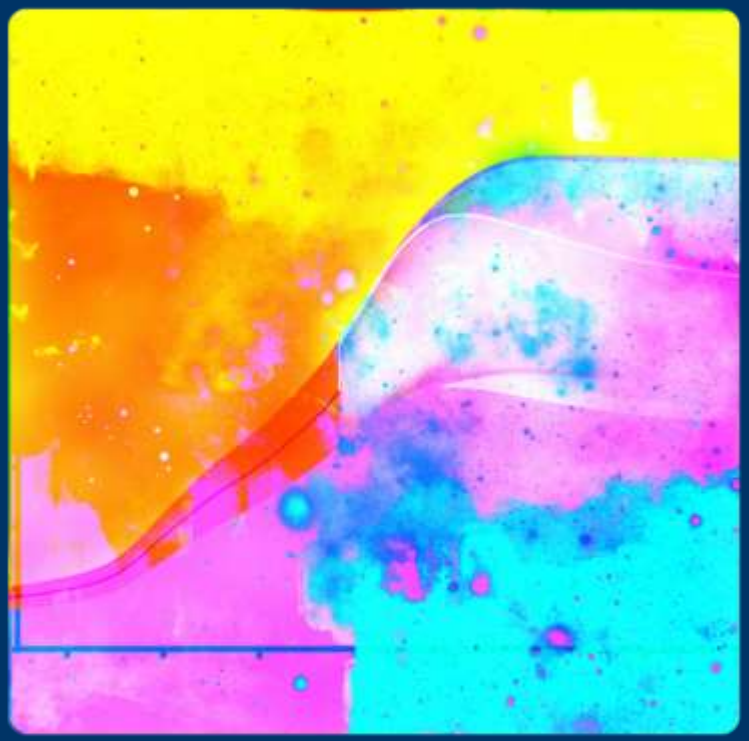


Mitigation and Adaptation Options

IPCC regional perspectives - Central and South America

December 5th, 2018

Dr. Debora Ley

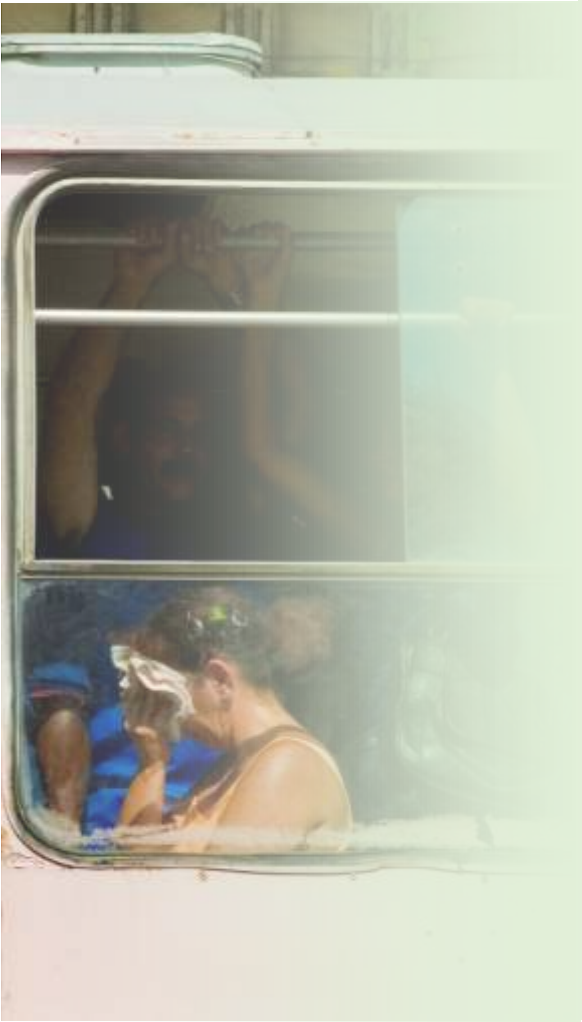
Feasibility Context: Mitigation & Adaptation Options to enable Four Systems Transitions

