

# Transboundary impacts of coastal risk and SLR on trade

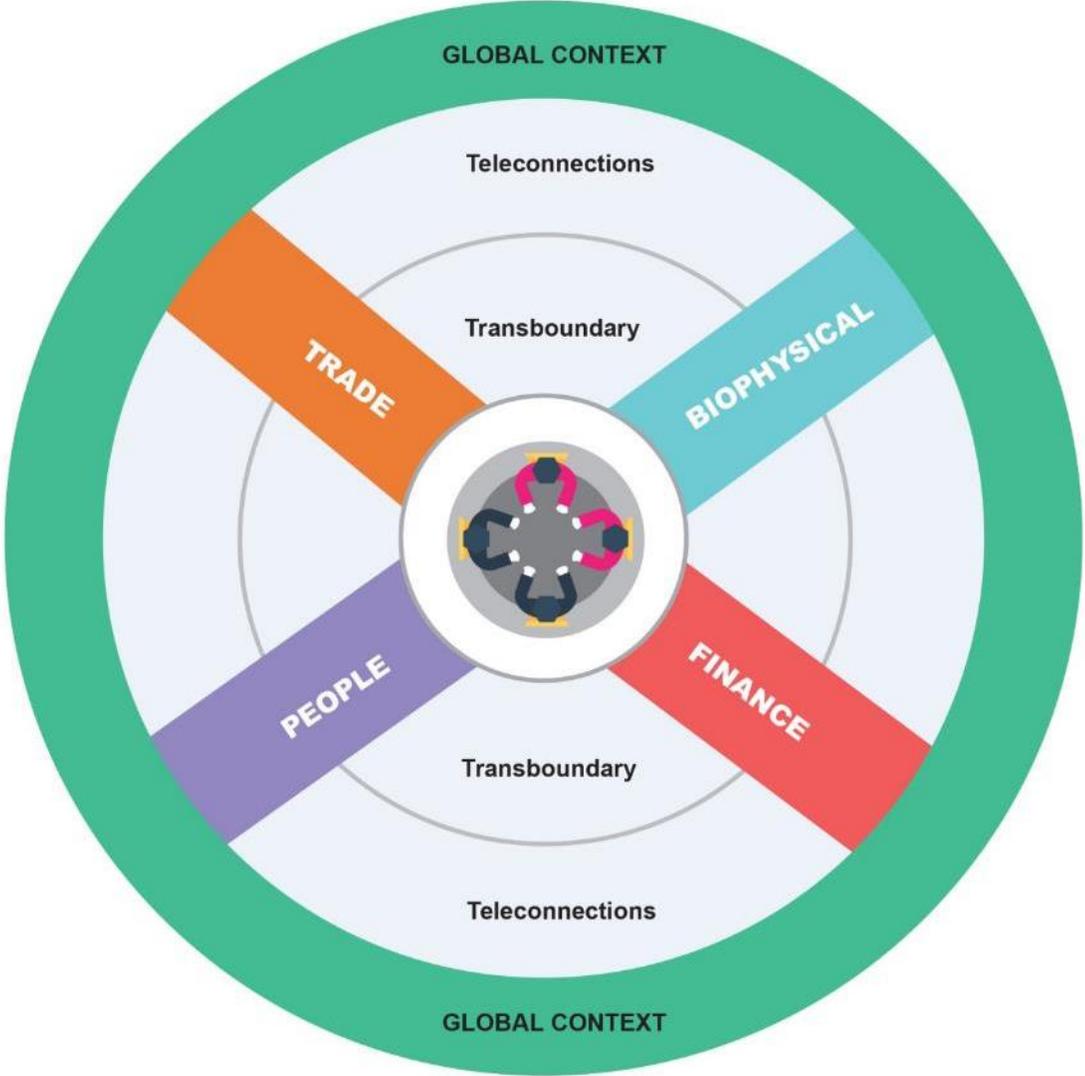
Magnus Benzie

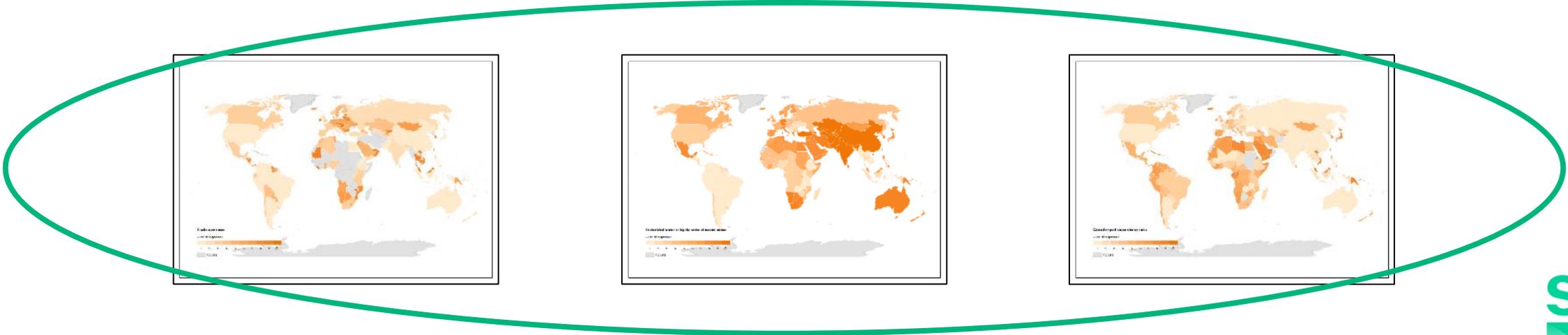
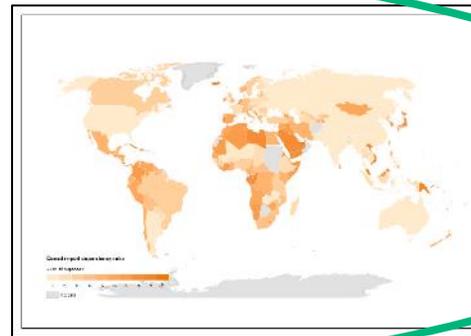
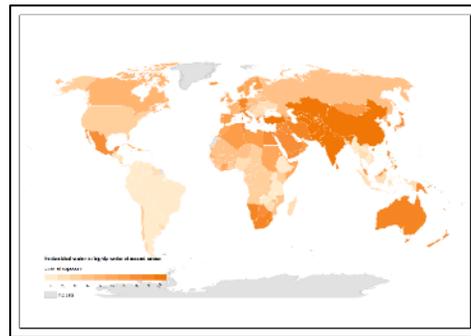
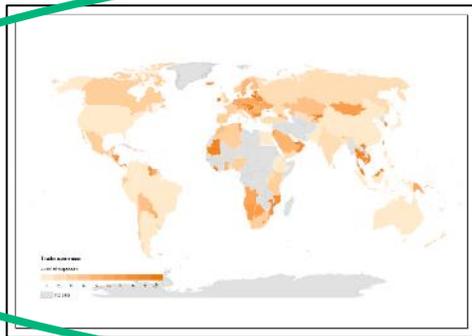
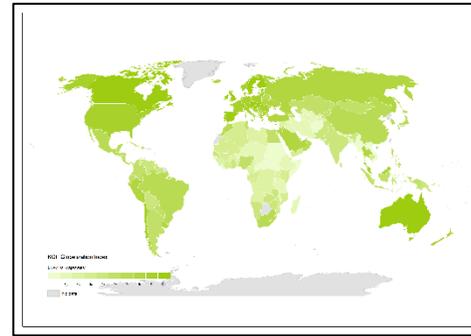
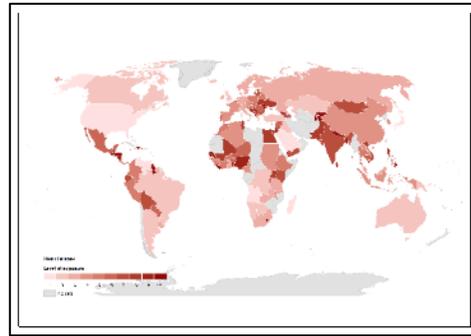
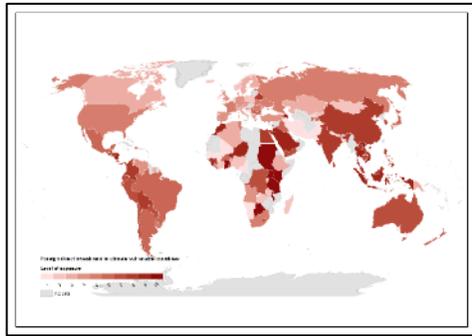
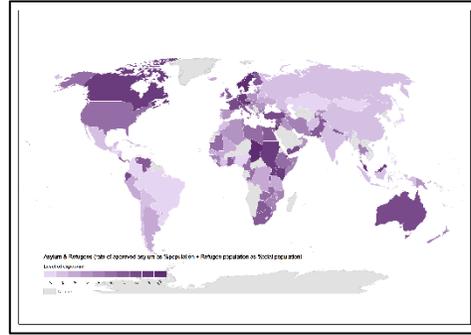
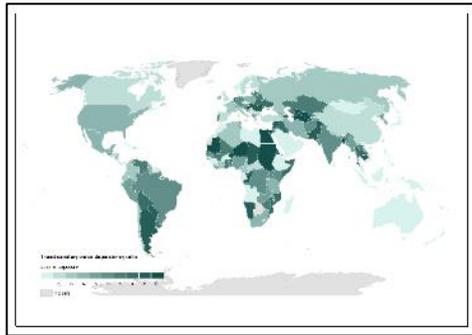
Research Fellow



