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Climate Action: Progress at Scale

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How can we make *progress at scale* on climate change mitigation, adaptation, and resilience?

Scaling for Climate Change Mitigation

- Numerous studies and pathways: Net Zero frameworks
- California Roadmap
- Technology innovations: solar, wind, storage, transportation (EV, sustainable fuels), zero-carbon manufacturing, CCUS, …
- Scaling: cost reduction via commercialization of products and services

Scaling strategies for Climate Change Adaptation and Resilience are in their Infancy

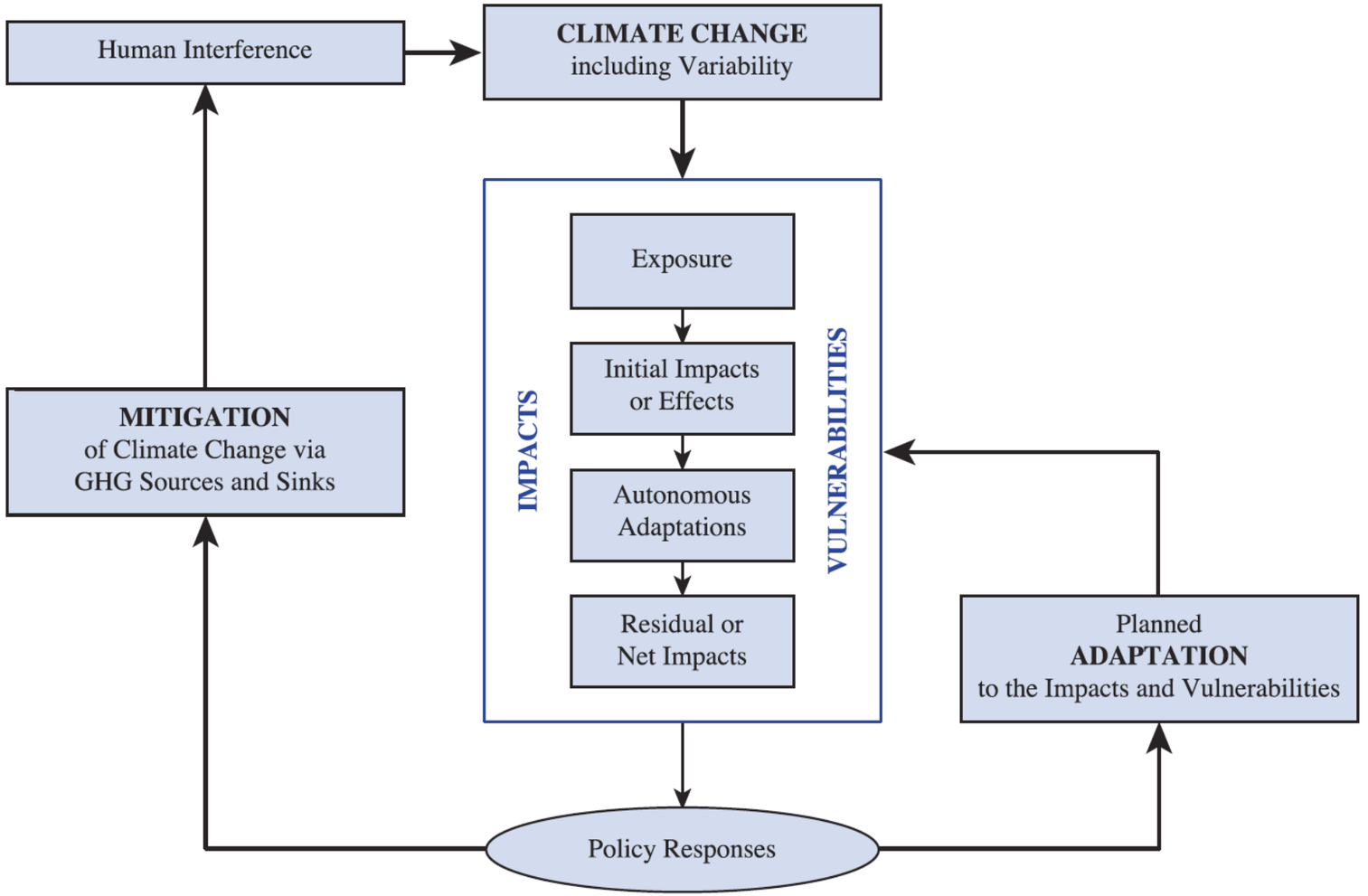


Figure 1

