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Cascading climate risks:
Towards adaptive and
resilient European Societies

Cross-border Climate Impacts Response Framework

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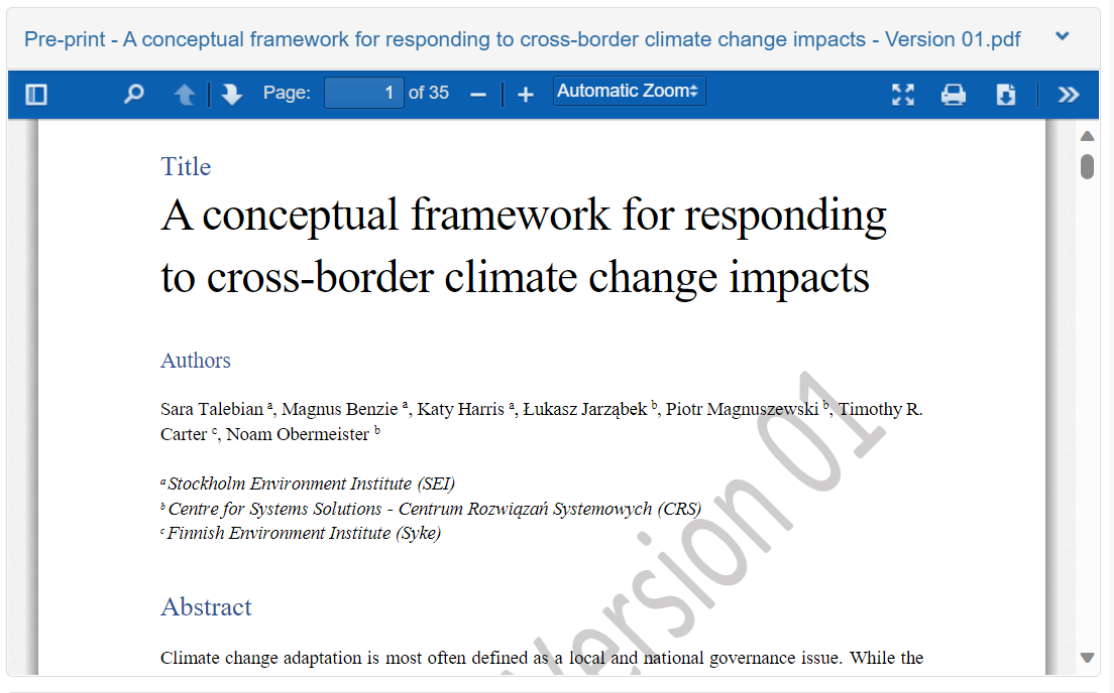
Talebian et al – forthcoming

Sister framework to Carter er al (2021)

- Same visual language & terminology
- Conceptual, not guidance
- Two worked examples

Stakeholder tendencies:

- think domestically
- ± target the trigger
- forget about the transmission system



