CONFERENCE

THE NEXT FRONTIERS IN SUSTAINABLE FINANCE:

Research and Data Needs

KEYNOTE SPEAKERS

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ESG Data Officer - Institut Louis Bachelier

Capucine NOBLETZ
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INTRODUCTION TO PLADIFES

Thibaud BARREAU

ESG Data Officer - Institut Louis Bachelier

PLADIFES

INSTITUT Louis Bachelier DATA LAB

INTRODUCTION TO PLADIFES

September 2024

PLADIFES PROVIDES DATA AND SERVICES TO FACILITATE RESEARCH IN BOTH TRADITIONAL FINANCE AND GREEN AND SUSTAINABLE ONE.

Led by the **ILB** via its **Data Lab**

Funded by the **ANR** since **2021**.

In collaboration with:

- The **CNRS** (**EUROFIDAI** laboratory),
- The **ESSEC** Business School,
- The ***Pôle Finance Innovation***.

PLADIFES OFFERS A RANGE OF USES/SERVICES DEPENDING ON WHO YOU ARE, CENTERED AROUND DATA.

Academics

- Access to ILB and EUROFIDAI databases
- Free data services
- Organized data sharing

Practitioners

- Access to ILB databases & tools
- Access Data/ESG services through ILB Labs
- Patronizing options

Data providers

- Access to ILB databases & tools
- Access data/ESG services through ILB Labs
- Organized data sharing for academics

Currently accessible extra financial databases through Pladifes

Corporate GHG Emission Estimation

Cost based pricing

Estimation of **corporate GHG emissions** (Scopes **1, 2, 3** and sum of the three, **50 000 companies**, from **2005-2022**)

Physical risk module

Free for academics

1. Sectoral wealth densities based on Climate Trace (**2022**)
2. **Cyclone future damages estimates**, based on CATHERINA (4 scenarios, 5 climate models)
3. More to come

ESG indicators

Depends on database

1. Indicators declared in **sustainability reports** (**13 500 companies, 15 indicators, 2018-2020**)
2. **Eurofidai** ESG data, based on **Clarity.ai**, (**50 000 companies**, **105 indicators**, **2016-2024**)

Critical materials

Free

1. **Extraction and reserves** of critical ones for low-carbon technologies (**20 minerals**, **1994-2020**)
2. Mineral **concentration indices**, based on the **HHI index** (**63 minerals**, **1994-2021**)
3. (Forthcoming) *Critical Raw Materials Index*

Carbon pricing index

Free

National carbon prices levels, scaled based on the **covered jurisdiction** (**251 countries**, **2000-2024**)

Asset level emissions

Free

1. **Corporate emissions from asset data**, based on **Climate Trace** (10 sectors, **2015-2022**)
2. **Projected emissions** based on academic methodology (**steel sector**, **2020-2030**)

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ENSAE
Universidad de Chile
UCLM Universidad de Castilla-La Mancha – Campus de Excelencia Internacional
Warwick – The University of Warwick
HEC Paris
University of St.Gallen
University of Portsmouth
LSE – The London School of Economics and Political Science
Banque de France – Eurosystème
McGill
CREST – Center for Research in Economics and Statistics
European Central Bank – Eurosystem

AND MANY MORE!

Institut Louis Bachelier Data Lab

PLADIFES

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COGEM - CORPORATE GHG EMISSION ESTIMATES

Mohamed **FAHMAOUI**

Data Engineer - Institut Louis Bachelier

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INSTITUT Louis Bachelier DATA LAB

COGEM - *Corporate GHG Emission Estimates*

September 2024

COGEM PROVIDES A DATABASE OF COMPANIES' CARBON FOOTPRINTS ESTIMATIONS ON ALL 3 SCOPES

OBJECTIVE

Applying statistical learning models to **estimate greenhouse gas emissions**:

- at **different levels** (Scope 1, Scope 2, Scope 3 and Scope 123 overall),
- for **all companies**, with **no geographical restrictions.**

POINTS OF INTEREST

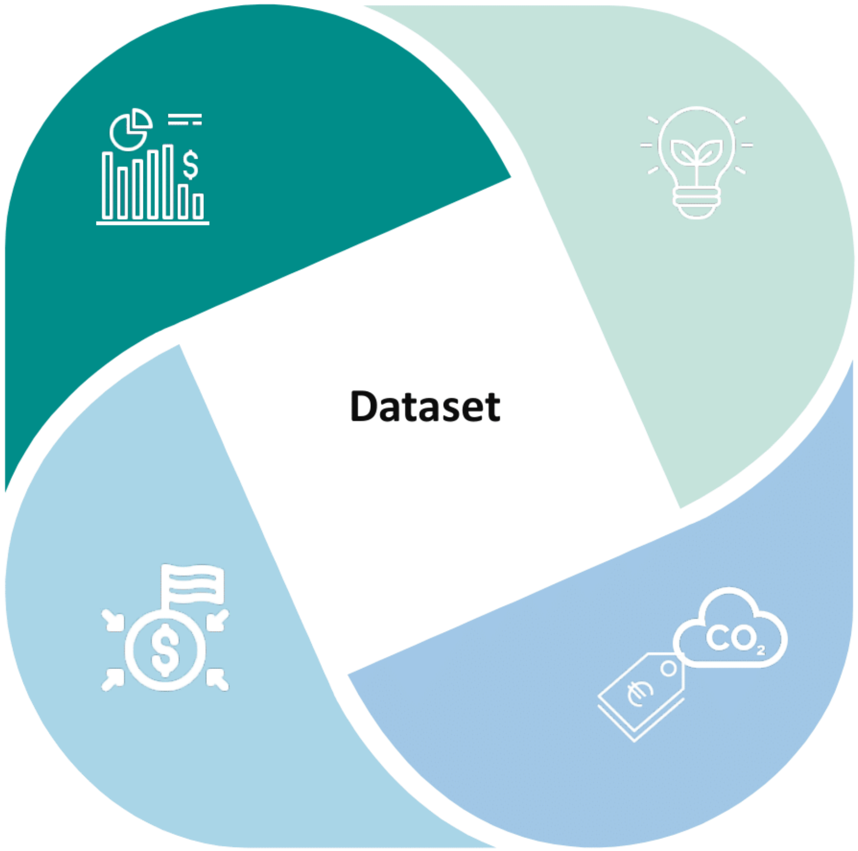
- Lack of transparent data on emissions, particularly on the scope 3.
- Limited literature has been produced on the subject, and no public repositories are available.
- To date, the data we created is limited to non-commercial usage.

PROVIDE ESTIMATED SCOPE 1 2 3 EMISSIONS OF COMPANIES, FOR ~47K LISTED COMPANIES.

In order to predict corporate greenhouse gas emissions, 5 separate databases are initially concatenated: 2 proprietary and 3 open-source.

Company data
(LSEG Data and Analytics (ex Refinitiv) and CDP)
~47k companies
Company’s financial and extra-financial data by year

Fuel intensity (Ember)
Carbon intensity of countries' energy mix by year



Income group (World Bank database)
Estimated gross national income per year

Carbon Pricing (World Bank Report)
Carbon tax policies in each country by year

Refinitiv and CDP: central data to which other information is added (join key = country of headquarters x year)

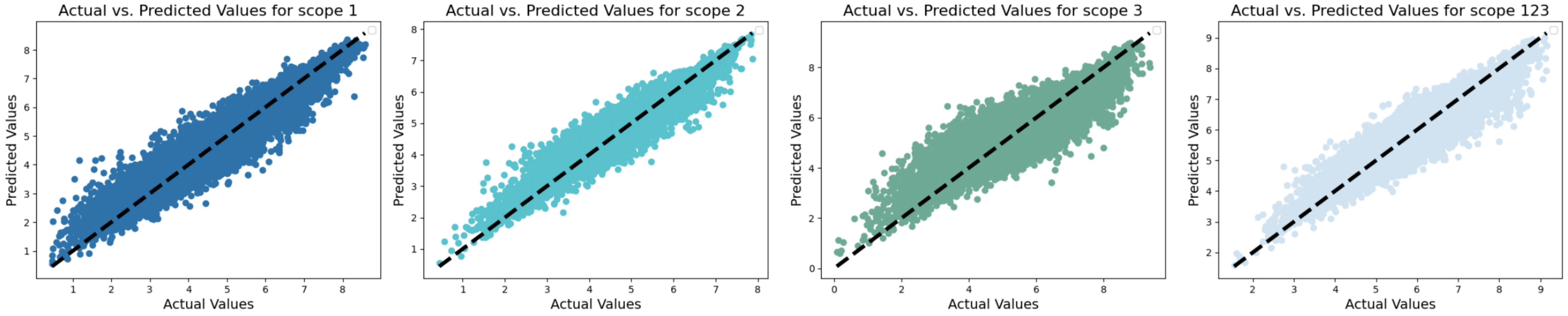
Data pre-processing is carried out in seven steps to obtain the basis for estimation.