Scope of the Working Group II assessment of the Intergovernmental Panel on Climate Change's Third Assessment Report, Technical Summary. Abbreviation: GHG, greenhouse gas. Figure reprinted from Reference 2.

Source: The Concept of Adaptation, Ben Orlove, 2021

Climate Change Adaptation and Resilience

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, human intervention may facilitate adjustment to expected climate and its effects.

Resilience

- The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure.
- Resilience is a positive attribute when it maintains capacity for adaptation, learning and/or transformation

Source: IPCC, 2022

Too Little, Too Slow

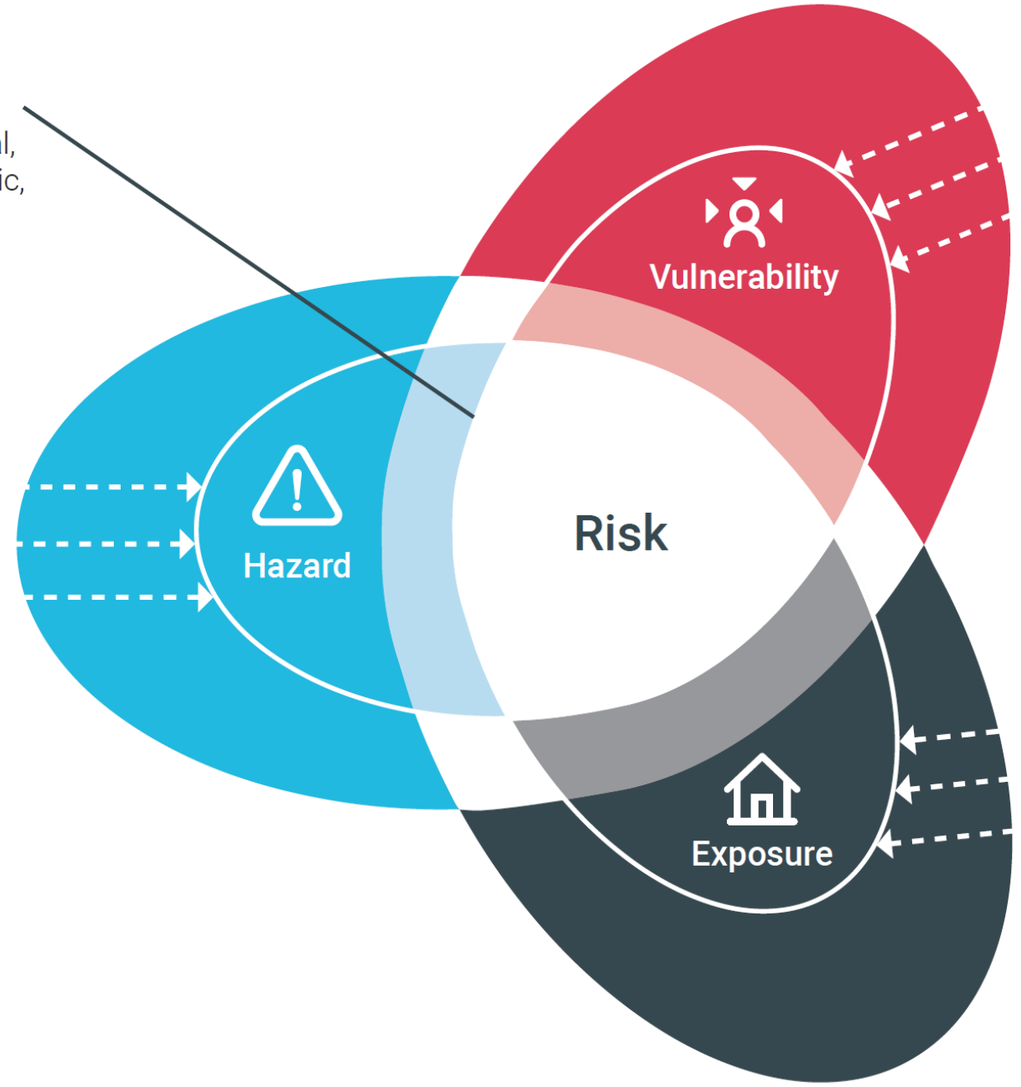
Climate adaptation failure
puts world at risk