1. Energy System Transitions
2. Land and Ecosystem Transitions
3. Urban and Infrastructure System Transitions
4. Industrial system Transitions

+

Enabling Conditions &

Assess Synergies, Trade-offs & Knowledge Gaps



Adaptation needs will be lower in a 1.5°C world compared to a 2°C world *(high confidence)* and avoided impacts will be greater

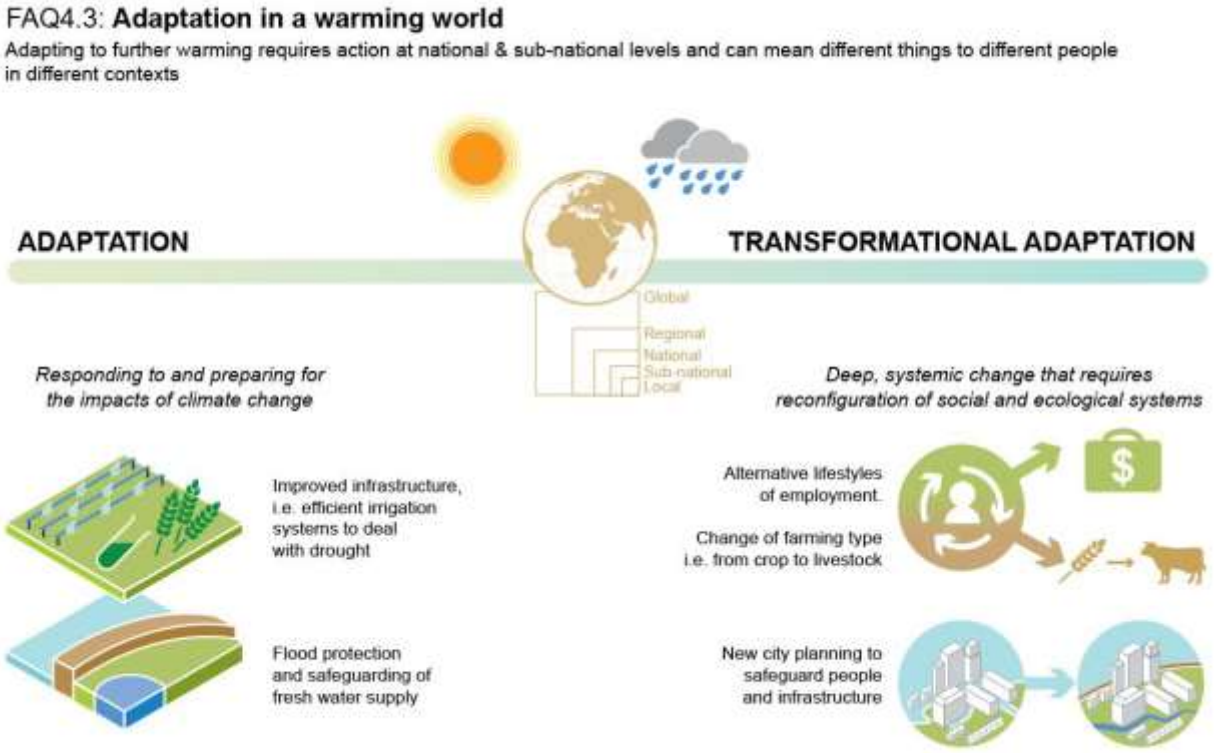
Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems adaptation facilitates adjustment to expected climate and its effects.

