School of the Built Environment

University of Reading

Climate Resilience in the Built Environment

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School of Construction Engineering and Management

12th May, 2025

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My Climate Risk Research

Understanding Climate Risk and Resilience in (*through*) Built Environment

- Research expertise : Construction project risk modelling and assessment.
- Applied research and development at the interface of engineering, management, and information sciences.

The Outline

- Construction Industry and Climate Change
- Climate Resilient Built Environment Research Cluster (**CRESBE**) in the **School of the Built Environment**
- **ClimateAdapt-TR** Project funded by **ISPF ODA Institutional Support Grant 2024-2025** (PI : Professor Irem Dikmen, Co-PI: Professor Stuart Green and Dr. Guzide Atasoy Ozcan and Dr. Emre Caner Akcay from METU, Turkiye)

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Construction and Climate Change

Massive carbon footprint

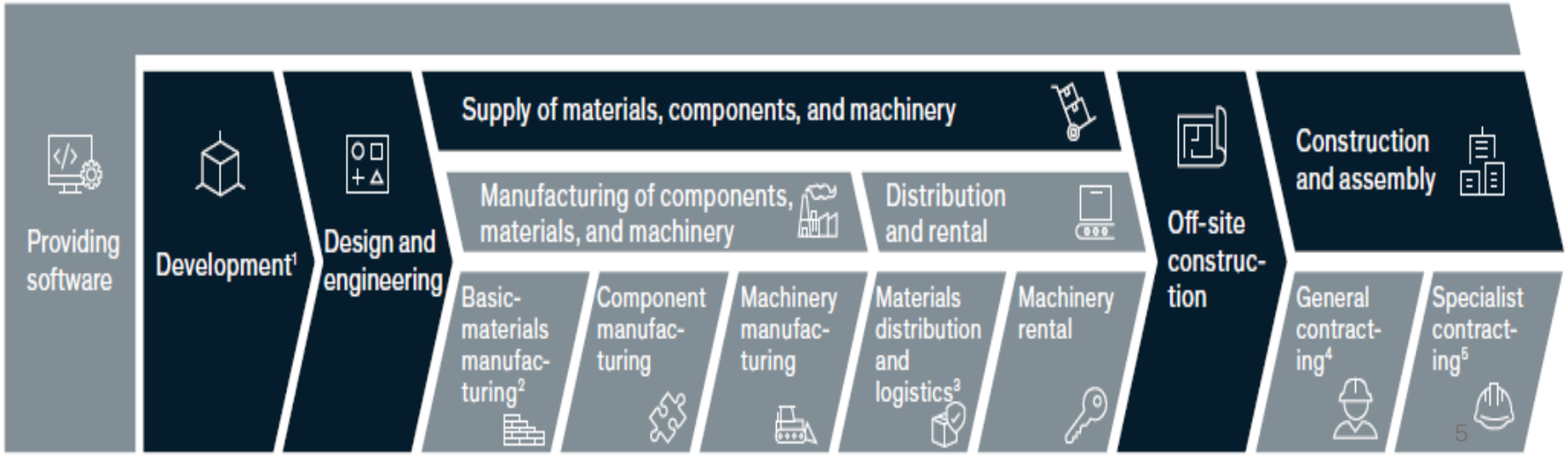
Environmental degradation

Waste …

Construction industry

- **50%** of globally extracted raw materials.
- **30%** global energy consumption
- **40%** of carbon dioxide emissions
- Production of materials like **cement** and **steel** is responsible for 20% of building-related carbon dioxide emissions

Decarbonisation and Circular Construction Agenda



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BAD NEWS

- The sector is not yet on track to align with 2050 targets.

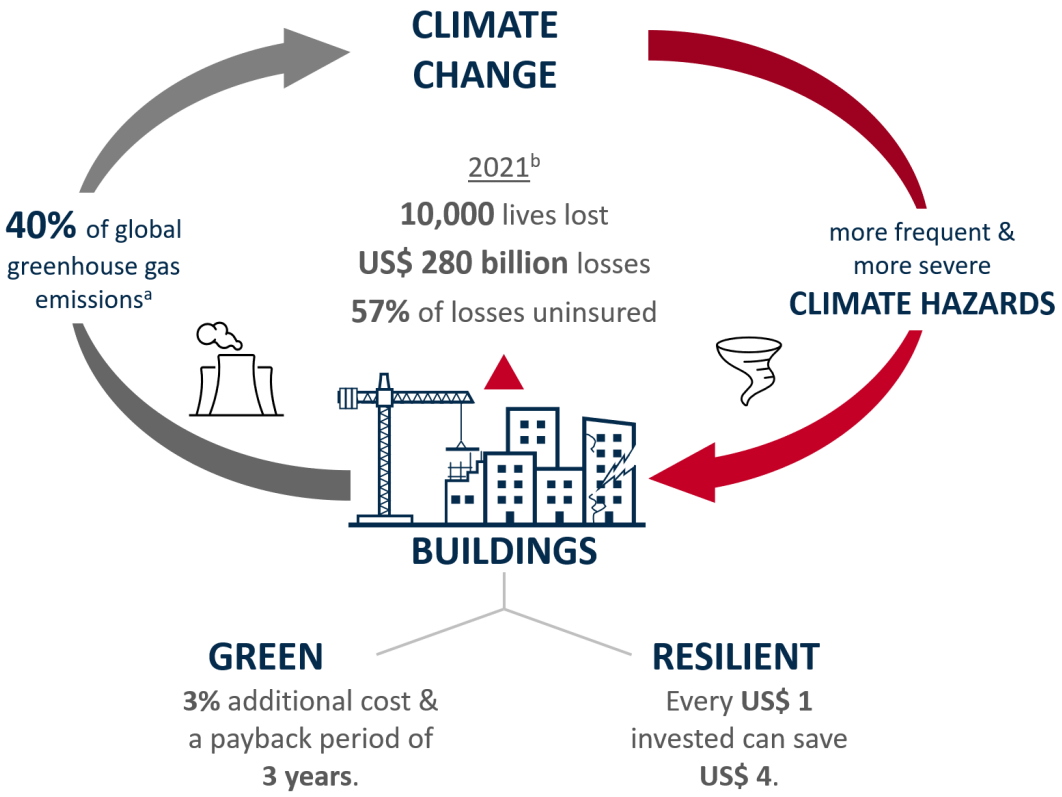
- CO_2 emissions from the sector have **risen by** 5% since 2015, far from meeting the 28 % **reduction** required by 2030.