Adaptation Gap Report 2022

Figure 5.1 Risk as defined by the IPCC

Limits to adaptation

- E.g. physical, ecological, technological, economic, political, institutional, psychological, and/or socio-cultural



Actions to reduce hazards

Examples include:

- Ecosystem-based measures to reduce coastal flooding
- Mangroves to alleviate coastal storm energy
- Water reservoirs to buffer low-flows and water scarcity

Actions to reduce vulnerability

Examples include:

- Social protection
- Livelihood diversification
- Insurance solutions
- Hazard-proof housing and infrastructure

Actions to reduce exposure

Examples include:

- Coastal retreat and resettlement
- Risk sensitive land use planning
- Early warning systems and evacuations

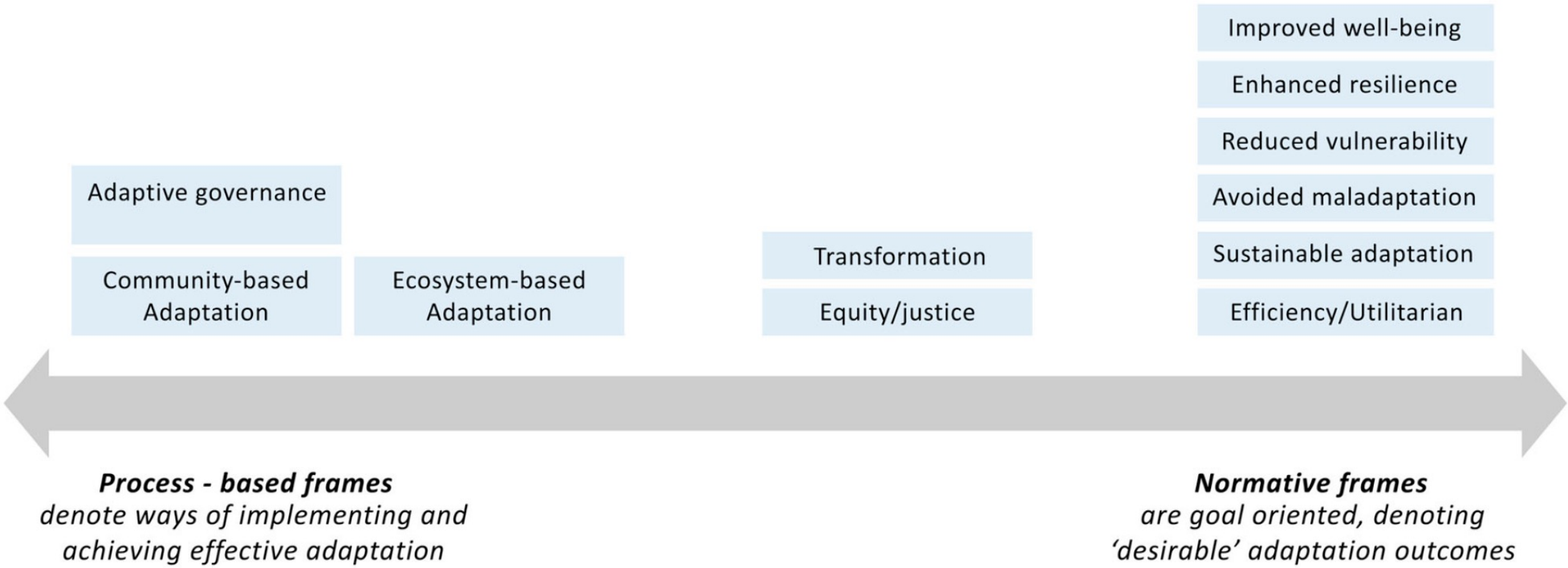


Figure 1. Frames to understand adaptation effectiveness range across a continuum of being process- or outcome-based. Source: authors, developed from the literature.

C. Singh, et al. Interrogating 'effectiveness' in climate change adaptation: 11 guiding principles for adaptation research and practice, 2022.

Table 2. Eleven principles for effective adaptation.

Adaptation should

(1) minimize costs, and maximize benefits
(2) support achievement of material, subjective, and relational wellbeing goals
(3) reduce vulnerability and/or increase adaptive capacity, especially of the most vulnerable and those most at risk to climate change
(4) increase resilience by building functional persistence over long timescales so that systems have the ability to bounce back from climatic shocks
(5) be economically, ecologically, and socially sustainable, explicitly looking at longer-term, cross-generational viability of adaptation actions
(6) take into account unintended negative consequences and explicitly look at the cross-scalar, long-term impacts of adaptation actions
(7) invest in ecosystem conservation, management and restoration to enhance ecosystem services, and hence reduce impacts of climate change on human systems
(8) be co-produced with communities to ensure inclusive and sustainable adaptation
(9) be oriented towards achieving transparency, accountability and representation in governance through multi-scalar, participatory, and inclusive processes
(10) be oriented toward socially just and equitable processes and outcomes
(11) be a process that fundamentally changes human thinking and practices in the face of climate change and overtly challenge the power structures that generate vulnerability to its impacts