For each of the 4 target variables, from the Refinitiv x CDP matched database, using CDP scope data:

1	**Handling outliers**	Removal of observations for which the target variable has an extreme value (see Appendix 2).
2	**Separation of test and training data**	Separation of into train and test data based on a specific methodology to limit bias towards under-represented sectors and countries
3	**Transformation of categorical variables**	Transformation of categorical variables via One-Hot Encoding (sectors) or Ordinal Encoding (income groups, years)
4	**Imputation of missing values**	Use of the sector average (see Appendix 4 in several slides)
5	**Logarithmic transformation**	Logarithmic transformation of numerical variables with an approximate lognormal distribution
6	**Selection of explanatory variables**	Selection based on the results of several research papers, as well as several iterative tests to study the importance of these variables
7	**Selecting the history to be used**	Retention of data from 2005 for scopes 1 and 2 and from 2011 for scope 3, then deletion of observations for which the target variable is missing.

CATBOOST (MACHINE LEARNING MODEL) IS THE BEST-PERFORMING MODEL FOR ALL 4 TARGET VARIABLES AND FOR ALL APPROACHES. PERFORMANCE IS CONSISTENT WITH THE STATE OF THE ART IN THIS FIELD.

	Scope 1	Scope 2	Scope 3	Scope 123 (scope 1 + scope 2 + scope 3)
R2 (log)	***0.92***	***0.92***	***0.83***	***0.9***
R2 (raw)	***0.79***	***0.77***	***0.63***	***0.73***



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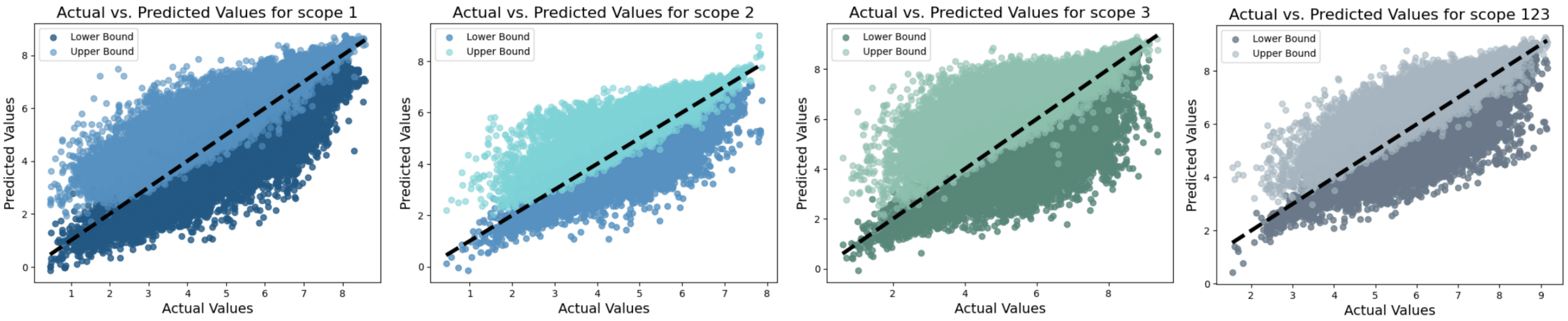
BEYOND SINGLE POINT ESTIMATES, WE ALSO ESTIMATE PREDICTION INTERVALS TO PROVIDE ADDITIONAL INFORMATION ON THE ESTIMATED SCOPES.

METHODOLOGY

A **prediction interval** represents a range of values within which a future observation has a given probability of falling. In our case, we derived **90% intervals**, i.e. the true value has theoretically 90% chance of being included in the interval.

In our CatBoost model, we use a specific option that allows us to also to estimate the variance (or uncertainty) associated with a prediction. A normal distribution assumption is then used to derive prediction intervals.



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We hope COGEM will help sustainable finance development by proposing a trustworthy and open methodology

State-of-the-art →	Our approach is distinguished by a precise preprocessing and a rigorous model evaluation, with particular consideration for underrepresented countries and sub-sectors.
Useful data for researchers →	Researchers can access databases and an online calculator for uncovered companies.
Update →	Progressive improvement of the methodology and continuous data maintenance based on users' feedback, with a responsive developing team.
A replicable methodology →	Private practitioners who have use cases requiring estimated emission data can obtain a replication of the methodology for a marginal cost.

Feel free to use the following QR Codes:

Database Link

Article Link

Github Link

CONFERENCE

CRITICAL RAW MATERIALS INDEX (CRMI)

Capucine **NOBLETZ**

Post doctoral researcher - Institut Louis Bachelier x Banque de France

Critical Raw Materials Index (CRMI)

A new index to assess the price dynamics of materials related to the energy transition

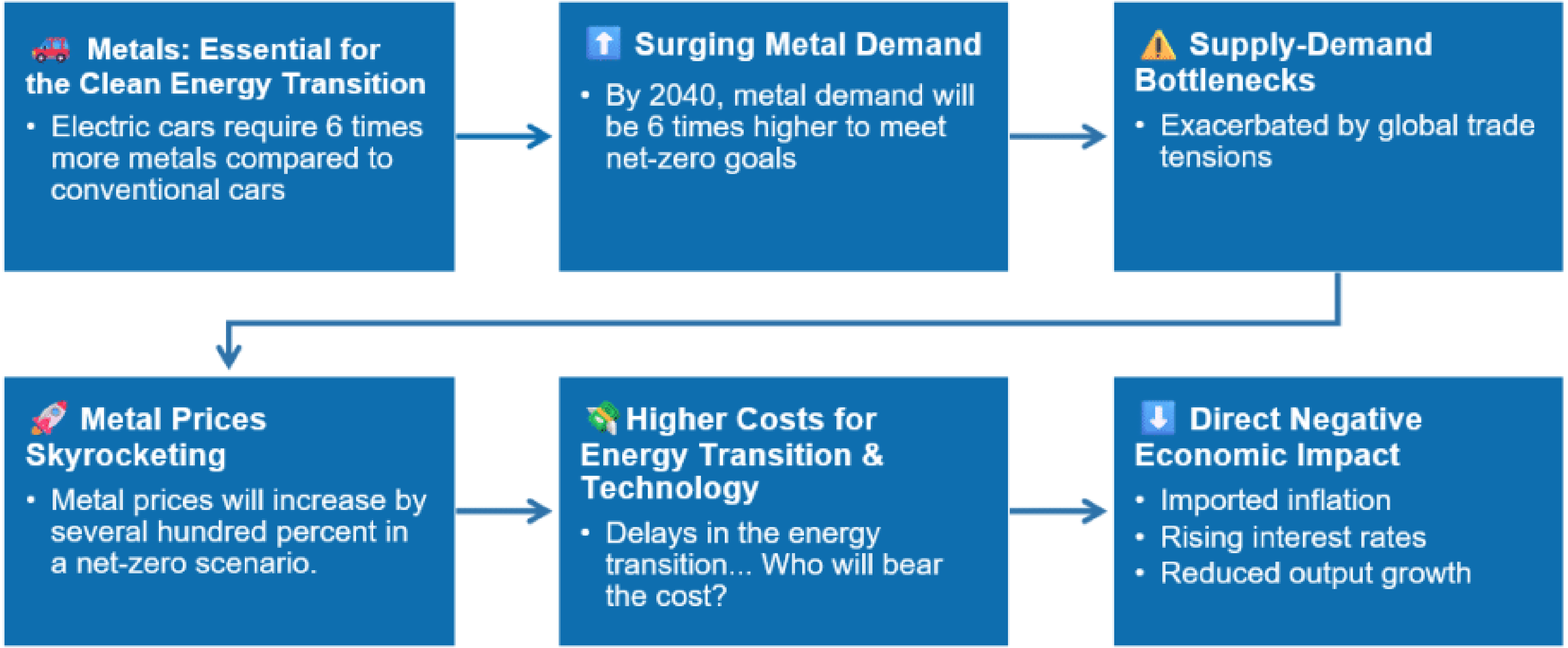
Jean-Baptiste Hasse[†] & **Capucine Nobletz**[‡]