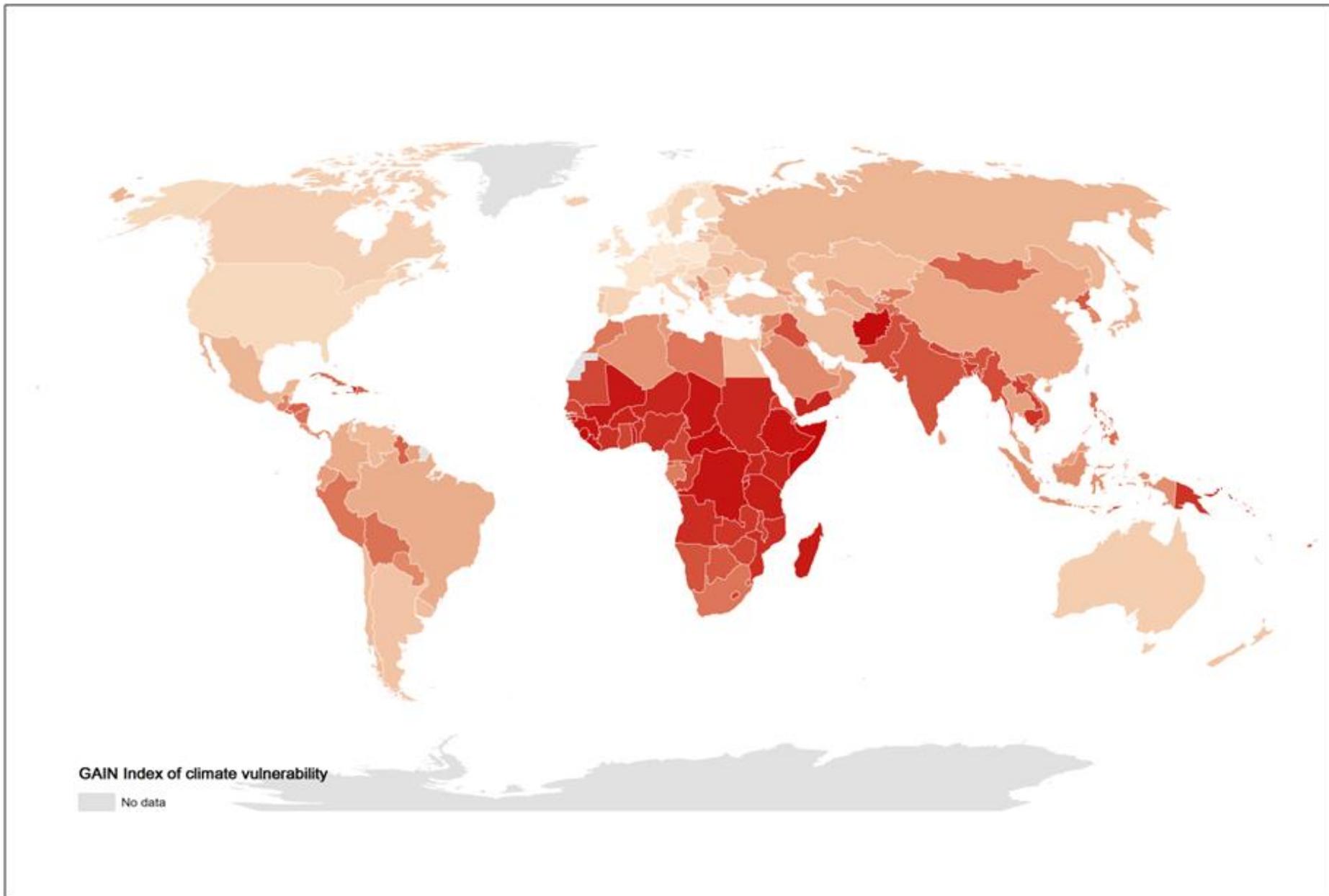
**In a globalizing world, transboundary climate risks flow between countries, including through complex supply chains and international trade. But risks from sea level rise are not well assessed.**

