

리스크 관리 관점에서의 지역 리질리언스 및 손실과 피해 기금 조작용

Jung Hee Hyun

Research Scholar

Systemic Risk and Resilience (SYRR), Advanced Systems Analysis (ASA)
International Institute of Applied Systems Analysis

hyun@iiasa.ac.at

International Institute for Applied Systems Analysis (IIASA)

We are an international research institute that advances systems analysis and applies its research methods to identify policy solutions to reduce human footprints, enhance the resilience of natural and socioeconomic systems, and help achieve the sustainable development goals.



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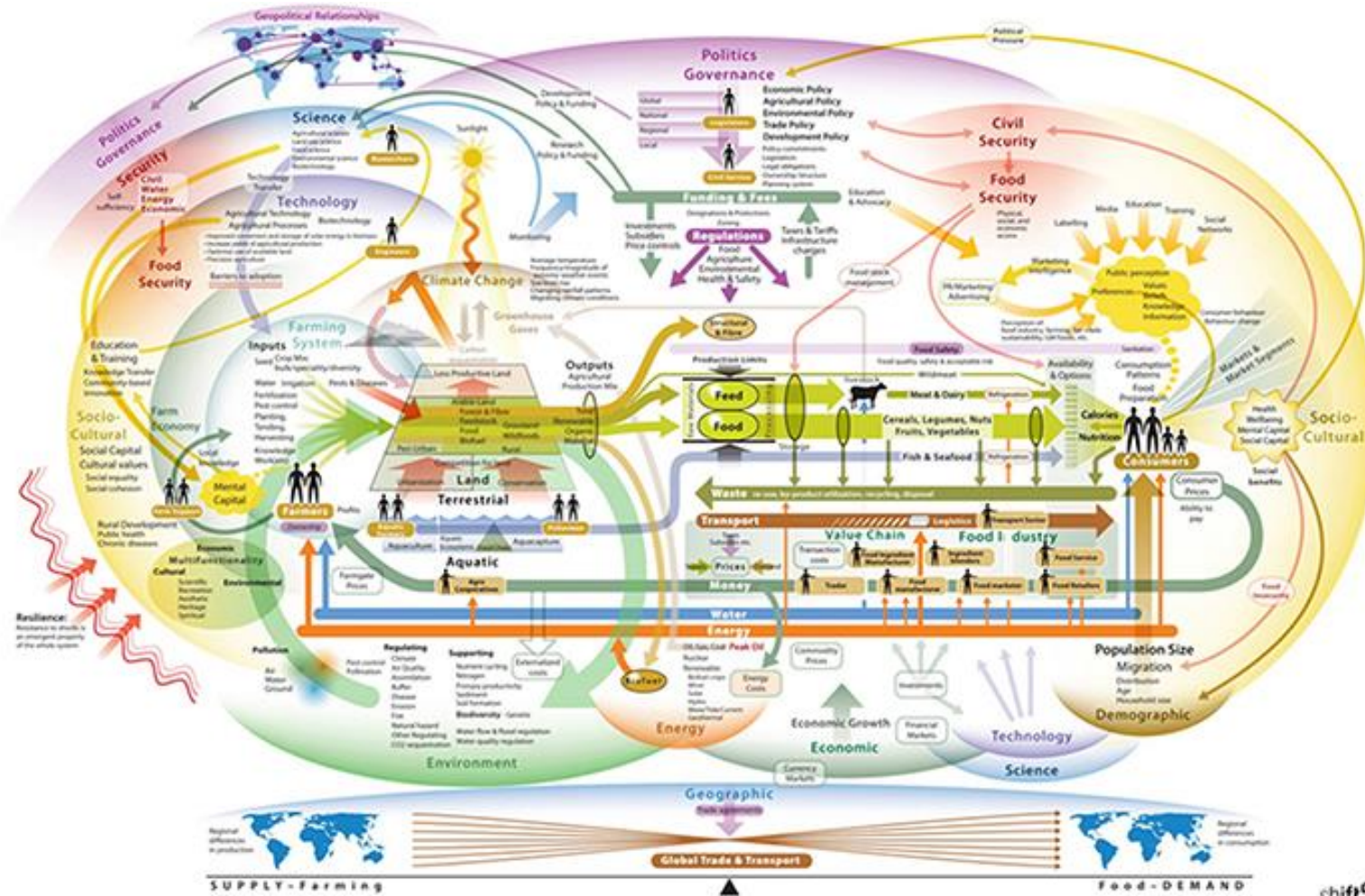
Programs

Advancing Systems Analysis	Biodiversity and Natural Resources	Economic Frontiers	Energy, Climate, and Environment	Population and Just Societies	Strategic Initiatives
<p>Research groups</p> <ul style="list-style-type: none"> Cooperation and Transformative Governance (CAT) Systemic Risk and Resilience (SYRR) Exploratory Modeling of Human-natural Systems (EM) Novel Data Ecosystems for Sustainability (NODES) 	<p>Research groups</p> <ul style="list-style-type: none"> Agriculture, Forestry, and Ecosystem Services (AFE) Biodiversity, Ecology, and Conservation (BEC) Integrated Biosphere Futures (IBF) Water Security (WAT) 	<p>Research groups</p> <ul style="list-style-type: none"> Economics of Equal Life Chances (EELC) Economics of disruptive change (EDC) 	<p>Research groups</p> <ul style="list-style-type: none"> Integrated Assessment and Climate Change (IACC) Pollution Management (PM) Sustainable Service Systems (S3) Transformative Institutional and Social Solutions (TISS) 	<p>Research groups</p> <ul style="list-style-type: none"> Equity and Justice (EQU) Migration and Sustainable Development (MIG) Multidimensional Demographic Modeling (MDM) Social Cohesion, Health, and Wellbeing 	<p>Jung Hee Hyun Guest Korea Research Foundation Postdoctoral Fellow Integrated Assessment and Climate Change Research Group Energy, Climate, and Environment Program</p>

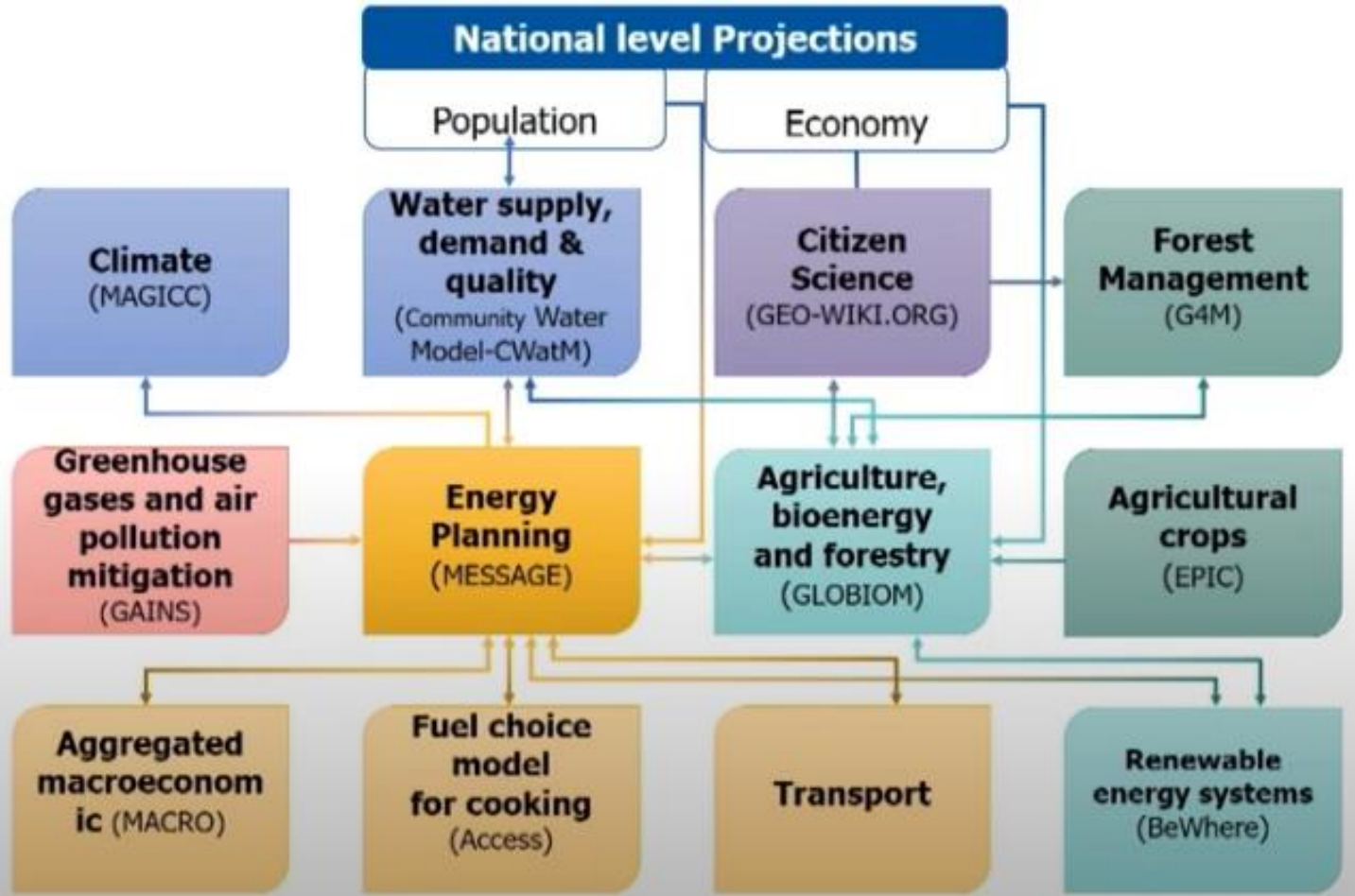
Human geography, social-ecological system analysis, climate adaptation, decision-making, climate finance

