

Exploring the efficient frontier in physical risk reporting

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“La finance sera
verte - ou elle ne
sera pas.”

*Bruno Le Maire
Ministre de l'Economie et des
Finances
Décembre 2017*

Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD) ¹



“Climate change is the Tragedy of the Horizon.”

Mark Carney, Governor of the Bank of England, 29 Sep 2015, speech at Lloyd's of London

¹ established 4 Dec 2015: <https://www.fsb-tcfd.org>, Speech: <https://www.bis.org/review/r151009a.pdf>, Video: <https://www.youtube.com/watch?v=V5c-eqNxeSQ>

TCFD: Climate-related risks, opportunities, and financial impact

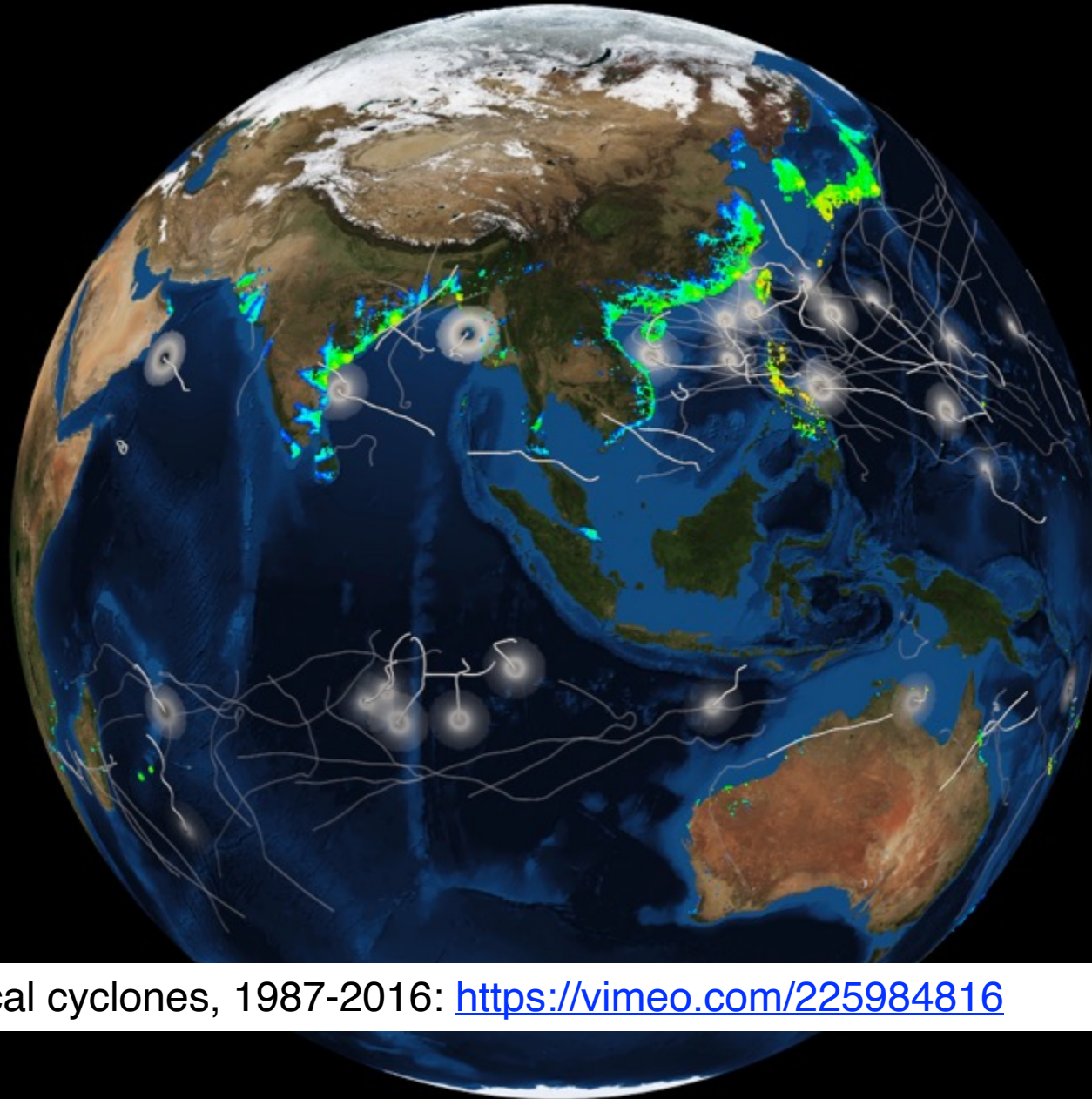


Physical climate risks disclosure – state of play¹

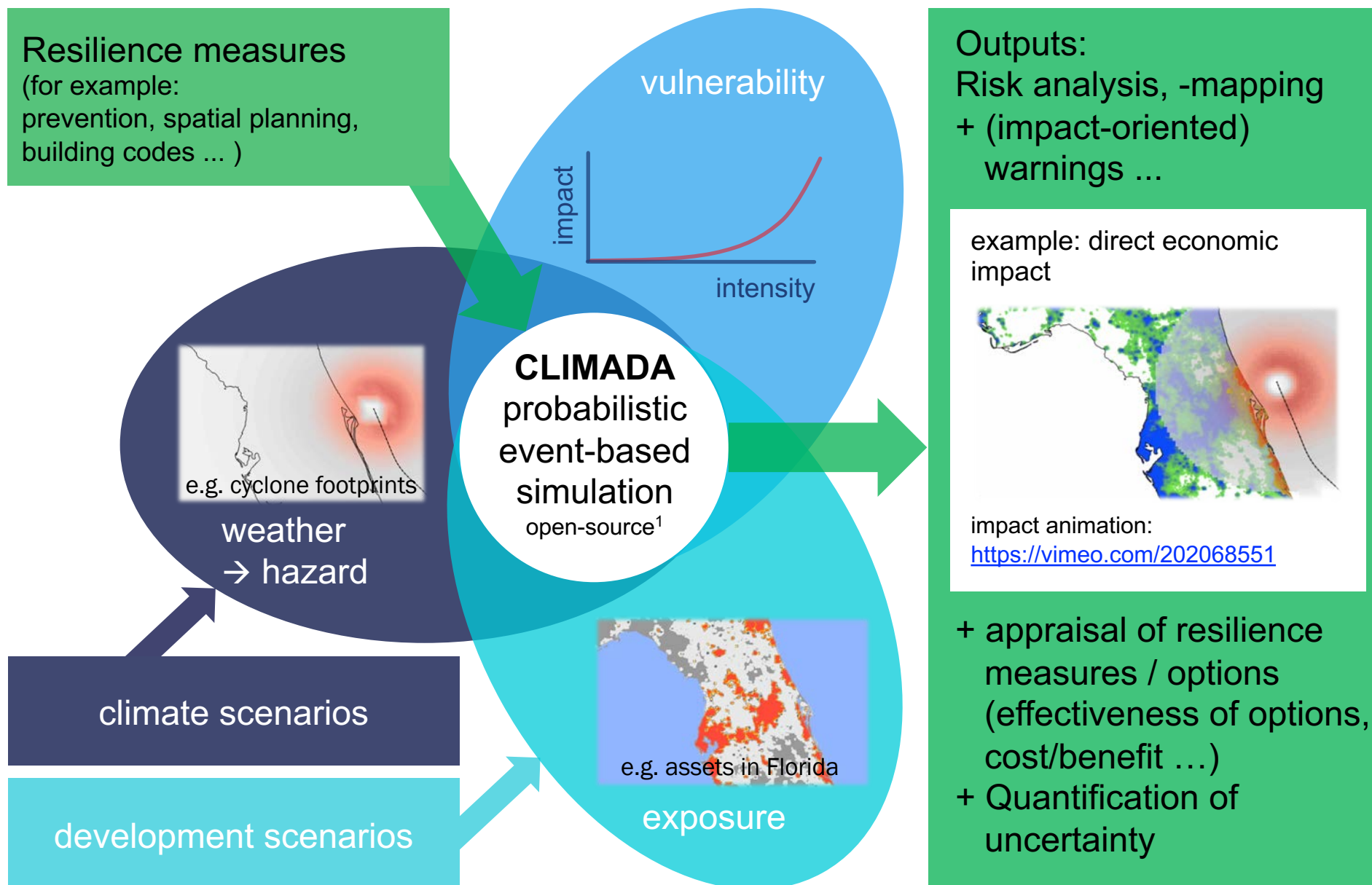
- An increasing number of consultancies, financial technology firms, data providers, and investment advisory groups now **offer information about localized physical climate risks**, entering a technology arms race among climate services providers (Keenan, 2019; Condon, 2023)
- The physical-risk scores produced by various commercial providers, each developing their own firm-level indicators of physical climate risk, **diverge substantially** (Hain et al., 2022).
- The proprietary nature of their products introduces significant challenges, including a lack of transparency and accessibility, for **comparison** and evaluation (Arribas et al., 2022).
- The efforts of regulatory bodies to establish **standards for measuring and reporting are still developing** (Fiedler et al., 2021)

¹ some of the text taken from Meiler, S., PhD thesis, outlook, to be defended 20 Nov 2023