# Climate risk pathways





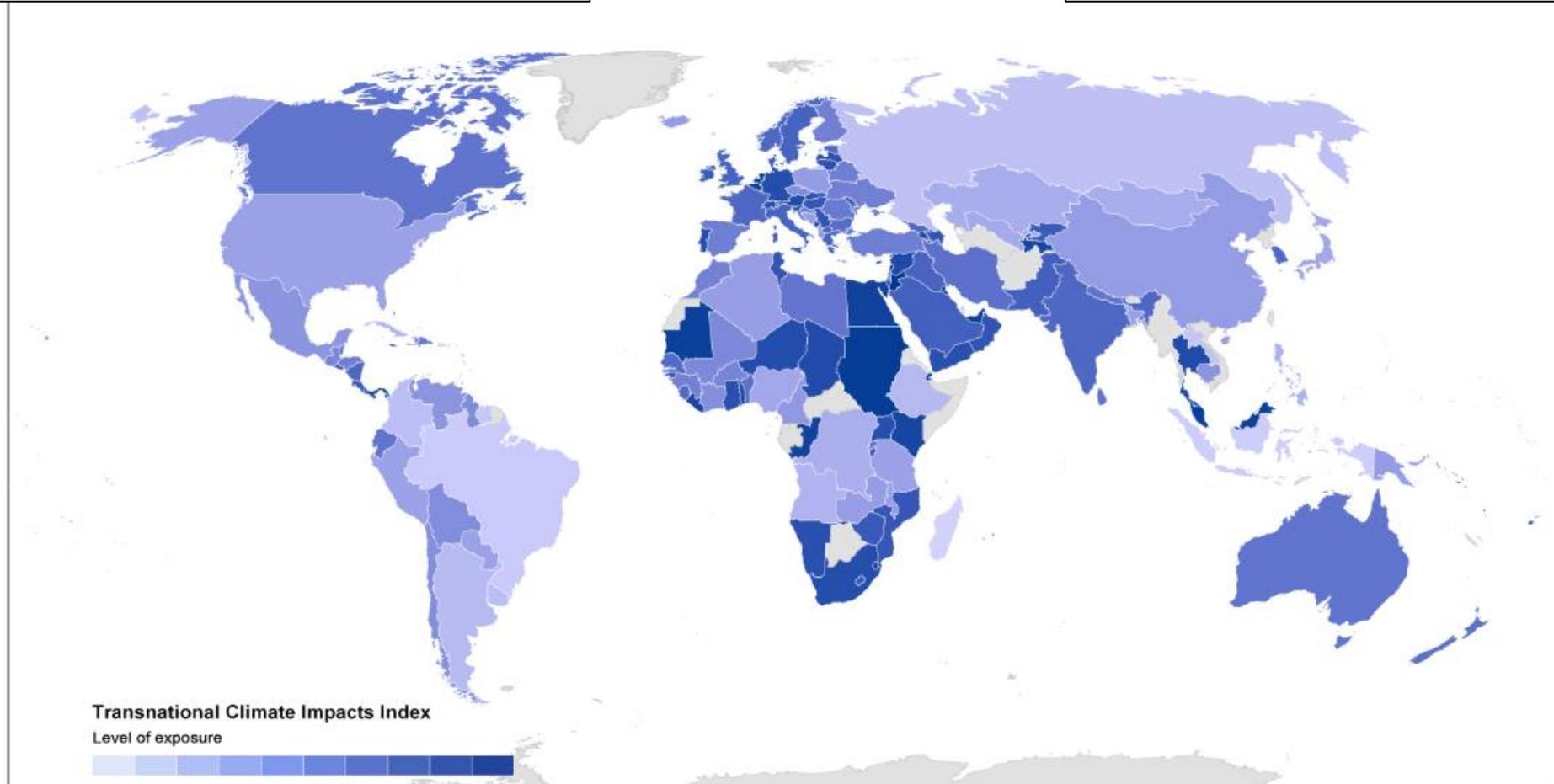
**Transnational Climate Impacts Index**



ND-GAIN index of vulnerability  
Source: <http://index.gain.org/>

**New adaptation needs** at the national level

**New motivation** to invest in adaptation globally



**New opportunities** for mechanisms under the Paris Agreement

**New challenges** for global governance beyond the UNFCCC

TCI Index  
Source: [Benzie et al \(2016\)](#)



# Adaptation Without Borders

Responding to a  
global challenge

## Three strategic agendas via which we'll aim to leverage impact

### 1. Pathways of risk



AWBI will advance the state of knowledge on transboundary climate risk and strengthen demand for breakthrough insights – conceptually and empirically – on the transboundary climate risks posing the greatest threat to humankind and the pathways through which they propagate

### 2. Policy



AWBI will address a critical blind spot in the UNFCCC policy agenda, and a restrictive, territorial framing of adaptation in the wider climate community, and harness the opportunities this reframing reveals to catalyse progress on the Global Goal on Adaptation and strengthen the 2023 Global Stocktake

### 3. Planning and implementation



AWBI will build demand among, and the capacity of, national adaptation planners to account for transboundary climate risks – to strengthen the resilience of NAPs, spark cooperation regionally/globally and strengthen accountability for transboundary risk management



Create Visibility



Gather Evidence



Build Connections



Inspire Action



Join us

ADAPTATION WITHOUT BORDERS

# Responding to a global challenge

We live in an interconnected world. The effects of climate change cross borders. So too do the impacts of our adaptation responses. The Adaptation Without Borders initiative responds to this challenge and creates opportunities to strengthen international cooperation on adaptation, paving the way towards lasting global resilience.





**Sea level rise and Trade**

# Sea level rise & Trade

- Most assessments of **sea level rise** do not consider *indirect effects via trade* (e.g. Dellink et al, 2019)
  - Some consider distribution of costs throughout economy with CGE models
  - Assessments of SLR impacts on specific supply chains are extremely rare
- Most assessments of **trade-related climate risk** do not consider *sea level rise* (e.g. Lunt et al, 2016; Schenker & Stephan, 2014)
  - Most focus on climate impacts on production (heat & productivity, or ag.)
  - Some mention climate impacts on transport (e.g. PwC, 2013)

Dellink et al (2019) The Sectoral and Regional Economic Consequences of Climate Change to 2060

Lunt et al (2016) Vulnerabilities to agricultural production shocks: An extreme, plausible scenario for assessment of risk for the insurance sector

Schenker & Stephan (2014) Give and take: How the funding of adaptation to climate change can improve the donor's terms-of-trade

PwC (2013) International threats and opportunities of climate change for the UK, Report for Defra



# Sea level rise & Trade

Bosello et al (2012)

- DIVA physical consequences of SLR + adaptation
- GTAP-EF economic consequences of land loss for EU25 + “ROW” region

***“The impact of sea-level rise is not confined to the coastal zone and sea-level rise indirectly affects landlocked countries as well (e.g. Austria)”***

Nicholls & Kebede (2012)

- UK likely to face risks to critical energy supply and supply chains from global SLR

Verschuur et al (2020)

- Vessel tracking data to assess port disruption from natural disasters
- Multiple ports affected simultaneously
- Substitution between ports is rarely observed

Bosello et al (2012) Economic impacts of climate change in Europe: sea level rise

Nicholls & Kebede (2012) Indirect impacts of coastal climate change and sea-level rise: the UK example

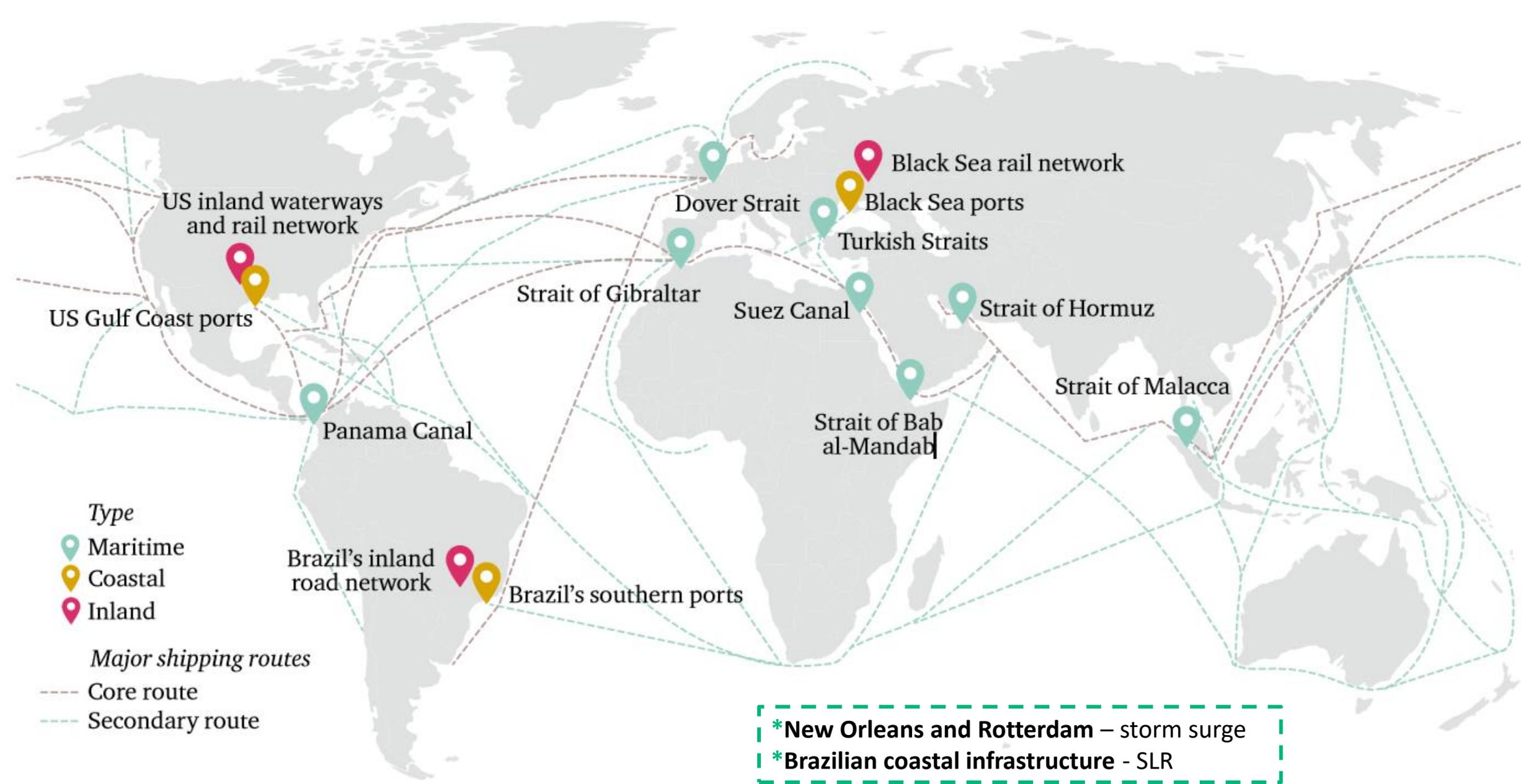
Verschuur et al (2020) Port disruptions due to natural disasters: Insights into port and logistics resilienc