<https://iiasa.ac.at/staff/jung-hee-hyun>

Approaching key political and scientific challenges with systems and complexity analysis

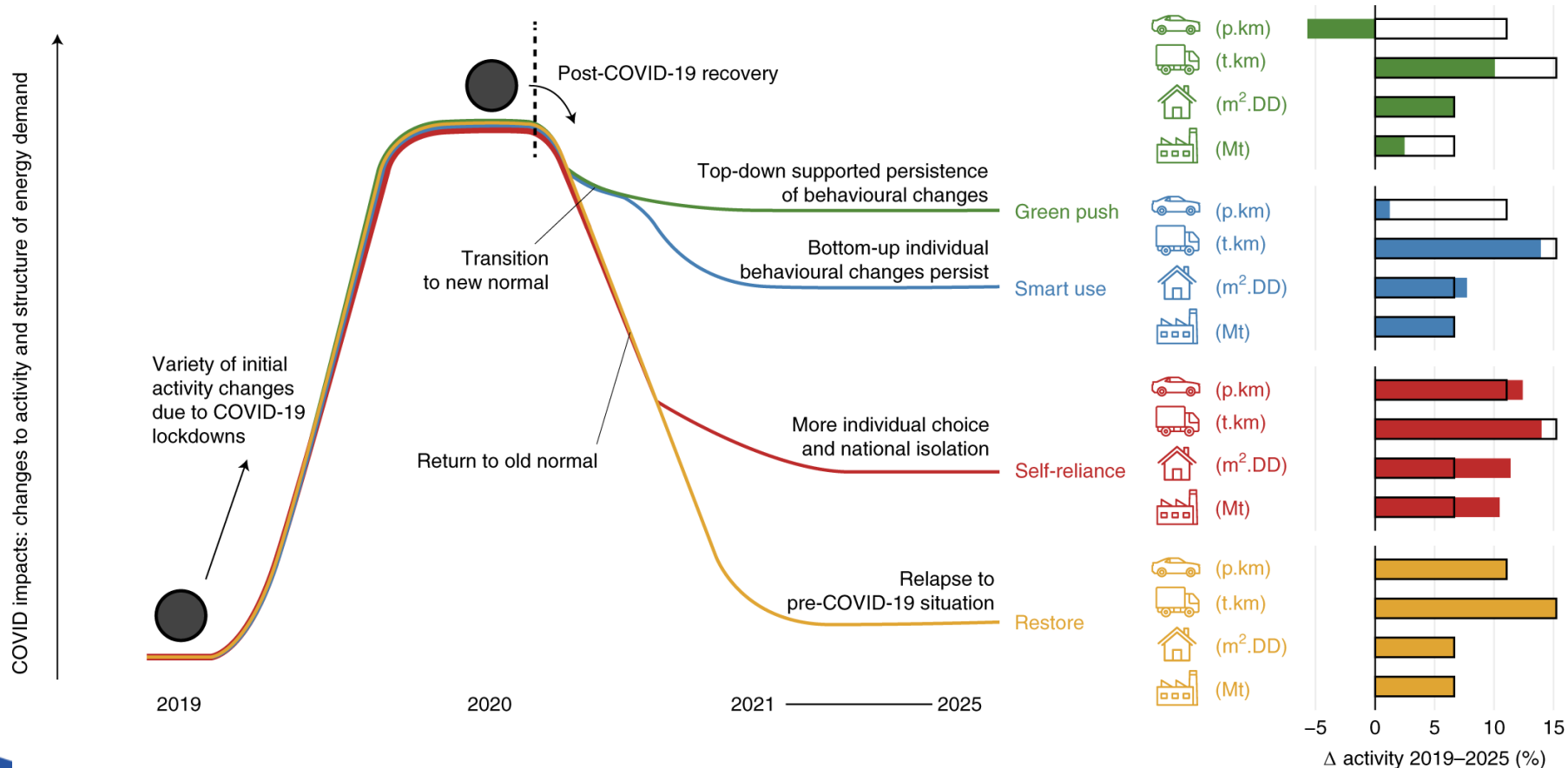


IIASA Integrated Assessment Framework



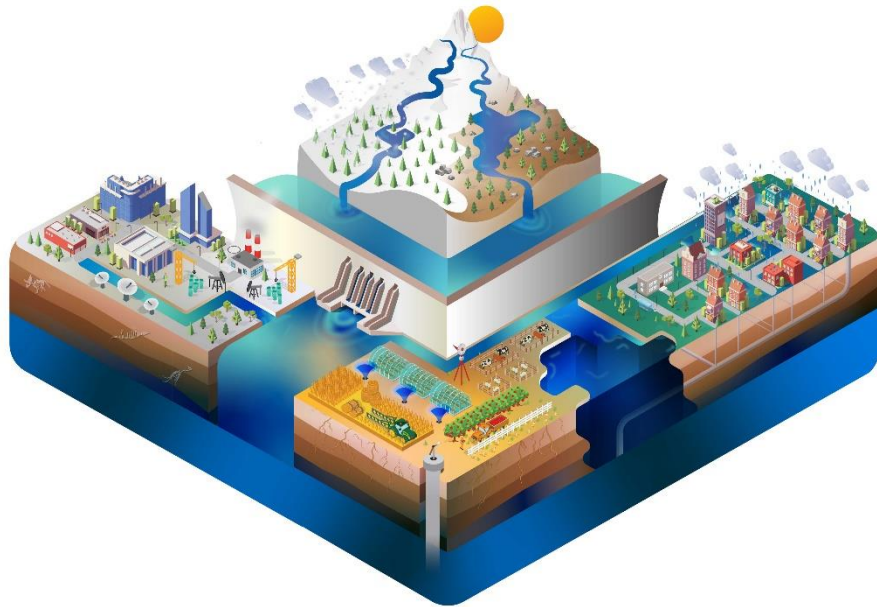
Narratives for post pandemic recovery

- understanding persistence of behavioral change

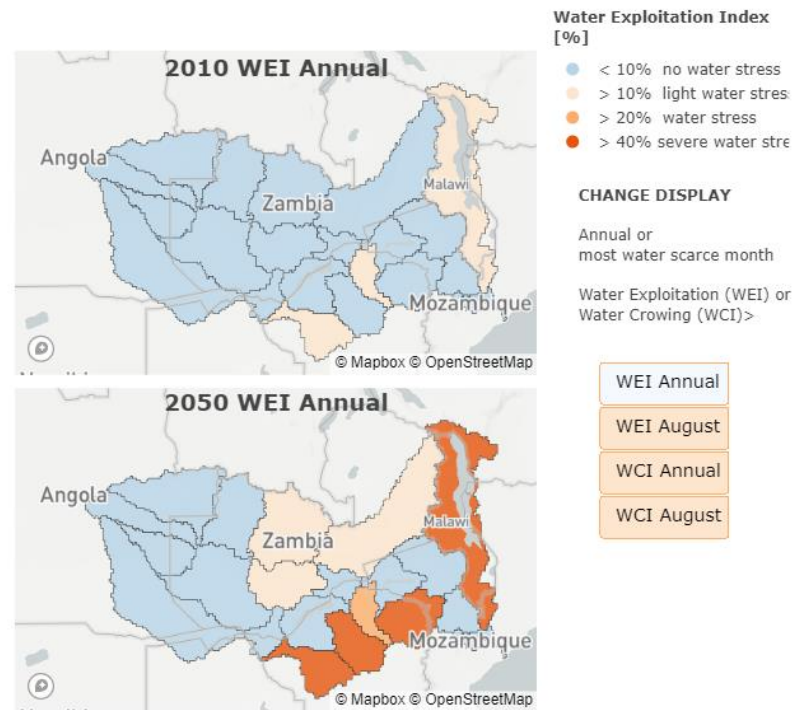


