NEA WEEKLY TALK PROGRAM

" Enhancing Infrastructure Resilience to Climate Extremes: Current Global Practices "

Moderator

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Special Guest

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Chief Guest

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Secretary, Ministry of Water Supply (GoN)

ON FRIDAY, 06 DECEMBER 2024 **START AT 03:30 PM**

ENGINEER BHAWAN, NEA TRAINING HALL, PULCHOWK, LALITPUR

Live on NEA Facebook page.

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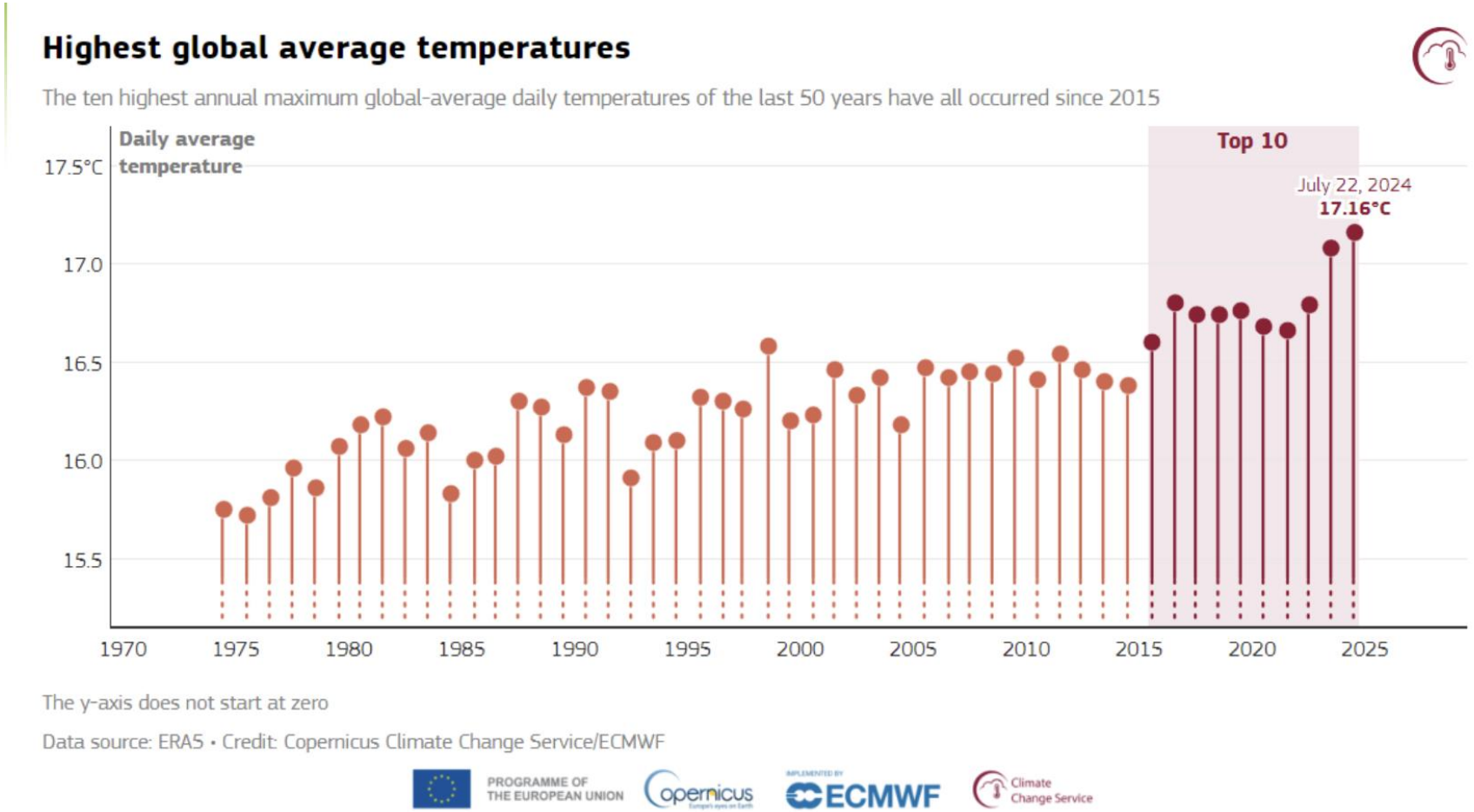
Presentation Outlines

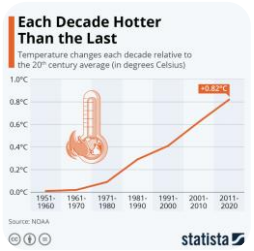
- Climate risks and extreme weather events
- Nepal's vulnerability to climate change
- United Nations on climate agenda and COP 29 outcomes
- Rationale for enhancing climate resilience of infrastructure
- Unlocking finance for climate-resilient infrastructures
- Measuring climate resilience of infrastructures
- Planning & implementing climate-resilient infrastructures
- Role of Engineers in climate actions

Global Warming: Annual Maximum Daily Average temperature



Annual maximum daily global average temperatures in the ERA5 record for the past 50 years (1974 to 2024). The ten highest annual maximum temperatures are highlighted in dark red. Data for 2024 are available up to 23 July 2024 at the time of publishing. Data source: ERA5. Credit: C3S/ECMWF.