[†]: Aix-Marseille Univ., CNRS, AMSE
[‡]: Institut Louis Bachelier, Banque de France

September 24, 2024

[†]: The project that led to this publication has received funding from the French government under the "France 2030" investment plan managed by the French National Research Agency (reference: ANR-17-EURE-0020) and from the Excellence Initiative of Aix-Marseille University - A*MIDEX. This research was performed as part of a research program titled "Financial and Extra-Financial Risks Management" under the aegis of the Europlace Institute of Finance, a joint initiative with insti7. ‡ This work is also supported by the Equipex PLADIFES ANR-21-ESRE-0036, as part of France 2030.

Introduction



Sources: IEA (2021), Martin Stuermer et al. (2021), & Hache and Louvet (2023).

Issue

- There is an urgent need for a deeper understanding of these transmission channels.
- To address this, we require a tool capable of tracking the dynamics of critical energy transition metal prices.

- Currently, no robust index exists to fulfill this role, which is the gap this paper aims to address.
- The **CRMI (Critical Raw Materials Index)** provides complete transparency regarding its construction methods, data sources, coding processes, and is built with a high degree of robustness.

⇒ **The working paper is available on the PLADIFES website, and negotiations for data distribution are currently underway.**

Data

- **Critical metals for energy transition:**
  - ▷ Selected based on the IEA (2024).
- **29 metal price series:**
  - ▷ Weekly spot prices from June 2016 to October 2023.
- **Included metals:**
  - ▷ Examples: Cobalt, Copper, Dysprosium, Gallium, Germanium, Graphite, Iridium, Lithium, Manganese, Neodymium, Nickel, Platinum, Silicon.
- **Six clean-energy sectors:**
  - ▷ Electric Vehicles, Electricity Networks, Grid Battery Storage, Hydrogen Technologies, Solar PV, Wind.
- **Selection criteria for metals:**
  1. Global exchange or Chinese export prices;
  2. Availability of data and daily price changes;
  3. The form of the metal traded.

Methodology

- **Composite indicator construction from Nardo et al. (2008):**
  - ▷ Result of a collaboration between the OECD and the JRC of the European Commission.
- **Weighting schemes:**
  1. Equal-weighting;
  2. Trade-Weighting;
  3. Trade-Weighting (capped - equally);
  4. **Trade-Weighting (capped - proportional).**
- **Trade-weighting details:**
  - ▷ Global export data sourced from the BACI database (Gaulier and Zignago, 2010);
  - ▷ The metal product codes selected are those that best match the metal shape of our data.

The Critical Raw Materials Index (CRMI)

Source: This figure illustrates the CRMI (base 100 = 2012). The weighting methodology is as follows: trade-weighted, a cap of 20% and a proportional redistribution of weights.

Sensitivity Analysis

- **Robust to data preprocessing techniques**, including:
  - ▷ Handling missing values;
  - ▷ Winsorization to address extreme values.

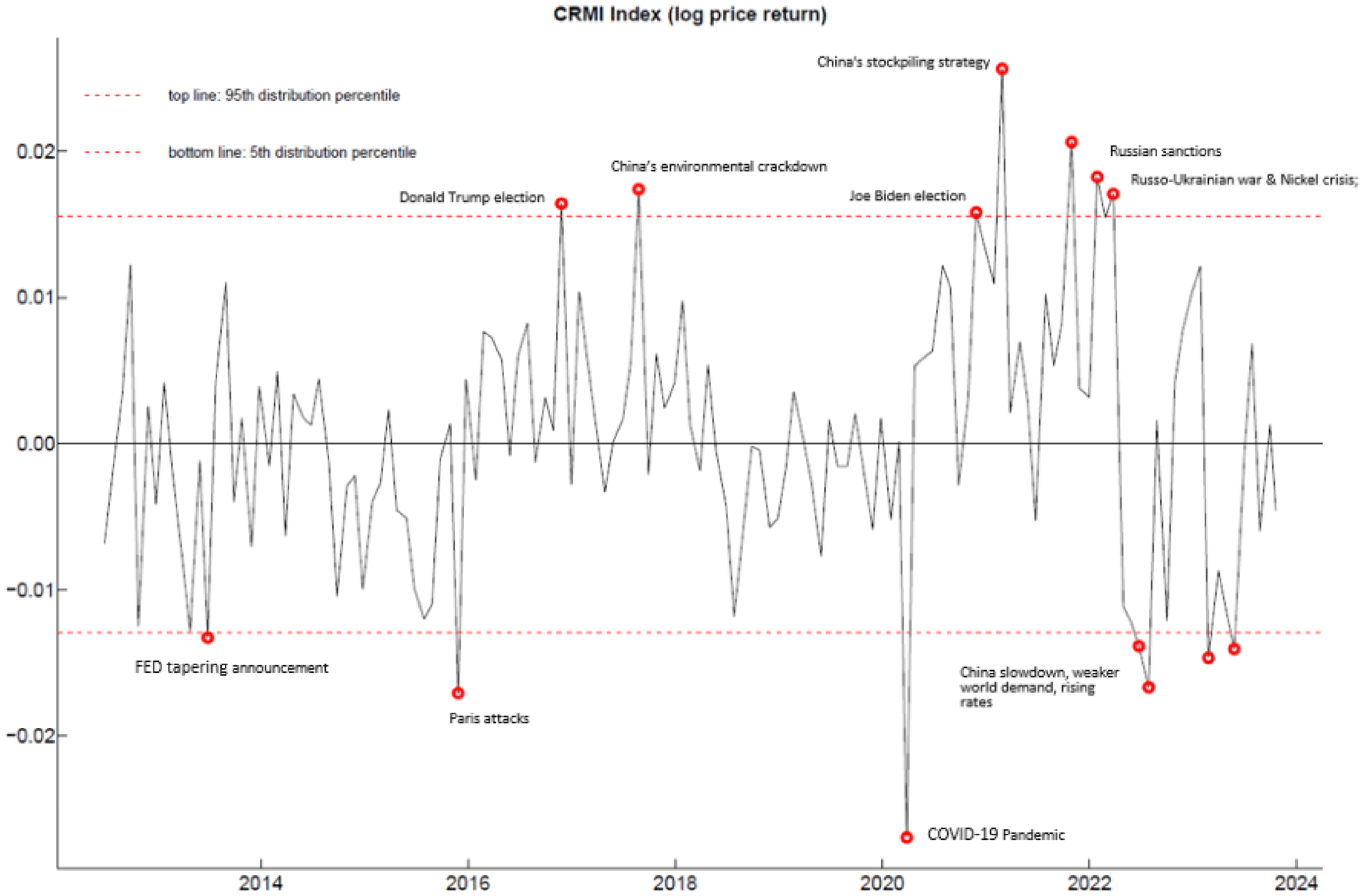
- **Robust to variations in weighting methodologies**, notably:
  - ▷ Economic perspective: Using metal market-availability weights (Thomas et al., 2022).