GOOD NEWS

- Increasing adoption of renewable energy and electrification.
- Green building certifications grew significantly
- Circular construction practices gaining ground (18% construction inputs in Europe.)

Climate Change Cycle in Construction

Climate Mitigation Agenda



Climate Adaptation Agenda

Image: Ommid Saberi, Naz Beykan (World Economic Forum)

Role of Infrastructure for Climate Resilience

New infrastructure and climate-proofing the infrastructure is needed to :

- Avoid direct and indirect costs of climate-induced disasters
- Ensure service quality and reliability


Flood in Spain, 2024


Thames barrier, UK

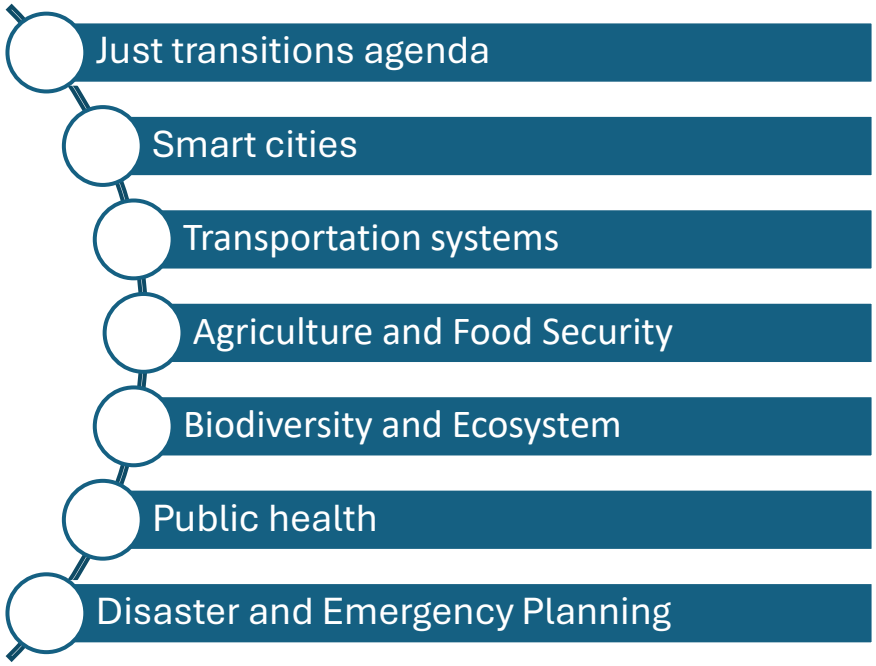
DISCONNECTED AGENDAS AND POLICY

Climate mitigation agenda

Transformation of the construction Industry

Climate adaptation

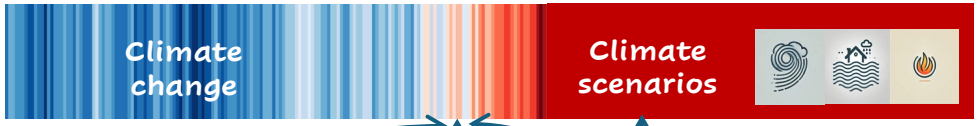
Cross-cutting



CLIMATE RESILIENT DEVELOPMENT

CLIMATE RESILIENT BUILT ENVIRONMENT RESEARCH CLUSTER (CRESBE)

https://research.reading.ac.uk/climateresilientbe/



Uncertainty

Extreme weather events
Disasters

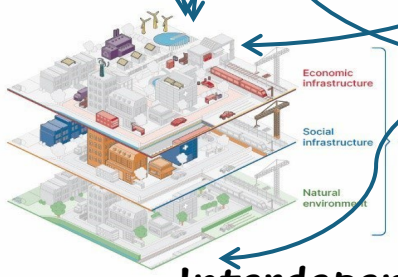
Interventions/efforts

Decarbonisation
- **Policy : Net Zero Targets, Circularity principles, Doughnut economics ...**
- **Target : Low carbon production, minimum waste ...**
- **Materials and technology : Green Materials, renewable energy, carbon capture ...**

Conflicting and/or reinforcing interventions

Climate Adaptation
- **Policy : IPCC Assessment reports, National Adaptation plans, standards...**
- **Target : climate risk assessment, disaster anticipation, prevention, emergency response, recovery ...**
- **Materials and technology : Climate resilient materials, new structures (flood barriers), early warning systems...**

Built Environment System



Outputs (building, infrastructure, city ...) – expectations such as thermal comfort, reliability, safety, well-being, social value, low cost, smartness .....

Digital, physical and social networks

Observations – physical, behavioural ...

Mental models, assumptions, expectations

Interdependency

Inputs and constraints
- Land
- Infrastructure
- Finance
- Resources (material, labour ...)
- Data, information
- Technology

Processes, Actors, Structures, Policy
- Planning, design, construction, operation, demolition...
- Corporate, supply chain and project management
- Projects, programmes and portfolio
- Stakeholders (contractor, government, university ...)
- Methods and tools (MMC, BIM, AI ...)
- Structures (Regulations, building codes ...)
- Policy (housing policy, urban development policy ...)