2011

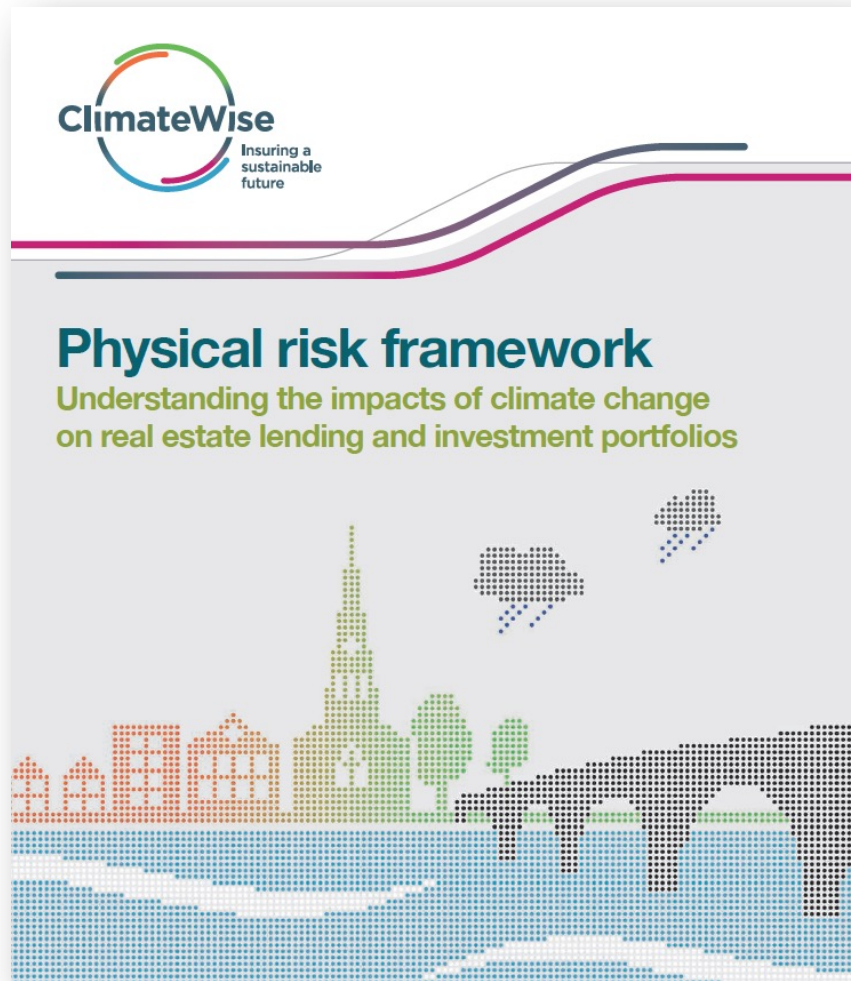


Full animation of global tropical cyclones, 1987-2016: <https://vimeo.com/225984816>



¹ <https://wcr.ethz.ch/research/climada.html> und Aznar-Siguan & Bresch, 2019: CLIMADA ... weather and climate risk assessment ..., <https://doi.org/10.5194/gmd-12-3085-2019>