Infrastructures in the Face of Changing Climate and Hazards



Each decade becoming hotter

Glacial melt

Informal Settlements: vulnerable

Road & infrastructure damage

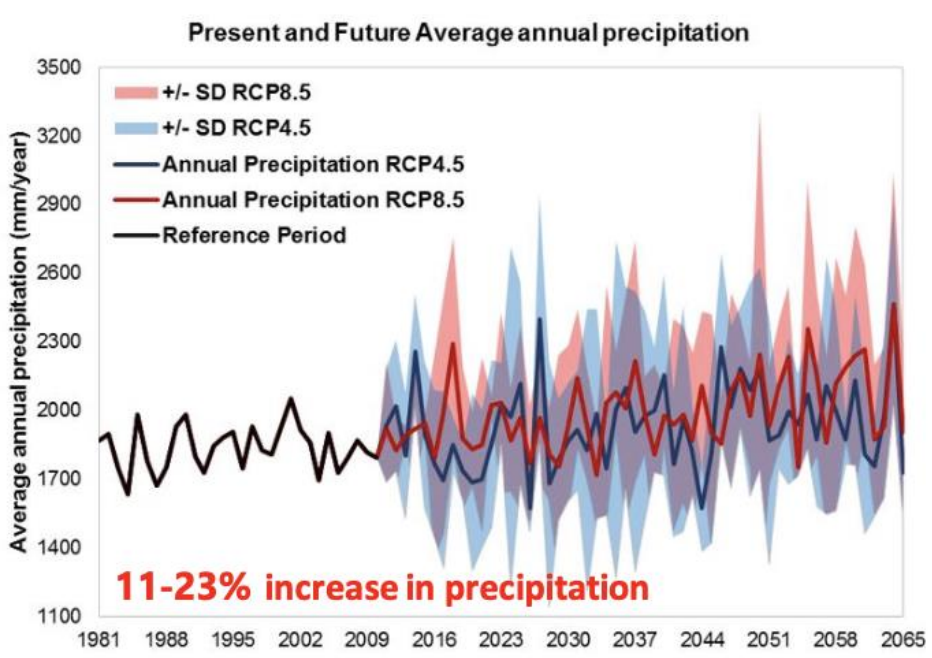
Flooding of Wastewater treatment plants

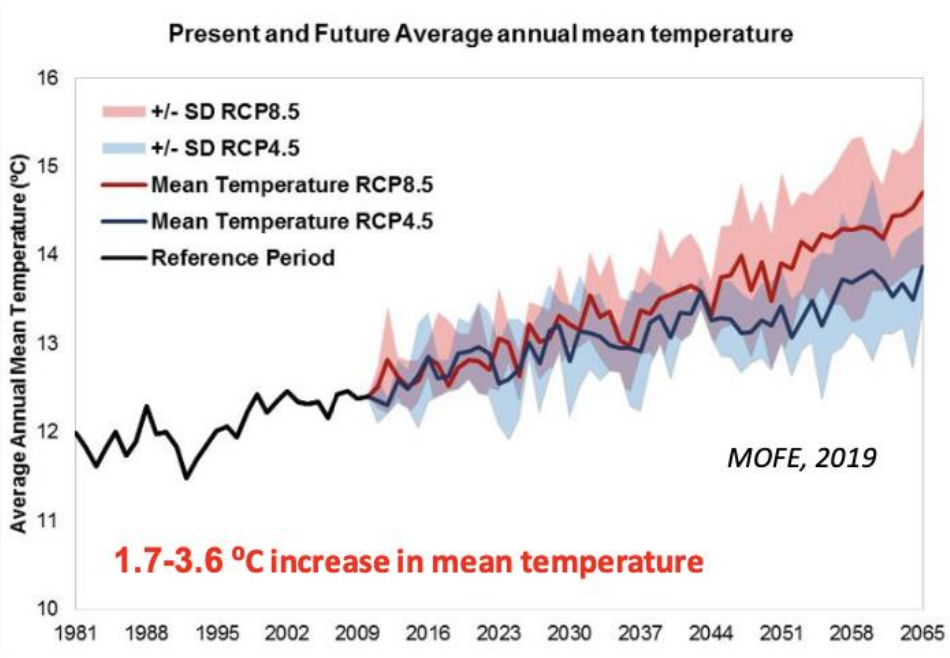
Drought

Approximately 3.3 to 3.6 billion people live in contexts that are highly vulnerable to climate change (IPCC, 2023).