Systemic Climate Resilience

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RESEARCH@CRESBE

Priority 1 : Considering BE as a part of social, economic, environmental and technological systems and we explore systemic impacts of decarbonisation and adaptation interventions to develop resilience heuristics at multiple scales

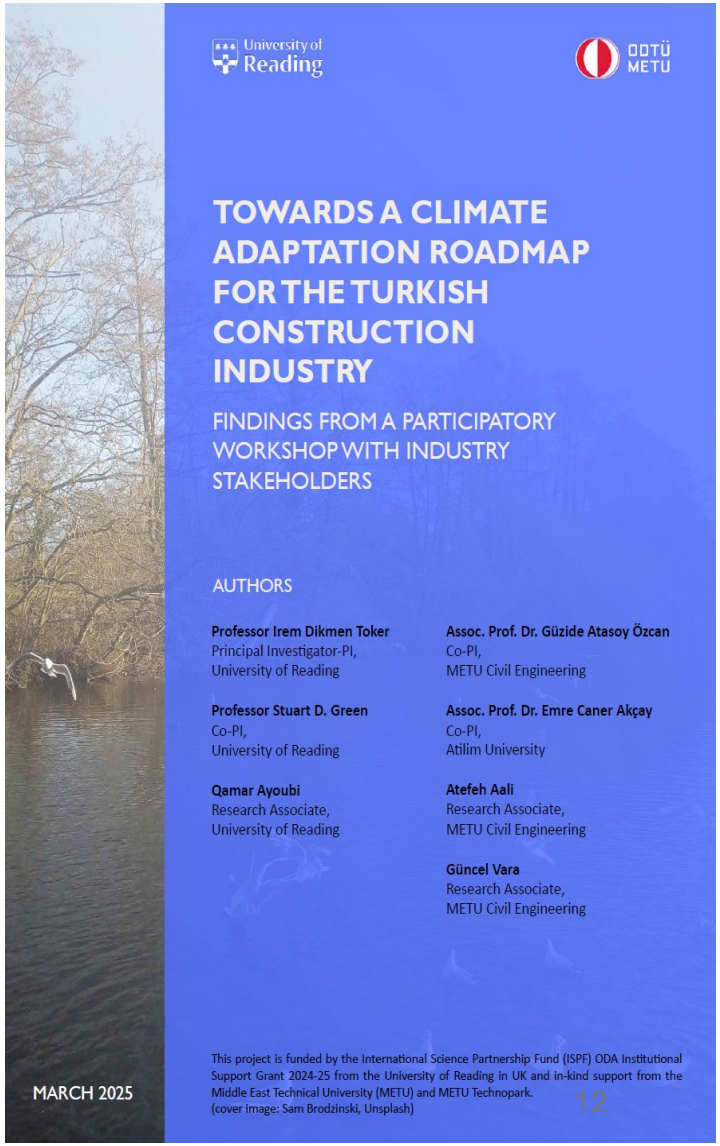
Priority 2 : The role of digital technology to navigate through systemic uncertainty and complexity

Priority 3: The narratives to make sense of the institutional context in which resilient built environment is conceptualized, designed, and delivered.

CROSS-DISCIPLINARY INSIGHTS AND COLLABORATION

ClimateAdapt-TR

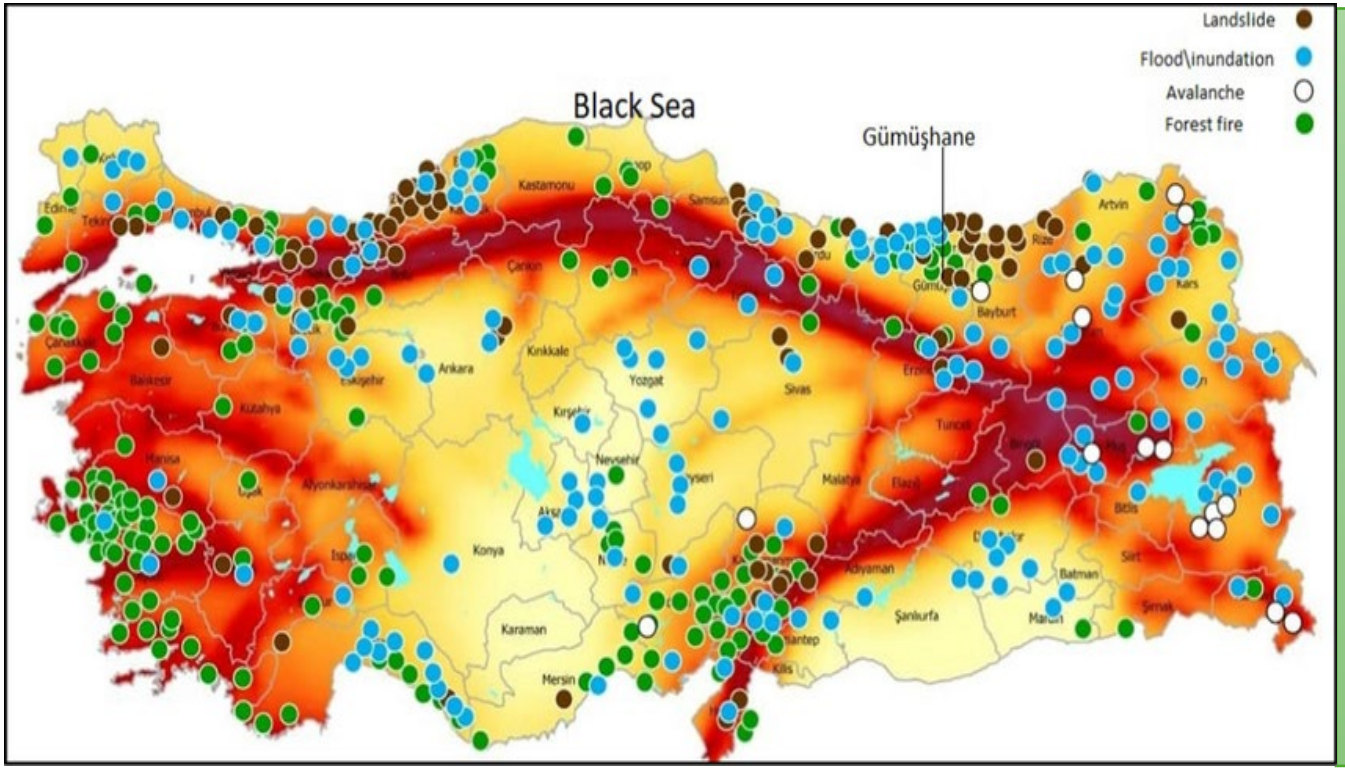
The aim of the project is to conduct a participatory workshop to raise awareness, facilitate dialogue among key industry stakeholders, and co-produce a preliminary set of priorities for climate adaptation pathways in Turkiye.