Jason Florio / Aurora Photos

Adaptation: Incremental and Transformational

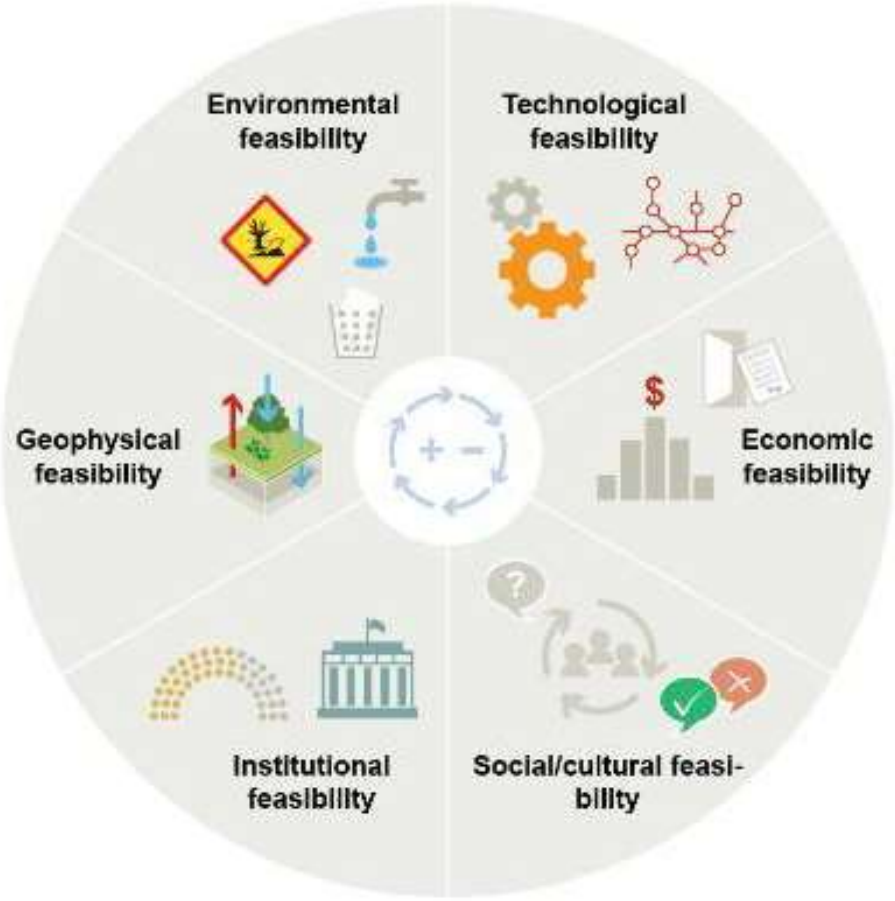
Incremental adaptation:
Adaptation that maintains th essence and integrity of a system or process at a given scale.

Transformational adaptatior
Adaptation that changes the fundamental attributes of a socio-ecological system in anticipation of climate chang and its impacts.



Feasibility assessment

Feasibility of options in system transitions



Mitigation and adaptation options assessed along six dimensions

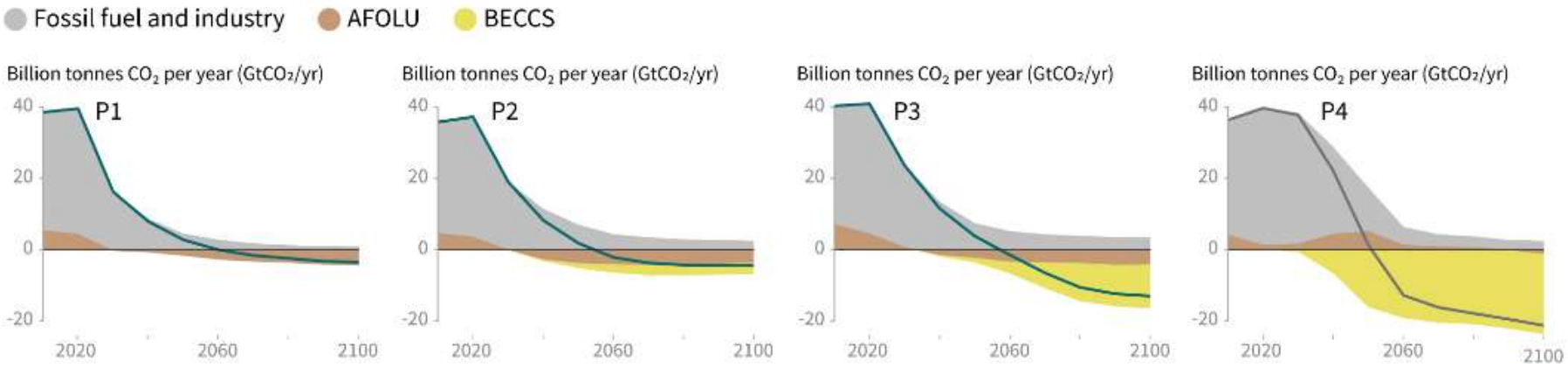
Result: where should a policymaker look first for quick wins? And what barriers need to be overcome?