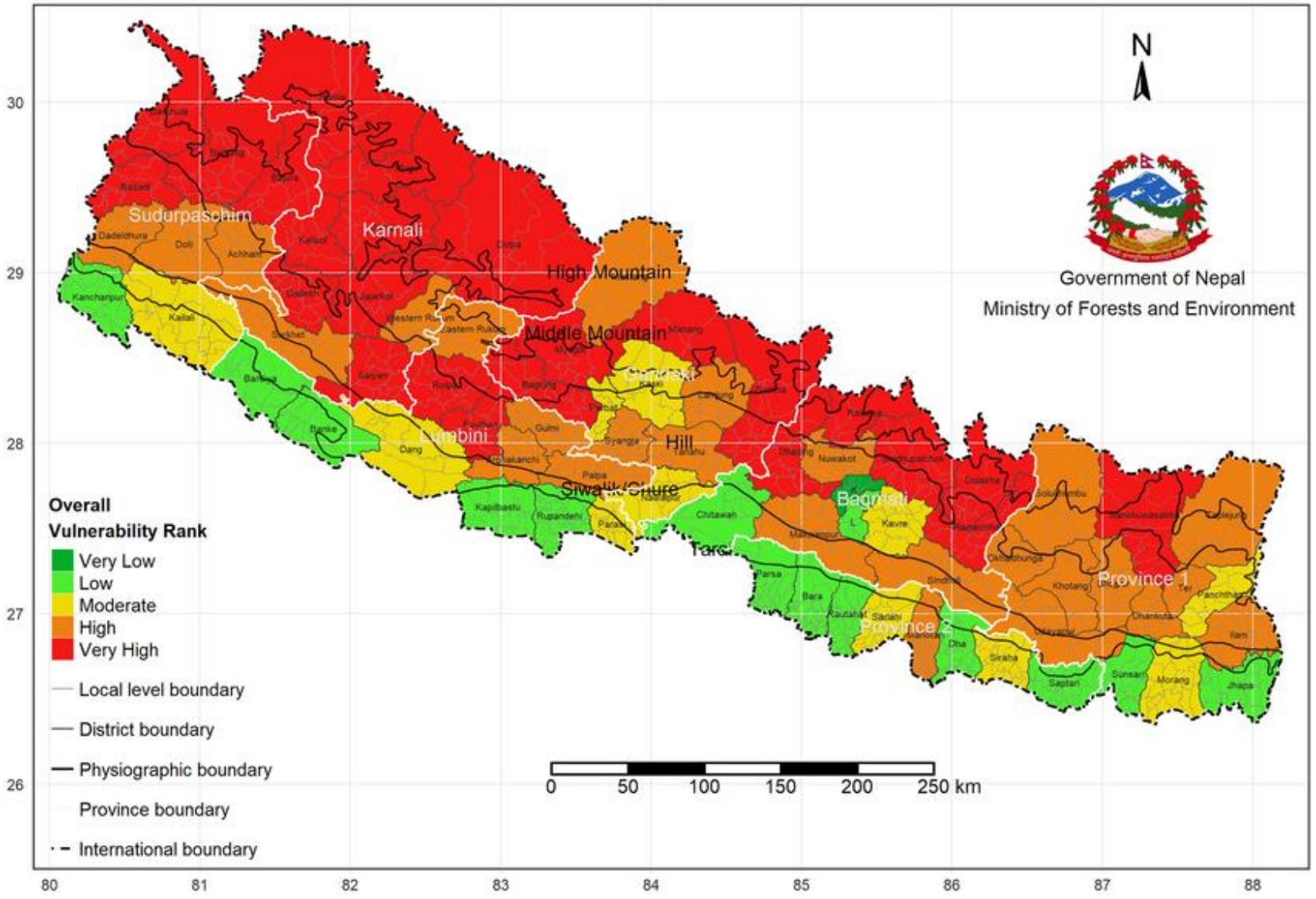
Climate Change Projections in Nepal

- Wetter and warmer climate towards the end of the century
- Climatic extremes will rise in the future
- More rainfall in the monsoon season and less in pre-monsoon season





Nepal's Vulnerability to Climate Change: Spatial Variation



Source: MoFE, 2021

Recent Climate Crises and Emergencies

- **Melamchi Floods** (June, 2021): Heavy rains led to massive floods and landslides in the Melamchi River area, causing significant damage to infrastructure and loss of lives.

- **Kanchanpur Flood** (July 2024) Loss and Damage: Physical Infrastructure+ Cottage and Small Industries+ Agriculture + Livestock =Total estimate-NPR 1,571,022,429.

- **Thame Flood** (August, 2024): was a significant event caused by the outburst of two glacial lakes in the Everest region's Solukhumbu District. This Glacial Lake Outburst Flood (GLOF) led to substantial damage in Thame village, part of the Khumbu Pasanglhamu Rural Municipality.

- **Floods and Landslides** (September, 2024): Extreme rainfall intensified by climate change caused severe floods and landslides, resulting in over 240 deaths. The rainfall was about 10% more intense due to human-induced climate change.

How is loss and damage (L&D) happening?

- Glacial melting and Glacial Lake Outburst Floods (GLOFs)
- Landslides and soil erosion
- Flooding
- Droughts
- Heatwaves
- Biodiversity loss
- Impact on agriculture and livelihoods
- Impact on Vulnerable Communities
- Water Resource Depletion

Why L&D is happening?