# Sea level rise & Trade

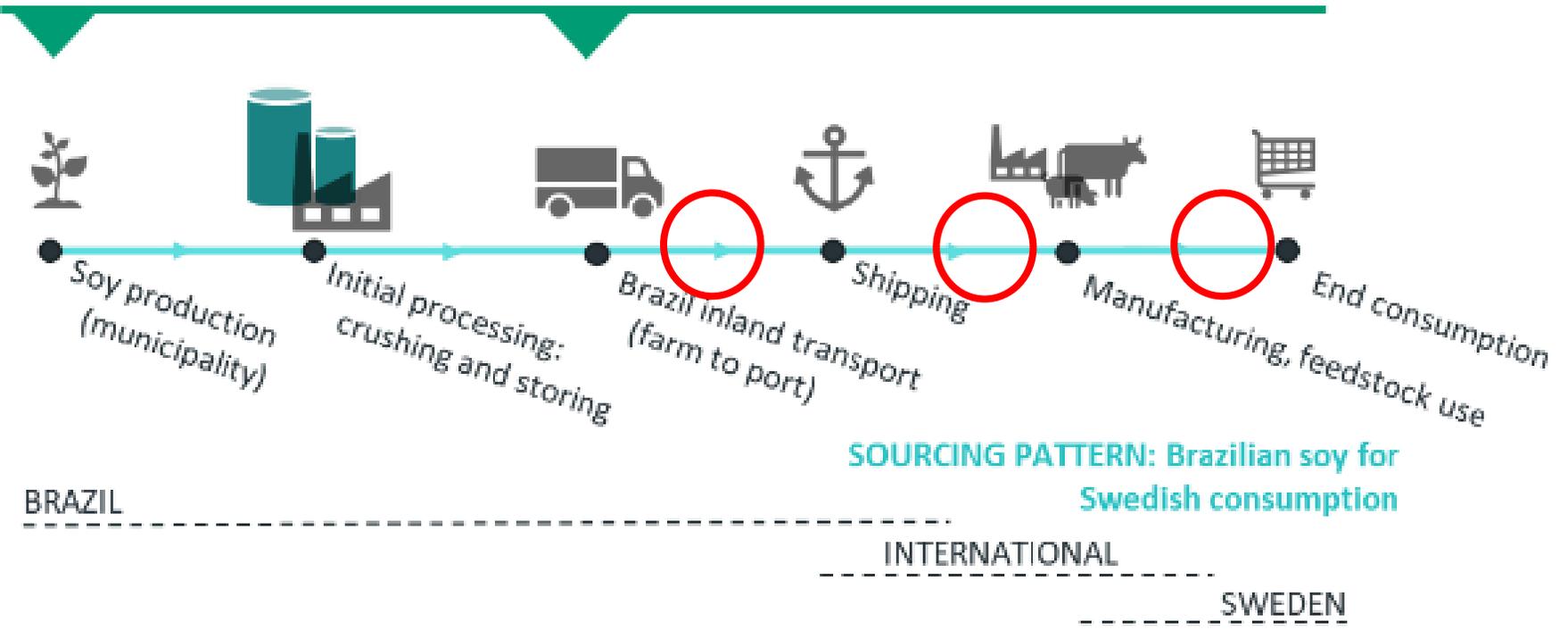
Some possible implications:

- Direct impacts on trade infrastructure: ports, ships, storage, in-land transport to port
- Temporary supply chain disruption: storms causing backlogs, spoiling of commodities → price shocks for import-dependent countries
- Long term competitiveness (e.g. rice exports from Bangladesh)
- SLR on SIDS: reducing very limited agricultural land → increasing food import dependence *whilst* damaging trade infrastructure
- New sea routes through Arctic change the risk profile of many trade-dependent countries, as well as the geopolitics of adaptation