Dimensions	Adaptation indicators	Mitigation indicators
Economic	Micro-economic viability Macro-economic viability Socio-economic vulnerability reduction potential Employment & productivity enhancement potential	Cost-effectiveness Absence of distributional effects Employment & productivity enhancement potential
Technological	Technical resource availability Risks mitigation potential	Technical scalability Maturity Simplicity Absence of risk
Institutional	Political acceptability Legal & regulatory feasibility Institutional capacity & administrative feasibility Transparency & accountability potential	Political acceptability Legal & administrative feasibility Institutional capacity Transparency & accountability potential
Socio-cultural	Social co-benefits (health, education) Socio-cultural acceptability Social & regional inclusiveness Intergenerational equity	Social co-benefits (health, education) Public acceptance Social & regional inclusiveness Intergenerational equity Human capabilities
Environmental / ecological	Ecological capacity Adaptive capacity/ resilience building potential	Reduction of air pollution Reduction of toxic waste Reduction of water use Improved biodiversity
Geophysical	Physical feasibility Land use change enhancement potential Hazard risk reduction potential	Physical feasibility (physical potentials) Limited use of land Limited use of scarce (geo)physical resources Global spread
	Total:19 indicators	**Total: 24 indicators**

Feasibility of options in system transitions

Adaptation indicators	Guiding questions for adaptation indicators
Micro-economic viability (benefits, costs, trade-offs & lock-ins)	What are the costs and trade-offs of the adaptation option (to what extent are vulnerable people, systems benefitted)?
Macro-economic viability (investment and financial, consumption, investment, inflation & trade)	Would the option lead to higher productivity? Does it lead to employment generation? Does it cost jobs?
Socio-economic vulnerability reduction potential	To what extent is the option reducing inequalities and enhancing economic opportunities?
Employment & productivity enhancement potential	How many people that can be employed or how much can a system's productivity increase under the option (without distorting employment generation potential and causing loss of jobs)

Feasibility of key options in illustrative model pathways



	Mitigation Option	Confidence	Economic	Technological	Institutional	Socio-cultural	Environmental	Geophysical	Context
All	Solar PV	High							Solar irradiation, incentive regime, legal framework for independent power producers
P1	Low/zero-energy buildings	High							Size of existing building stock, growth of building stock
P1, P2	Afforestation & reforestation	High							Depends on location, mode of implementation, and economic and institutional factors
P3, P4	Power sector CO_2 capture and storage	High							Local CO_2 storage capacity, presence of legal framework, level of development and quality of public engagement
P3, P4	BECCS	Medium							Depends on biomass availability, CO_2 storage capacity, legal framework, economic status and social acceptance

UNEP

Feasibility of Mitigation Options

System	Mitigation option	Evidence	Agreement	Ec	Tec	Inst	Soc	Env	Geo	Context
Energy system transitions	Wind energy (on-shore & off-shore)	Robust	Medium							Wind regime, economic status, space for windfarms and enhanced by legal framework for independent power producers affect uptake; cost-effectiveness affected by incentive regime.
	Solar PV	Robust	High							Cost-effectiveness affected by solar irradiation and incentive regime. Also enhanced by legal framework for independent power producers affect uptake.
	Bioenergy	Robust	Medium							Depends on availability of biomass and land and capability to manage sustainable land use. Distributional effects depend on the agrarian (or other) system used to produce feedstock.
	Electricity storage	Robust	High							Batteries universal but grid flexible resources vary with area's level of development
Land & ecosystem transitions	Reduced food wastage & efficient food production	Robust	High							Will depend on the combination of individual and institutional behaviour
	Dietary shifts	Robust	High							Depends on individual behaviour, education, cultural factors and institutional support
	Sustainable intensification of agriculture	Robust	High							Depends on development and deployment of new technologies
	Ecosystems restoration	Medium	High							Depends on location and institutional factors