- Human-Induced Climate Change
- Increased Frequency and Intensity of Extreme Weather Events
- Slow-Onset Processes
- Socioeconomic Vulnerability
- Environmental Degradation and Poor Land Management
- Limited Adaptive Capacity and Governance Gaps

Climate Change in United Nations' Agenda

- United Nations Framework Convention on Climate Change (UNFCCC) – is an international treaty adopted in 1992 & entered into force on 21 March 1994 – ratified by 198 countries.
- Objective of UNFCCC is to "stabilize greenhouse gases concentrations in the atmosphere"

<u>UNFCCC principle:</u>

- Equity
- Common but differentiated responsibilities
- Precautionary principles
- Cost-effectiveness

<u>Conference of Parties (COP):</u>

- As per Article 7.2 of UNFCCC, COP is the "supreme body" of this convention.
- Parties to the UNFCCC continue to adopt decisions, review progress and consider further action.
- COP is the highest decision- making body and usually meets annually.
- COP assesses the effects of the measures taken by Parties and the progress made in achieving GHGs emission reduction.

Nepali Delegates on COP 29 led by Rt. Hon'ble President:
Baku, Azerbaijan (Nov 11-22, 2024)

Speech by Rt. Hon. President of Nepal at COP 29

Paramount concerns:
Climate justice and climate finance, including reparations for loss and damage

Existing situation
- Climate-related disasters--glacial lake outburst and devastating floods in Nepal
- Complicated process to receive funds for targeted communities

We are committed to:
- Implement our ambitious emission reduction target set out in the second NDC

Call for:
- Urgent operationalization of the Loss and Damage fund.
- Technology transfer and adequate capacity building grants.
- Climate finance to Nepal, recognizing our contributions.
- Adaptation and mitigation efforts to protect human civilization, and a habitable planet.
- Setting out a clear NCQG based on the principles of climate justice, equity and capacity.
- Integrated and holistic adaptation strategies that link mountains to the sea.

"Protecting Himalayas is protecting ourselves and entire humanity across the planet."

Few achievements from COP 29 (24 Nov 2024)

- After long negotiations, the COP29 concluded with a decision on a New Collective Quantified Goal on Climate Finance (**NCQG**), which encompasses **USD 300 billion annually** by 2035--for adaption, mitigation and recover loss & damage.
- Carbon market has opened up, bilateral **Carbon Trading** agreement signed between Nepal and Sweden.
- Little progress on leveraging procedural access to climate fund, acknowledging **Loss and Damage** as a part of climate **fund** (fund will start financing projects in 2025 and has gathered pledges worth more than £579.7 million).
- Little progress in limiting global temperature rise up to 1.5 degrees Celcius by cutting fossil fuels (30 countries signed the COP29 Declaration on **Reducing Methane** from Organic Waste).

Implementing an Ambitious National Adaptation Plan (2021-2050)

NAP Sectors fund gaps – 47 billion USD

Sector	Billion USD
Agriculture and food security	11.2
Forest, biodiversity and watershed conservation	8.7
Water Resources and Energy	5.35
Rural and Urban settlements	2.85
Industry, transport and physical infrastructure	3.05
Tourism, natural and cultural heritage	1.13
Health, Drinking water and sanitation	4.75
Disaster risk reduction and management	8.05
Gender, Social inclusion, livelihood and governance	0.7
National capacity building, research and awareness rasing	0.16

NAP is a process that helps reduce vulnerability to climate change by identifying and addressing medium- and long-term adaptation needs.

Second Nationally Determined Contribution (NDC) - 2020

Sector	Targets (Gases Covered: CO2, NO2, CH4)		Nature of the Target
	Policy	Activity-based	
Energy	By 2030, expand clean energy generation from approximately 1,400 MW to 15,000 MW, of which 5-10 % will be generated from mini and micro-hydro power, solar, wind and bio-energy. Of this, 5,000 MW is an unconditional target. The remainder is dependent upon the provision of funding by the international community.		Conditional upon international support
Waste		By 2025, 380 million litres/day of wastewater will be treated before being discharged, and 60,000 cubic meters/year of faecal sludge will be managed. These two activities will reduce around 258 Gg CO2 eq. compared to BAU.	Conditional upon international support
Waste		By 2030, create an enabling environment for both public and private sector to treat industrial and municipal waste, including faecal sludge.	Conditional upon international support
Waste		Focus on co-production of energy and organic fertilizer from solid waste, wastewater and faecal sludge.	Conditional upon international support
AFOLU		By 2030, upgrade watershed health and vitality in at least 20 districts to a higher condition category.	Conditional upon international support
AFOLU		By 2030, create an inventory of wetlands in Nepal and sustainably manage vulnerable wetlands.	Conditional upon international support

AFOLU: Agriculture, Forest & Other Land Use

Climate Funds and Financial Entities

- ✓ Adaptation Fund
- ✓ Green Climate Fund (GCF)
- ✓ Global Environment Facility (GEF)
- ✓ Special Climate Change Fund (SCCF)
- ✓ Least Developed Countries Fund (LDCF)
- ✓ Loss and Damage Fund (COP 28)
- ✓ New Collective Quantified Goal on Climate Finance (NCQG)

Enhancing climate resilience of infrastructure: Rationale

- For **ability of society and economies** to **adapt to and absorb negative impacts** of climates.
- **Withstand and recover rapidly** from disruptions caused by changing climatic conditions throughout its lifetime (new assets, and existing ones retrofitted or operated differently).
- **Increase lifespan of infrastructure, protect investment returns, ensure business continuity, and** lower the cost of damages and repairs.
- **Integrate current and future climate risks into planning** and decision-making.
- **Adequate financing and technical capacity**.
- **Performance measurement of resilience indicators** is needed to adjust operation and maintenance over time.