C. Singh, et al. Interrogating 'effectiveness' in climate change adaptation: 11 guiding principles for adaptation research and practice, 2022.

Strengthening Adaptation-Mitigation Linkages for a Low-Carbon, Climate-Resilient Future

POLICY PERSPECTIVES

OECD ENVIRONMENT POLICY PAPER NO. 23

TABLE 3. **The multiple co-benefits offered by nature-based solutions (NbS)**

	Associated ecosystem services							
Nature-based Solution	Coastal protection	Reduction in riverine flood impacts	Reduction in urban flood impacts	Filtering pollution	Carbon sequestration	Habitat creation	Heat mitigation	Recreational opportunities
Protecting/ restoring coastal habitats	●			●	●	●		●
Protecting/ restoring upland forests		●	●	●	●	●	●	●
Creating urban green spaces			●	●		●	●	●

Source: (OECD, 2020[39])

TABLE 1. **Adaptation-mitigation linkages in G20 members' NAPs and NDCs**

Sector	Climate action	Mitigation benefit	Adaptation benefit	Trade-offs
Forestry	Forest conservation and rehabilitation	Carbon sequestration	Increase resilience to water-related risks (floods, landslides, mudslides, torrents)	Monoculture plantations can be susceptible to fire
Agriculture and land management	Use of crop varieties with higher drought and pest resistance; Sustainable land management practices (efficient nitrogen use and soil management)	GHG emissions savings from reduced energy consumption for irrigation and improved soil quality	Increase resilience to droughts and floods	Biofuel production in some context
Water management	Protect and restore marine ecosystems such as seagrass beds, mangroves, saltmarsh, coastal wetland; storm water management	Carbon sequestration	Enhance resilience to water-related risks (coastal floods and storms; droughts)	Solar water pumps in arid zones
Urban planning	Urban green space expansion (parks, green roofs)	Carbon sequestration, GHG emissions savings from reduced energy consumption for cooling	Increase resilience to extreme heat and urban floods (by decreasing urban heat island effect and increasing water absorption capacity)	Building less dense areas; use of air-conditioning

Source: Adapted from table 3 in (UNFCCC, 2016[21]); presentations at the first G20 CSWG meeting in March 2020 by Dr. Taha Zatari (KSA) (Zatari, 2020[22]), by Tarek Sadek from the ESCWA (Sadek, 2020[23]), by JP Gattuso (Gattuso, 2020[24]) and by David Thomas (Thomas, 2020[25]).