https://zenodo.org/records/7817615

The framework elements

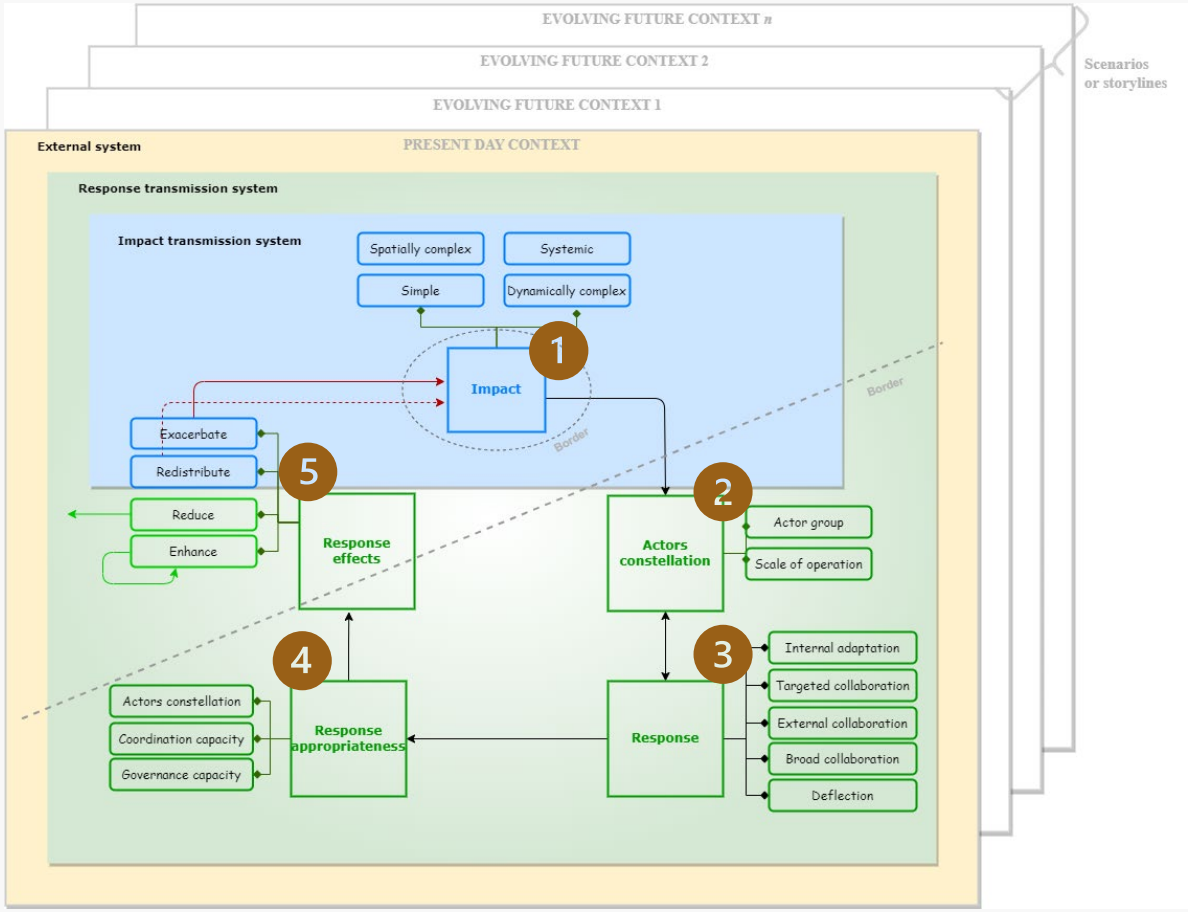
1. **Cross- border climate impacts typology**
   - ✓ Describe plausible cross-border climate impact types.

2. **Actor constellations**
   - ✓ Identify collections of actors in any given governance space:
     e.g. at origin, component/ ITS and recipient scales

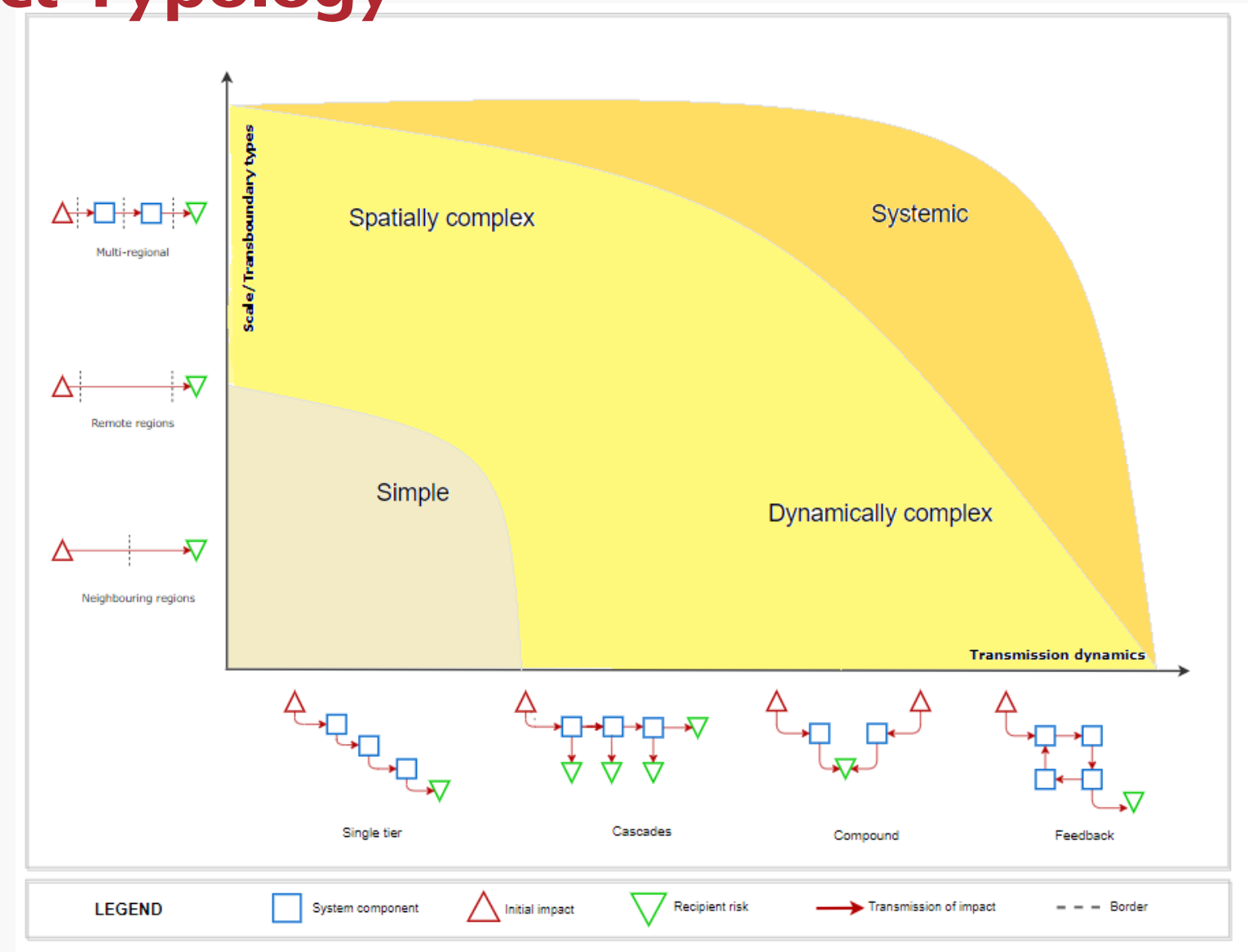
3. **Response typology**
   - ✓ Describe plausible response types for addressing cross-border climate impacts.