Download the CLIMATEADAPT-TR project report from :

https://research.reading.ac.uk/climateresilientbe/

Turkiye



Future projections under RCP4.5 and RCP8.5 scenarios indicate temperature increases of up to 5°C by the end of the century, along with shifting precipitation patterns, **increased heat waves, and heightened drought and wildfire risks.** These changes will significantly impact Türkiye's climate, particularly in Eastern Anatolia, the Mediterranean, and the Black Sea regions, necessitating proactive adaptation strategies

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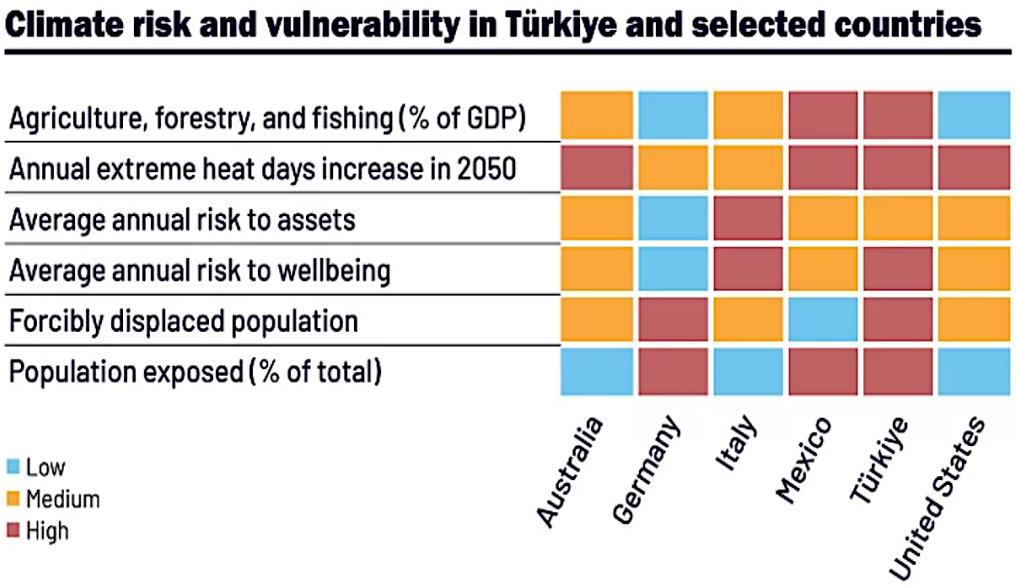
Turkiye-Syria Earthquake (Feb 2023)

Direct damage and total economic loss is 11% of GDP

Turkiye

"Türkiye **has high vulnerability in most climate vulnerability dimensions** selected by the World Bank. Its transport system is more vulnerable than comparable countries…"



Source: www.worldbank.org/

Annual economic losses due to climate-induced disasters (direct) damages is estimated as 3% of GDP.

ClimateAdapt-TR Workshop

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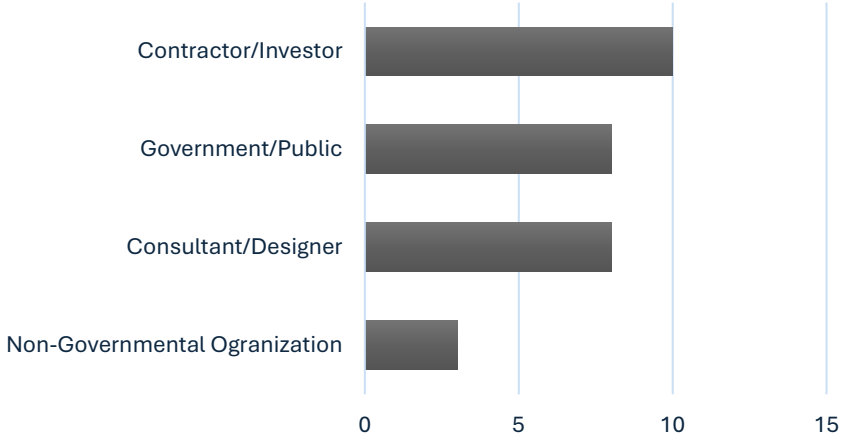
Adaptation to Climate Change: Turkish Construction Industry Workshop

NOVEMBER 19,2024

Today's Agenda

9:30 - 9:45	Welcome
9:45 - 10:00	Session 1. Defining the context: Climate mitigation and adaptation
10:00 - 11:00	Session 2. Setting the agenda of the day: Brainstorming on workshop themes
11:00-12:00	Session 3. Presentations: Global challenges and adaptation pathways
12:00-12:45	Lunch break
12:45-13:15	Session 4. Clustering the themes
13:15-14:15	Session 5. Climate Adaptation Pathways (1): Groupwork
14:15-14:30	Coffee break
14:30-15:30	Session 6. Climate Adaptation Pathways (2): Group presentations
15:30-16:00	Session 7. Wrap-up: Towards the construction industry roadmap



27 attendees

Let's talk about Climate Risk

TASK 1 : Think about CLIMATE RISK in the built environment

- Hazards, exposure and vulnerability
- Impact on processes, assets, companies, projects, finance, technology ....

What should be in the CLIMATE ADAPTATION AGENDA of stakeholders of the Turkish construction industry ? (CHALLENGES)

