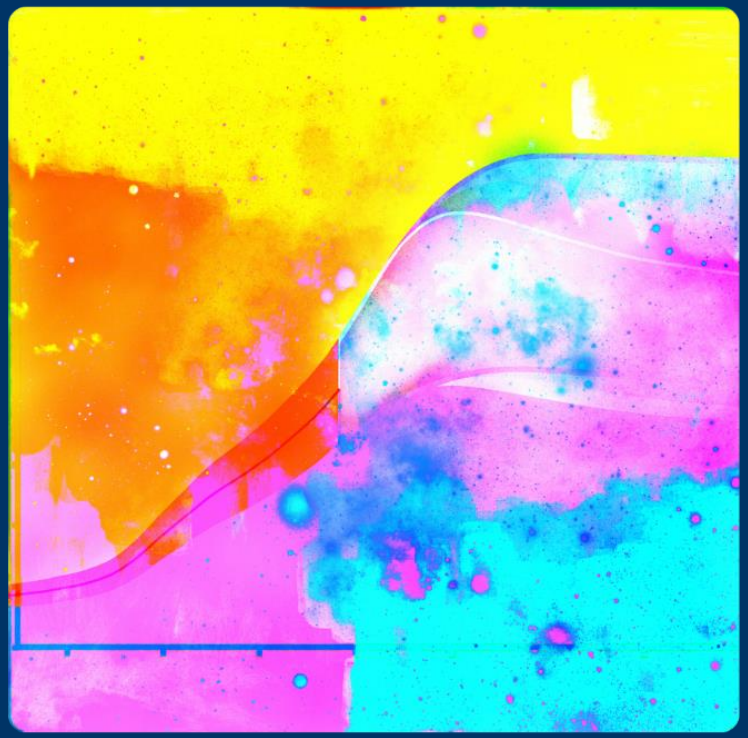
SPM4 | Indicative linkages between mitigation and sustainable development using SDGs (the linkages do not show costs and benefit)




Jason Florio / Aurora Photos

Raising Ambition, Resources and Capabilities

- To strengthen the global response, almost all countries would need to significantly raise their level of ambition.
- Developing countries and vulnerable communities will need additional resources and adaptation finance to adapt to 1.5°C.
- Implementation of this raised ambition would require enhanced institutional capabilities in all countries, including building the capability to utilize Indigenous and local knowledge.



Questions?