Community water futures and solutions initiative (WFaS)

- water stress according to SSP-RCP scenarios

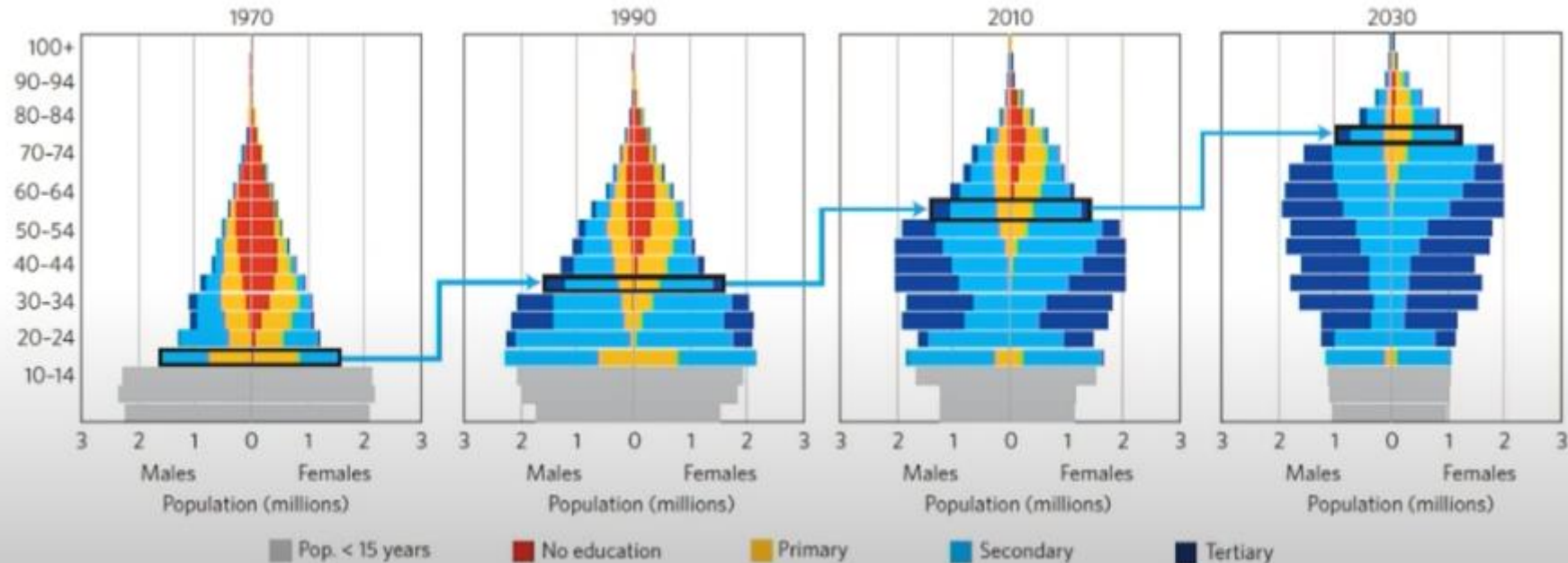
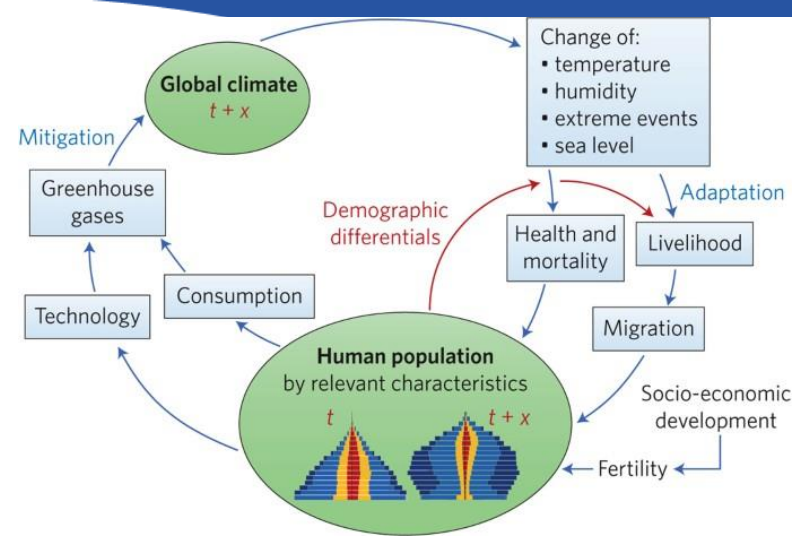


Zambezi Water Exploitation Index (WEI)



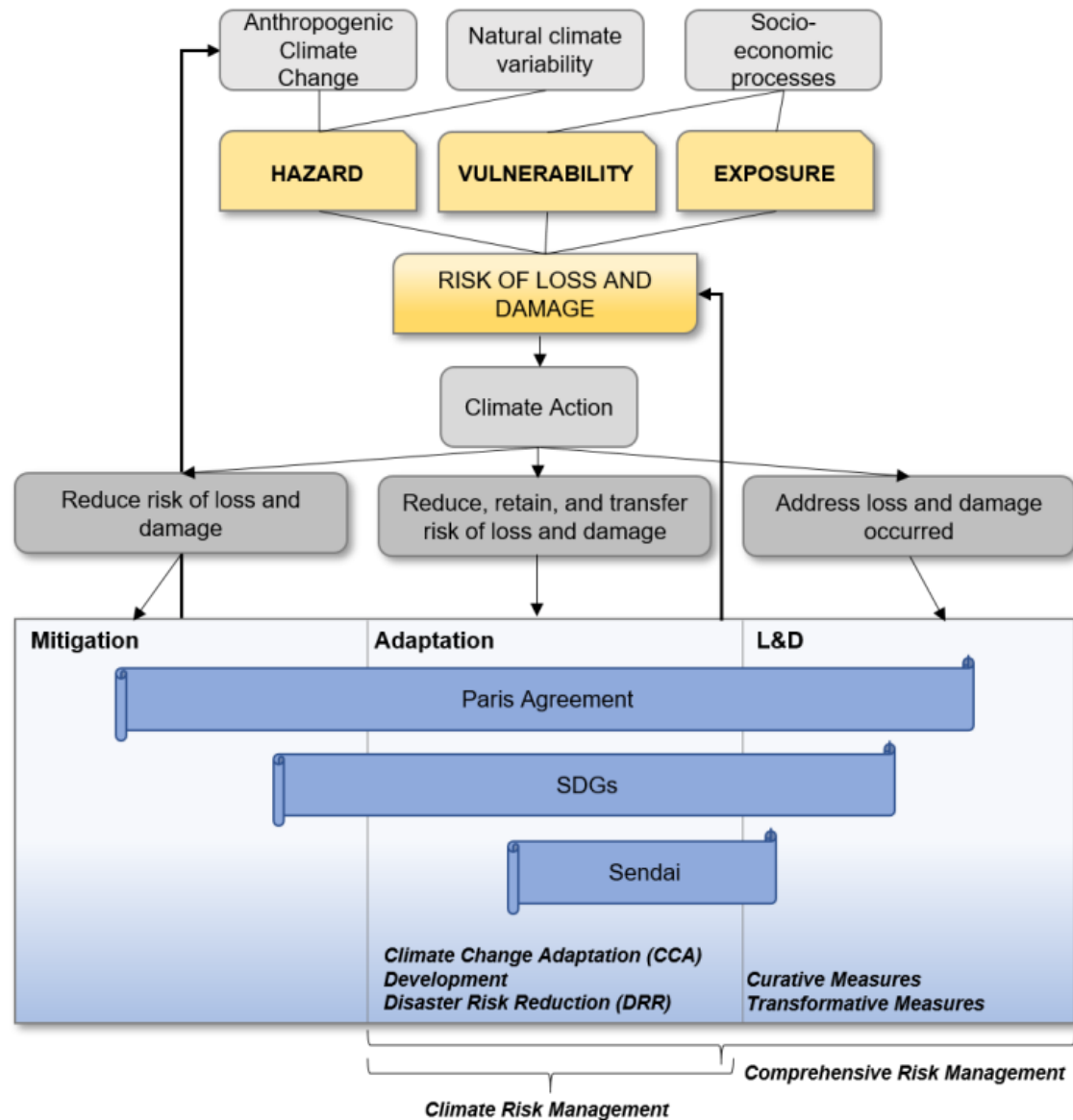
Multi-dimensional population dynamics - demographic adaptation capacity projections (S.Korea)