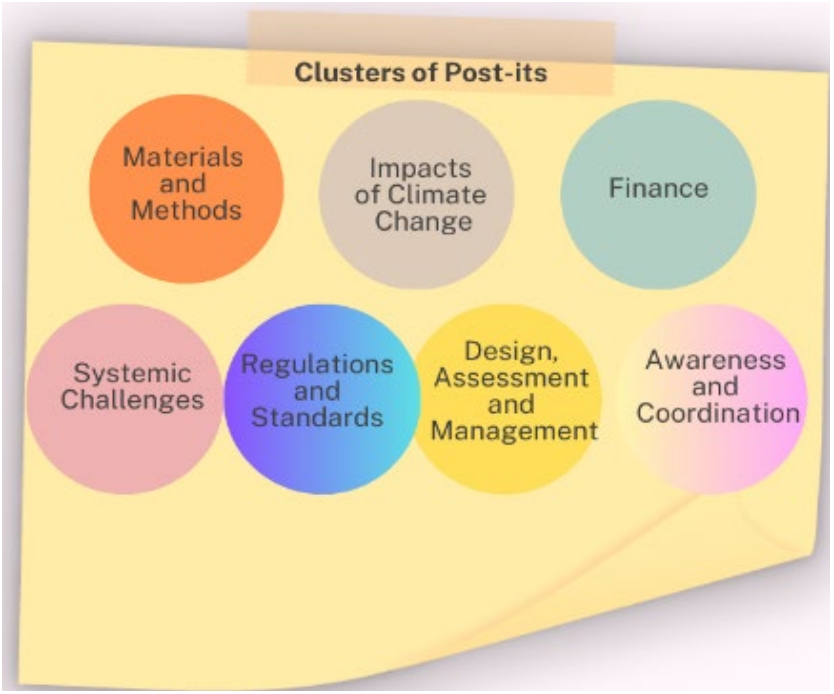
PLEASE USE

- **3 POST-ITS**
- **MAX 5 WORDS IN EACH POST-IT**

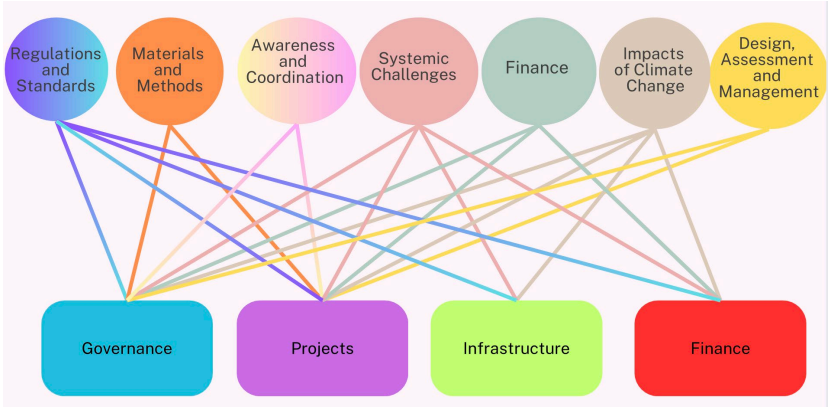
Examples :

thermal comfort in housing,
flood-resilient construction sites,
design standards for infrastructure systems,
lack of data/information for risk assessment,
changes in global construction markets...

Challenges


Clusters of Post-its
Materials and Methods
Impacts of Climate Change
Finance
Systemic Challenges
Regulations and Standards
Design, Assessment and Management
Awareness and Coordination

Themes



Workshop Groups	Theme	Participants	Stakeholder representation
G1	Infrastructure	P3, P12, P14, P16, P25, P26	Government/Public (1) Contractor/Investor (2) Consultant/Designer (3)
G2	Finance	P8, P9, P11, P13, P20	Non-Governmental Organization (1) Government/Public (1) Contractor/Investor (3)
G3	Governance	P1, P2, P5, P7, P10, P18, P24	Government/Public (3) Consultant/Designer (4) Non-Governmental Organization (1)
G4	Projects	P17, P19, P21, P6, P23	Government/Public (3) Contractor/Investor (2) Non-Governmental Organization (1)

The Groups were asked to respond to the below questions:

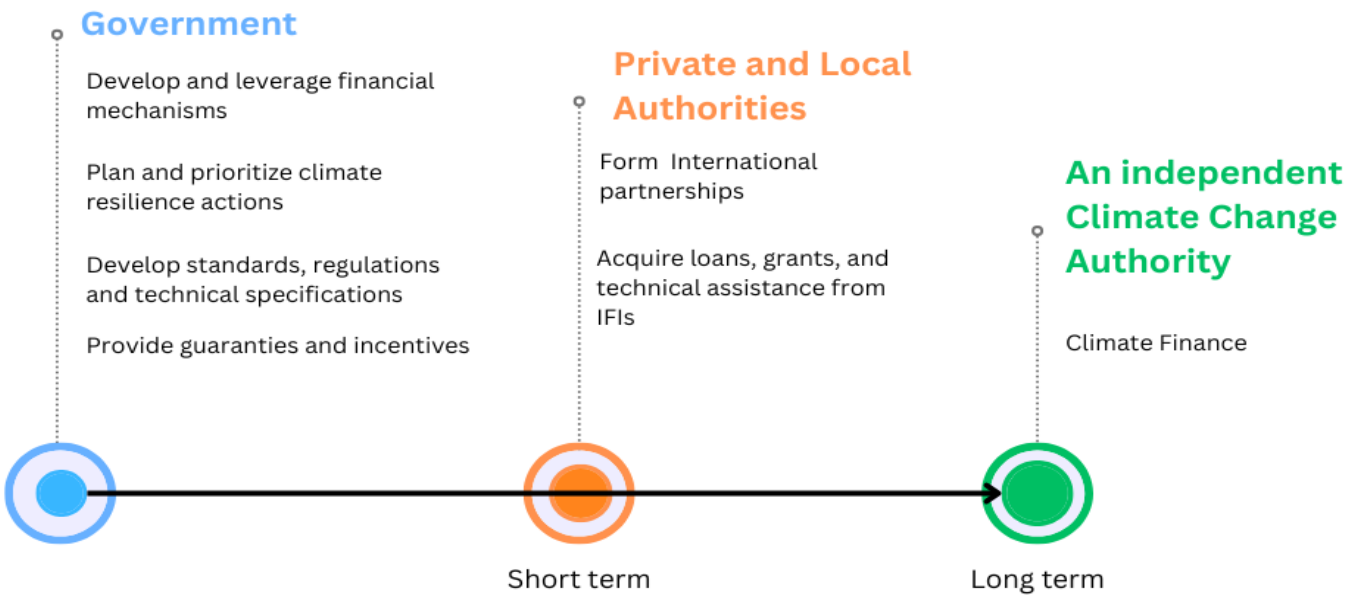
Governance: How can the construction industry be more resilient to climate change?

Project management: How can the construction projects be made resilient to climate change?