Validation

Following the index validation approach of Caldara and Iacoviello (2022):

- We assess whether the CRMI accurately captures the historical evolution of critical materials prices $\Rightarrow$ **Plausibility.**
- We compare the CRMI against other comparable economic time series to ensure consistency and relevance $\Rightarrow$ **Comparability.**

Plausibility



Comparability

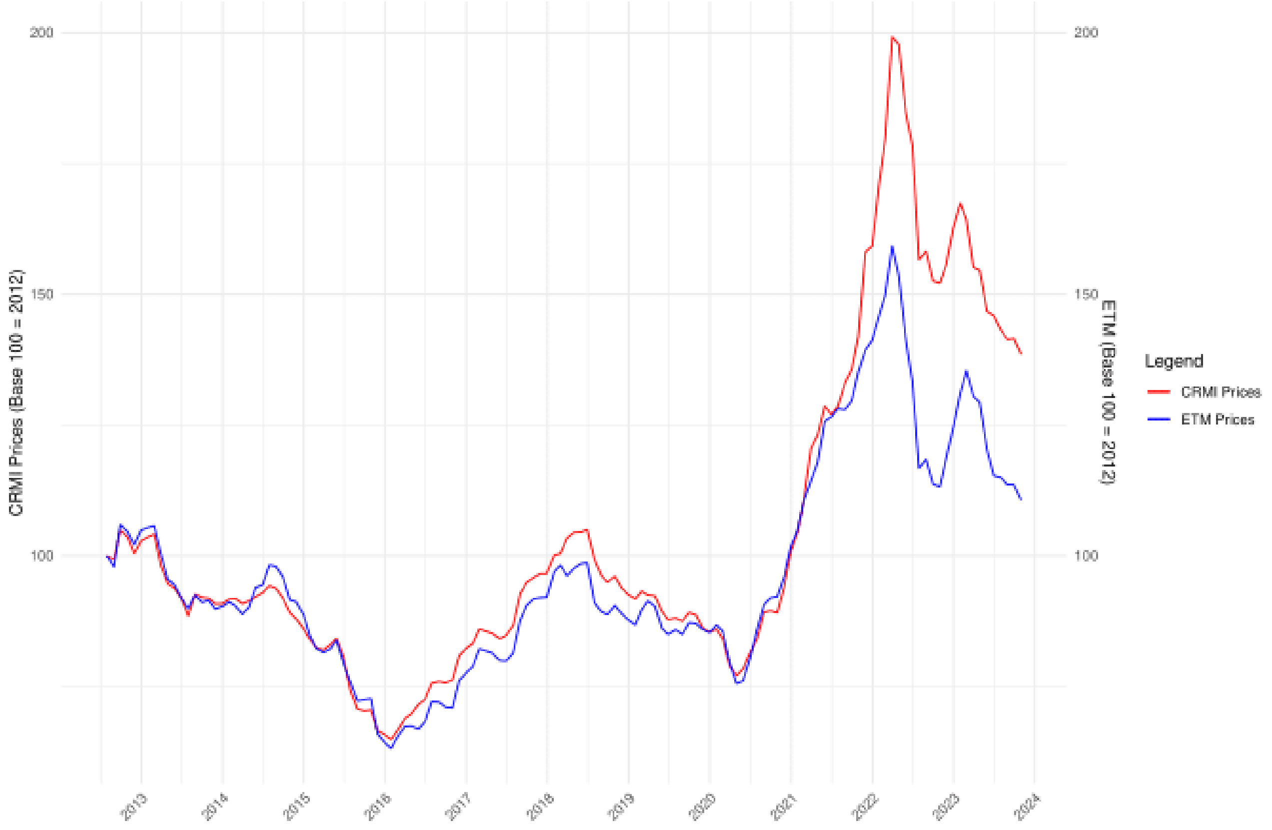
CRMI & ETM

	CRMI	ETM
Metal coverage	29	16
Selection	IEA (2024)	Ad-hoc
Frequency	Weekly	Monthly
Starting date	June 2012	June 2012
Base	2012 (Index=100)	2016 (Index=100)
Currency	USD/CNY	USD
Methodology	Equal-weighted; Trade-weighted; HHI-weighted	Trade-weighted
Trade database	BACI	UN COMTRADE
Exchange volume proxy	Export	Import
Average weight	2014-2016	2012-2021
HS nomenclature	6-digits HS17	6-digits HS12
HS code selection	Match the data metal shape	Expert judgements
Sub-indexes	By energy transition sectors	No sub-indexes
Robustness	Missing values/Winsorization	No robustness checks

Legend: The Energy Transition Metal Index (ETM) is a sub-index of the Primary Commodity Price Index (PCPI), from the IMF.

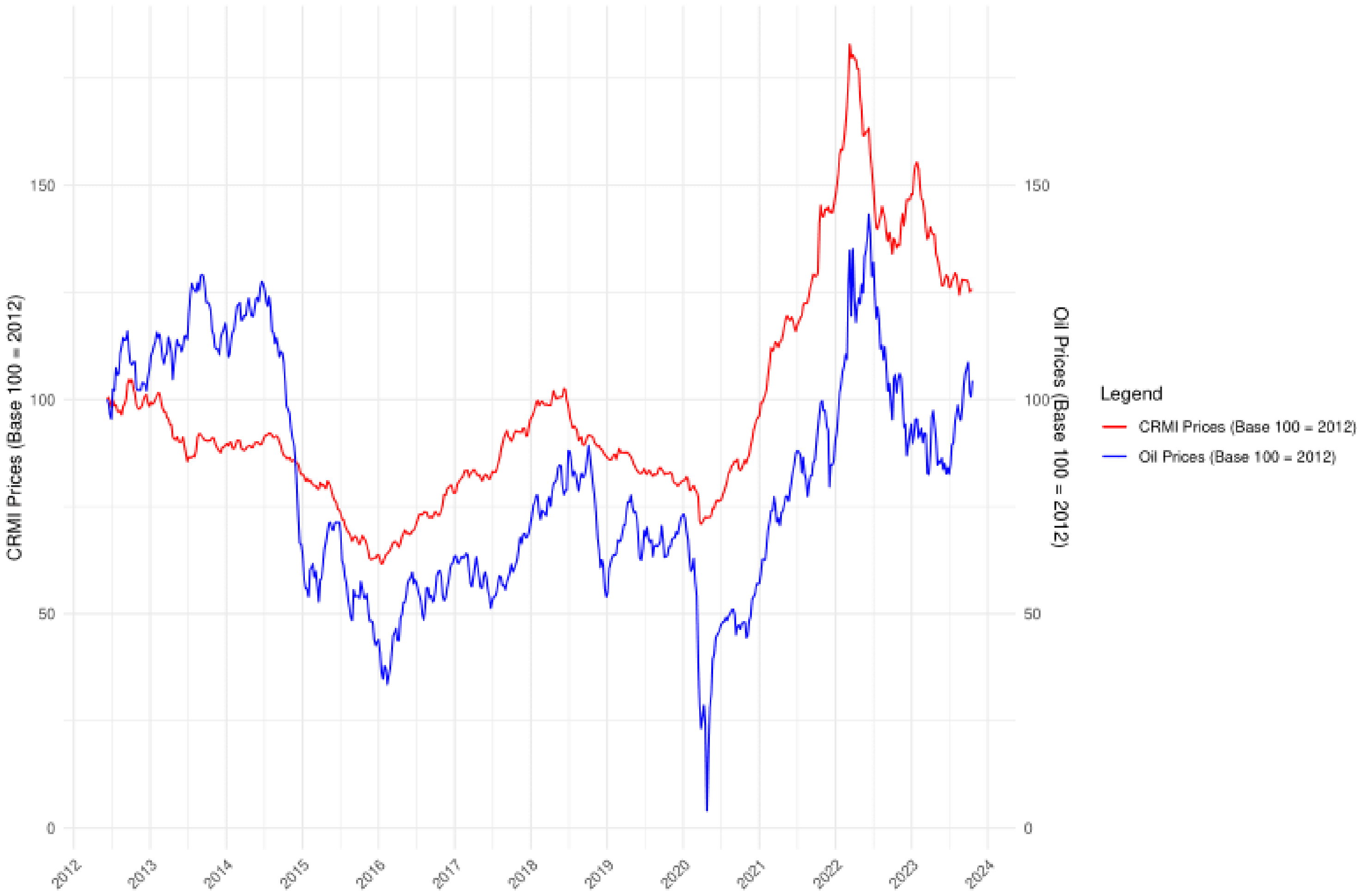
Comparability

CRMI & ETM



Comparability

CRMI & Oil Prices



Conclusion

- The CRMI is a new index designed to track the price dynamics of energy transition metals.
- This index is a necessary tool to better understand the current and future role of critical metals in the energy transition.
- Forthcoming: Utility examples showcasing the application of this index.