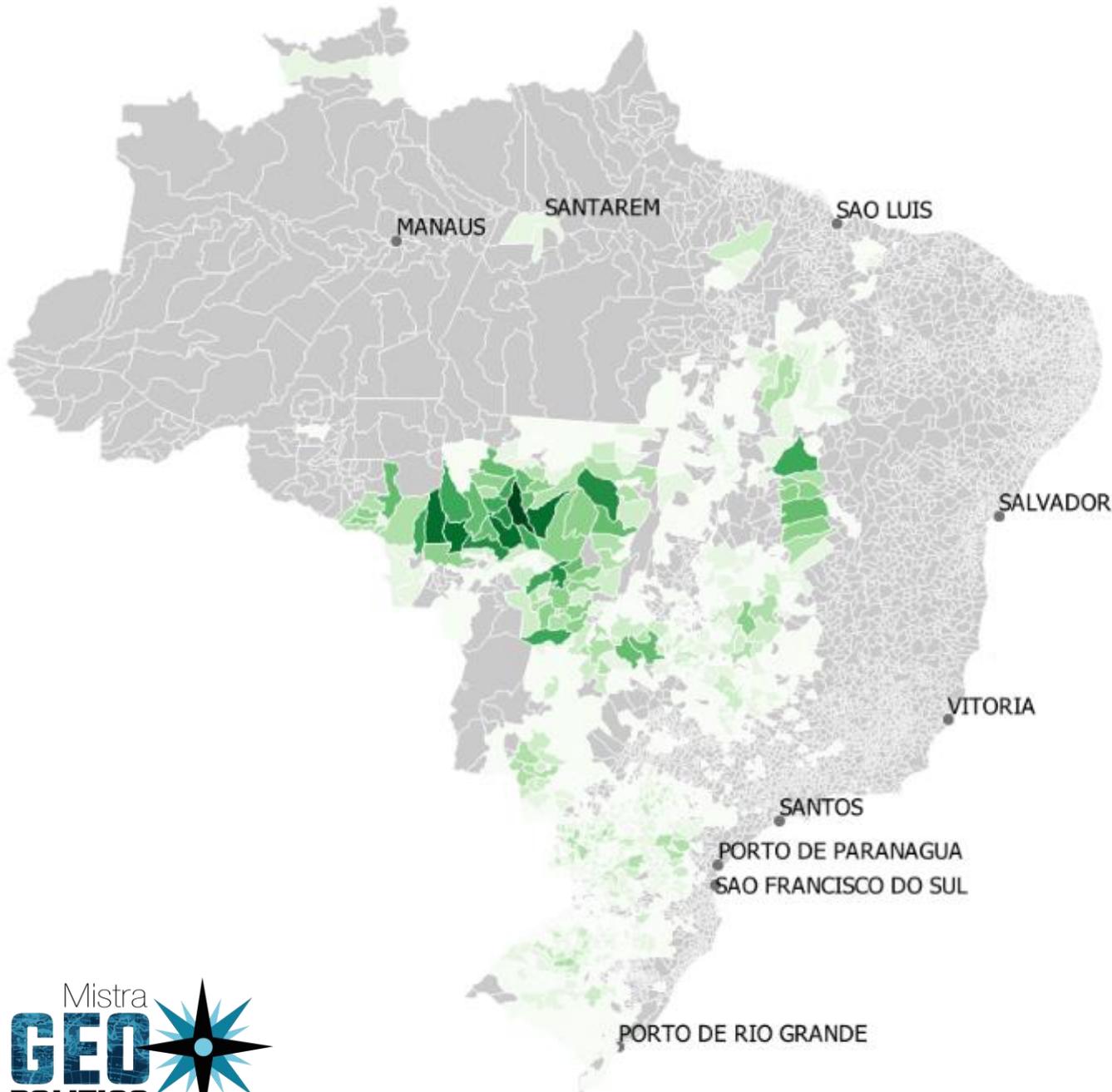


Maritime, coastal and inland choke points – Chatham House: Bailey & Wellesley (2017) Chokepoints and Vulnerabilities in Global Food Trade

## CLIMATE CHANGE IMPACTS

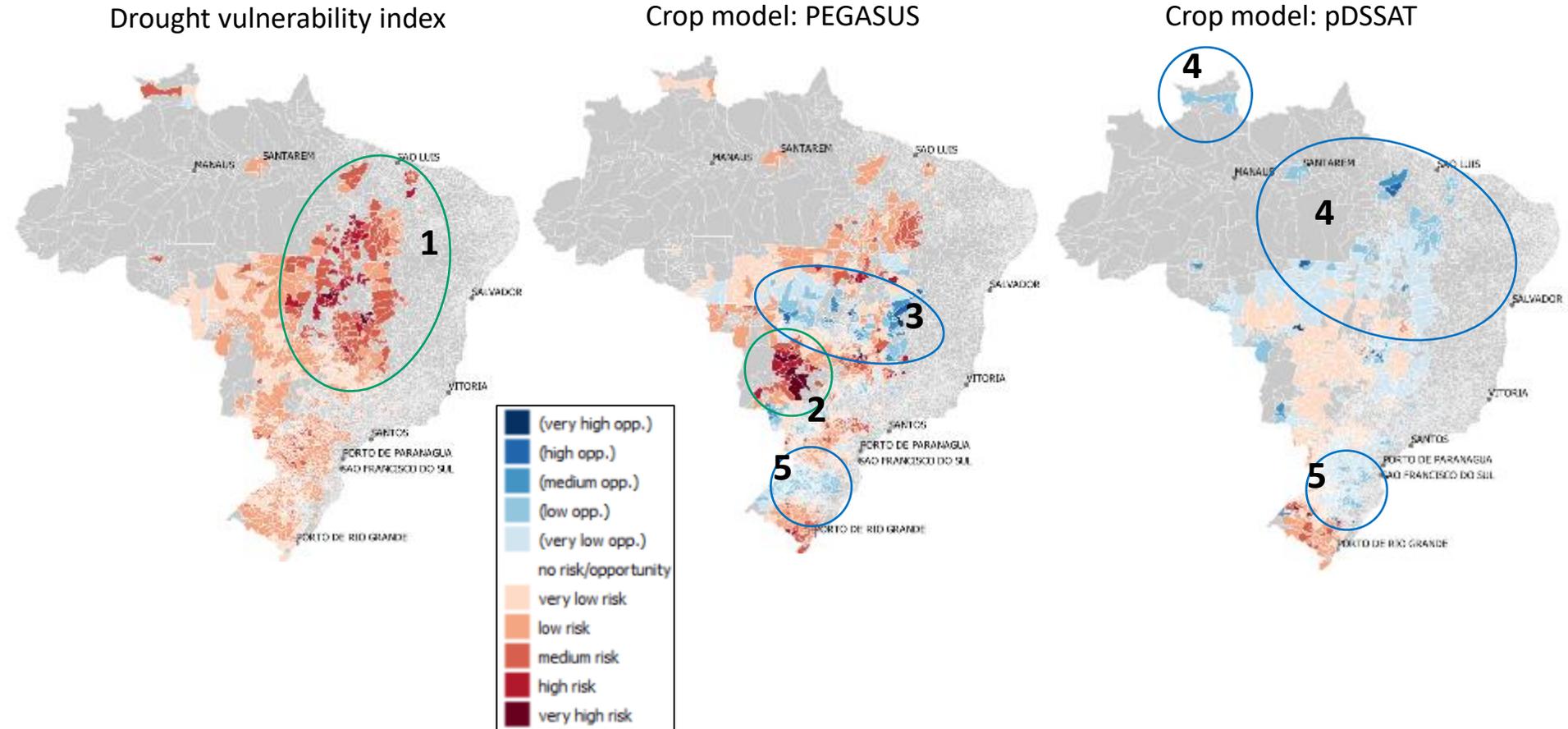


## Sourcing patterns for Brazilian soy to Sweden



Source: Lager & Benzie (forthcoming)