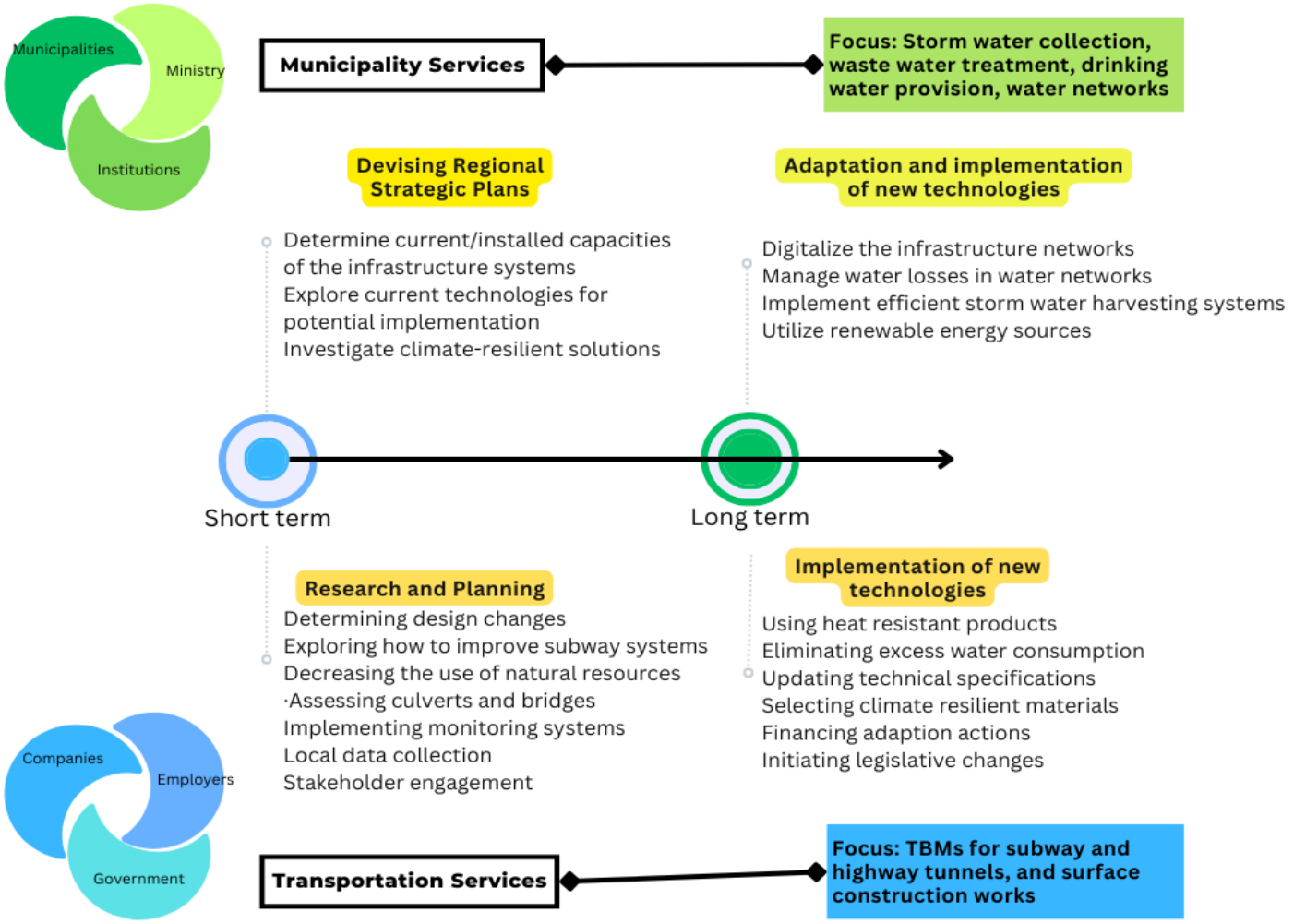
Infrastructure: How can infrastructure be made resilient to climate change?

Finance: What would be the financial mechanisms to initiate climate resilience actions ?

Finance


Government
Develop and leverage financial mechanisms
Plan and prioritize climate resilience actions
Develop standards, regulations and technical specifications
Provide guaranties and incentives
Private and Local Authorities
Form International partnerships
Acquire loans, grants, and technical assistance from IFIs
An independent Climate Change Authority
Climate Finance
Short term
Long term

Infrastructure



Governance

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01 **Data Requirements**

Data needs, collection, sharing, management, validation, security, coordination, impacts, tools, governance.

02 **Regulations**

Regulations, education, penalties, curricula, energy sources, MDB collaboration.

03 **Communication and Coordination**

Committees, workshops, knowledge sharing, advisory board, awareness, and campaigns.

