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multi-scale infrastructure systems analytics

A global multi-hazard risk analysis of road and railway infrastructure assets

Koks[1], Rozenberg[2], Zorn[1], Tariverdi[2], Vousdoukas[3], Fraser[2], Hall[1], Hallegatte[2]

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Outline

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- Motivation
- Methodology
- Results
- Discussion Points

Link to Paper

https://www.nature.com/articles/s41467-019-10442-3

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Motivation

- Importance of Transport
  - SDG9
  - Sendai, SDG11, ….
  - Significant investments - Fiji **30%** of public spending on transport
- Low income countries
  - Need to spend 0.5 – 3.3% of GDP annually on transportation (US$157bn – US$1tn) + 1 – 2% for maintenance
  - Investment needs are the highest, but risk assessments are scarce and disasters impacts on the economy are typically underestimated
- Existing global studies
  - single aspects (buildings, pop exposed,…)
  - single hazards (flood risk)

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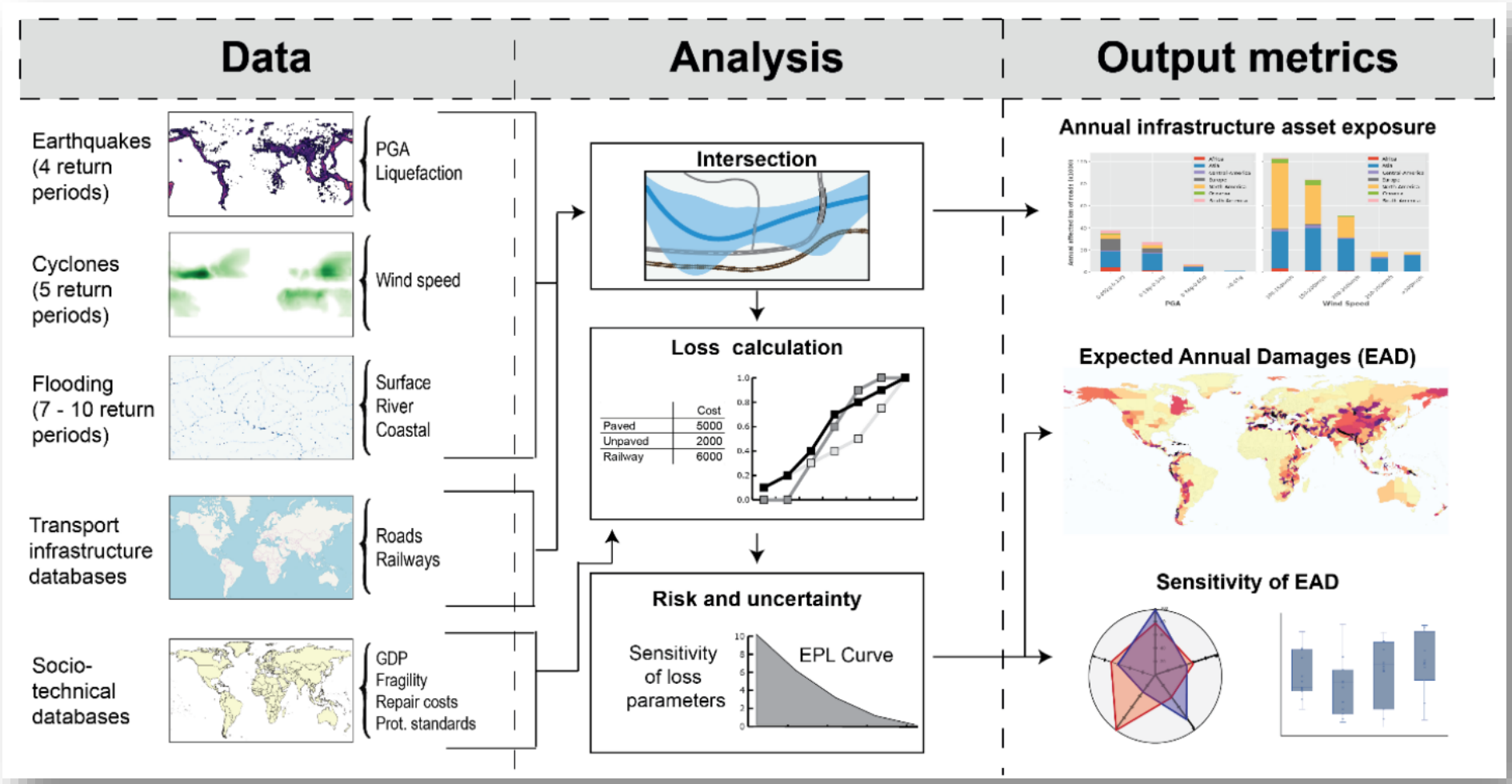
Methodology