Feasibility of Mitigation Options

System	Mitigation option	Evidence	Agreement	Ec	Tec	Inst	Soc	Env	Geo	Context
Urban & infrastructure transitions	Land-use & urban planning	Robust	Medium							Varies with urban fabric, not geography or economy; requires capacitated local government and legitimate tenure system
	Electric cars and buses	Medium	High							Varies with degree of government intervention; requires capacity to retrofit "fuelling" stations
	Sharing schemes	Limited	Medium							Historic schemes universal new ones depend on ICT status; undermined by high crime and low levels of law enforcement
	Public transport	Robust	Medium							Depends on presence of existing 'informal' taxi systems, which may be more cost effective and affordable than capital intensive new build schemes, as well as (local) government capabilities
	Non-motorised transport	Robust	High							Viability rests on linkages with public transport, cultural factors, climate and geography
	Aviation & shipping	Medium	Medium							Varies with technology, governance and accountability
	Smart Grids	Medium	Medium							Varies with economic status and presence or quality of existing grid
	Efficient appliances	Medium	High							Adoption varies with economic status and policy framework
	Low/zero-energy buildings	Medium	High							Depends on size of existing building stock and growth of building stock
Industrial system transitions	Efficiency	Robust	High							Potentials and adoption depends on existing efficiency, energy prices and interest rates, as well as government incentives.
	Afforestation & reforestation	Robust	High							Depends on location, mode of implementation, and economic and institutional factors
	Soil carbon sequestration & biochar	Robust	High							Depends on location, soil properties, time span

Feasibility of Adaptation Options

System	Adaptation option	Evidence	Agreement	Ec	Tec	Inst	Soc	Env	Geo	Context
Energy system transitions	Power infrastructure, including water	Medium	High							Depends on existing power infrastructure, all generation sources and with intensive water requirements
Land & ecosystem transitions	Conservation agriculture	Medium	Medium							Depends on irrigated/rainfed system, ecosystem characteristics, crop type, other farming practices
	Efficient irrigation	Medium	Medium							Depends on agricultural system, technology used, regional institutional and biophysical context
	Efficient livestock	Limited	High							Dependent on livestock breeds, feed practices,and biophysical context (e.g. carrying capacity)
	Agroforestry	Medium	High							Depends on knowledge, financial support, and market conditions
	Community-based adaptation	Medium	High							Focus on rural areas and combined with ecosystems-based adaptation, does not include urban settings
	Ecosystem restoration & avoided deforestation	Robust	Medium							Mostly focused on existing and evaluated REDD+ projects
	Biodiversity management	Medium	Medium							Focus on hotspots of biodiversity vulnerability and high connectivity
	Coastal defense & hardening	Robust	Medium							Depends on locations that require it as a first adaptation option
	Sustainable aquaculture	Limited	Medium							Depends on locations at risk and socio-cultural context
Urban & infrastructure system transitions	Sustainable land-use & urban planning	Medium	Medium							Depends on nature of planning systems and enforcement mechanisms
	Sustainable water management	Robust	Medium							Balancing sustainable water supply and rising demand especially in low-income countries
	Green infrastructure & ecosystem services	Medium	High							Depends on reconciliation of urban development with green infrastructure