Physical Risk Framework



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AXA

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Swiss Re

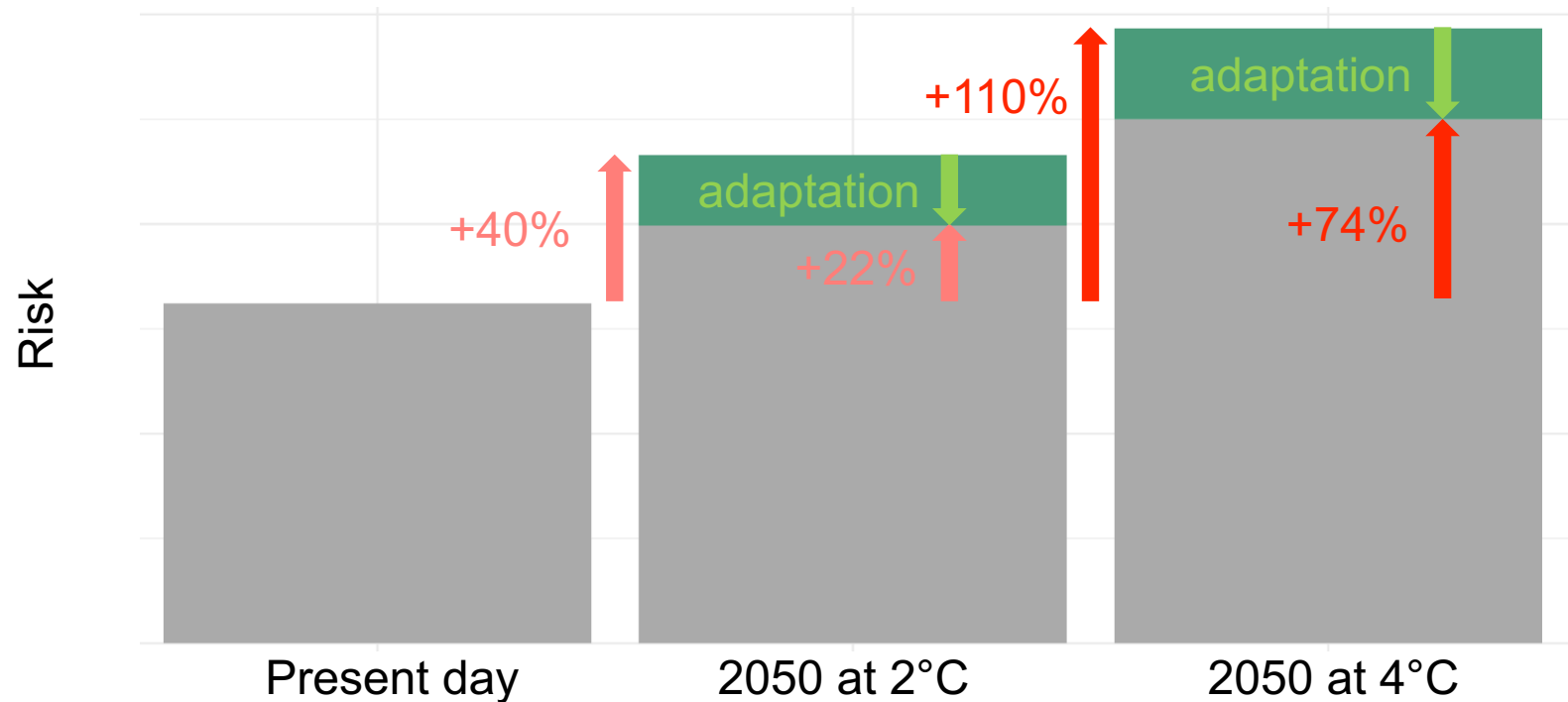
TOKIO MARINE
NICHIDO

TOKIO MARINE
KILN

Willis
Towers
Watson

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UK banks – physical tropical cyclone risk on loan portfolios



Expected damages to assets¹ exposed to tropical cyclones increase by 40% with 2 degrees of warming and 110% with 4 degrees of warming. Adaptation could limit these to 22% and 74% increase.

¹ Westcott, M., Ward, J., Surminski, S., Sayers, P., Bresch, D.N. and Claire, B., 2020. Be prepared: Exploring future climate-related risk for residential and commercial real estate portfolios. *The Journal of Alternative Investments*, **23**(1), pp. 24-34. <https://jai.pm-research.com/content/early/2020/05/09/jai.2020.1.100.abstract>