FIGURE 2. **Aligning climate change mitigation and adaptation policies: differences, synergies and trade-offs**

SYNERGIES

Carbon sequestration that simultaneously reduces exposure to climate change impacts (e.g. reforestation that reduces landslide hazard, mangrove restoration that reduces coastal hazards).

GHG emissions reduction that simultaneously reduces exposure to climate change impacts (e.g. increasing urban green spaces to reduce urban heat island effect).

DIFFERENCES

Different knowledge and information required to inform policy making

Distinct stakeholders

Distinct distributional impacts
(global mitigation vs. local adaptation benefits)

TRADE-OFFS

Mitigation actions that increase exposure and vulnerability to climate change
(e.g. hydropower investments in hazard prone areas)

Adaptation actions that undermine mitigation efforts
(e.g. air conditioning investments)

Source: OECD, 2021

California Climate Adaptation Desired Outcomes

- Strengthen Protections for Climate Vulnerable Communities
- Bolster Public Health and Safety to Protect Against Increasing Climate Risks
- Build a Climate Resilient Economy
- Accelerate Nature-Based Climate Solutions and Strengthen Climate Resilience of Natural Systems
- Make Decisions Based on the Best Available Climate Science
- Partner and Collaborate to Leverage Resources

Strengthen Protections for Climate Vulnerable Communities

- Goal A: Engage with and build capacity in climate-vulnerable communities
- Goal B: Improve understanding of climate impacts on California's communities, including the forces that drive vulnerability
- Goal C: Build resilience in climate-vulnerable communities through state programs

Bolster Public Health and Safety to Protect Against Increasing Climate Risks

- Goal A: Reduce urgent public health and safety risks posed by climate change
- Goal B: Consider future climate impacts in governmental planning and investment decisions
- Goal C: Improve infrastructure’s climate resilience to protect public health and safety