Lutz, W. & Mutarak, R. (2017). Forecasting societies' adaptive capacities through demographic metabolism model. *Nature Climate Change* 7 (3) 177-184. 10.1038/NCLIMATE3222.

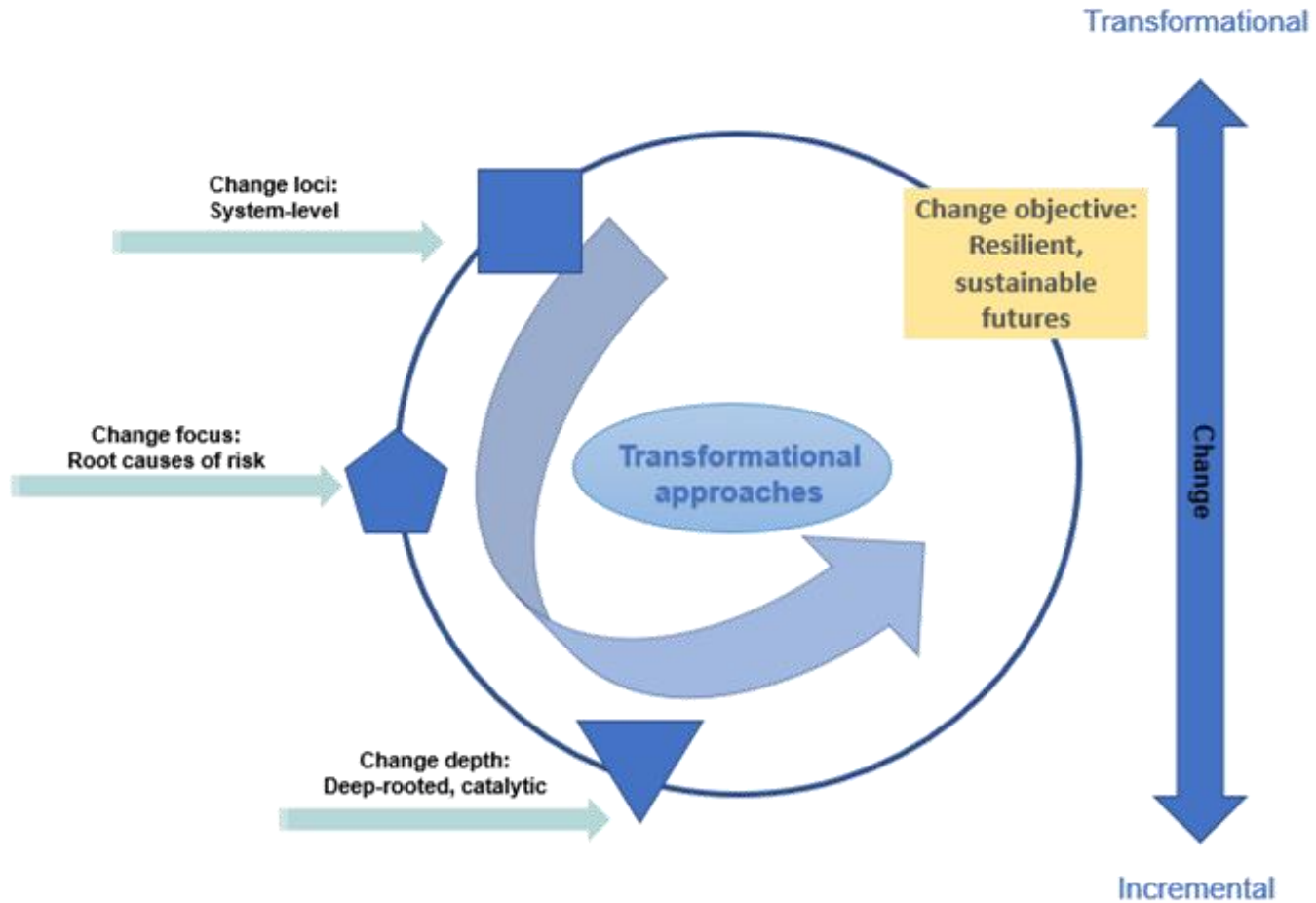


Systemic Risk and Resilience Group research scope –

Relationship between risk of loss and damage and the three key global agreements: Sendai, SDGs, and Climate Action