<https://www.cisl.cam.ac.uk/resources/sustainable-finance-publications/physical-risk-framework-understanding-the-impact-of-climate-change-on-real-estate-lending-and-investment-portfolios>

² asset base: global exposure of leading 9 UK banks' loan portfolios.

Challenges

Availability

Natural catastrophe models mainly exist for (top) OECD countries for select hazards

→ Need for a globally consistent framework ✓ and worldwide coverage of main hazards

Accessibility

Natural catastrophe models are proprietary either to (re)insurance companies or so-called model vendors

→ Need for open-source and -access models with full transparency (and APIs to open-data sources) ✓

Applicability

Proprietary natural catastrophe models are myopic – ready to assess risk today, but not under future climate yet

→ Need for integration of climate impacts in a transparent scenario fashion (as in open-source models ✓)



Aggregate-ability

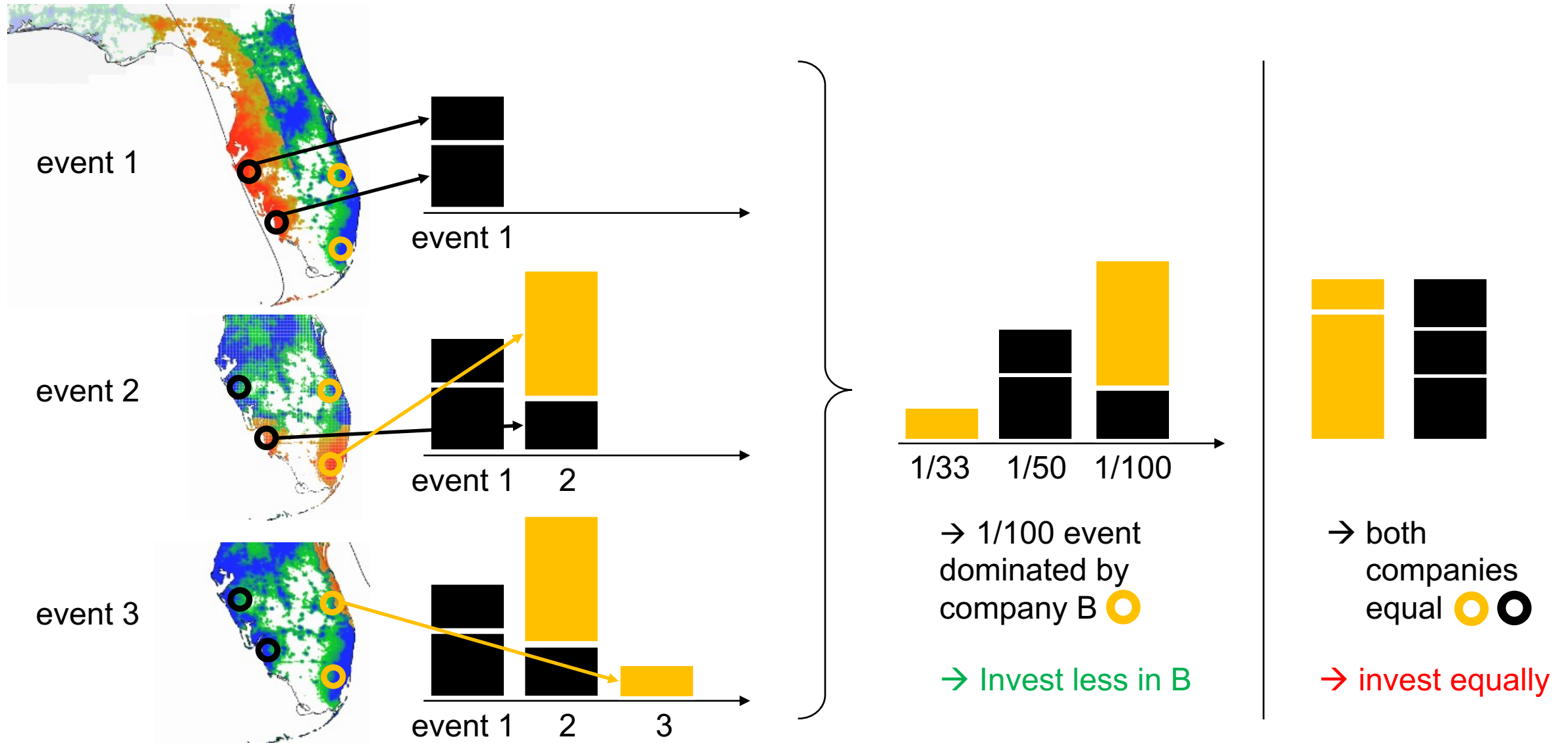
Physical risk disclosures today are company-specific, no established methodology for inter-comparison