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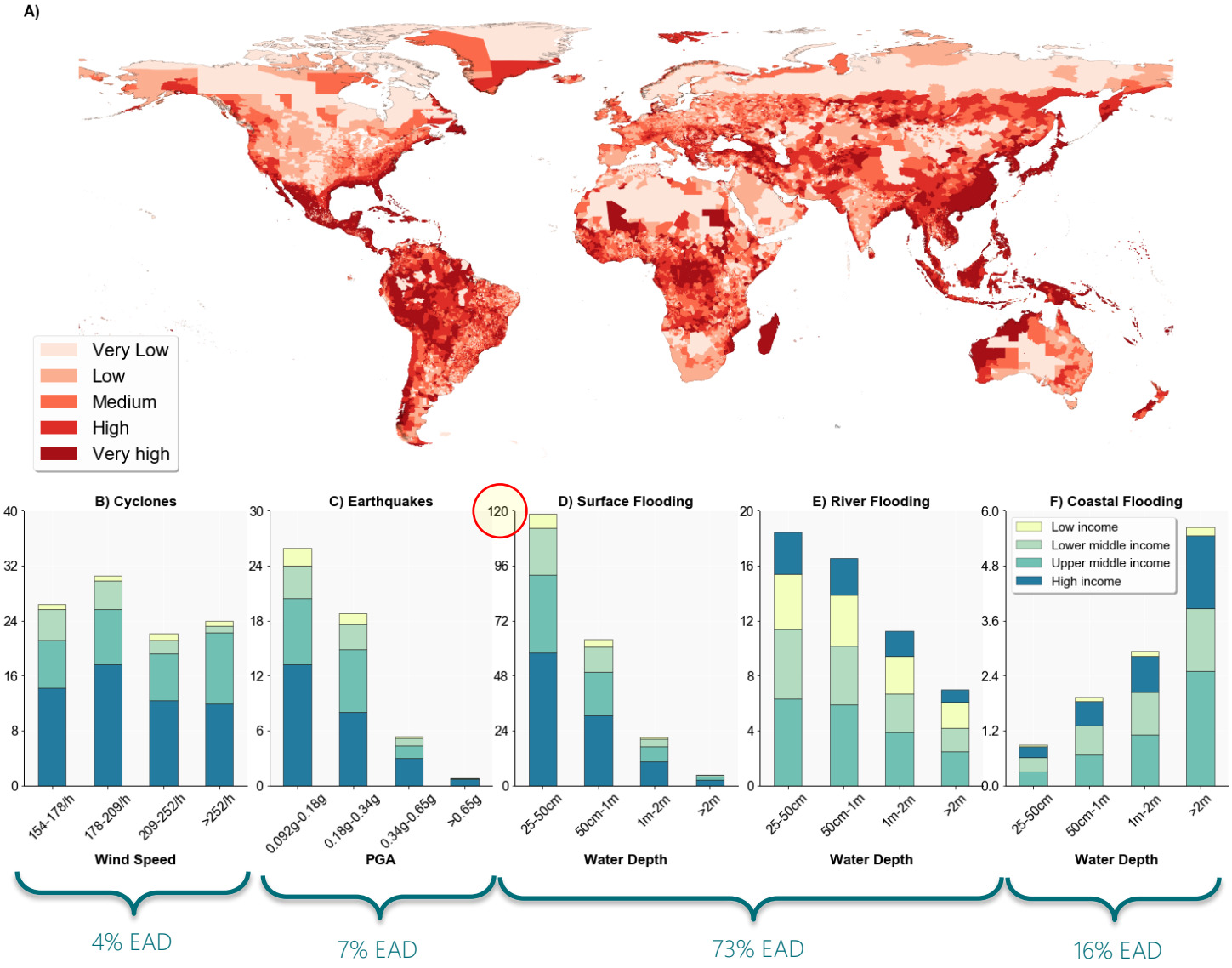
Results 1