4. **Response appropriateness**
   - ✓ Identify factors relevant to the identification and selection of potential response options,
   - ✓ Hypothesise the suitability of multiple response types for each impact type,
   - ✓ And structure enquiry into the possible governance modalities to cross-border climate impacts.

5. **Response effects and effectiveness**



1. Impact Typology



Based on Carter et al., 2021; Schweizer, 2021; IRGC's framework (Marie-Valentine and Thomas, 2018)

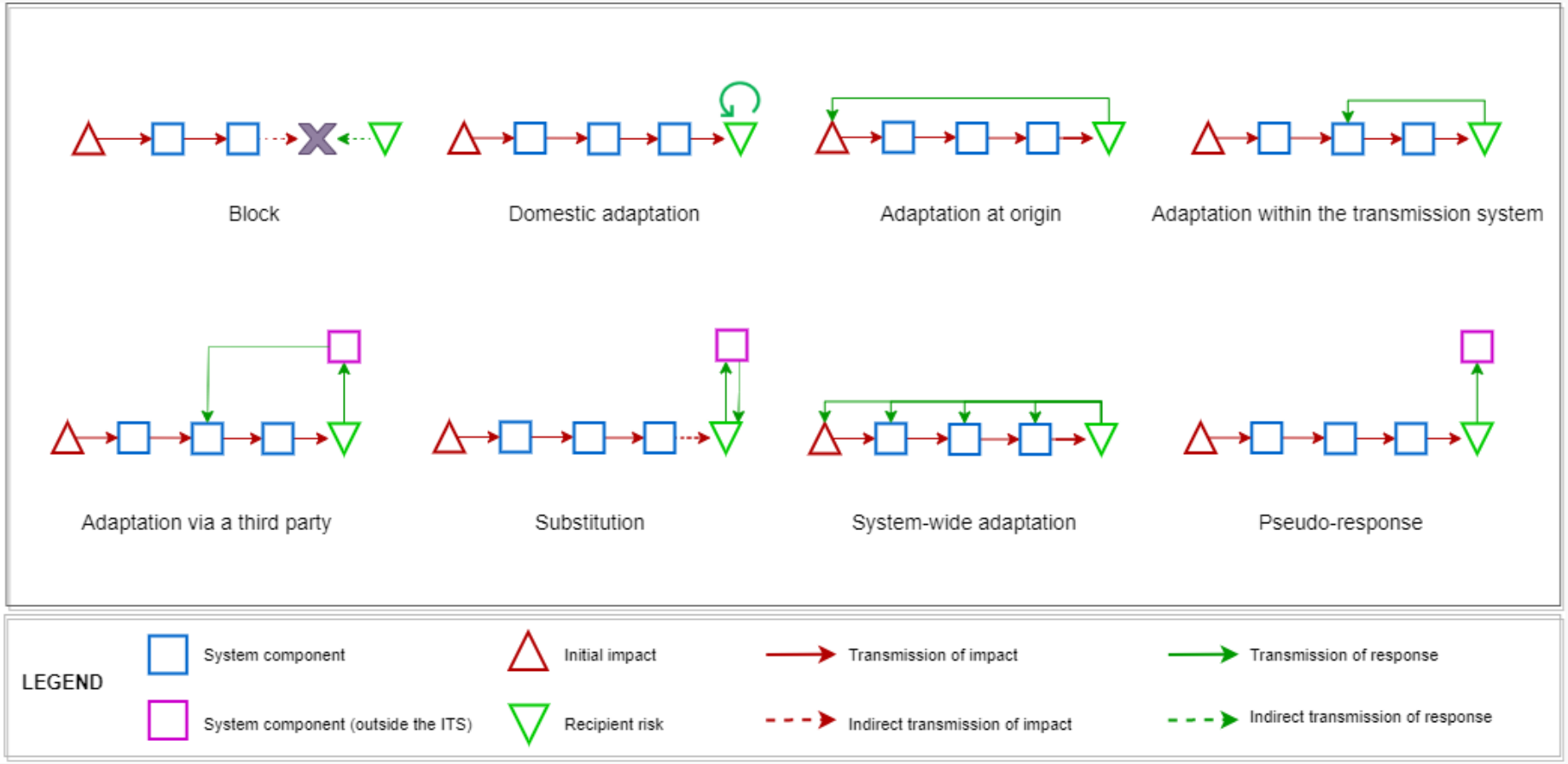
Spatially complex cross-border climate impacts occur in one location and propagate to the recipient location via system components located in more than one jurisdiction (multi-regional). The transmission dynamic of these impacts is a single-tier cascade. These impacts are characterised by low dynamic complexity and high spatial complexity (e.g., the impacts of decreased supply of coffee in the global south to import-dependent regions in the global north, through linear agricultural supply chains with relatively straightforward links between producers, processors, and consumers).