→ Need not only for consistent approaches (scenarios, risk metrics ...), but even more so for



appropriate aggregation method (e.g. event-based)

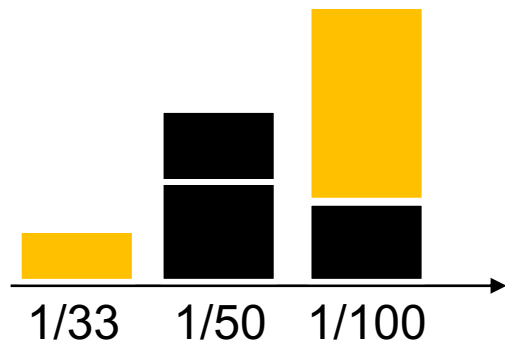
Event-based risk assessment – risk differentiation


 company A
 company B



Event-based risk assessment – risk differentiation (cntd)

 company A
 company B



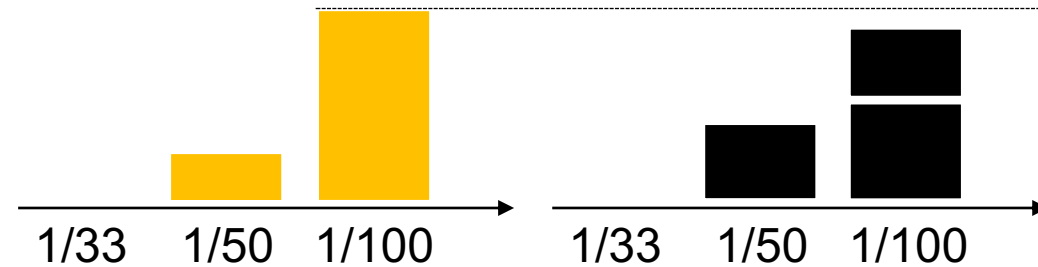
→ 1/100 event dominated by company B 

→ Invest less in B

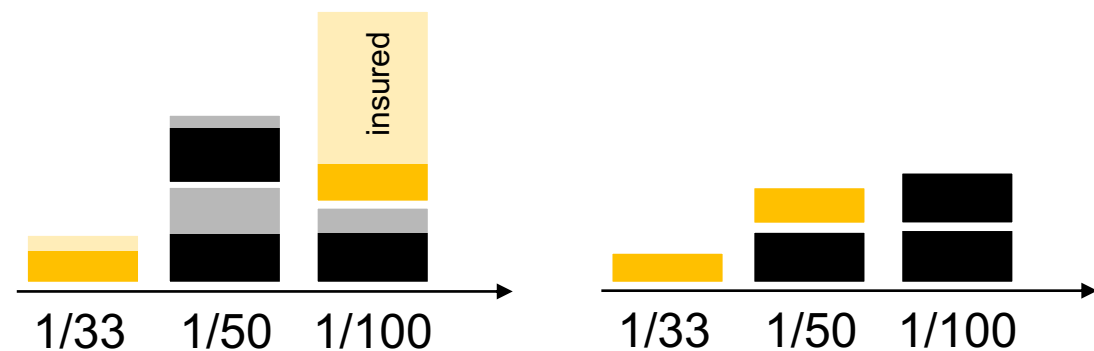


→ both companies equal  

→ invest equally



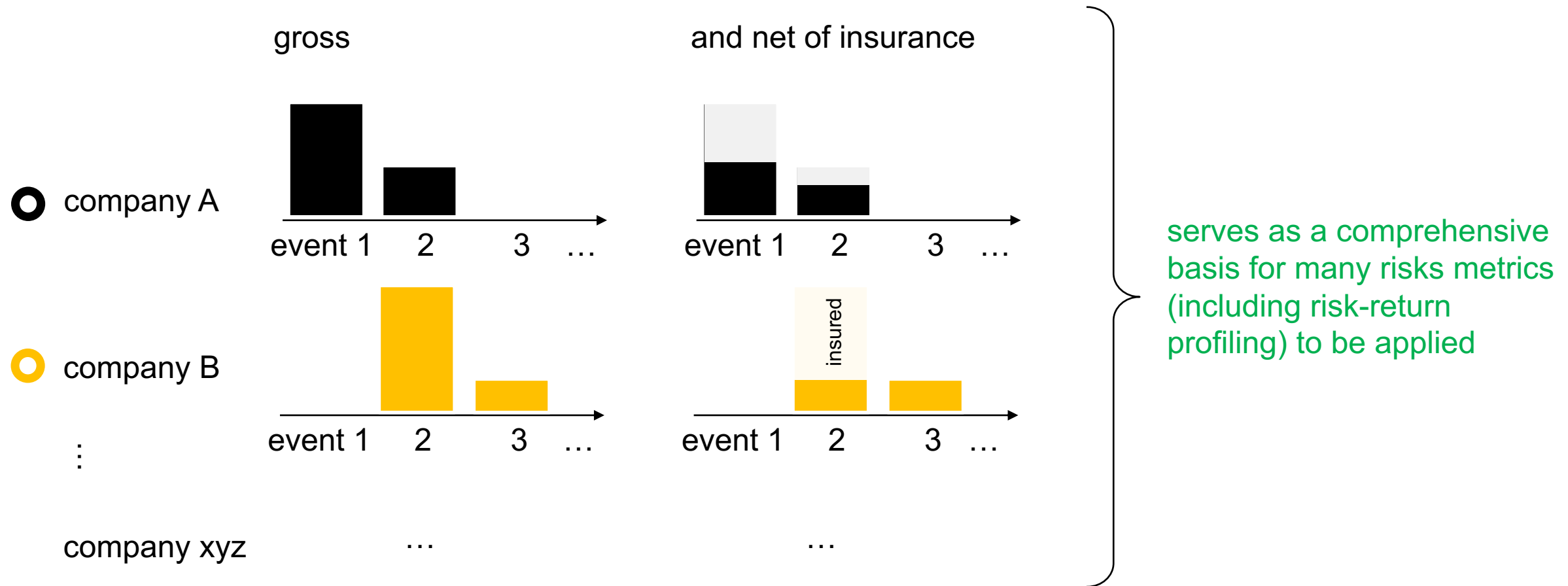
→ Almost no differentiation on stand-alone 1/100 event