Thank you for your attention!

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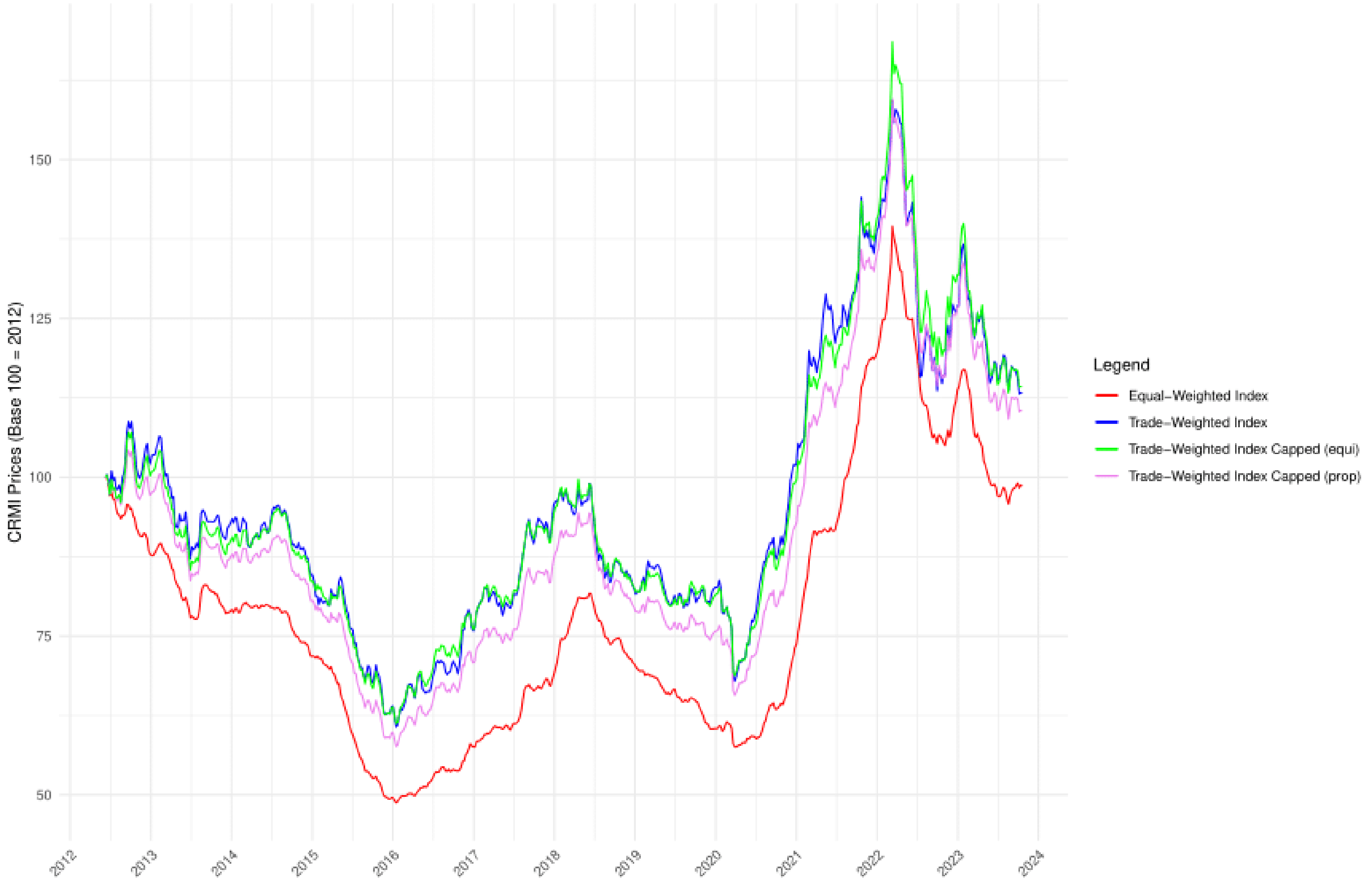
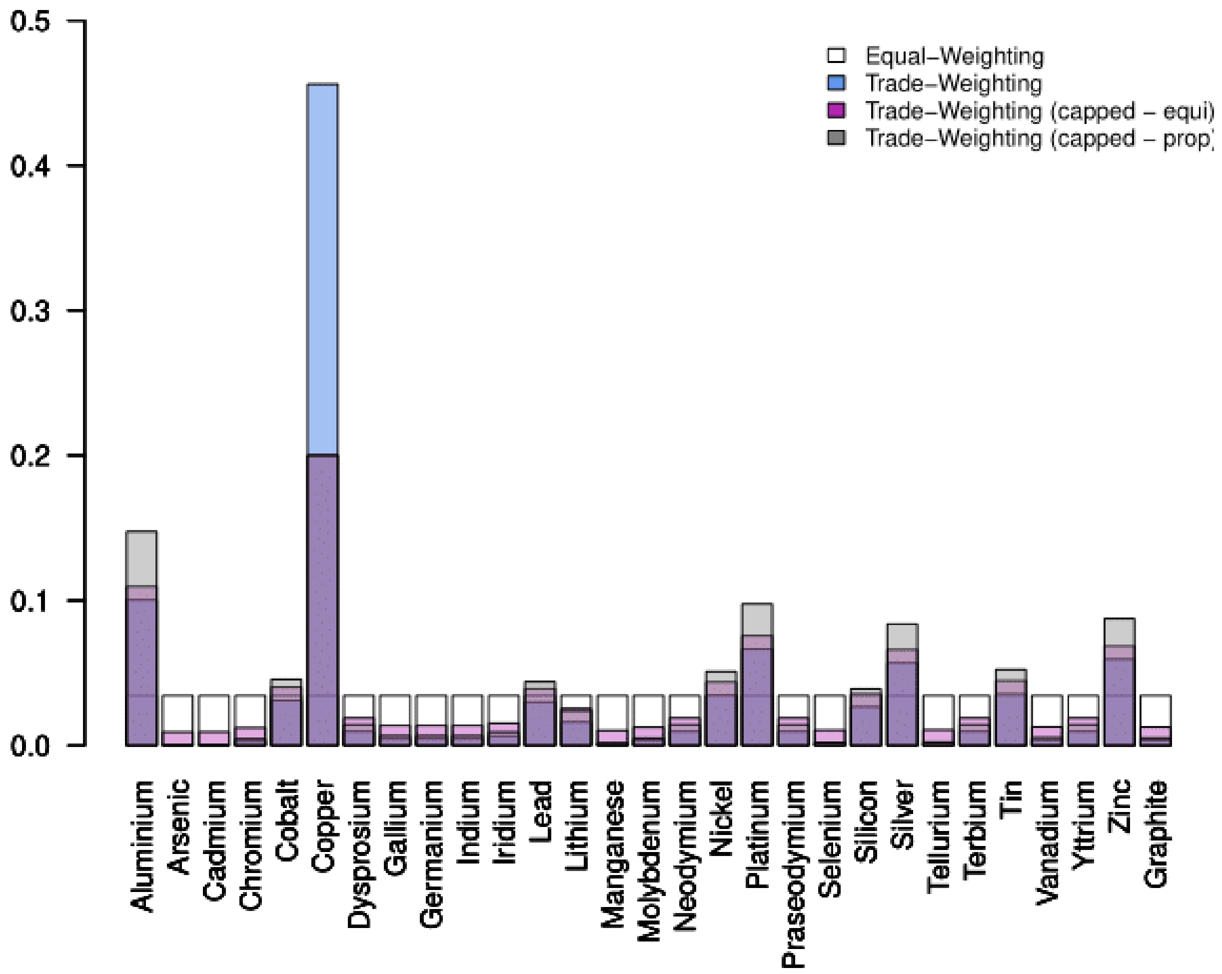
Supplement materials