Feasibility of Adaptation Options

System	Adaptation option	Evidence	Agreement	Ec	Tec	Inst	Soc	Env	Geo	Context
	Building codes & standards	Limited	Medium							Adoption requires legal, educational, and enforcement mechanisms to regulate buildings
Industrial system transitions	Intensive industry infrastructure resilience and water management	Limited	High							Depends on intensive industry, existing infrastructure and using or requiring high demand of water
Overarching adaptation options	Disaster risk management	Medium	High							Requires institutional, technical, and financial capacity in frontline agencies and government
	Risk spreading and sharing	Medium	Medium							Requires well developed financial structures and public understanding
	Climate services	Medium	High							Depends on climate information availability and usability, local infrastructure and institutions, national priorities
	Indigenous knowledge	Medium	High							Dependent on recognition of Indigenous rights, laws, and governance systems
	Education and learning	Medium	High							Existing education system, funding
	Population health and health system	Medium	High							Requires basic health services and infrastructure
	Social safety nets	Medium	Medium							Type and mechanism of safety net, political priorities, institutional transparency
	Human migration	Medium	Low							Hazard exposure, political and socio-cultural acceptability (in destination), migrant skills and social networks

Critical enabling conditions

- Finance & investment
  - Additional 2.5% overall, but considerable redirection from fossil to low-emission
- Policy instrumentation
  - Including de-risking investment
- Institutional capacity
  - Needed globally in e.g. government, companies, communities and banks
- Governance: ability to cooperate across actors
- Behaviour change, also for public support
- Technological innovation

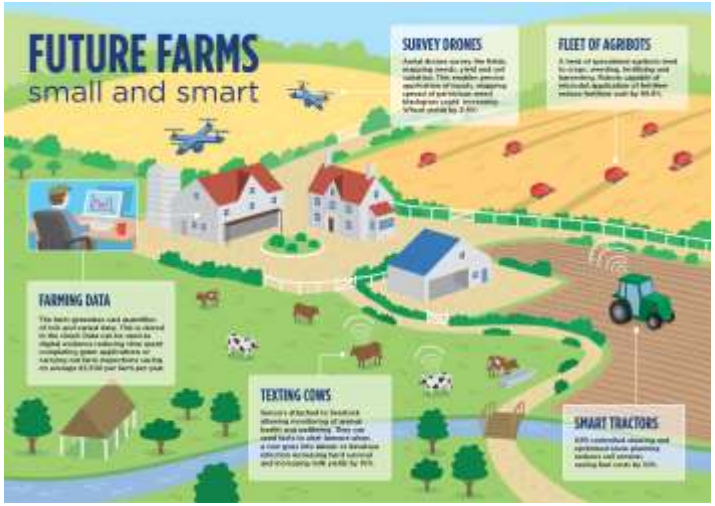
Peter Essick / Aurora Photos

Behavioral changes and socio-cultural feasibility of adaptation

- Farmer decision making
- Building design
- Water conservation
- Role of incentives