04 **Methods**

Sustainable methods, standards, AI tools, risk structures, compliance strategies

Projects

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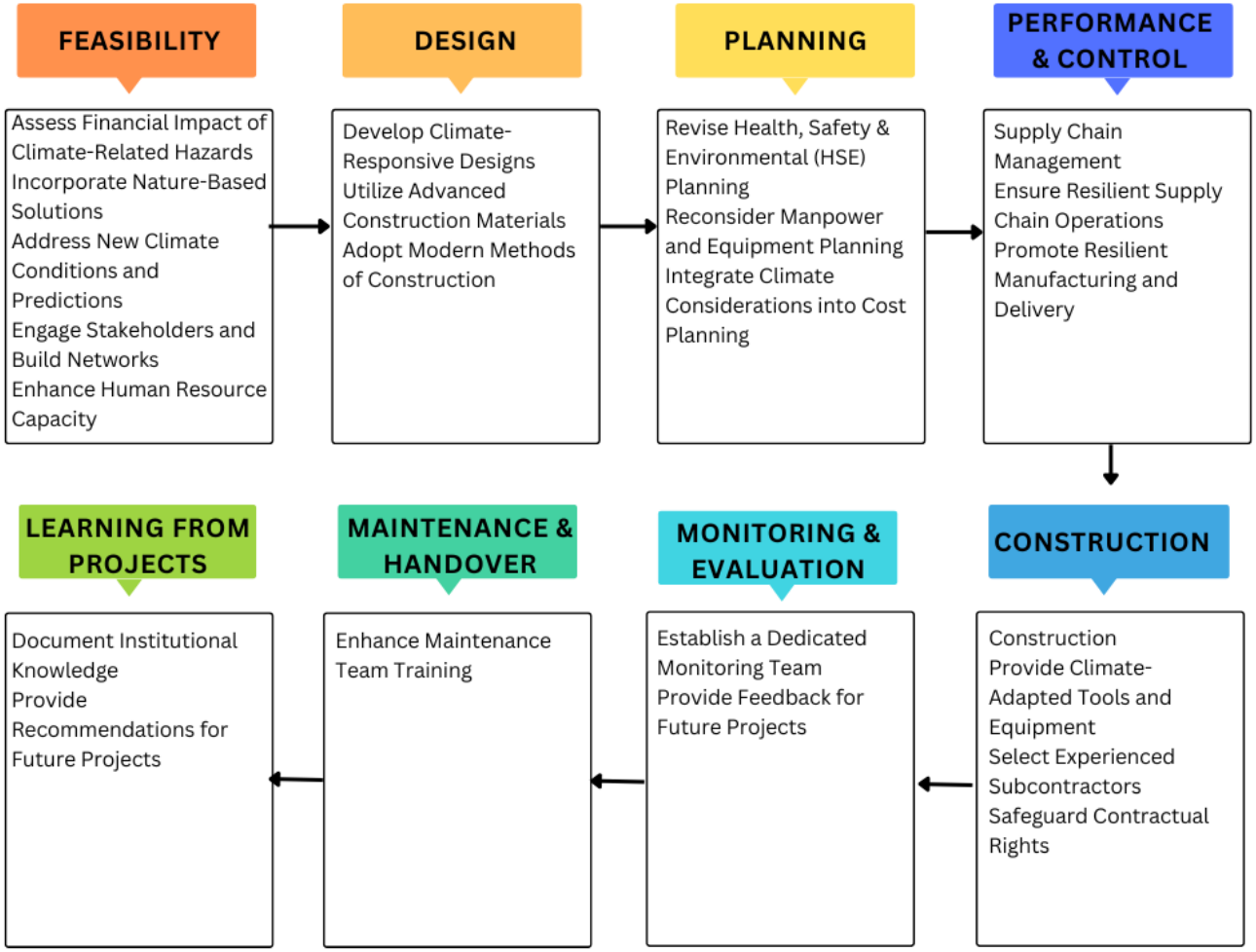
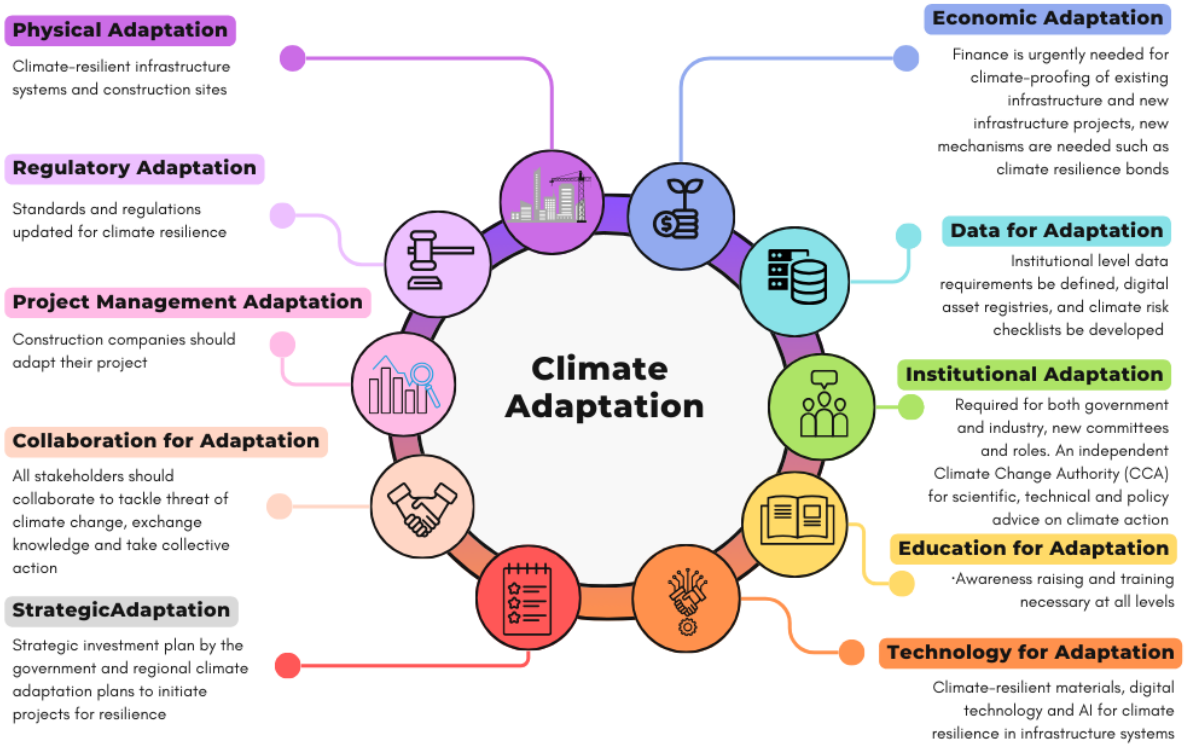
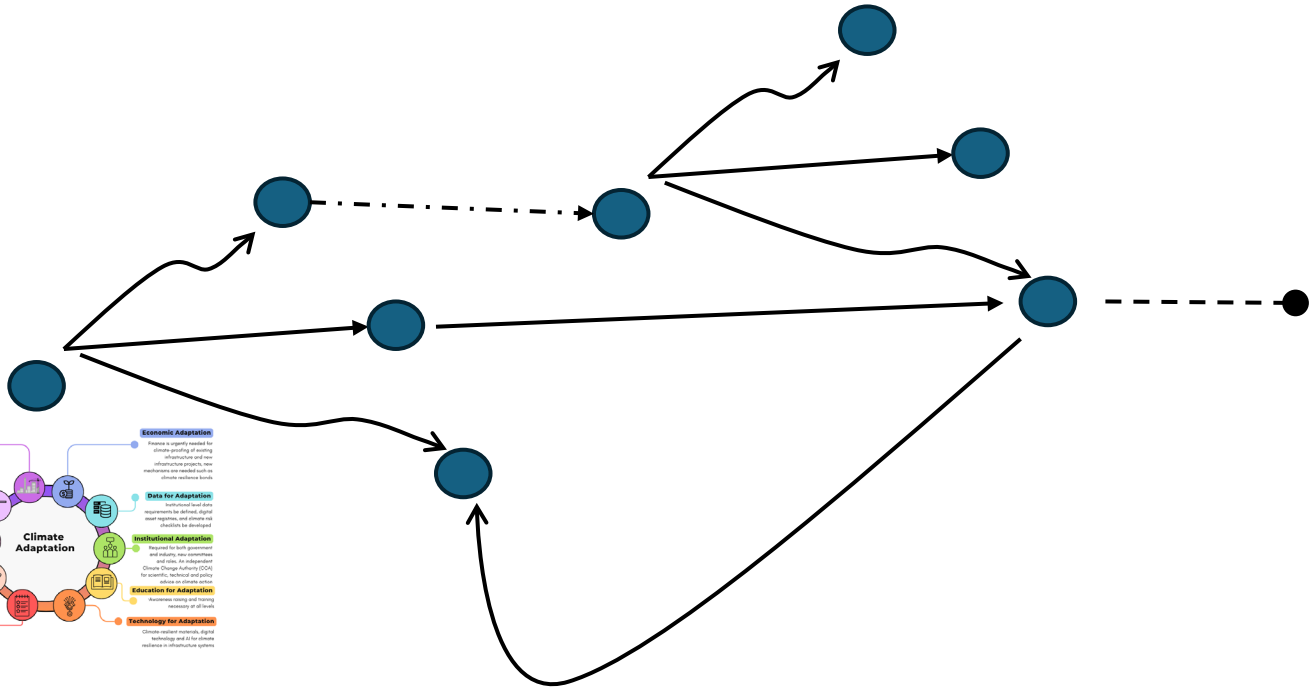