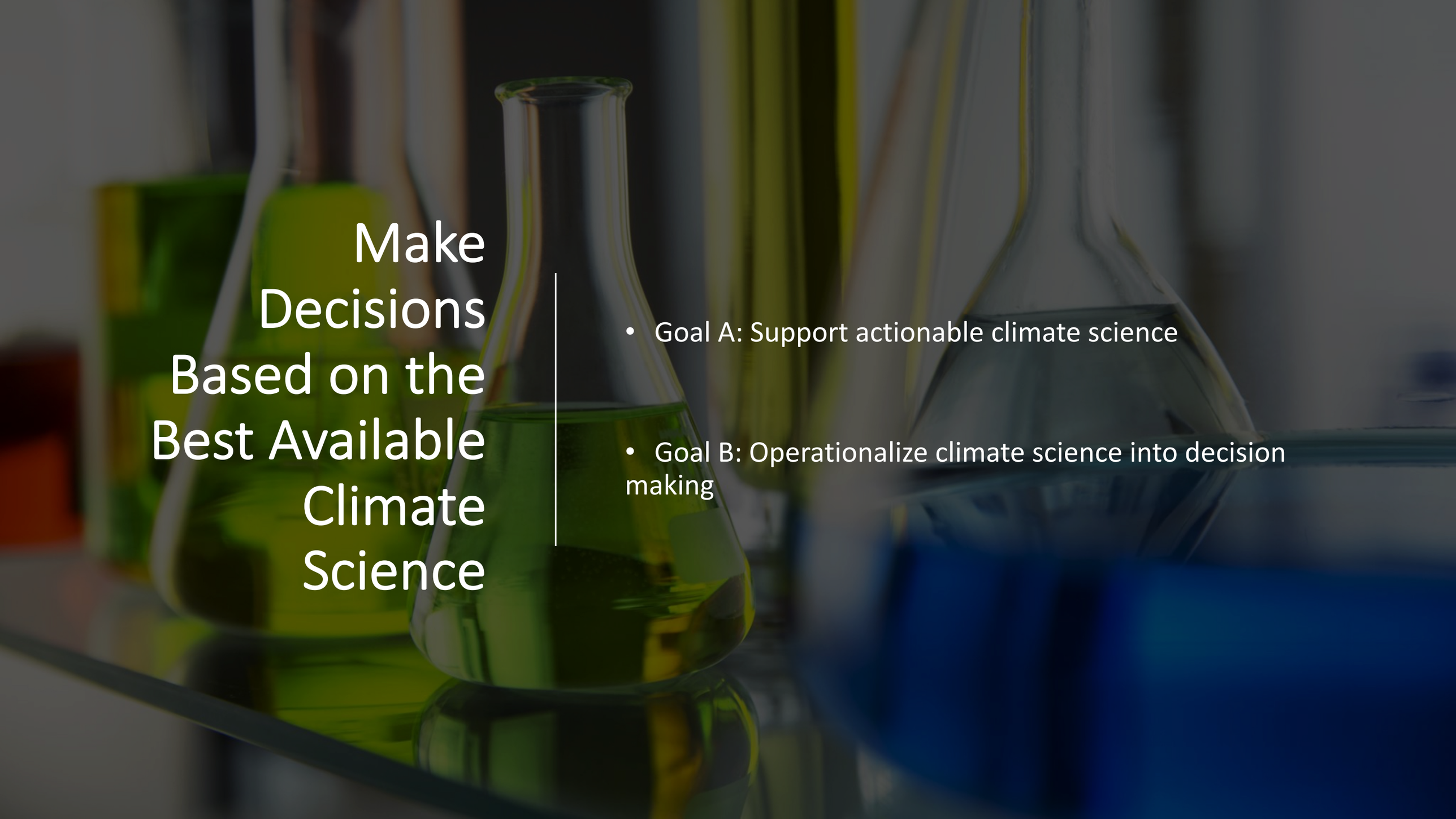
Build a Climate Resilient Economy

- Goal A: Expand economic opportunities for California by building climate resilience

- Goal B: Deepen understanding of how climate change affects California’s economy

Accelerate Nature-Based Climate Solutions and Strengthen Climate Resilience of Natural Systems

- Goal A: Increase the pace and scale of nature-based climate solutions
- Goal B: Increase landscape connectivity and establish climate refugia
- Goal C: Integrate nature-based solutions into relevant infrastructure and investment
- Goal D: Accelerate state processes to support the implementation of nature-based climate solutions