Trade Weighting



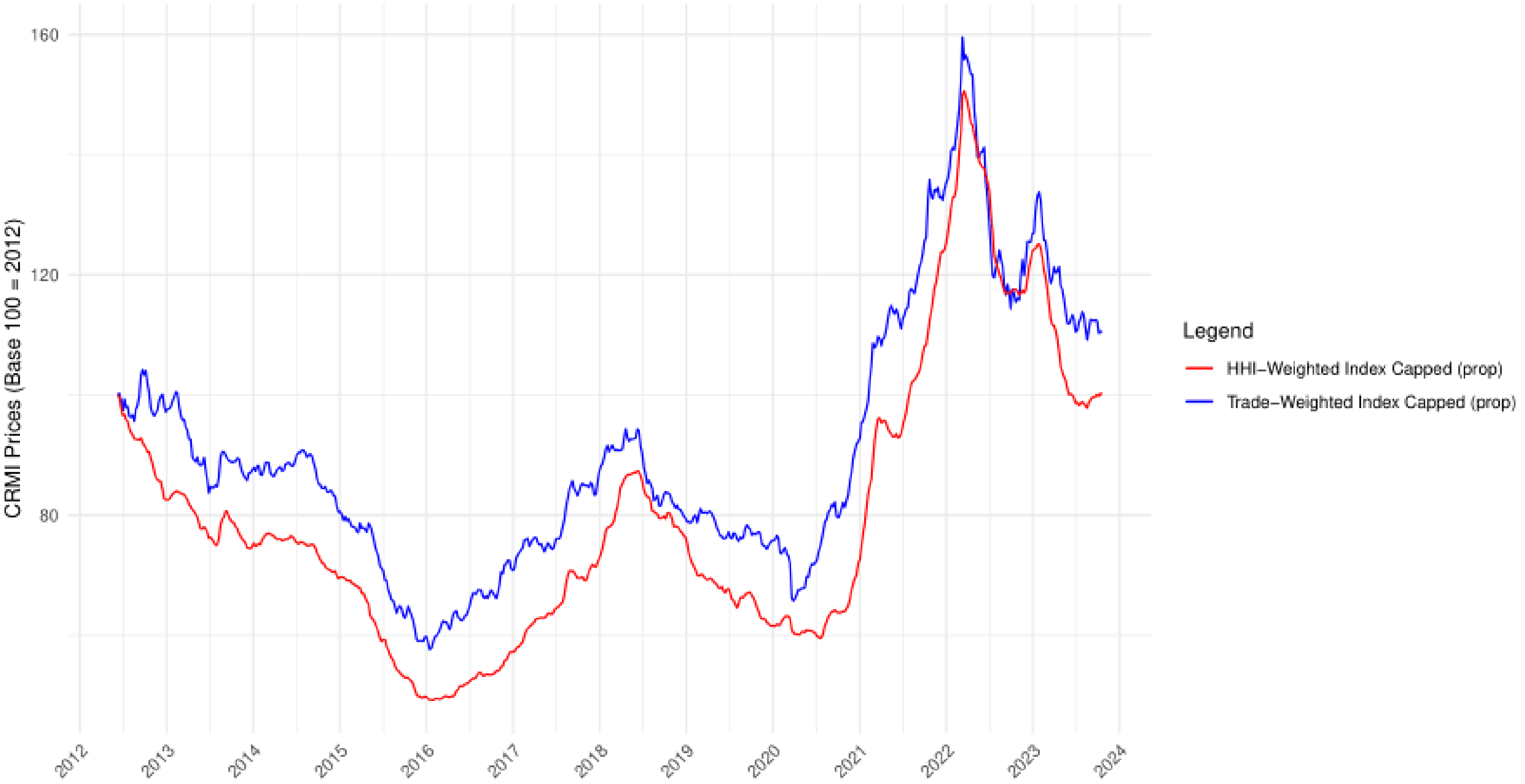
Supplement materials

In detail



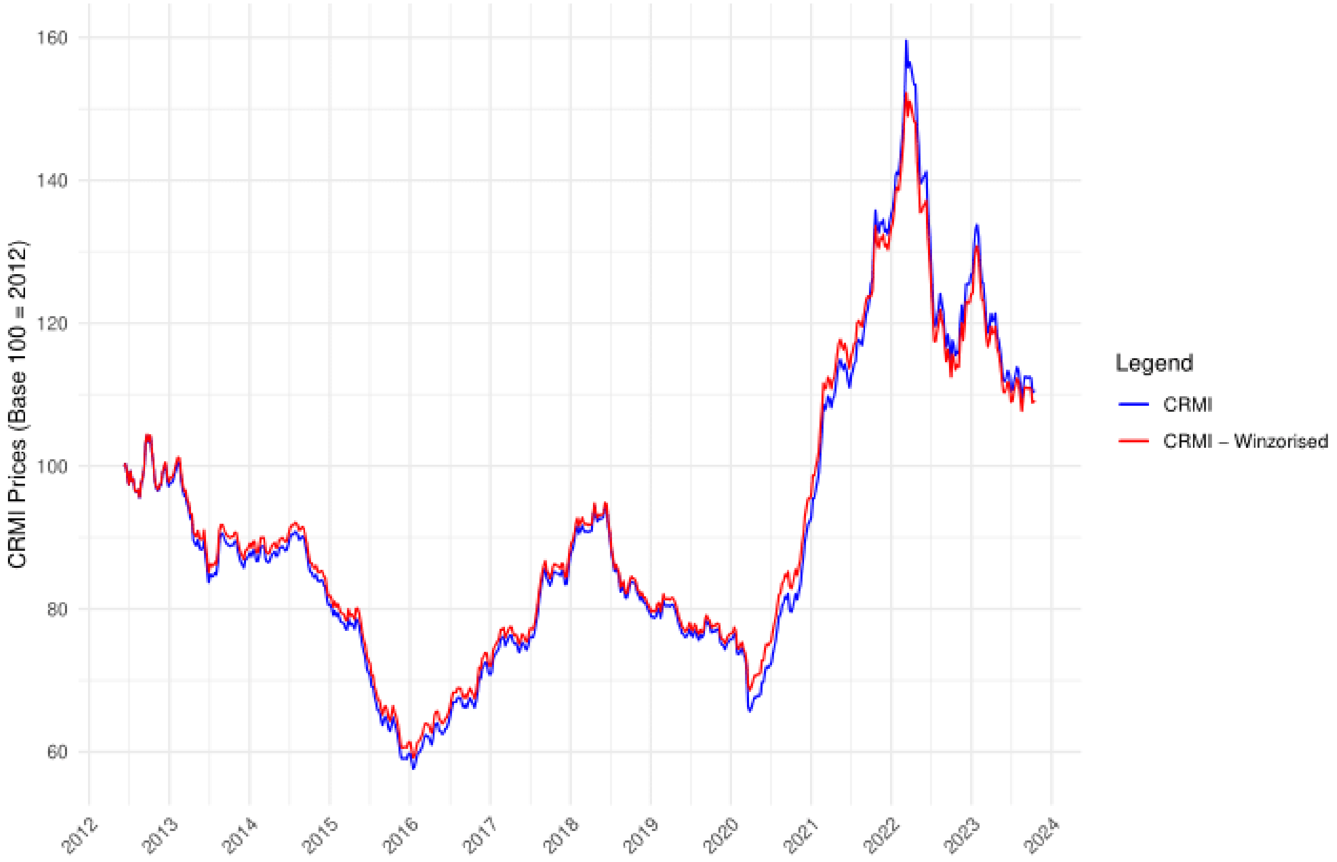
Supplement materials

Economic Weighting



Supplement materials

CRMI - Winsorized



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CATHERINA

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CATHERINA

Theo Le Guenedal, *Lead Prospective and climate research*, Innovation Lab, Amundi Technology