Climate Adaptation Agenda

- Climate proofing the infrastructure – urgent
- Standards and regulations for resilience
- Changes in the way construction sector works : People, project delivery and management methods – Collaboration
- Requirements : Asset registry, finance, adaptation planning, data, training …



Climate Adaptation Pathways

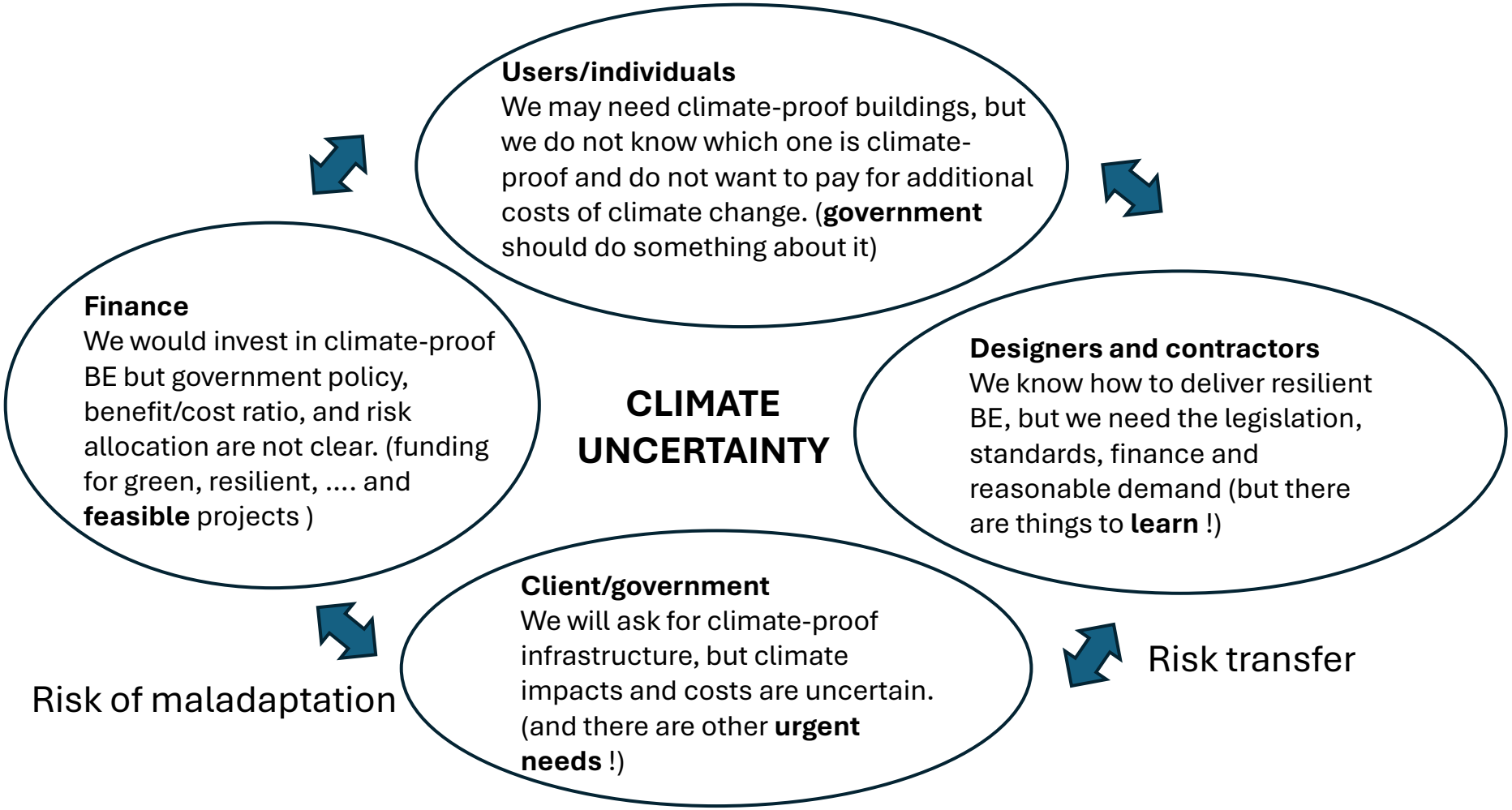


We must start doing things differently

Implications for Research

- Different **narratives** by practitioners conceptualise about climate mitigation and adaptation in construction, roles, responsibilities, policy implications …
- Narratives help us to identify systems and loops (vicious circle of inaction ?)

Vicious circle of blame



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THANK YOU

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