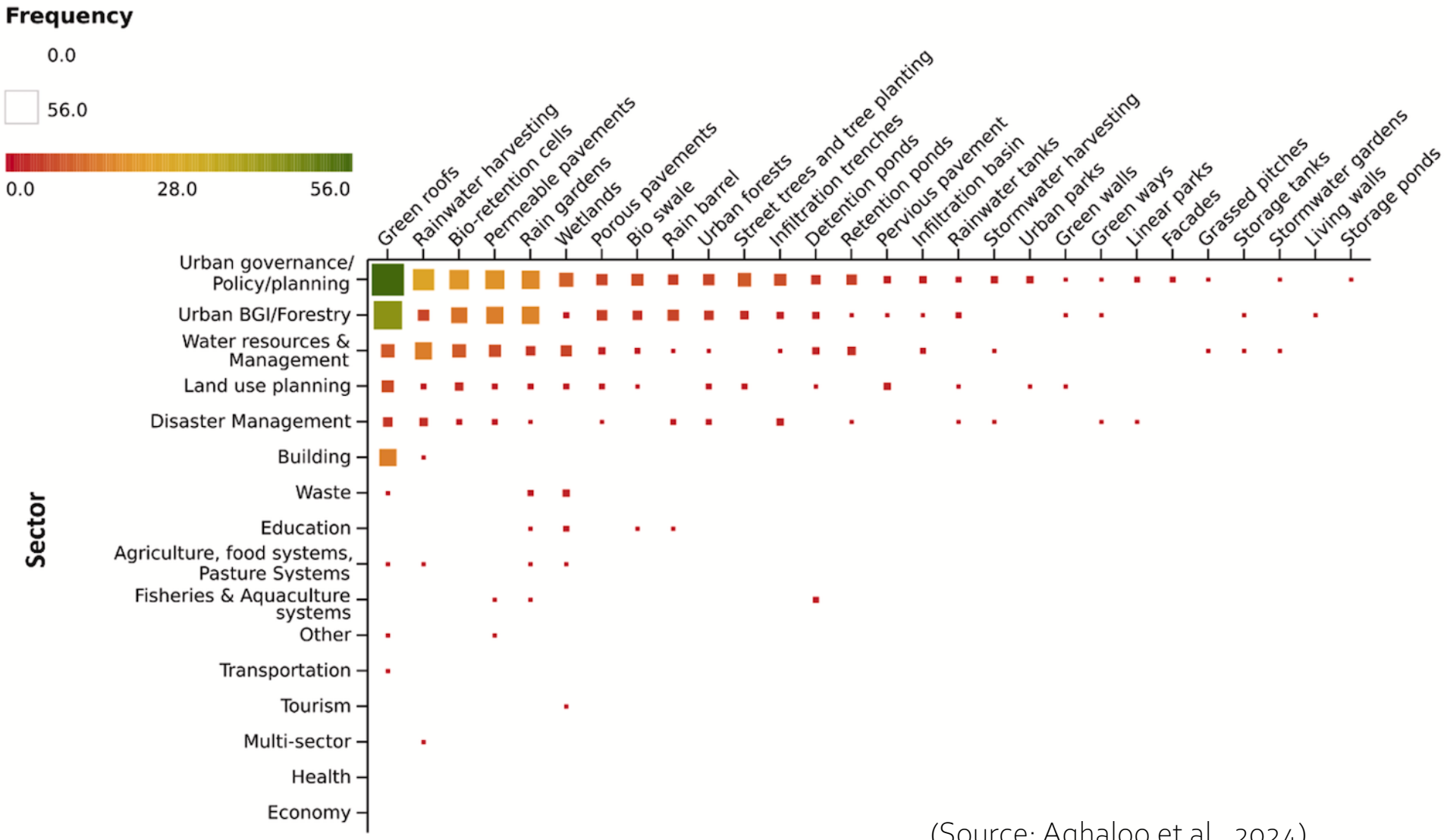
(OECD, 2024)

Unlocking finance for climate-resilient infrastructures

- The **mainstreaming of climate resilience** into infrastructure financing/investment.
- **Investing upfront in climate resilience** can yield **benefits over the lifetime** of the asset (greater service reliability and quality, lower maintenance costs, and reduced exposure).
- A **systemic approach** is needed to make physical **climate risk visible in investment decisions** and thereby demonstrate that resilience is a source of value rather than just a cost.
- Mobilizing **private financing and investment** will be critical for achieving resilient infrastructure systems (addressing regulatory barriers, ensuring effective risk sharing).
- Integrating climate resilience into long-term planning, and **linking planning to financing**.
- Developing **new funding models**.