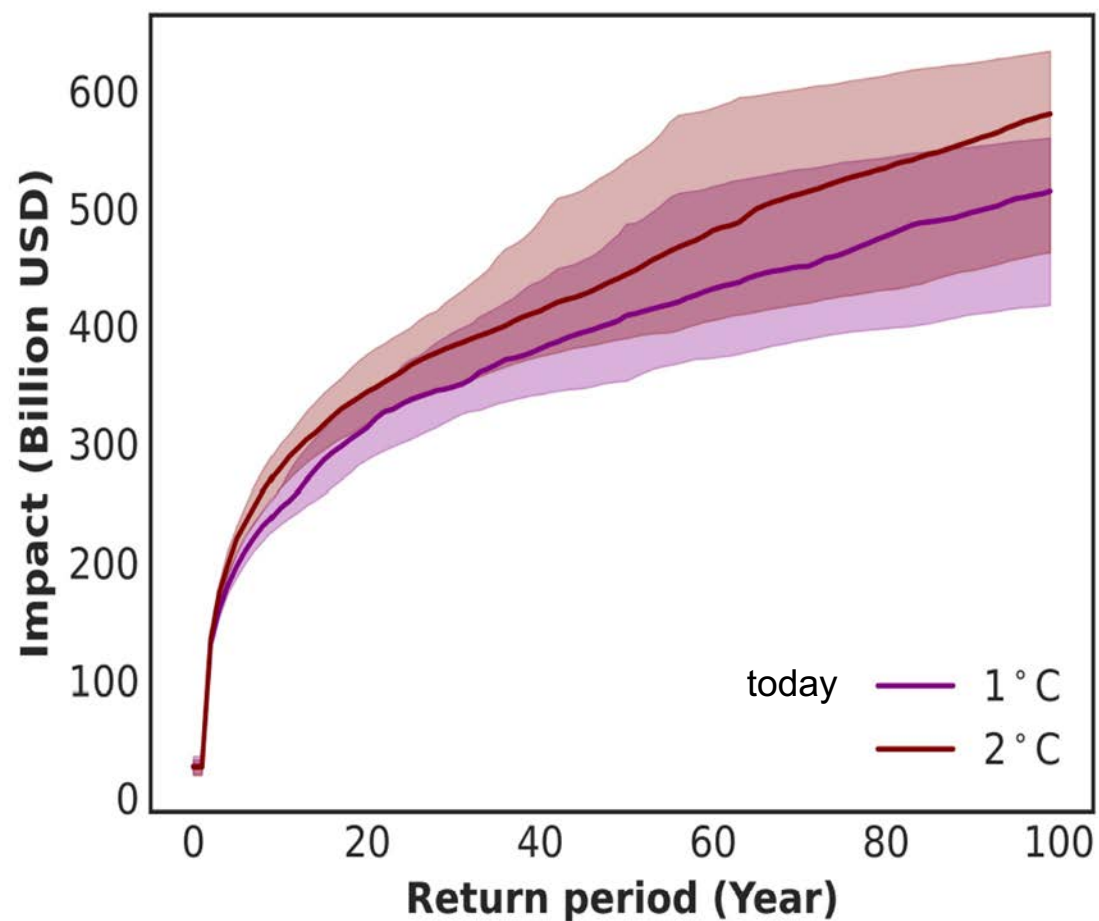
Net of insurance → invest less in A

Aggregate-ability – a suggested methodology for inter-comparison

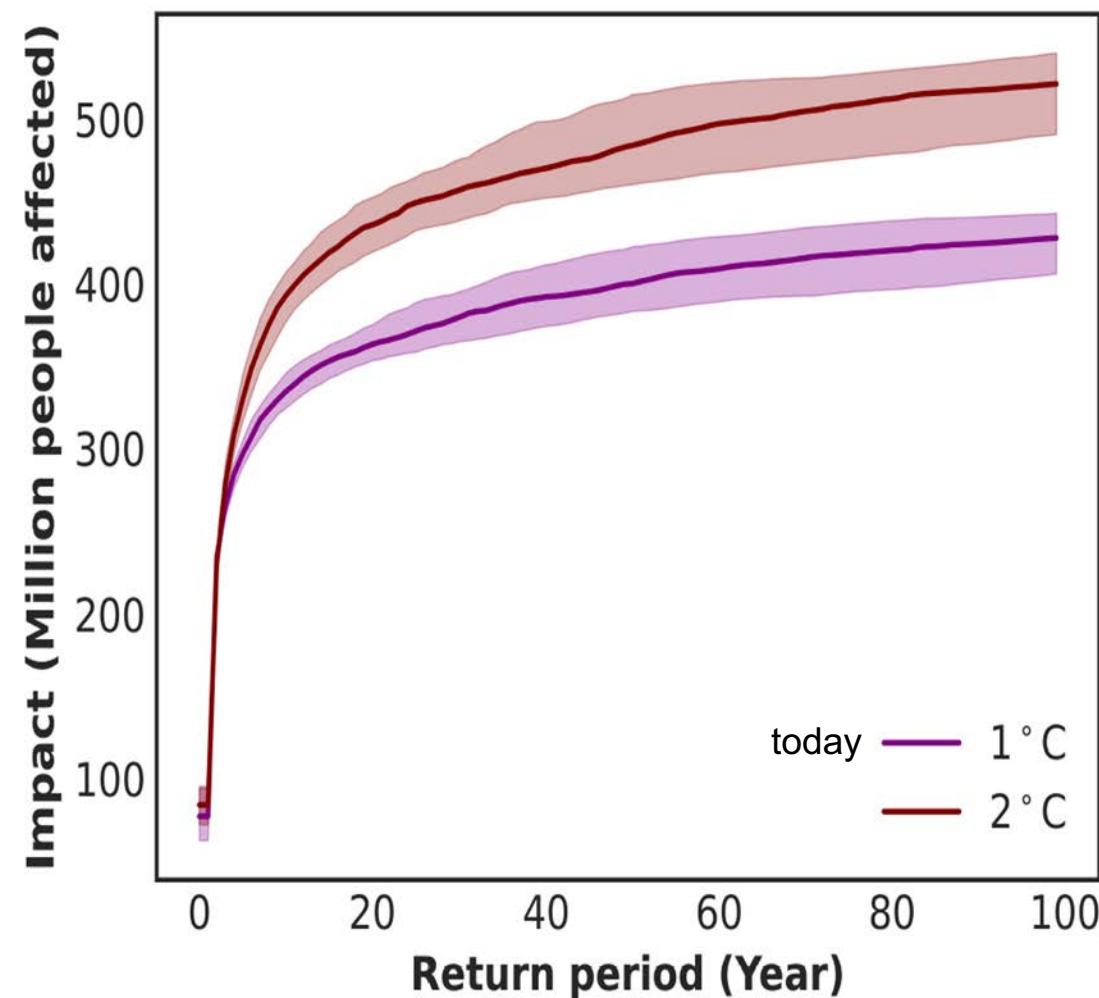
Each company to report modeled impact on a per-event basis of a reference hazard set, gross and net