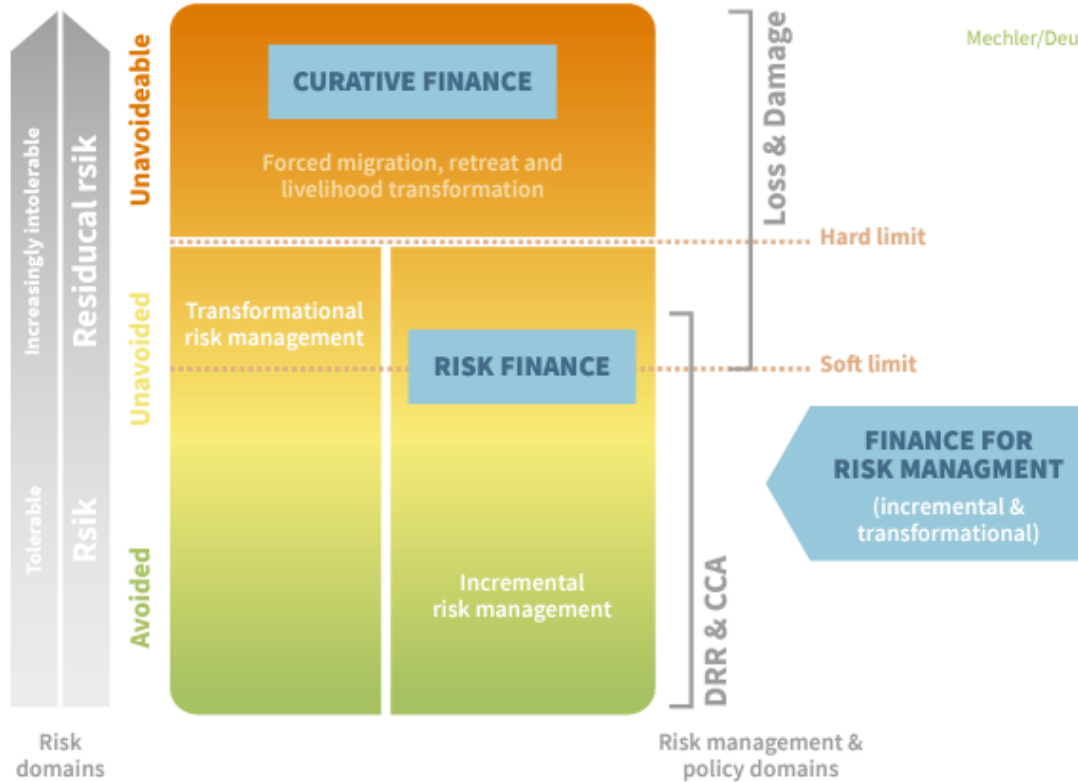


Transformational risk management

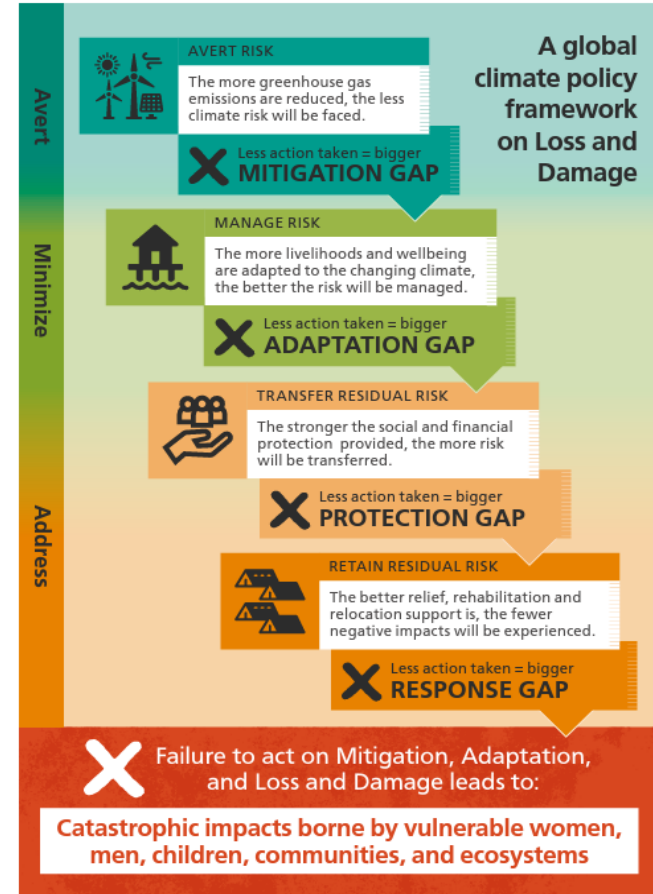


(Deubelli & Venkateswaran, 2021)

Risk layering frameworks



Source: Mechler/Deubelli 2021



(McQuistan & Mechler, 2022)

SYRR projects

Name of Project	Short description
Flood Resilience Alliance	<p>An innovative global partnership between research, development and humanitarian NGOs and the private sector that works together for making a step change with regard to policy, finance and the practice of managing floods and other climate-related hazards towards increased community resilience.</p> <p>https://floodresilience.net/</p>
MYRIAD-EU	<p>Multi-hazard risk management for risk-informed decision-making in the EU is a EU project that aims to support policy-makers, decision-makers, and practitioners to develop forward-looking disaster risk management pathways that assess trade-offs and synergies across sectors, hazards, and scales. The interlinkages between the different hazards and economic sectors will be studied in 5 pilots.</p> <p>https://www.myriadproject.eu/</p>
PEERS: Co-developing Pathways Towards Climate Resilient Regions in Europe	<p>Support at least 150 European regions and communities towards climate resilience by 2030. Develop a Resilience Maturity Curve to assess adaptation needs; step-by-step framework and supporting services of the Regional Resilience Journey; latest climate resilience and adaptation knowledge and data, behavioral change, governance, and engagement with a dedicated effort on financing</p>
Climate risk and vulnerability assessment framework and toolbox (CLIMAAX)	<p>Provide financial, analytical and practical support to stakeholder group, allowing an improvement of regional climate and emergency risk management plans; combined with Climate Adaptation policies and CC adapted Early Warning Systems and self-protection protocols of adequate actions to reduce community vulnerabilities.</p>

5 pilots serve as laboratories for systemic multi-hazard risk assessment and management. Each pilot focuses on the connections between different risks and at least 3 of the following economic sectors:



ECOSYSTEMS & FORESTRY



ENERGY



FINANCE



FOOD & AGRICULTURE

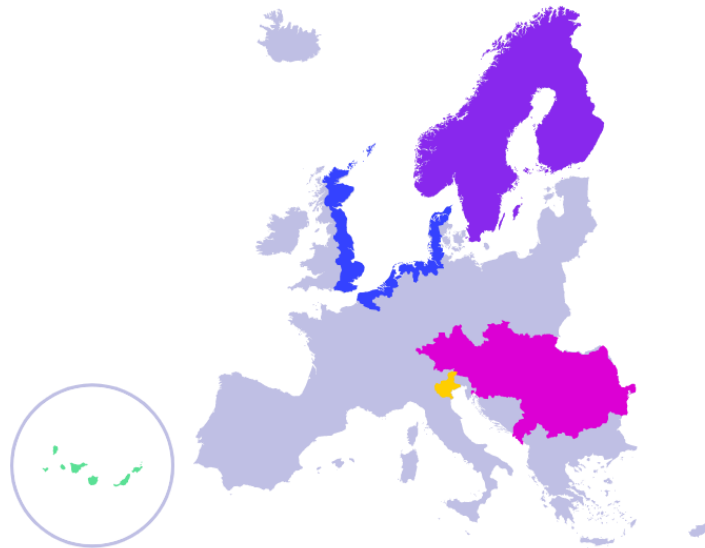


INFRASTRUCTURE AND TRANSPORT



TOURISM

Systemic risk interdependencies throughout Europe



DANUBE

CHALLENGE

How can we increase resilience to multiple disasters that impact several interconnected countries with strong macro-economic relations?

SECTOR

FINANCE

FOOD & AGRICULTURE

INFRASTRUCTURE AND TRANSPORT

HAZARDS



DROUGHT



EARTHQUAKE



FLOOD



HEAT



LANDSLIDE



THUNDER AND HAIL

KNOW MORE

Flood Resilience Assessment – operationalizing resilience



Advance
knowledge...

Develop
expertise...

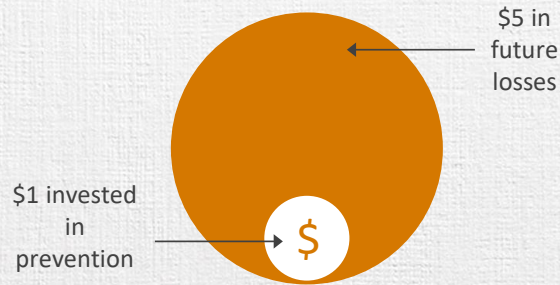
Design
strategies...

To help communities improve their ability to deal with the impact of floods

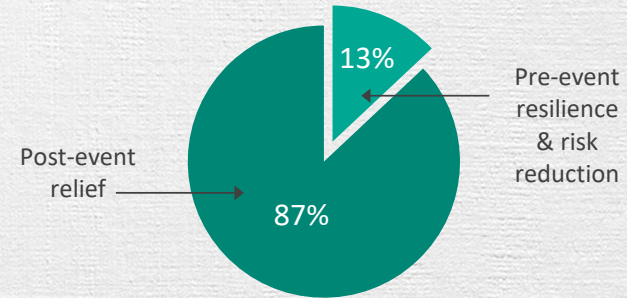
Why focus on floods?

Floods affect more people globally than any other types of natural hazard.

Why focus on resilience, rather than relief and recovery?



We find: Every \$1 invested in **prevention** saves \$5 in future losses.



But: Only 13% of spending on aid goes into **pre-event resilience & risk reduction**, 87% goes to post-event relief.

Building people's resilience to floods before the event will enable them to continue to develop their communities and improve their lives.

➔ Start with measuring (FRMC tool)

How Do We Define Resilience?

The ability of a system, community, or society to pursue its social, ecological, and economic development and growth objectives, while **managing its disaster risk** over time in a mutually reinforcing way



Individual:
Get a degree



Household:
Buy a vehicle



Small business:
Expand production



Community:
Electrify the community

There's a
flood event

Are the community members going to be able to achieve their goals in their planned timeframes?