(OECD, 2024)

Specific NbS interventions and associated sectors: Global practices



(Source: Aghaloo et al., 2024)

Harnessing Nature-based solutions (NbS) for climate-resilient infrastructure

- NbS have significant potential to enhance climate resilience of infrastructure in **cost-effective and flexible** ways that harness **social and environmental co-benefits**.
- NbS can build climate-resilient infrastructure **as substitutes, complements or safeguards** to grey solutions.
- NbS need to be better and consciously **integrated into the policy, regulatory and institutional frameworks** that enable infrastructure development.
- NbS to be incorporated into the **technical training** programs of **designers and operators** of infrastructure.
- Foster the **use of NbS for enhancing climate resilience in infrastructure**, while reaping their benefits for mitigating climate change, enhancing ecosystem services and protecting biodiversity.

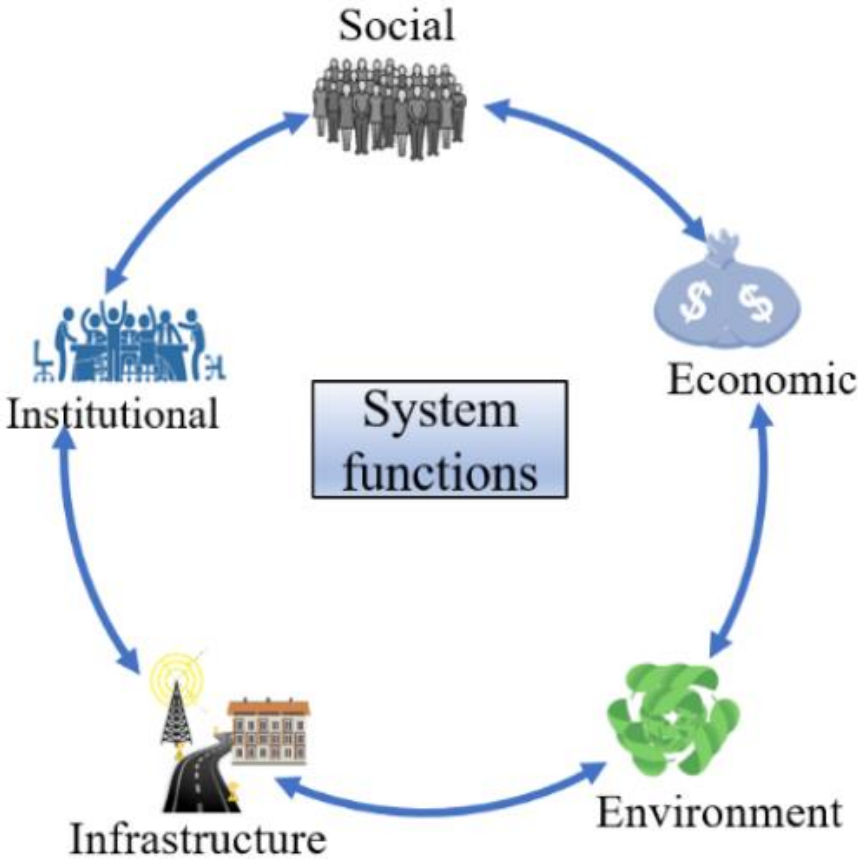
(OECD, 2024)

Climate Resilience Domains

Climate-resilient infrastructures should be able to:

- ✓ Withstand exposure to hazards
- ✓ Help beyond resilience
- ✓ Contain failures
- ✓ Limit the consequences of a complete failure
- ✓ Facilitate quick recovery
- ✓ Enable flexibility