24/09/2024

Climate data and events modeling

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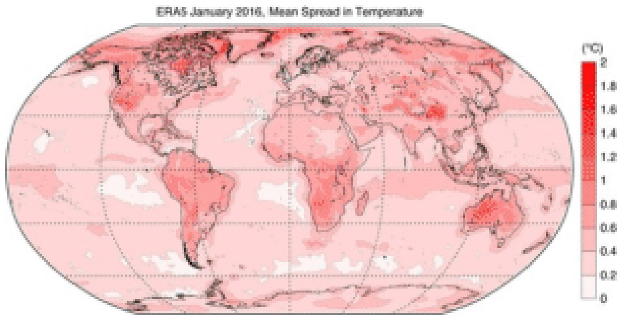
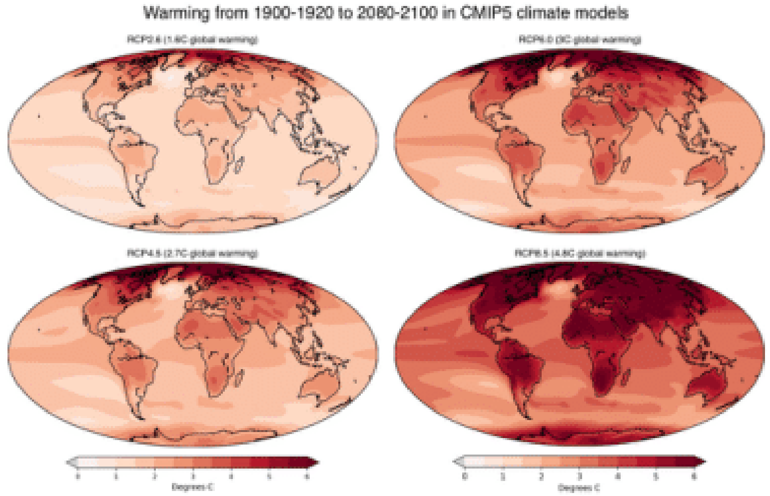
Reanalyse (ERA, MERRA-2)



Simulation and projection (CMIP)



Climate data types

- Meteorological record
- Reanalysis
- Modeled data: historical and projection (by AOGCMs) → can be biased and must be corrected carefully!

Sensitivity to climate change (examples)

- **Floods**: modeled with PCR-GLOB, NOAH-MP or LISFLOOD (precipitation/river) - DIVA (coastal) +3 to 5% ↗ flood likelihood (Tabari, 2020)
- **Storms**: Tropical Cyclone intensity ↗ 11% by 2100 (Knutson et al., 2010), +25% of expected damage from storm in Germany
- **Droughts**: 72% global land go through aridification in the future (Tabari, 2020)

CATHERINA

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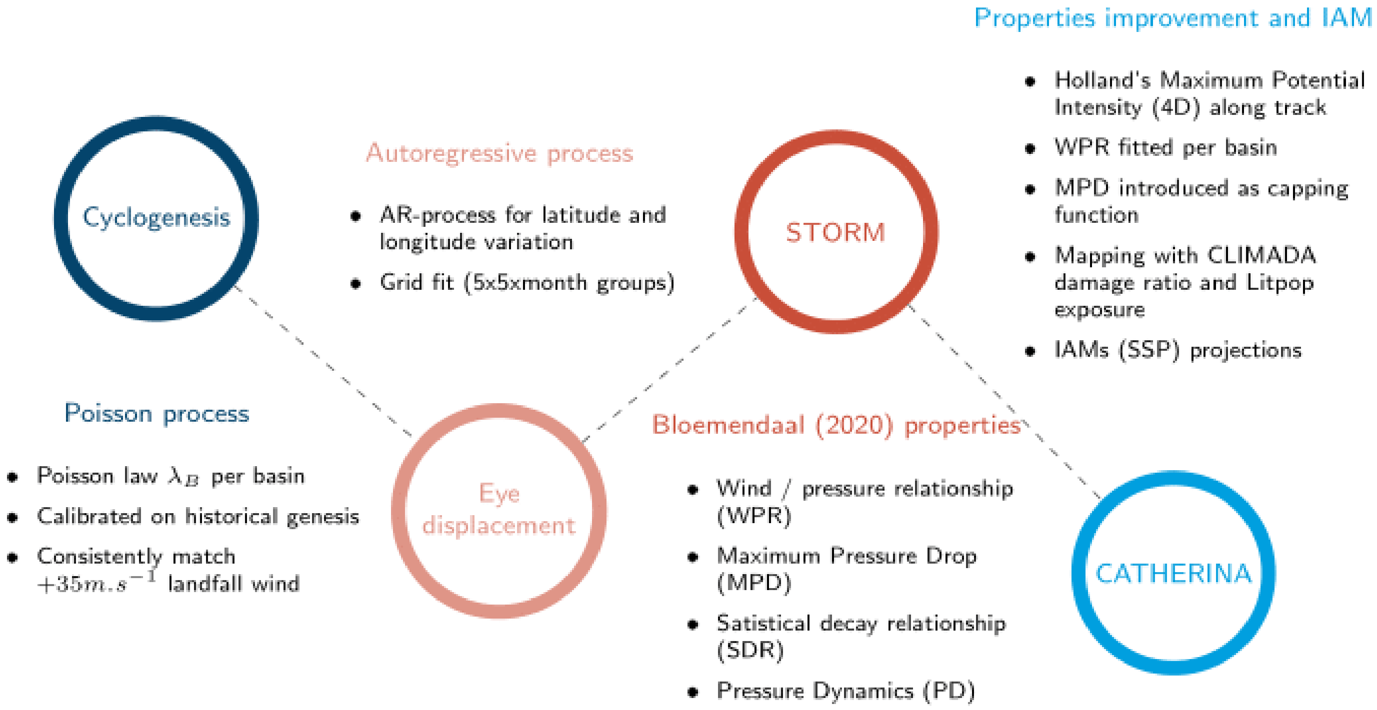
⇒ Cyclone generation Algorithm including a THERmodynamic module for Integrated National damage Assessment (CATHERINA)