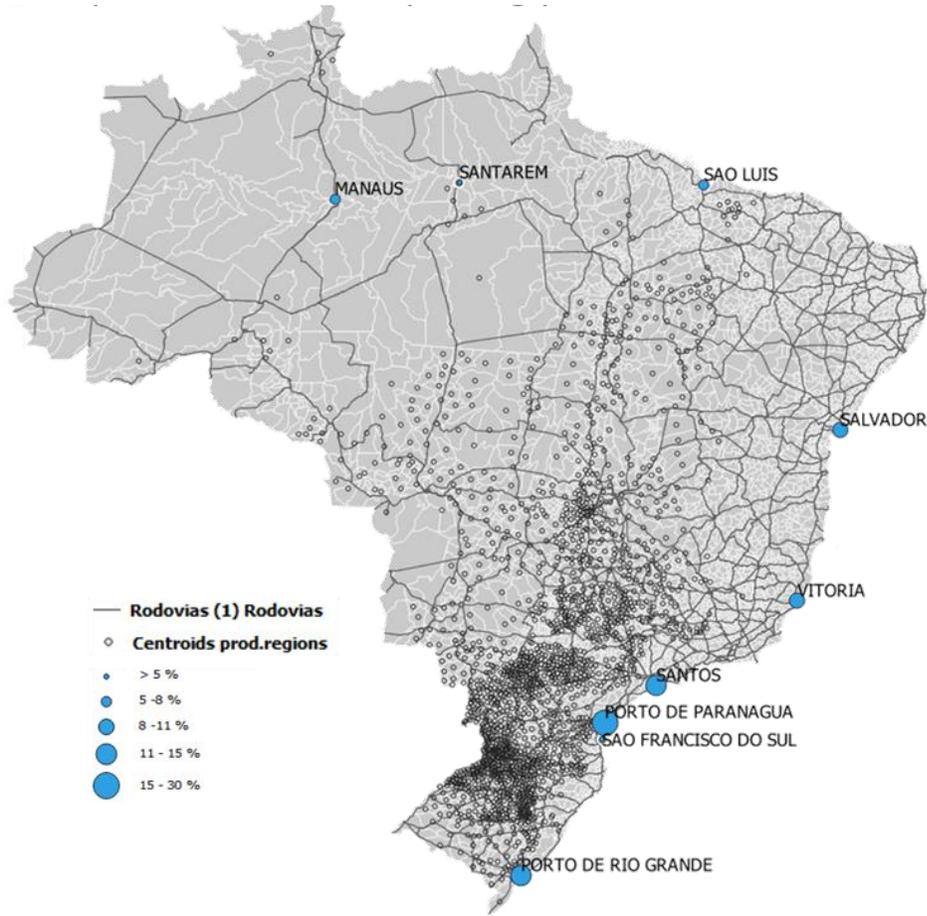
# Production impacts



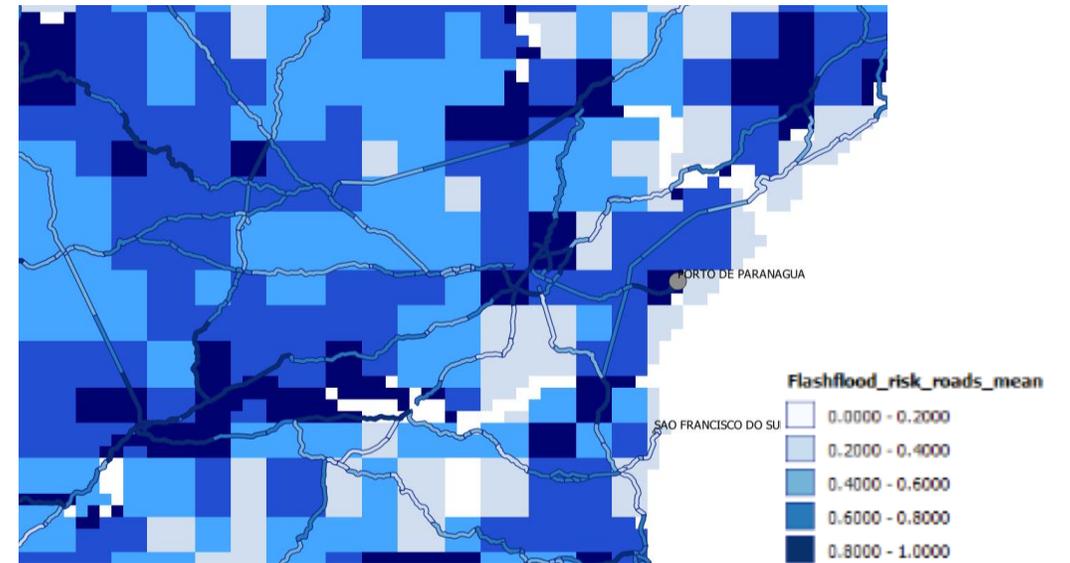
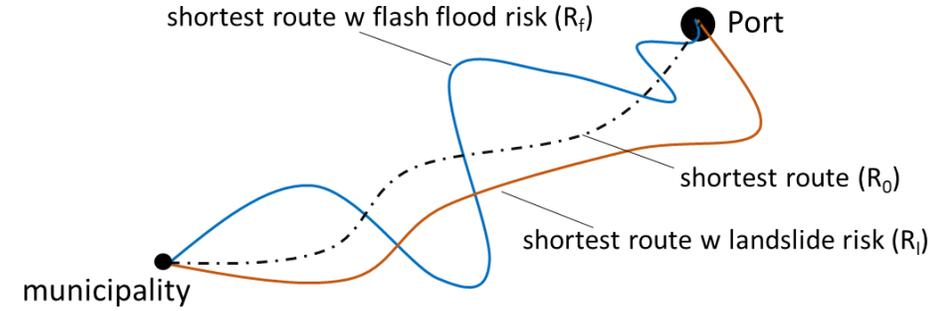
*Drought vulnerability index (Debortoli, Camarimba and Hirota, 2015) and the globally gridded crop models PEGASUS and pDSSAT soy predictions (Hobbs et al., 2018)*

Source: Lager & Benzie (forthcoming)

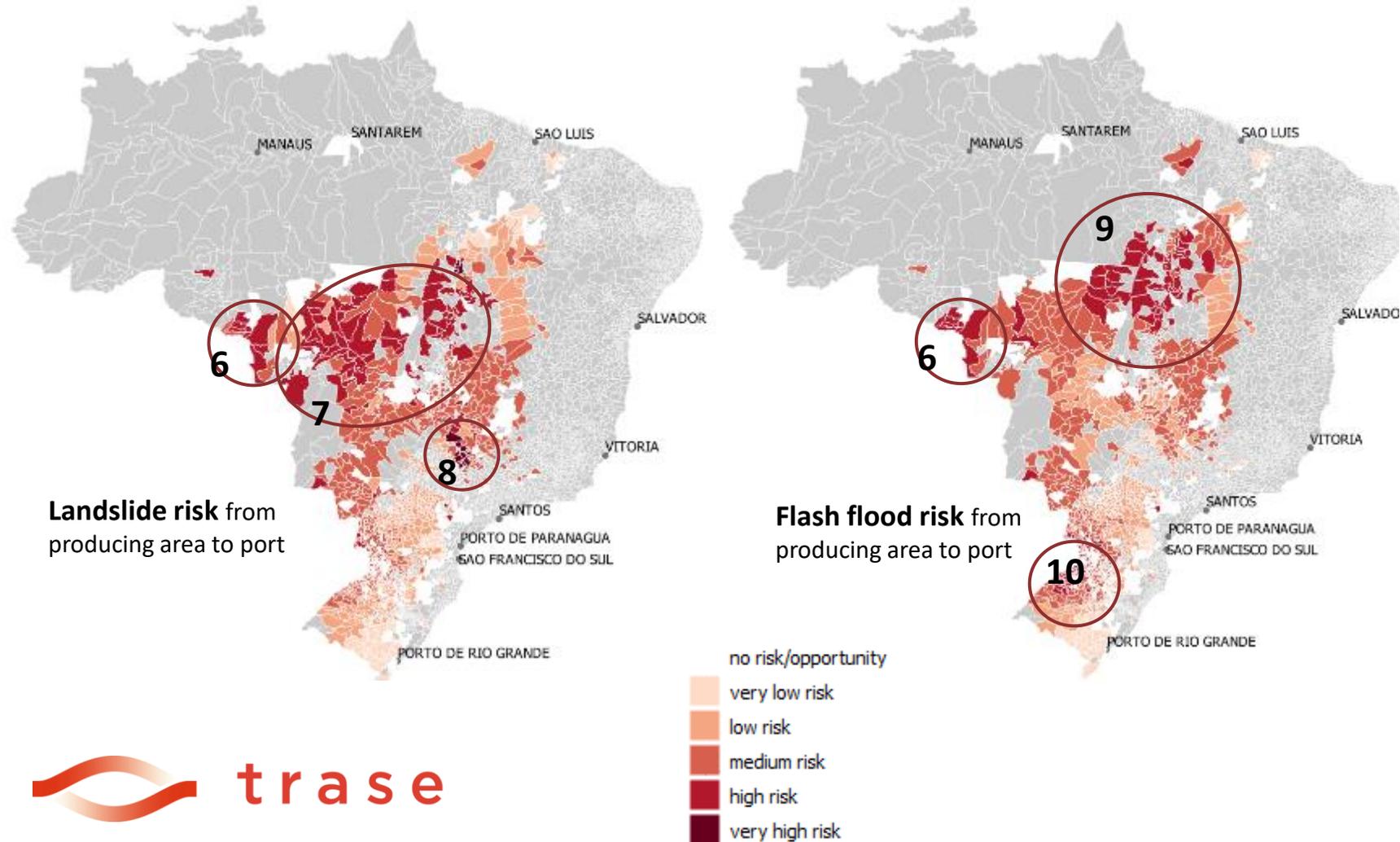
# Transport impacts



Highway network of Brazil (rodovias) and soy exporting ports, classified by percentage share of exports to the EU.