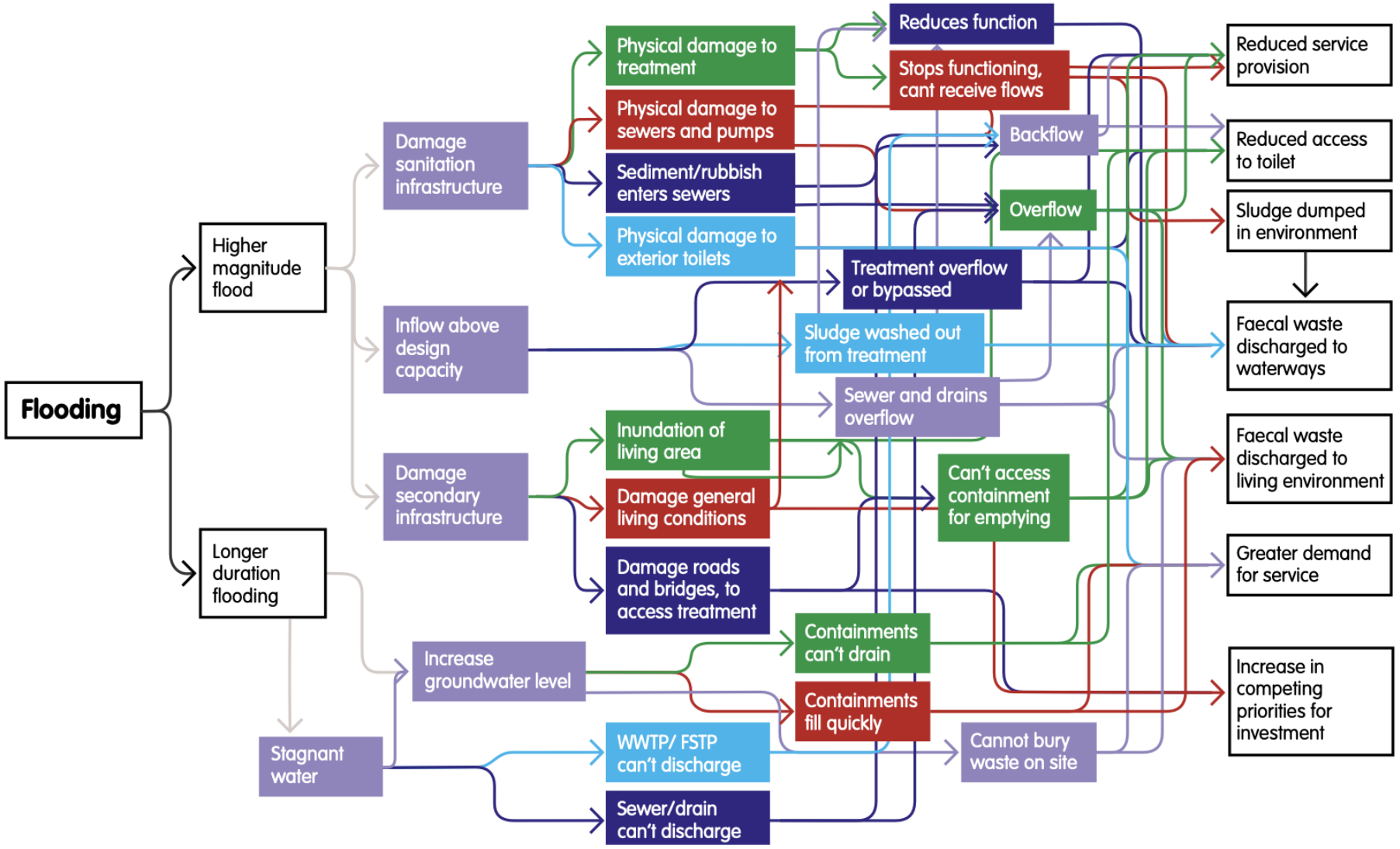
(UTS-IFS, 2023)



(Sono et al., 2021)

"Resilience is the ability of a system, community or society exposed to hazards **to resist, absorb, accommodate to and recover** from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions." –UNISDR, 2009

Compounding effects of climate extremes on infrastructures



Source: (UTS-IFS & SNV, 2019)

Ensuring climate resilience: Possible indicators ?

Studies show that making infrastructure more climate-resilient can **add up to 3% to upfront costs**, however it has a **benefit-cost ratio of about 4:1** (Global Commission on Adaptation, 2019).

Bazraman et al., 2022 (Urban resilience)	Environment	Quantity of water resources
		Diversity of plant species
		Precipitation changing
		Drought
		Land subsidence
		Air quality and pollutants
	Infrastructure	Green Space
		Reused cars
		Attention to the prevailing wind Direction in construction of settlements
		Adaptation of residential buildings according to climate conditions
		Building density
		Existence of alternative infrastructure in the event of crisis
		Attention to the prevailing wind direction in factories location
		Resistance of infrastructure networks
		Land use change
		Number of floors
		Percentage of neighborhoods with worn-out texture;
	Institutional	Level of awareness of citizens about the concepts of climate change
		Encouragement policies in creating and Green Roof Development
		Training Programs on the risks of Climate Change
		Energy Management Policies
		Training Programs to Encourage the use of Public transport
		Mandatory policies in compliance with climate-friendly urban planning laws)
	Socio-economic	Percentage of population living in informal places
		Growth Population
		Insured Persons
		Neighborhood Relations
		Job Security
		Immigration
		Residents' Awareness to Climate Change