Systemic cross-border climate impacts transmit to the recipient location via multiple system components across more than one jurisdiction (multi-regional). Their transmission dynamic could be multi-tier cascades (also called cascades in short), compound, or feedback. They are characterised by high spatial and dynamic complexity. (e.g., the impacts in Europe – in the form of food affordability crisis – of global food market's inflation which is caused by the simultaneous occurrence of a crop failure in Africa resulting from prolonged droughts, and a decline in food production in Ukraine resulting from war).

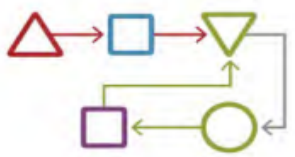
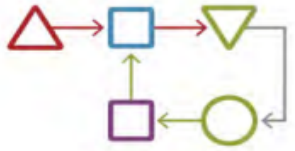
Simple cross-border climate impacts occur in one location and transmit to adjacent geographical regions (neighbouring) or distant locations (remote) in a cascade from one system component to the other (single-tier). The cascade could be escalating, amplified in each system component compared to the previous one, or diminishing, reduced in each system component compared to the previous one. The spatial and dynamic complexity of these impacts is low (e.g., the impacts of flooding caused by the melting of glaciers upstream between two neighbouring countries that share a river basin).

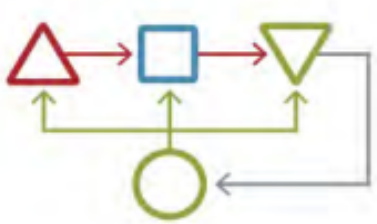
Dynamically complex cross-border climate impacts transmit to neighbouring or remote regions. The transmission dynamic of these impacts could involve cascade tiers with associated risks and opportunities at multiple system components (cascades), caused in multiple different locations before converging to affect the recipient (compound), or originate amplifying feed back between multiple system components (feedback). These impacts are characterised by high dynamic complexity and low spatial complexity (e.g., the impacts in Europe – in the form of migration – of a decline in food production in Sahel resulting from complex multi-dimensional dynamics between climate events such as drought, and non-climate events, such as conflict).