How Do We Measure Resilience when...

- the inevitable role of **subjectivity and values** in the analysis of resilience
- resilience thinking starts with the premise that the **social and ecological** aspects of the study **system** are not identifiably separate
- balance between **internal and external forces** (drivers and perturbations) acting on the system
 - Nodes and linkages, drivers and attributes, change over time, etc.

No defined framework for measuring resilience

Difference from Risk

Risk

=

Hazard

X

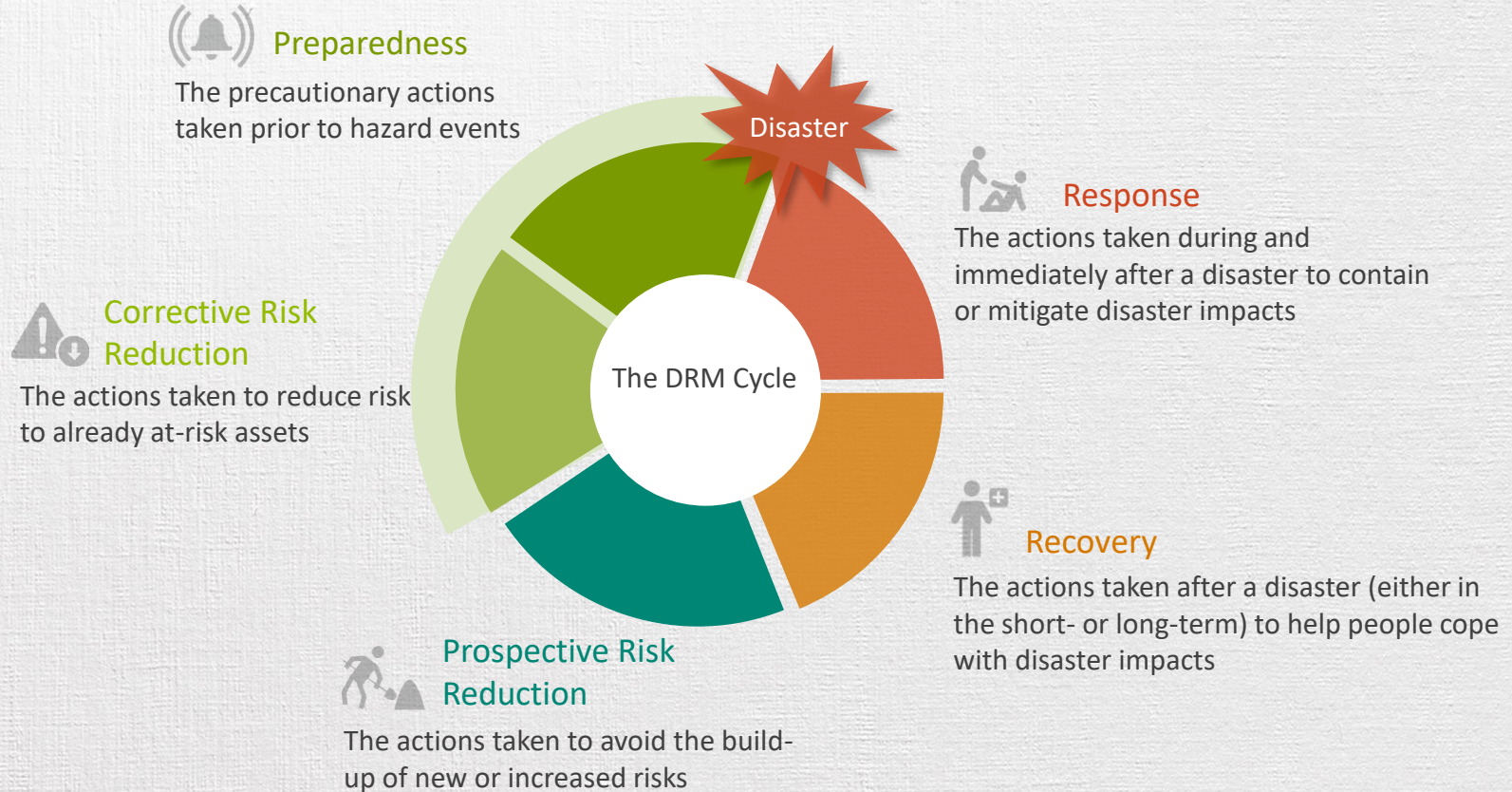
Exposure

X

Vulnerability



The Disaster Risk Management Cycle Lens



The Five Capitals

Financial:

level, variability, and diversity of income sources and access to other financial resources that contribute to wealth



Natural:

the natural resource base, including land productivity and actions to sustain it, as well as water and other resources that sustain livelihoods



The Five Capitals



Human:

knowledge, education, skills, health



Social:

social relationships and networks, bonds aiding cooperative action, links facilitating exchange of and access to ideas and resources



Physical:

things produced by economic activity from other capital, such as infrastructure, equipment, improvements in crops, livestock, etc.

The 4Rs of Resilience

Robustness

the ability to
withstand a shock

Redundancy

functional diversity

Resourcefulness

the ability to mobilize
when threatened

Rapidity

the ability to contain losses and
recover in a timely manner

The 7 Themes Lens



Assets

Physical assets in the community, such as buildings and their contents, productive assets, land, and infrastructure



Livelihoods

The means through which community members make a living, including people's capabilities, income, and activities required to secure the necessities of life via income or subsistence



Natural environment

The living and non-living components that occur naturally (are not made by humans), including natural features such as rivers, ecosystems, and the ecosystem services they provide



Life and health

The protection of human life and supporting human physical health



Lifelines

Essential systems or critical infrastructure that provide the necessities for meeting the community's needs



Governance

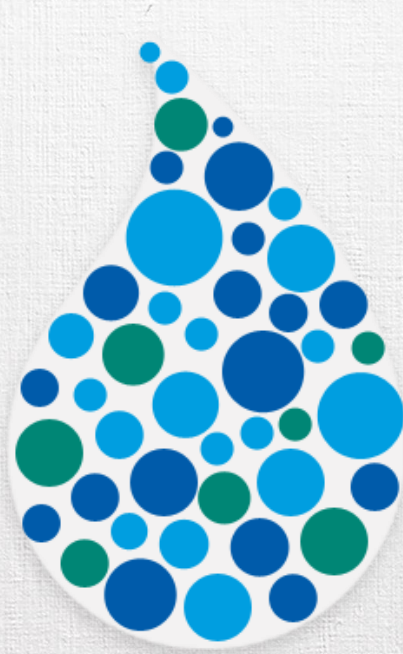
Formal/official and informal/unofficial organizations and institutions, and their operations, that govern life in the community



Social norms

Informal agreements that govern people's behavior

The Sources of Resilience



44 sources defined in the
FRMC framework

- Based on the community's assets and complementary resources that sustain and improve their wellbeing
- Take into account the multiple dimensions of resilience
- Serve as proxies before a flood to measure how a community fares, or how it performs after a flood

The 44 sources of resilience at a glance

Source Name	Capital code	4R	DRM cycle	Theme
Household asset recovery	F01	Redundancy	Recovery	Assets
Community disaster fund	F02	Resourcefulness	Recovery	Governance
Business continuity	F03	Rapidity	Preparedness	Livelihoods
Household income continuity strategy	F04	Redundancy	Preparedness	Livelihoods
Risk reduction investments	F05	Robustness	Corrective Risk Reduction	Assets
Disaster response budget	F06	Rapidity	Response	Governance
Conservation budget	F07	Robustness	Prospective Risk Reduction	Natural Environment
Evacuation and safety knowledge	H01	Robustness	Preparedness	Life and Health
First aid knowledge	H02	Robustness	Preparedness	Life and Health
Education commitment during floods	H03	Resourcefulness	Prospective Risk Reduction	Livelihoods
Flood exposure awareness	H04	Resourcefulness	Corrective Risk Reduction	Assets
Asset protection knowledge	H05	Robustness	Corrective Risk Reduction	Assets
Future flood risk awareness	H06	Robustness	Prospective Risk Reduction	Assets
Water and sanitation awareness	H07	Robustness	Response	Life and Health
Environmental management awareness	H08	Resourcefulness	Prospective Risk Reduction	Natural Environment
Governance awareness	H09	Resourcefulness	Corrective Risk Reduction	Social Norms
Natural capital condition	N01	Redundancy	Prospective Risk Reduction	Natural Environment
Priority natural units	N02	Robustness	Prospective Risk Reduction	Natural Environment
Priority managed units	N03	Robustness	Corrective Risk Reduction	Natural Environment
Natural resource conservation	N04	Resourcefulness	Prospective Risk Reduction	Governance
Natural habitat restoration	N05	Resourcefulness	Corrective Risk Reduction	Governance
Flood healthcare access	P01	Robustness	Response	Life and Health
Early Warning Systems (EWS)	P02	Robustness	Preparedness	Life and Health
Flood emergency infrastructure	P03	Resourcefulness	Preparedness	Life and Health
Provision of education	P04	Robustness	Recovery	Livelihoods
Household flood protection	P05	Robustness	Corrective Risk Reduction	Assets