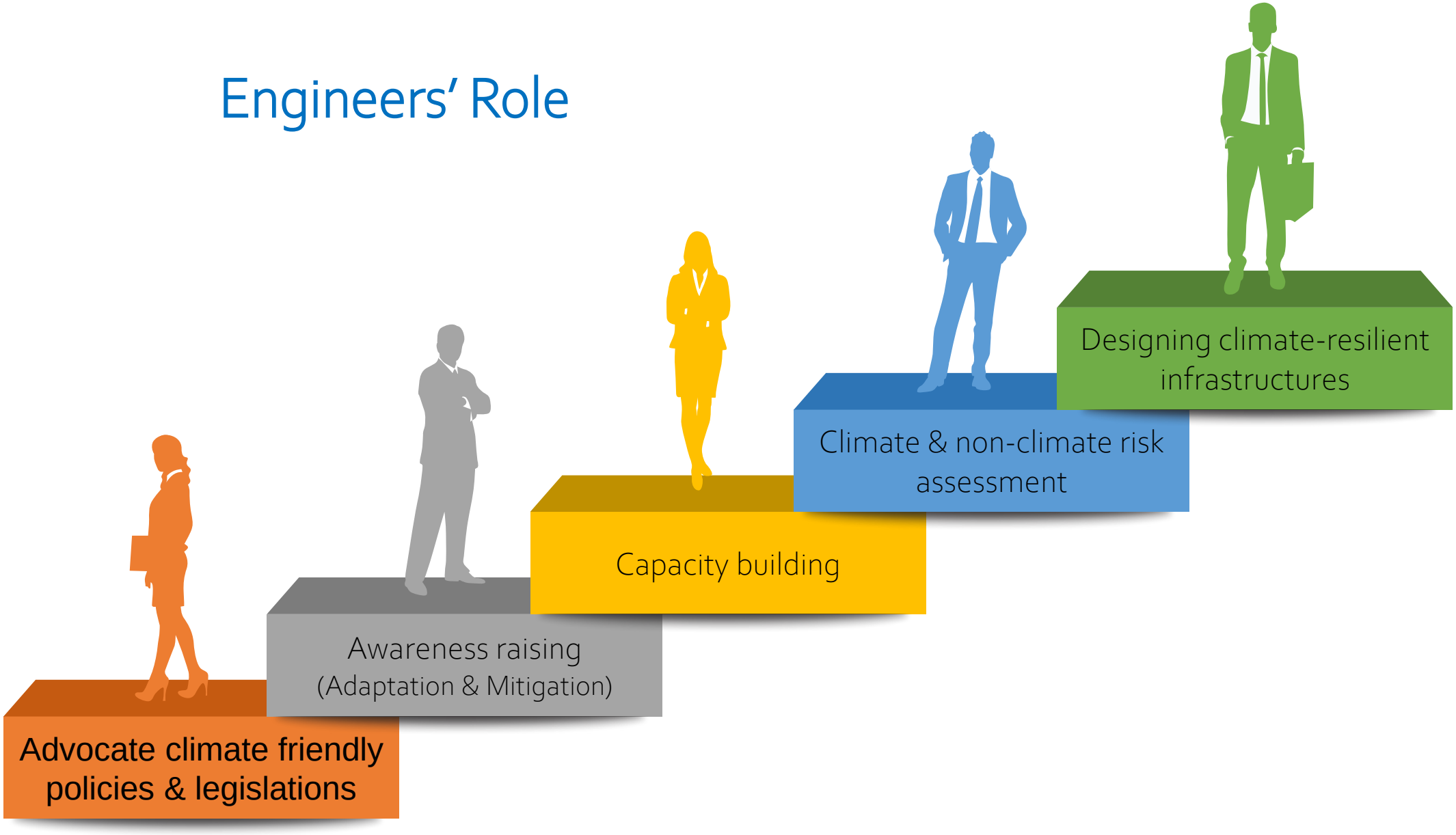
Planning & implementing climate-resilient infrastructures: Ways forward

- Identify the **interdependencies among infrastructure** systems.
- **Share information about vulnerabilities** to climate risks.
- Work with **stakeholders to identify climate-related risks** (climate and non-climate).
- Set out requirements for actors to meet **resilience standards**.
- **National and sub-national budgeting arrangements** are well-positioned to invest in climate-resilient infrastructure over the long term.
- Use **data and new technologies** during maintenance and operations to maintain service levels in the face of increasing climate-related risks.

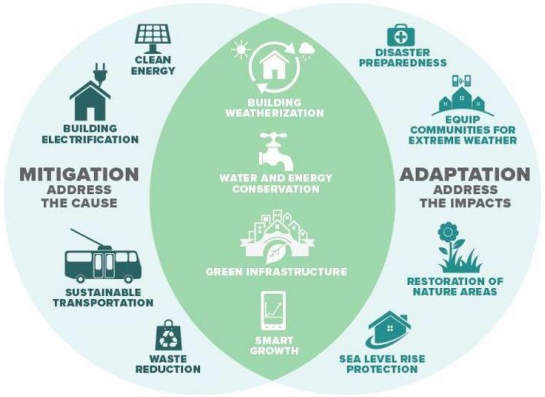
Planning & implementing climate-resilient infrastructures..(continued)

- Apply holistic approach for planning processes to ensure **policy coherence and the integration of climate-resilience considerations across the spectrum of government policies – from infrastructure and innovation to trade, industry,** and **investment policies**.
- Addressing **social equity and inclusion.**
- Making infrastructure climate resilient calls for a "**mindset shift**" in policies.
- Infrastructure planned, built, and operated in a **forward-looking way**: (knowledge sharing and technical assistance, partnerships for R&D, increased investment and financing.

Engineers' Role



THANK YOU



"Climate change is the single greatest threat to a sustainable future but, at the same time, addressing the climate challenge presents a golden opportunity to promote prosperity, security and a brighter future for all."

→**Ban Ki-Moon**
Former Secretary-General of the UN