Make Decisions Based on the Best Available Climate Science

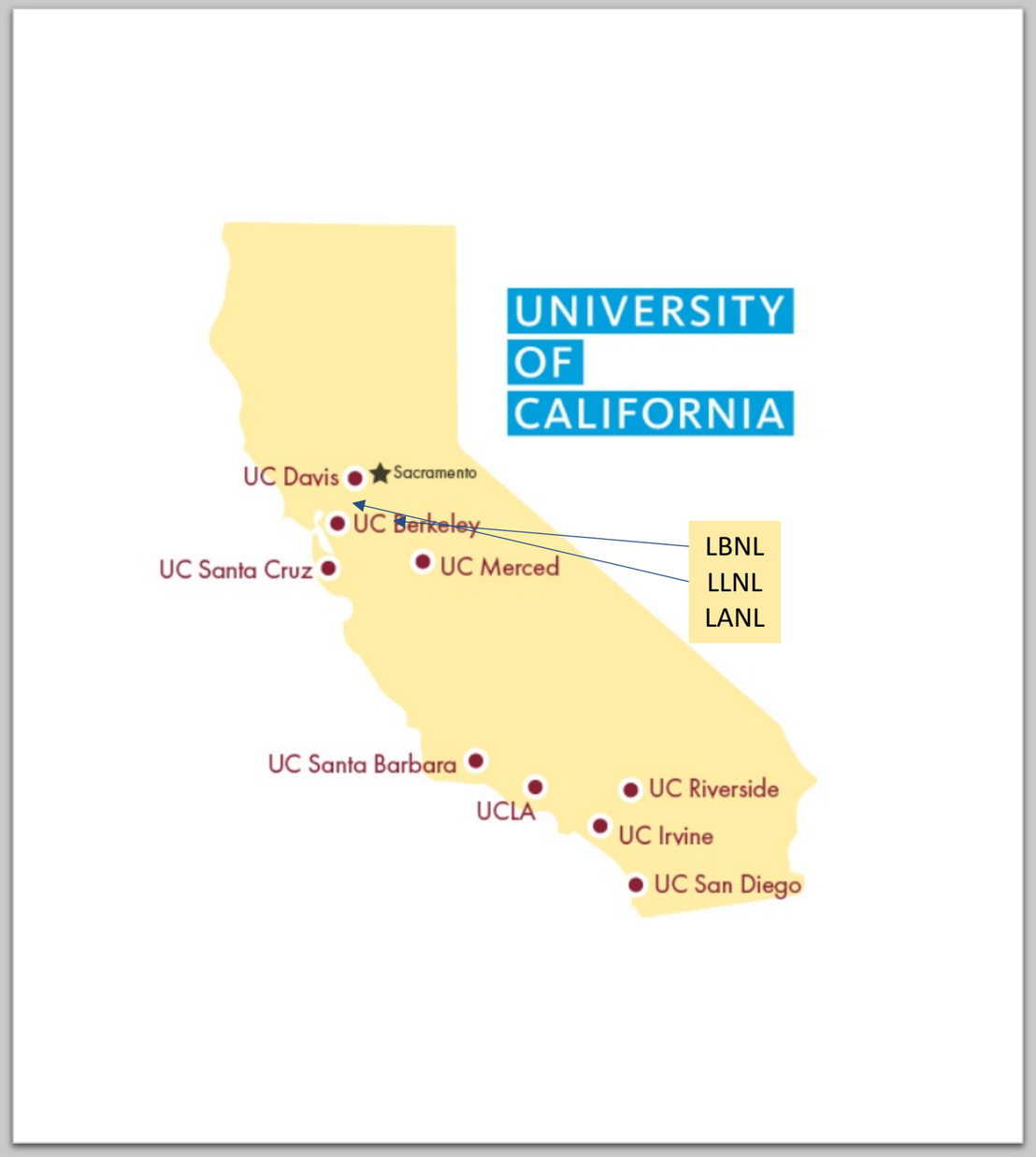
- Goal A: Support actionable climate science
- Goal B: Operationalize climate science into decision making

Partner and Collaborate to Leverage Resources

- Goal A: Collaborate to build climate resilience across sectors and regions
- Goal B: Increase awareness of climate adaptation and resilience issues

California Climate Action Sectors

- Biodiversity and ecosystems
- Coastal
- Forestry
- Land management and conservation
- Land use and built environment
- Public health
- Transportation
- Tribal
- Urban
- Water resources



University of California

- State of CA Public Research University
- 10 Campuses, 3 National Labs, ANR, NRS, UC Health
- ~200 research climate related centers
- > $350M in new annual research grants in climate related themes
- World class faculty, researchers, and students
- Statewide presence

Questions

How does university research in climate change translate into practical solutions for adaptation and resilience at the community, region, and state levels?

What are the key pathways and methodologies for scaling of climate adaptation and resilience innovations? What are the key products and services?

How can we develop mutually beneficial and productive partnerships between UC research community and CA state agencies to develop scalable approaches to climate change adaptation and resilience?