Technology innovations and feasibility for adaptation

- Precision agriculture
- Smart homes and cities
- Disaster early warning

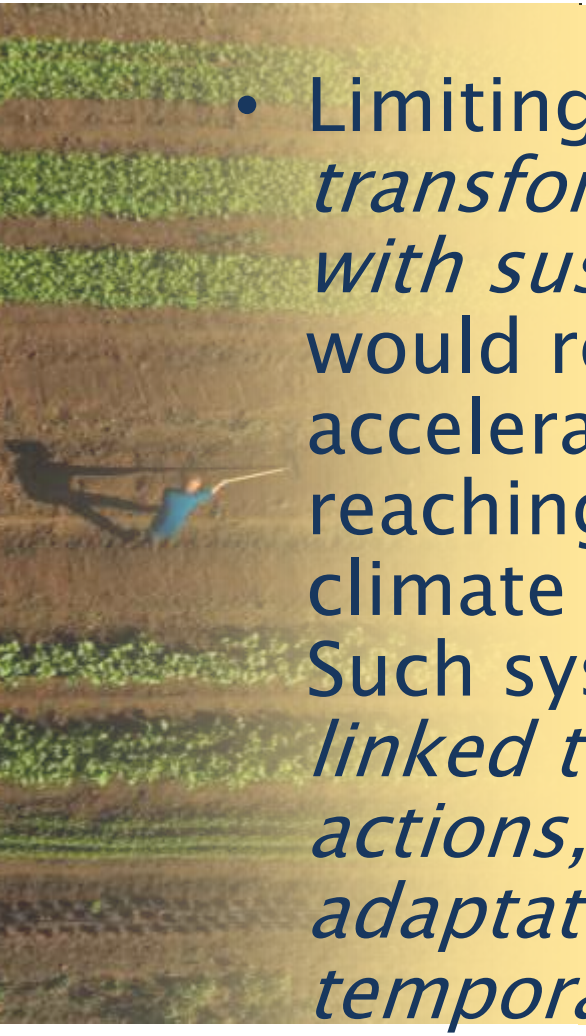


Climate Resilience in LAC

Case Studies of LAC Highlighted in the SR

- Mayan Indigenous Knowledge
- Integrated Watershed Management in Guatemala
- Disaster preparedness, response, and governance in the Caribbean (Cuba, Jamaica, UK Outer Territories)
- Forests, food security, and poverty alleviation in the Amazon

Summary for Policy Makers (SPM)



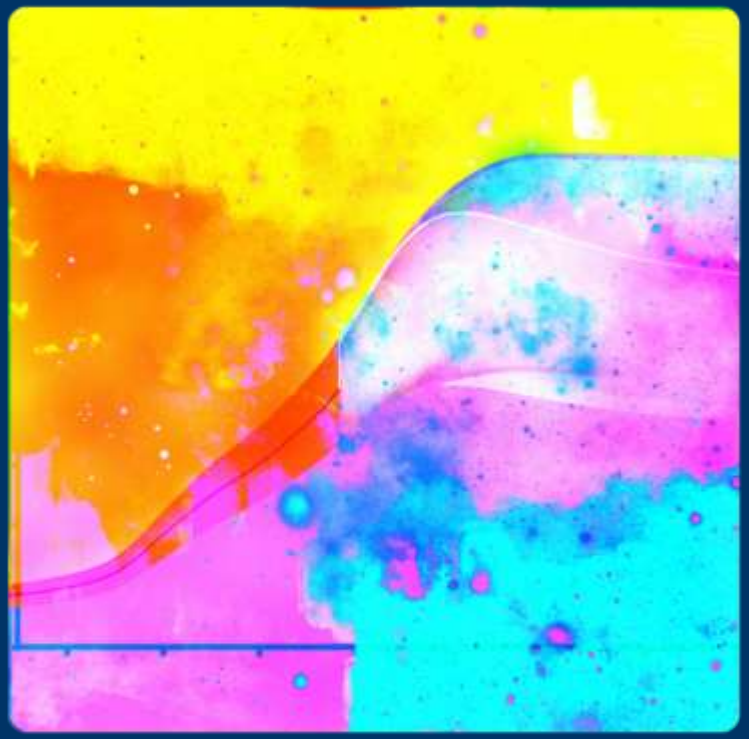
- Limiting warming to 1.5°C would require *transformative systemic change, integrated with sustainable development*. Such change would require the upscaling and acceleration of the implementation of far-reaching, multi-level and cross-sectoral climate mitigation and addressing barriers. Such systemic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

Peter Essick / Aurora Photos

Summary for Policy Makers (SPM)

- *A mix of mitigation and adaptation options implemented in a participatory and integrated manner can enable rapid, systemic transitions in urban and rural areas that are necessary elements of an accelerated transition to 1.5°C worlds. Such options and changes are most effective when aligned with economic and sustainable development, and when local and regional governments are supported by national governments*
- Increasing evidence suggests that a climate-sensitive realignment of savings and expenditure towards low-emission, *climate-resilient infrastructure* and services requires an evolution of global and national financial systems

Peter Essick / Aurora Photos



Thank you!

Questions?

debbieannley@yahoo.com