3. Response typology



Governance modality	Cooperation and influence	Potential actor constellations	Response types	
Internal adaptation	Very low cooperation across scales Very low capacity for external influence	Public and private actors at local and national levels	**Block** – A response type focused on preventing a cascading cross-border climate impact from affecting the recipient country's economy, society, and ecosystem through setting up barriers. *For example, Egypt, affected by the global food security crisis, reduces its dependence on global markets by strengthening small-scale agriculture and production capacities at home.*	
			Domestic adaptation – A response type focused on reducing vulnerabilities and/or increasing adaptive capacity of the recipient country through managing and/or absorbing the risks. *For example, a country affected by higher prices of certain food commodities in the global market reduces its population's vulnerability by promoting alternative diets containing alternative grains and plants produced locally and/or imported from less volatile sources and markets.*	

Governance modality	Cooperation and influence	Potential actor constellations	Response types	
External Collaboration	Medium to high cooperation across scales Medium to high capacity for external influence	Public and private actors in a few countries, including those not affected by the impact	**Substitution** – A response focused on substituting the source of impact and reducing dependency to a vulnerable system by creating new connections with a third party(s), i.e., a country or entity not affected by the same cross-border climate impact. *For example, a country affected by climate events in its traditional trade partner countries diversifies its trade portfolio through finding and connecting with new exporter countries.*	
			Adaptation via a third party – A response focused on mitigating and/or managing an impact through engaging and collaborating with an external or third party, i.e., a country or entity not affected by the same cross-border climate impact. *For example, the EU manages migration from countries affected by climate events by supporting international humanitarian and organisations (e.g., UNHCR, WFP, FAO, etc.) to address climate-induced risks to livelihoods and food security in those countries.*	

Governance modality	Cooperation and influence	Potential actor constellations	Response types	
Broad collaboration	Very high cooperation across scales Very high capacity for external influence	Public and private actors at transnational levels in several countries	**System-wide adaptation** – A response that targets a cross-border climate impact from multiple intervention points to maximise joint efforts in managing the impact, aiming at building system-wide resilience. *For example, the EU supports regional institutions and actors to drive regional integration and maintain political dialogue and transnational coordination and collaboration on addressing cascading climate impacts and implications for region-wide stability, development, and peace.*	

4. Response appropriateness

A logical process for pairing impact types with response types,

And consequently, appropriate governance modalities for addressing different impact types.

Based on three criteria:

- Actor constellations
- Cross-scale coordination capacity
- Governance capacity (including administrative and implementation capacity)

5. Response effects and consequences

Reduce risk – Effective in reducing risk as intended, thus contributing to enhanced resilience not only of the recipient, but also to other system components who are linked to the recipient.

Exacerbate risk – Effective at one scale (e.g., for the recipient) but in such a way that overall risk elsewhere in the ITS increases;

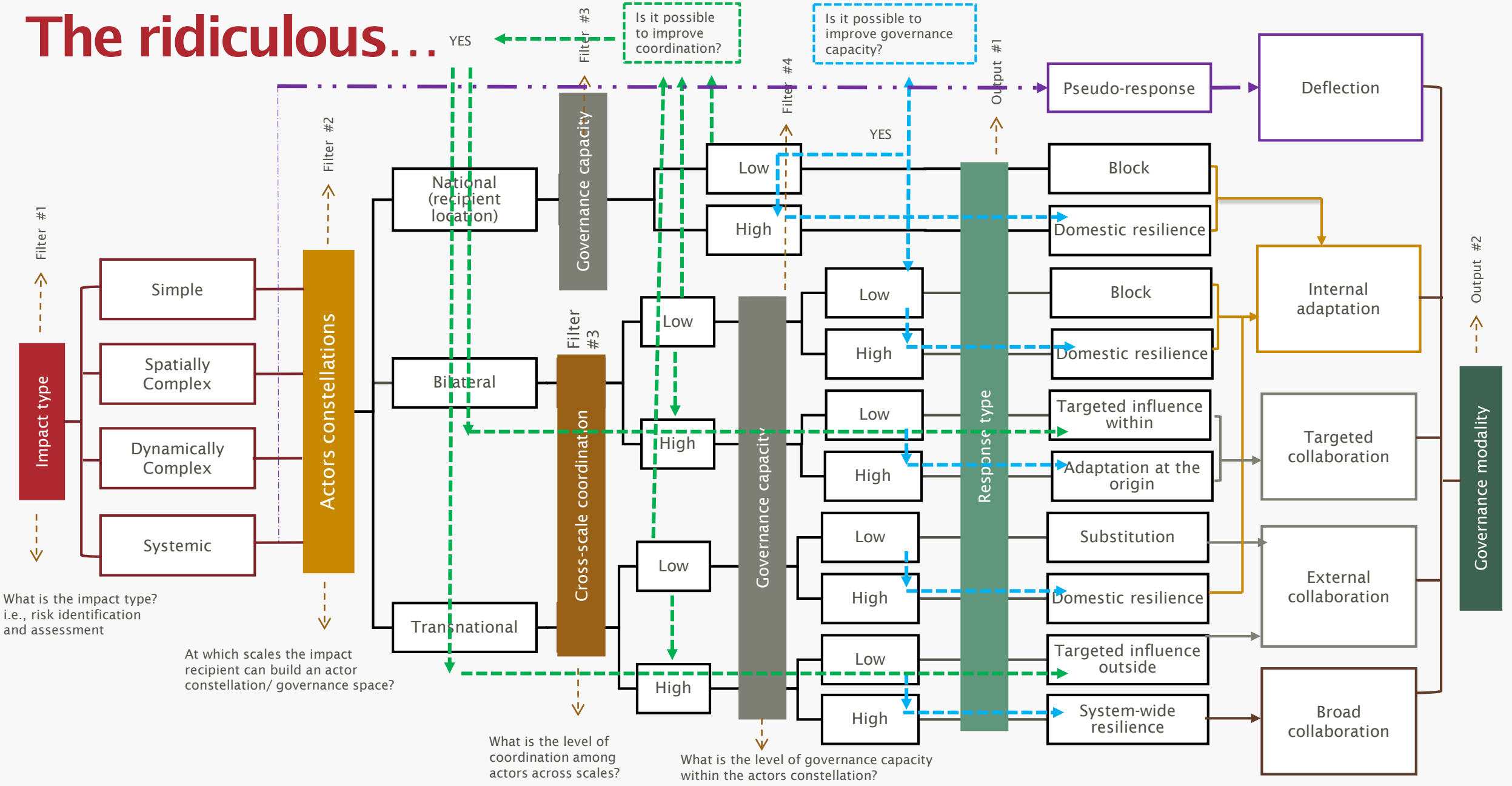
Redistribute risk - they may be effective at one scale (e.g., for the recipient) but by transferring risk to another system component, thus making no net contribution to resilience at the system level.