Global multi-hazard risk assessment

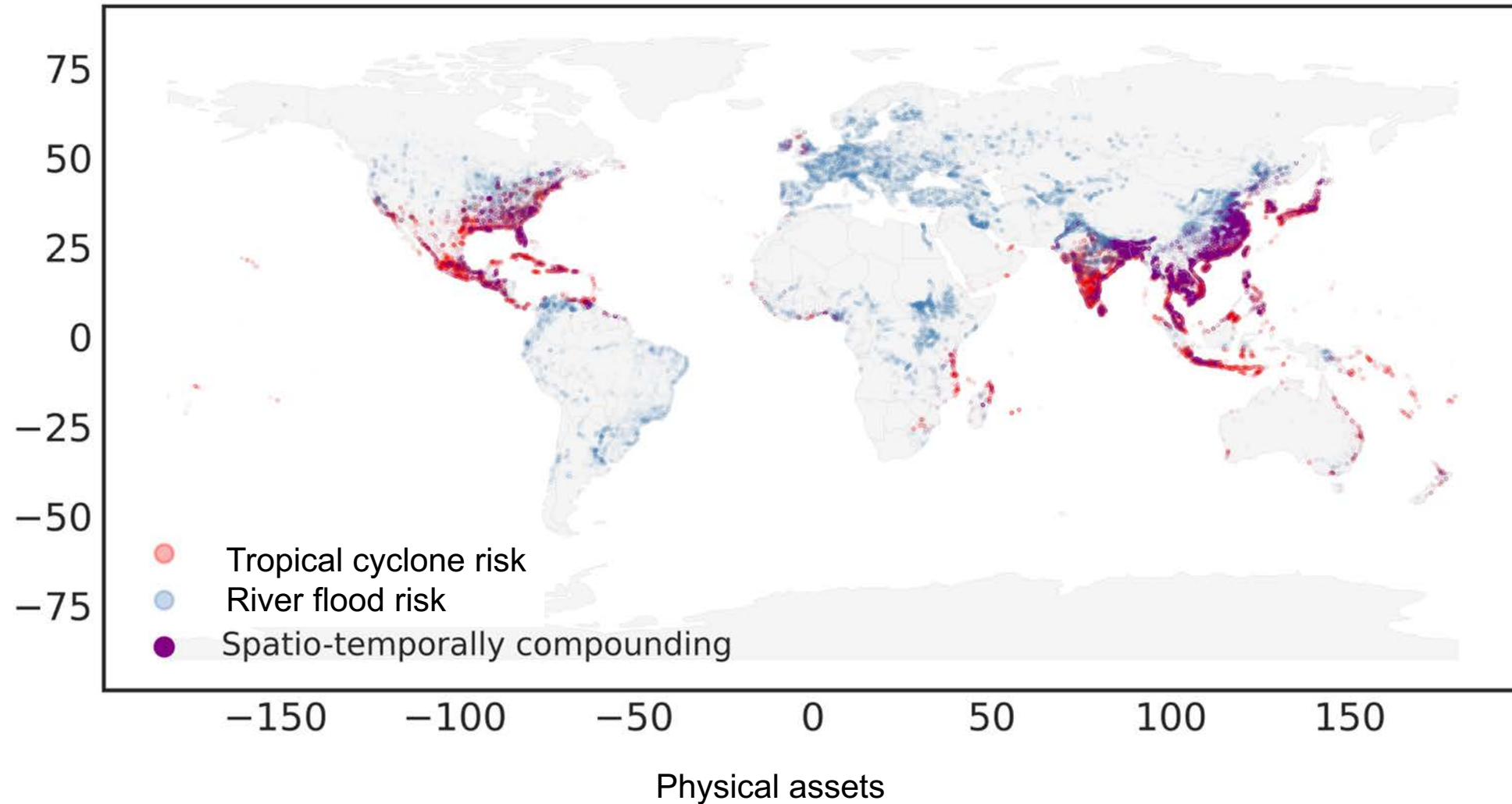


Physical assets



Population

Global multi-hazard risk assessment – physical assets



Event-based physical climate risk reporting

Prerequisites

- globally consistent **reference hazard event sets** for main perils both under current and future climate conditions (tropical cyclones, floods, droughts, wildfires to start with)
- globally consistent, **interoperable open-source and -access models**

Pros

- modeled impact on a per-event basis of a reference hazard set, gross and net serves as a comprehensive basis for many risks metrics (including risk-return profiling) to be applied
- companies need to disclose neither asset locations, nor supply chain structure, nor vulnerabilities
- allows for true transparency and enables risk-aware long-term investment strategies to be enacted

Cons

- Looks like quite some data volume, but a ridiculous argument in the era of big data

This presents a tremendous opportunity for the academic community to work towards **interoperable models** and **reference hazard event sets** both under current and future climate conditions.

CLIMADA – Collaborations (logo style, size arbitrary)



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology
MeteoSwiss



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BERN



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Wetter und Klima aus einer Hand



LOSS MODELLING
FRAMEWORK



ASIAN DEVELOPMENT BANK



National Center for Atmospheric
Research



THE WORLD BANK



InsuResilience
Solutions Fund



"La Ciencia sin Moral es Vana"



POTSDAM-INSTITUT FÜR
KLIMAFOLGENFORSCHUNG



THE GLOBAL GOALS
For Sustainable Development



CLIMADA Technologies



Atlantic Council



Adrienne Arsht-
Rockefeller Foundation
Resilience Center



Accelerating the global mindset towards anticipating climate impact and adaptation

Supporting a global client base in climate adaptation and resilience with decision-critical insights

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