Large scale flood protection	P06	Robustness	Corrective Risk Reduction	Assets
Transportation interruption	P07	Redundancy	Response	Lifelines
Communication interruption	P08	Rapidity	Response	Lifelines
Flood emergency food supply	P09	Robustness	Response	Lifelines
Flood safe water	P10	Robustness	Response	Lifelines
Flood waste contamination	P11	Robustness	Response	Lifelines
Flood energy supply	P12	Redundancy	Recovery	Lifelines
Community participation in flood related activities	S01	Resourcefulness	Preparedness	Life and Health
External flood response and recovery services	S02	Resourcefulness	Preparedness	Life and Health
Community safety	S03	Robustness	Recovery	Life and Health
Community disaster risk management planning	S04	Rapidity	Prospective Risk Reduction	Governance
Community structures for mutual assistance	S05	Resourcefulness	Response	Social Norms
Community representative bodies	S06	Resourcefulness	Corrective Risk Reduction	Governance
Social inclusiveness	S07	Resourcefulness	Corrective Risk Reduction	Social Norms
Local leadership	S08	Resourcefulness	Prospective Risk Reduction	Governance
Inter-community flood coordination	S09	Resourcefulness	Preparedness	Social Norms
Integrated flood management planning	S10	Resourcefulness	Corrective Risk Reduction	Governance
National forecasting policy & plan	S11	Resourcefulness	Preparedness	Governance

FRMC concept

1 COMMUNITY DATA COLLECTION

1/25
Waste management awareness
 Q: How concerned are people about garbage, particularly into the water source?
 Not at all concerned
 A little concerned
 Somewhat concerned
 Very concerned

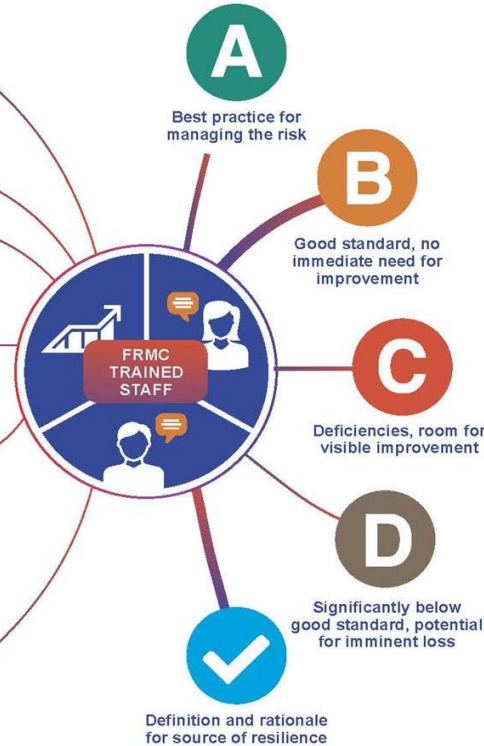
MIXED DATA COLLECTION METHODS

- HOUSEHOLD SURVEYS
- FOCUS GROUP DISCUSSIONS
- KEY INFORMANT INTERVIEWS
- SECOND SOURCE DATA
- COMMUNITY GROUP DISCUSSIONS

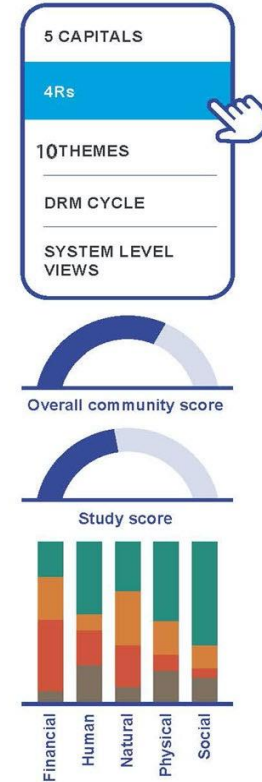
2 88 SOURCES OF RESILIENCE

- Waste management awareness
- Household income continuity strategy
- Personal safety
- Flood regulation and local enforcement
- Watershed/Basin scale management plan&structure
- Flood exposure awareness
- Household flood insurance
- Social inclusiveness
- Non-erosive flood recovery knowledge
- Lifelines infrastructure
- Individual (HH) Flood Vulnerability Management
- Early Warning Systems (EWS)

3 EXPERTS ASSIGN GRADES TO EACH SOURCE



4 DATA ANALYSIS AND INTERPRETATION



BASELINE STUDY AT TIME 1
 88 SOURCES OF RESILIENCE

FLOOD

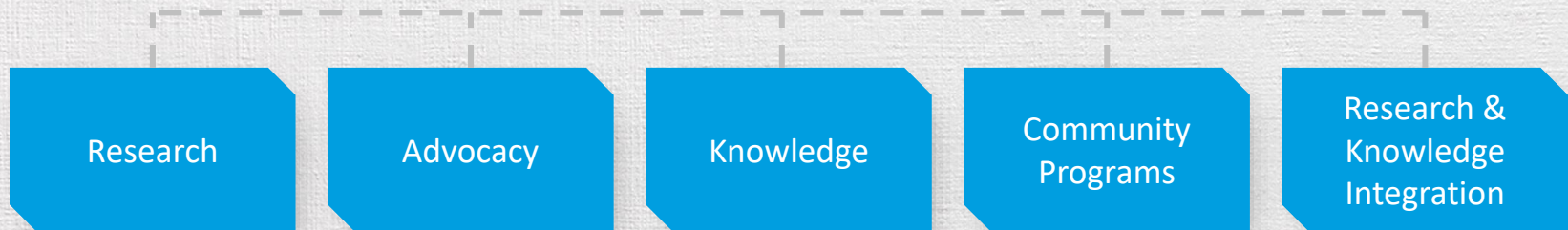
POST-EVENT STUDY
 29 OUTCOMES AFTER FLOODING

REPEATED STUDY AT TIME 2
 88 SOURCES OF RESILIENCE

The Zurich Alliance – Holistic organization for systematic research and implementation