Enhance – Effective in exploiting opportunities associated with the impact

The sublime…

https://www.youtube.com/watch?v=z5tnKr67WC8&t=3s

The ridiculous…



Conclusions

- Planners can use this framework to identify specific types of responses, depending on the nature of risk they face, and their own capacities
- Current adaptation governance does not provide for the collaboration and cross-scale cooperation that will be needed to manage most cascading climate risks
- Countries with low coordination capacity have few viable options

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Operationalisation of the framework

Case studies

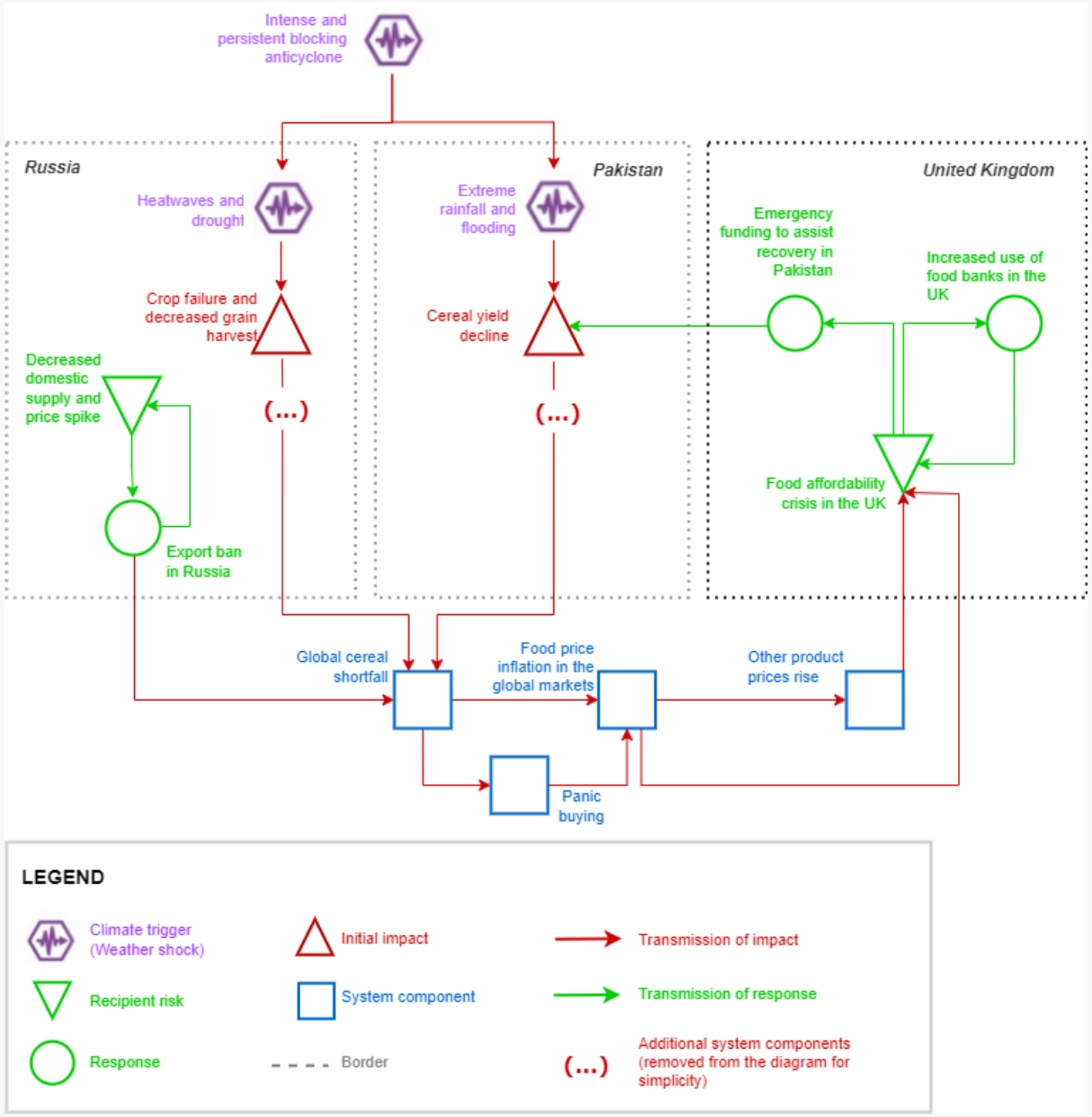
Historical case:

- Impact and impact type:
  - Food affordability crisis in the UK in 2010 (Systemic)
- Initial impact:
  - Crop failure in Russia & Pakistan
- Responses and response types:
  - Food bank in the UK (domestic resilience adaption)
  - Food aid to Pakistan (adaptation at the origin)

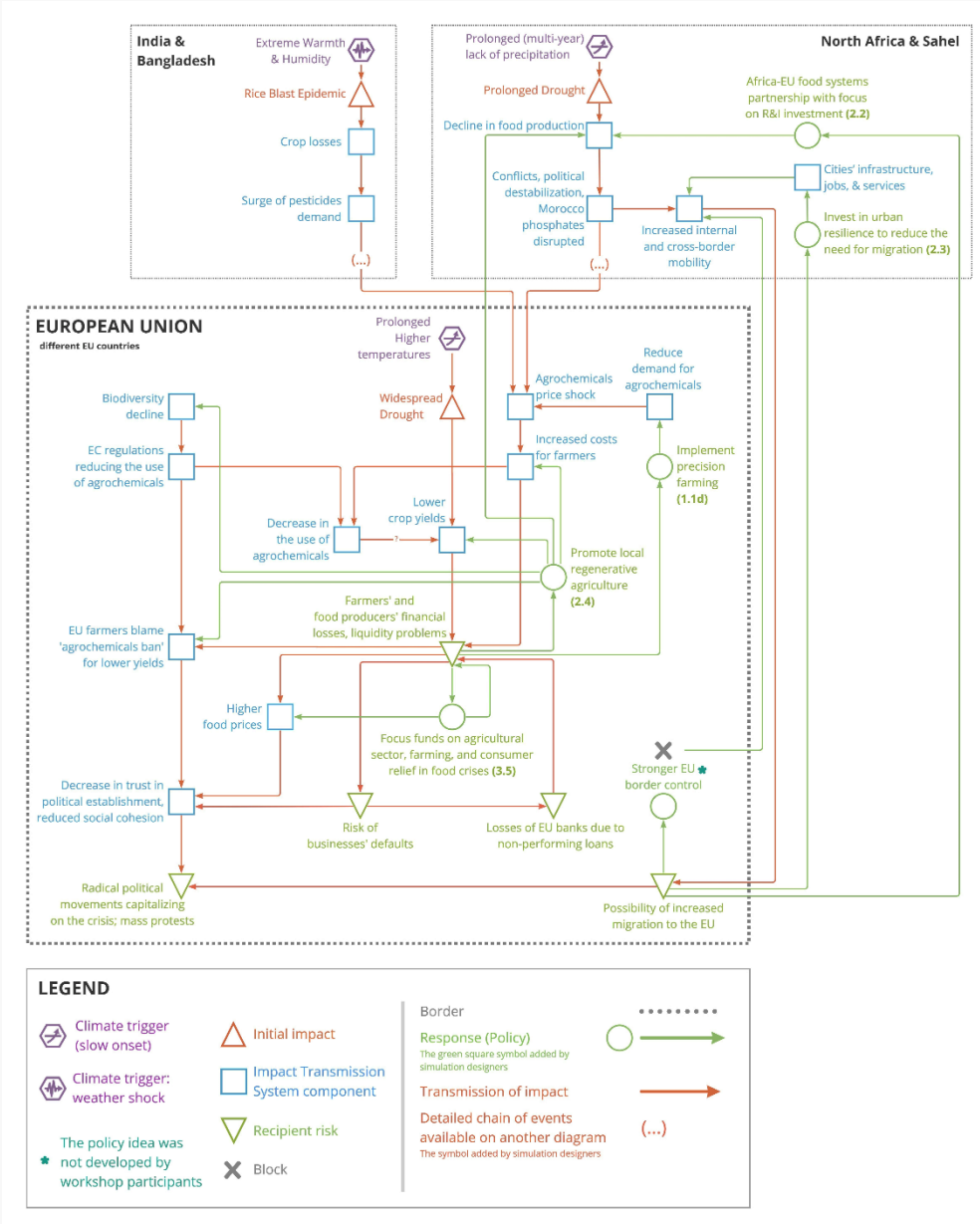
Simulation case:

- Impact and impact type (initial suggestion):
  - Farmers' and food producers' financial losses in the EU (Systemic)
- Initial impact:
  - Drought in North Africa & Sahel
  - Rice blast Epidemic in India & Bangladesh)
  - Palm oil production disruption in Indonesia
  - etc.
- Responses and response types:
  - National subsidies to food sector, EU land use framework for protein crops (domestic resilience)
  - Sustainable fertilizer value chain (substitution, domestic and system-wide resilience)
  - Commitment to open trade (system-wide resilience)
  - Strengthen global critical food supply chain (substitution)

Historical case study: food affordability crisis in the UK


Intense and persistent blocking anticyclone
Russia
Heatwaves and drought
Crop failure and decreased grain harvest
Decreased domestic supply and price spike
Export ban in Russia
(...)
Pakistan
Extreme rainfall and flooding
Cereal yield decline
(...)
United Kingdom
Emergency funding to assist recovery in Pakistan
Increased use of food banks in the UK
Food affordability crisis in the UK
Global cereal shortfall
Food price inflation in the global markets
Other product prices rise
Panic buying
LEGEND
Climate trigger (Weather shock)
Initial impact
Transmission of impact
Recipient risk
System component
Transmission of response
Response
Border
(...)
Additional system components (removed from the diagram for simplicity)

Simulation case: sub-storyline within EU


India & Bangladesh
Extreme Warmth & Humidity
Rice Blast Epidemic
Crop losses
Surge of pesticides demand
(...)
North Africa & Sahel
Prolonged (multi-year) lack of precipitation
Prolonged Drought
Decline in food production
Africa-EU food systems partnership with focus on R&I investment (2.2)
Conflicts, political destabilization, Morocco phosphates disrupted
Cities' infrastructure, jobs, & services
Increased internal and cross-border mobility
Invest in urban resilience to reduce the need for migration (2.3)
(...)
EUROPEAN UNION
different EU countries
Prolonged Higher temperatures
Widespread Drought
Biodiversity decline
EC regulations reducing the use of agrochemicals
Agrochemicals price shock
Reduce demand for agrochemicals
Increased costs for farmers
Implement precision farming (1.1d)
Lower crop yields
Decrease in the use of agrochemicals
Promote local regenerative agriculture (2.4)
Farmers' and food producers' financial losses, liquidity problems
EU farmers blame 'agrochemicals ban' for lower yields
Higher food prices
Focus funds on agricultural sector, farming, and consumer relief in food crises (3.5)
Stronger EU border control
Decrease in trust in political establishment, reduced social cohesion
Risk of businesses' defaults
Losses of EU banks due to non-performing loans
Radical political movements capitalizing on the crisis; mass protests
Possibility of increased migration to the EU
LEGEND
Climate trigger (slow onset)
Climate trigger: weather shock
The policy idea was not developed by workshop participants
Initial impact
Impact Transmission System component
Recipient risk
Block
Border
Response (Policy)
The green square symbol added by simulation designers
Transmission of impact
Detailed chain of events available on another diagram
The symbol added by simulation designers
(...)