Multi-hazard Exposure



46,566 regions

>50 million km

27% exposed ≥ 1 hazard (250yr)

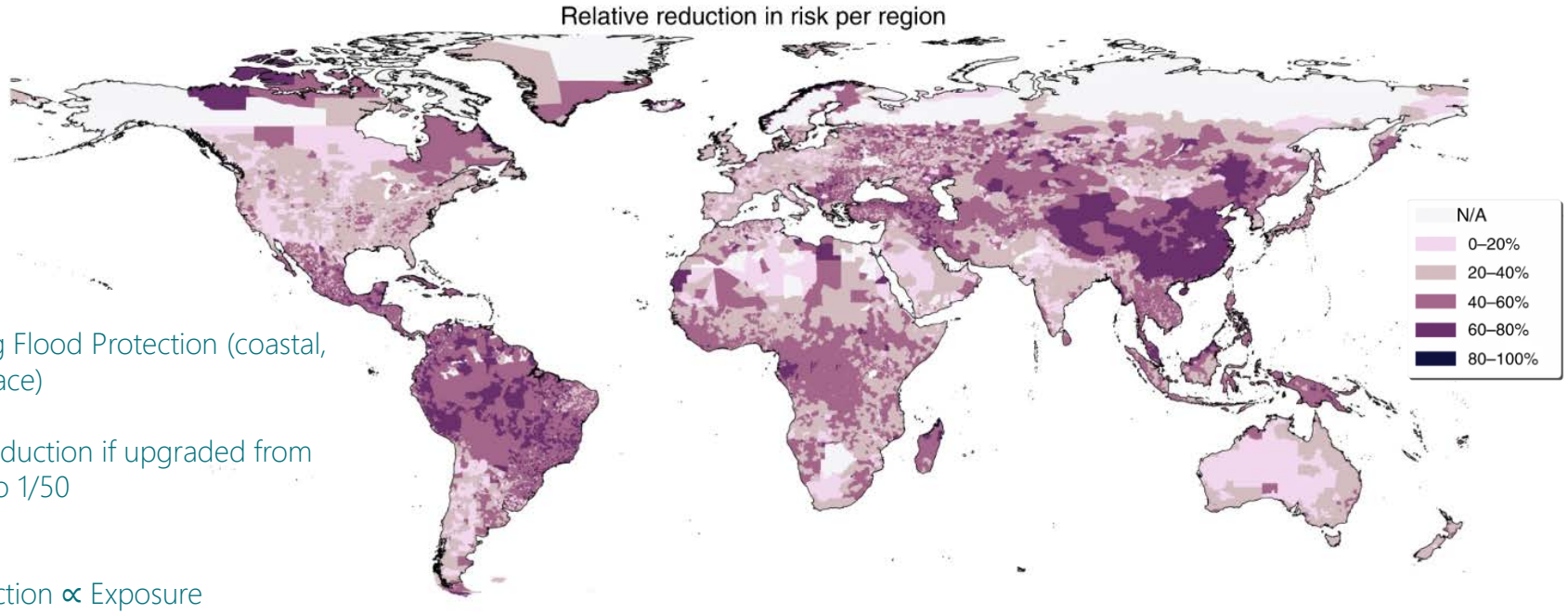
7.5% exposed to 100-yr flood

0.5% of global assets exposed p.a. (3.1-22 billion USD)