# Transport impacts



Source: Lager & Benzie (forthcoming)

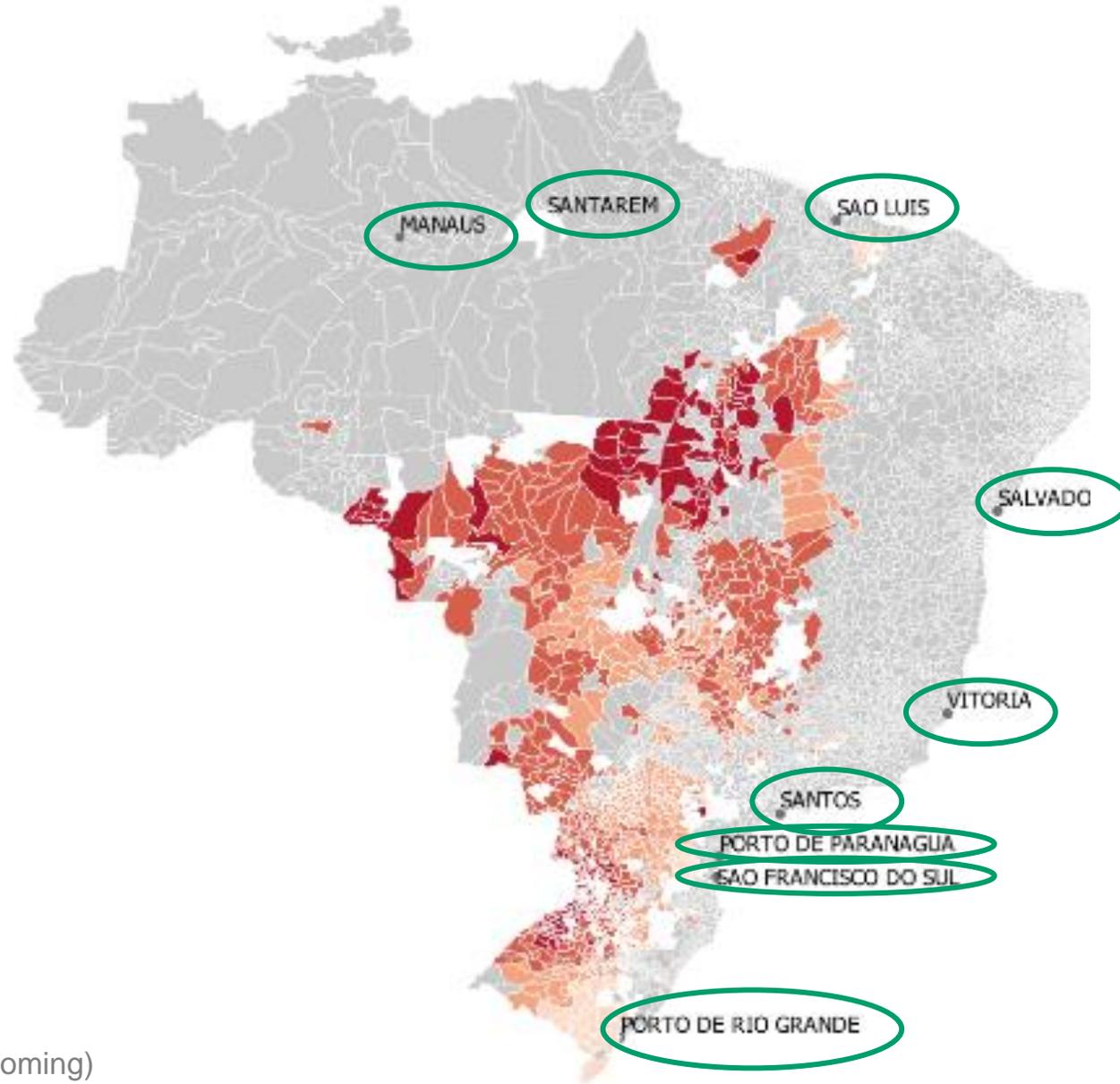
*Landslide and flash flood risks in Brazil (Debortoli et al., 2017)*

## Transport impacts

### Missed opportunity!

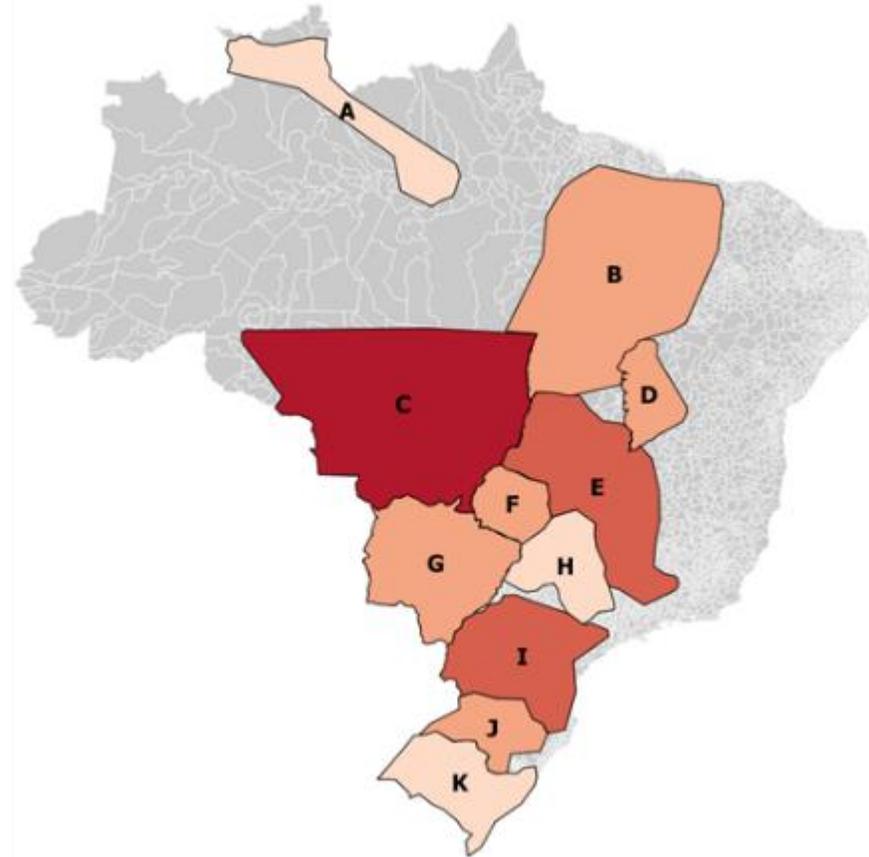
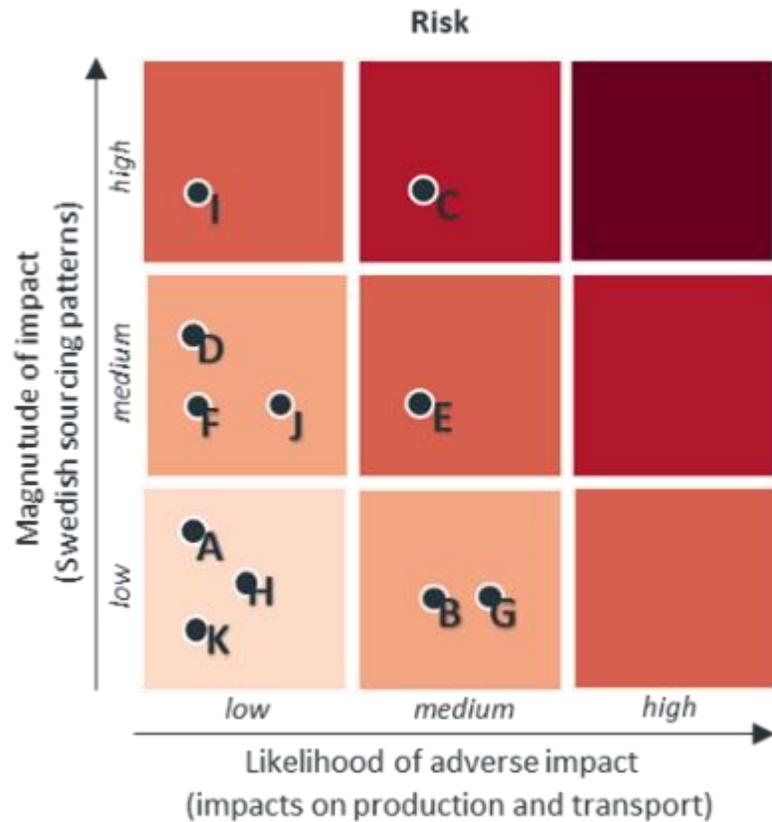
- Assess magnitude of risks from SLR at each port
- Assess likelihood of trade disruption for importer using supply chain data

PROTECT?  
INSeapTION 2??