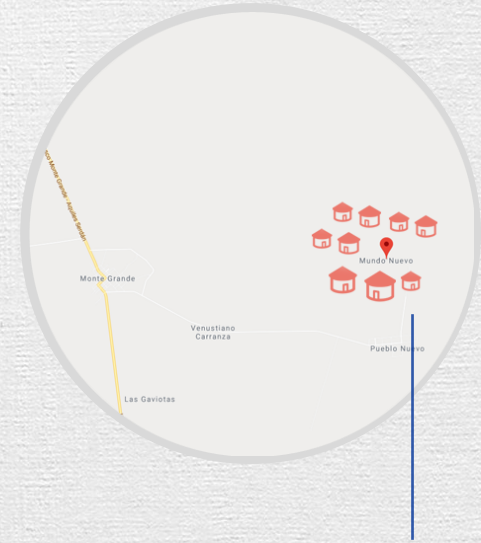
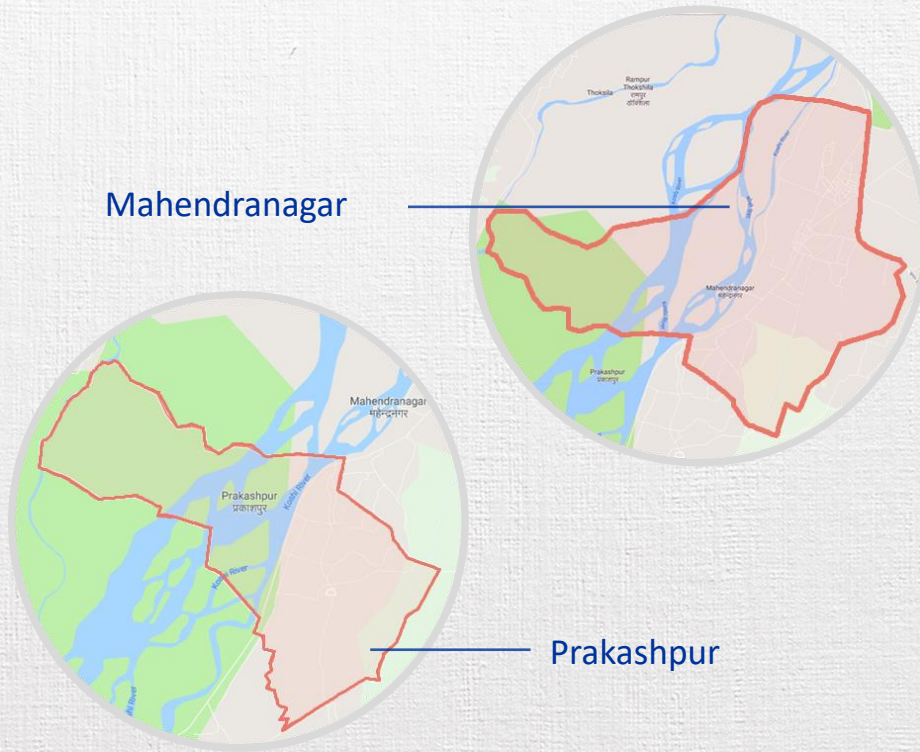
Work streams



Alliance 2.0 Community programs



How Do You Define a Community?



Nuevo Mundo, Mexico

A community largely defines itself, be it by physical, administrative, social or other bonds that make it form a unit.

Data collection

? Household Surveys

Household data collection is a structured interview between the local field team and individual households, usually held in the interviewee's home.



? Focus Group Discussions

A focus group session consists of a number of pre-invited respondents (ideally no more than 20) participating in a structured conversation. The discussion is moderated by the local field worker.



? Key Informant Interviews

Key informant interviews are in-depth interviews with people who have specialist knowledge about the community and the subject.



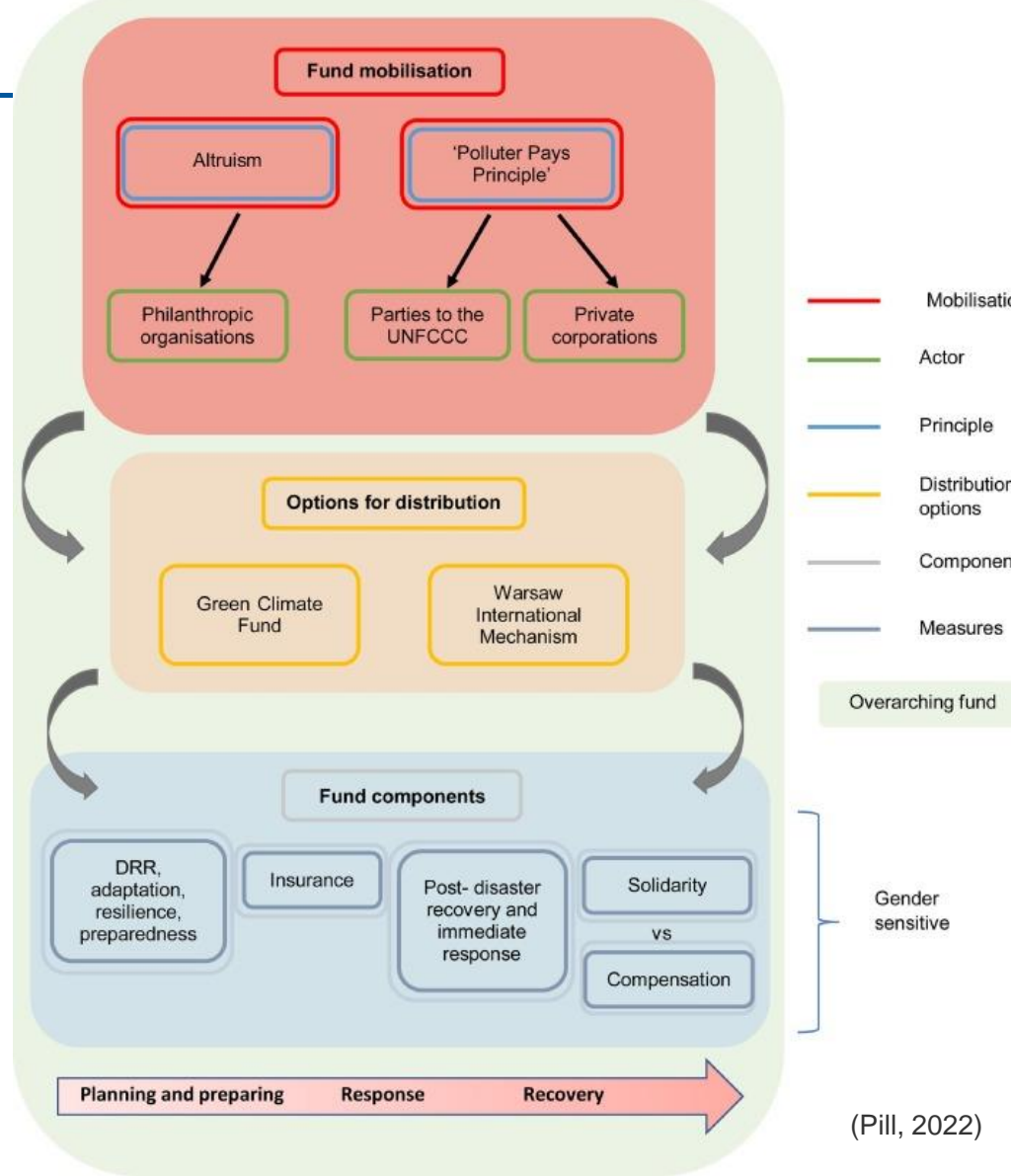
? Secondary Source Data

Secondary data is data that has been already collected or is readily available. This may include:

- Information from prior projects or other organizations
- Census data
- National or international data including online or offline government data
- Data from hazard/vulnerability assessments and risk maps

Upscaling community efforts – Loss and Damage fund (COP27)

- a. Early warning systems
- b. Emergency preparedness
- c. Slow onset events
- d. Irreversible and permanent loss and damage
- e. Comprehensive risk assessment and management
- f. Risk insurance facilities, climate risk pooling and other insurance solutions
- g. Non-economic losses
- h. Resilience of communities, livelihoods and ecosystems.



Addressing the response gap - bolster immeasurable

How to finance according to

- Climate attribution
- Measure slow-onset events (SOE) and Non-economic Losses (NELs)
- Identify appropriate financial instruments
 - insurance, catastrophe bonds, social protection schemes, contingency funds, tax, levy, etc.

Table 1: Potential loss and damage from slow-onset processes

Economic loss and damage	Non-economic loss and damage
<ul style="list-style-type: none"> ■ Damage and loss of infrastructure and property ■ Loss for fisheries and aquaculture ■ Losses in livestock production ■ Economic loss of agriculture production ■ Reduction and loss of crop productivity ■ Loss of areas for tourism and recreation 	<ul style="list-style-type: none"> ■ Damage or loss of ecosystems and their services ■ Decrease and loss of biodiversity ■ Decrease or loss of freshwater availability ■ Increased morbidity/mortality, potential loss of life ■ Loss of (cultural) heritage ■ Loss of identity ■ Loss of health ■ Loss of local and indigenous knowledge ■ Loss of land and habitat for people and animals ■ Loss of territory

Source: Source: Schäfer et al. 2021a

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