Results 2

Expected Annual Damage

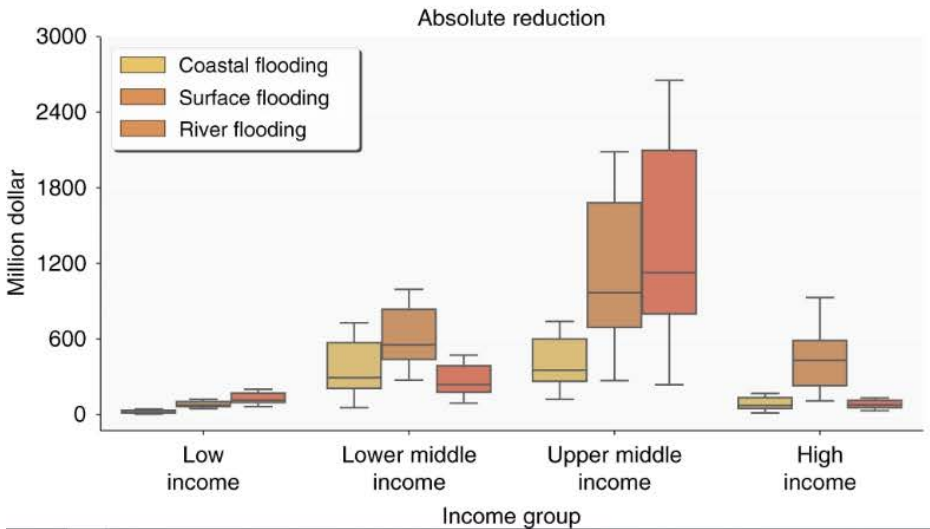
Results 3

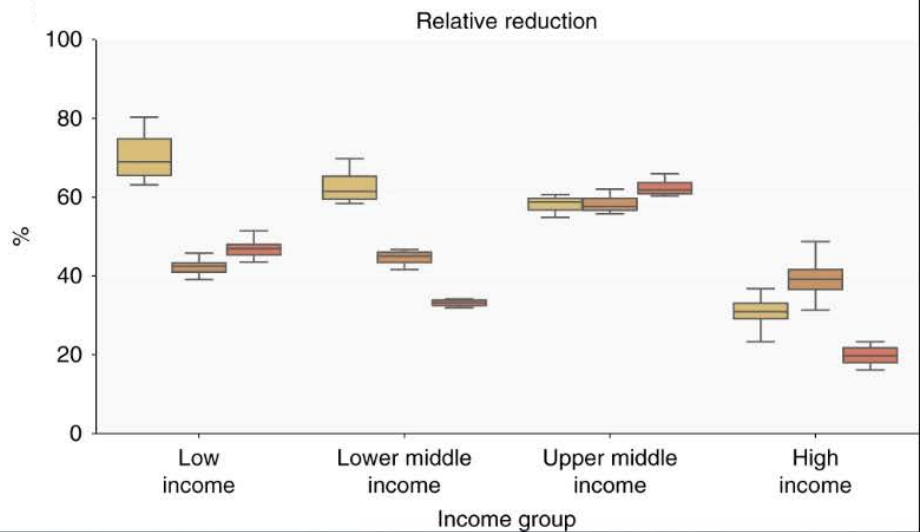


Increasing Flood Protection (coastal, river, surface)

- 42% reduction if upgraded from 1/100 to 1/50

Risk reduction ∝ Exposure





Discussion Points

- Importance of targeting exposed roads for maximum BCR
  - 2% spending of road value on drainage → positive BCR for 60% of exposed roads (even better if targeted further)
  - Low-regrets options
  - Local hazard maps

- Sensitivity
  - Roads: fragility and repair costs
  - Bridges: reconstruction costs
  - Location specific costs and fragility?

- EAD (3.1-22 billion) is small = 0.2-1.5% of maintenance
  - prioritise regular maintenance over resilience building?

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