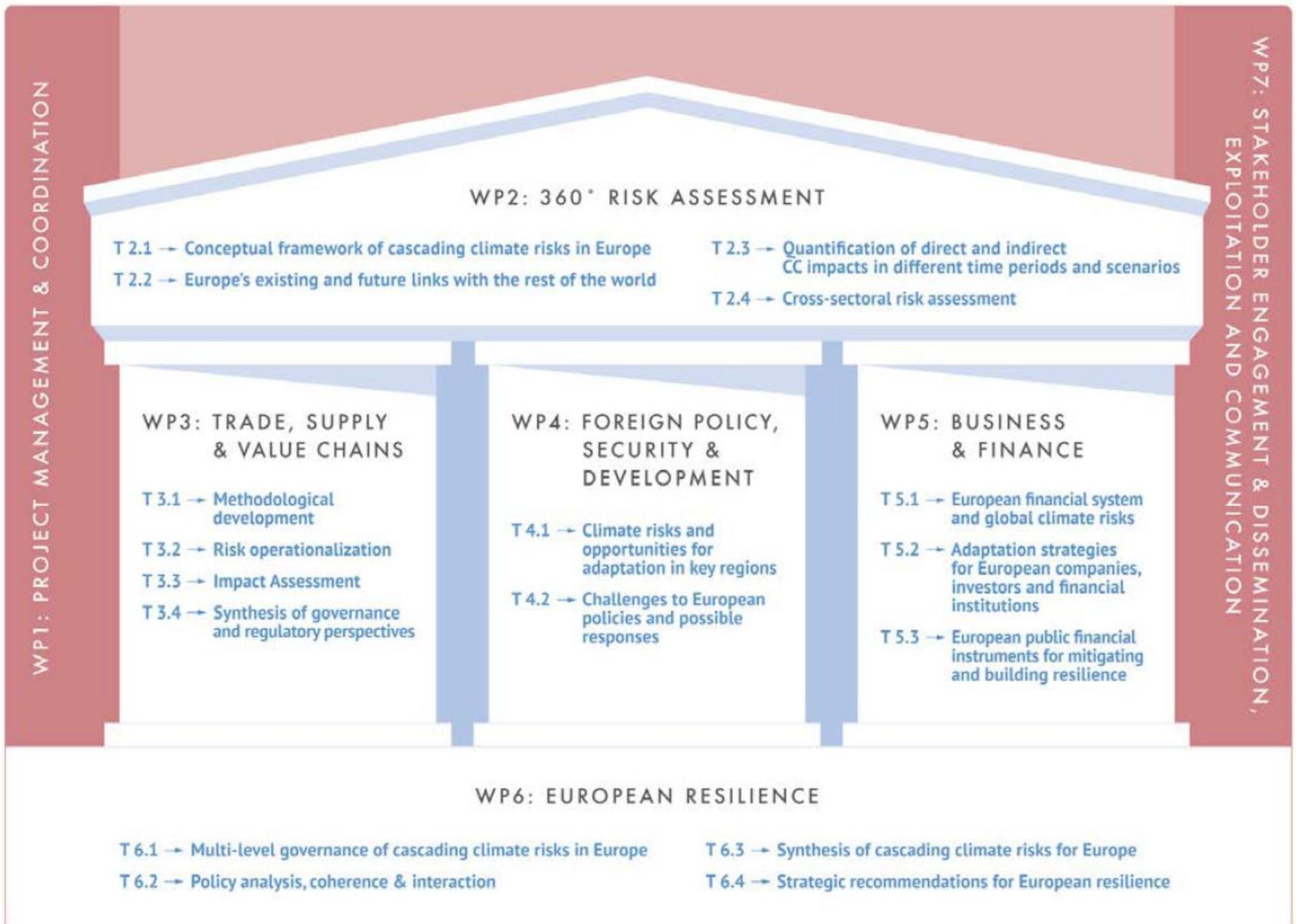
Source: Lager & Benzie (forthcoming)

# Integrated assessment: Risk to Swedish sourcing of Brazilian soy



# cascaades





# WP3 – Trade

## Models

CGE: GE3AR (CMCC)  
MRIO: IOTA (SEI)  
PE: MAgPIE & TWIST (PIK)  
Network: CHMAT (CH)

- Stakeholder input from policy simulation exercises

## Focus

Crop yields  
Food market effects  
Energy supply/ demand & trade  
Transport infrastructure  
Chokepoints

- Case studies and policy responses

## Results

Global trade flows  
EU external and internal trade  
Price  
Food security

### Link:

- Security and Foreign Policy
- Finance / Investment

WP Lead: Francesco Bosello

Partners: CMCC, SEI (York and Stockholm), PIK, Chatham House, SYKE





# Cascading climate risks: towards adaptive and resilient European Societies

CASCADES identifies how the risks of climate change to countries, economies and peoples beyond Europe might cascade into Europe. It does so by analysing how these risks interact with major challenges facing European societies. We are working with a diverse range of stakeholders – both within and outside Europe – to support the design of a coherent European policy framework to address these risks.

Download our first policy brief:  
Cascading climate impacts: a new factor in European policy-making (PDF, 510 KB)

[DOWNLOAD PUBLICATION](#)



# Closing remarks

- Sea level rise (but not “coastal risk”): long term trend
- Trade and supply chains: can evolve rapidly, highly dependent on socio-economic and geopolitical dynamics (c.f. COVID shocks→trends)
- Assessments of SLR on trade therefore:
  - Need to consider a range of SSPs (at a minimum)
  - Speak to a specific set of planners and stakeholders (e.g. long-term financiers, pension funds, ??)
- Adaptation planning does not currently address trade-related climate risk (SLR or otherwise)
- Risk ownership for adaptation to trade risks remains unclear in government structures
- Strategic management of supply chain climate risks is far less evident than often assumed
- Global coastal climate services on trade risks therefore need to define end users carefully

MANY THANKS

[magnus.Benzie@sei.org](mailto:magnus.Benzie@sei.org)

### Top 10 High Risk Bilateral Trade Relationships for Rice

Visualising the top exporters and importers of climate change risk for global rice trade.



RANK	EXPORTER - IMPORTER	RISK TO BILATERAL TRADE	BILATERAL TRADE FLOW (TONNES)	IMPORTER'S TOTAL STOCK	IMPACT OF CLIMATE CHANGE ON PRODUCTION
1	Thailand - Singapore	██████████	31.8mn	32.6mn	-35%
2	Senegal - Tunisia	██████████	0.3mn	0.4mn	-43%
3	Iraq - Kuwait	██████████	0.3mn	0.5mn	-59%
4	Colombia - Chile	██████████	1.6mn	2.4mn	-42%
5	Nigeria - Morocco	██████████	4.2mn	4.4mn	-28%
6	Nicaragua - Honduras	██████████	0.3mn	0.4mn	-31%
7	USA - Canada	██████████	7.0mn	8.6mn	-31%
8	Brazil - Bolivia	██████████	11.7mn	12.2mn	-26%
9	Cambodia - Brunei	██████████	6.1mn	6.3mn	-25%
10	Vietnam - South Africa	██████████	1.1mn	1.7mn	-23%

*The SOURCE Index is a new quantitative assessment which links climate impact models to agricultural commodity flow data, helping to identify key sources of climate risk in global markets.*

*Adams et al. (Forthcoming, 2020)*