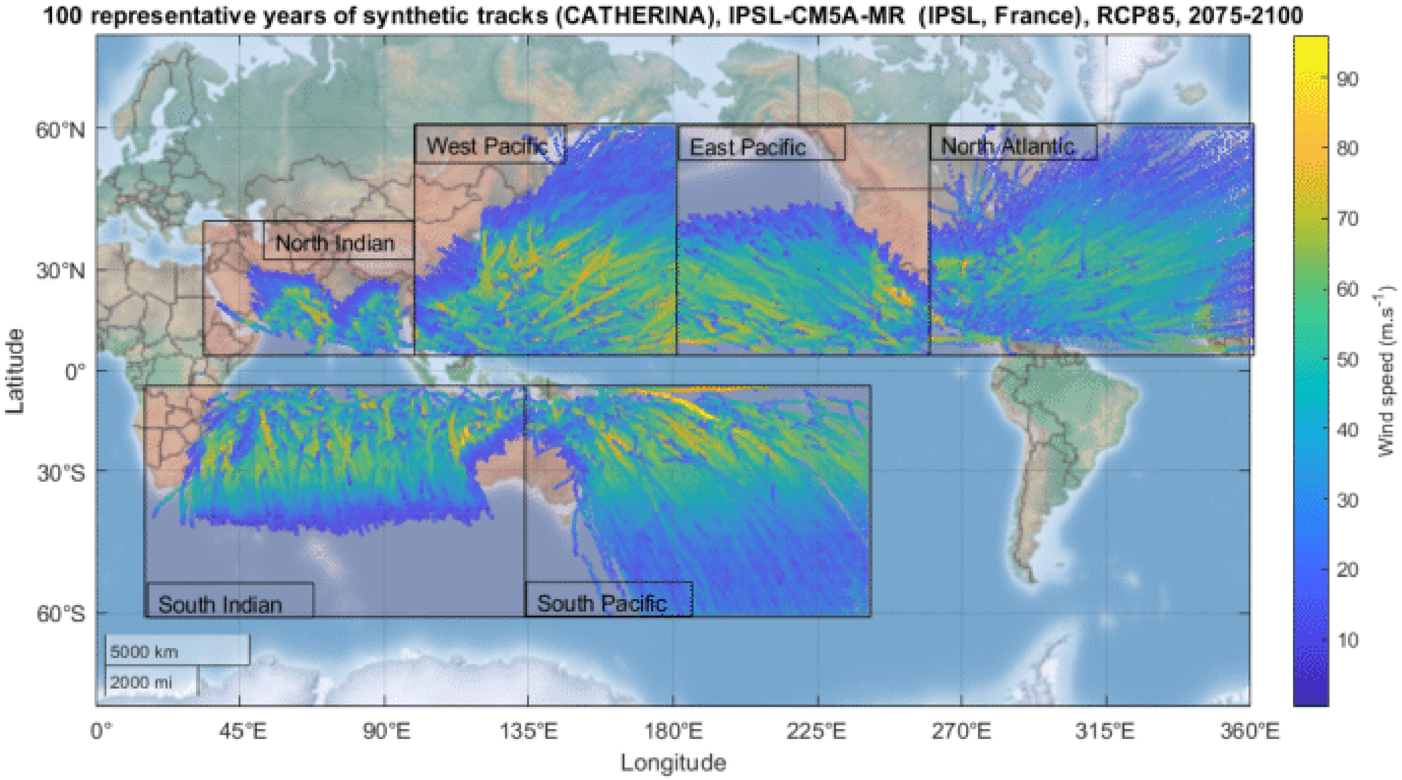
CATHERINA 1.2

Access through Institut Louis Bachelier:

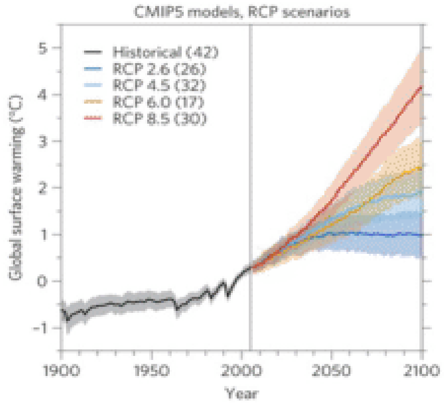
- python code: with CMIP6 models through Climate Data Store API
- Data:
  - Sample of synthetic tracks
  - Gridded damages
  - Statistics of national damage in RCPs

A cyclone database…

… generated from AOGCM data (CMIP6)

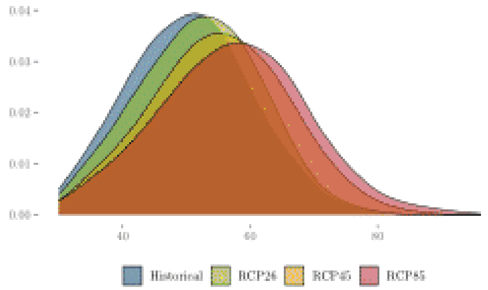


Climate change scenarios



Source: IPCC AR5

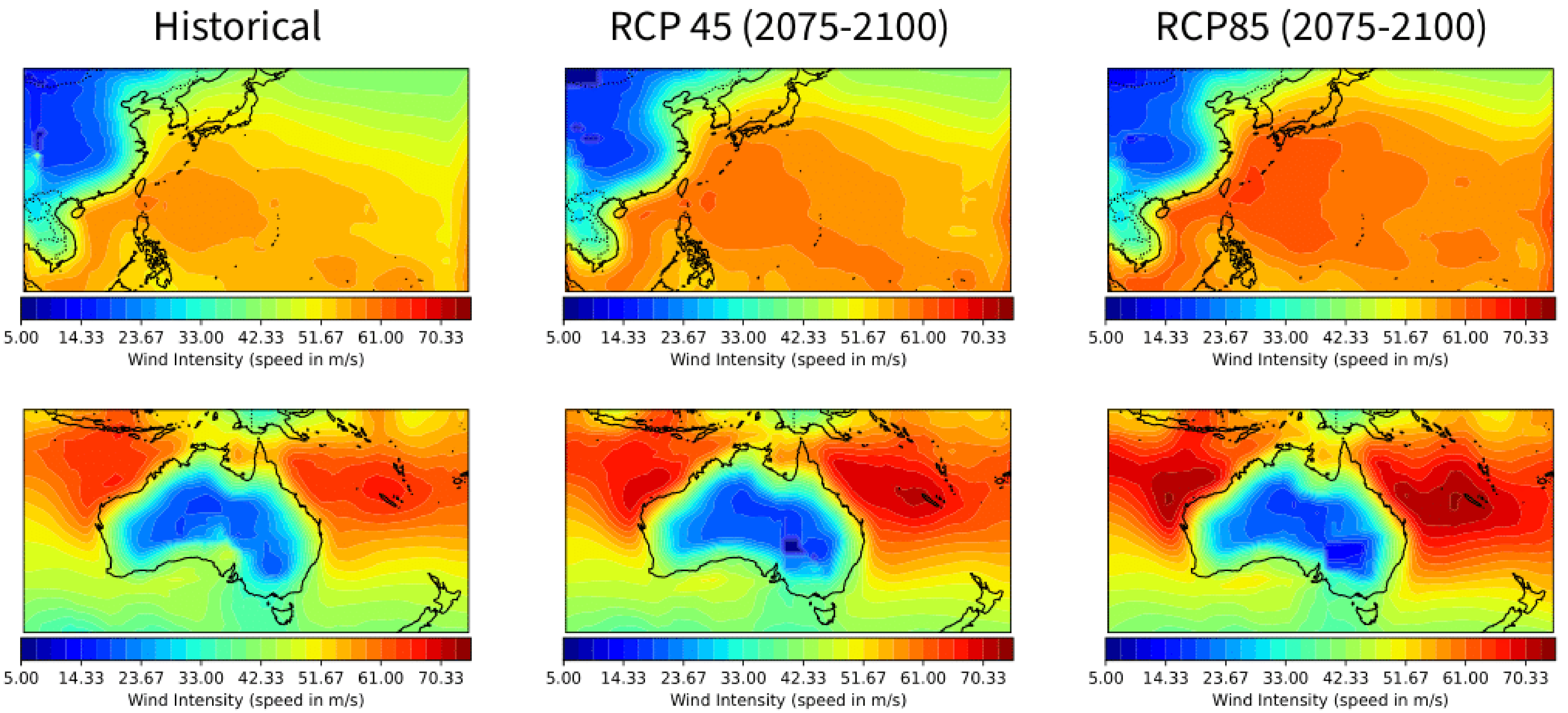
Max. wind (m/s) (2070-2100)



Source: Le Guenedal et al. (2022), Geoscientific Model Development

Example TC Wind - CMIP6 MIROC ES2L

Preliminary Results - Wind 98th percentile



Damage function

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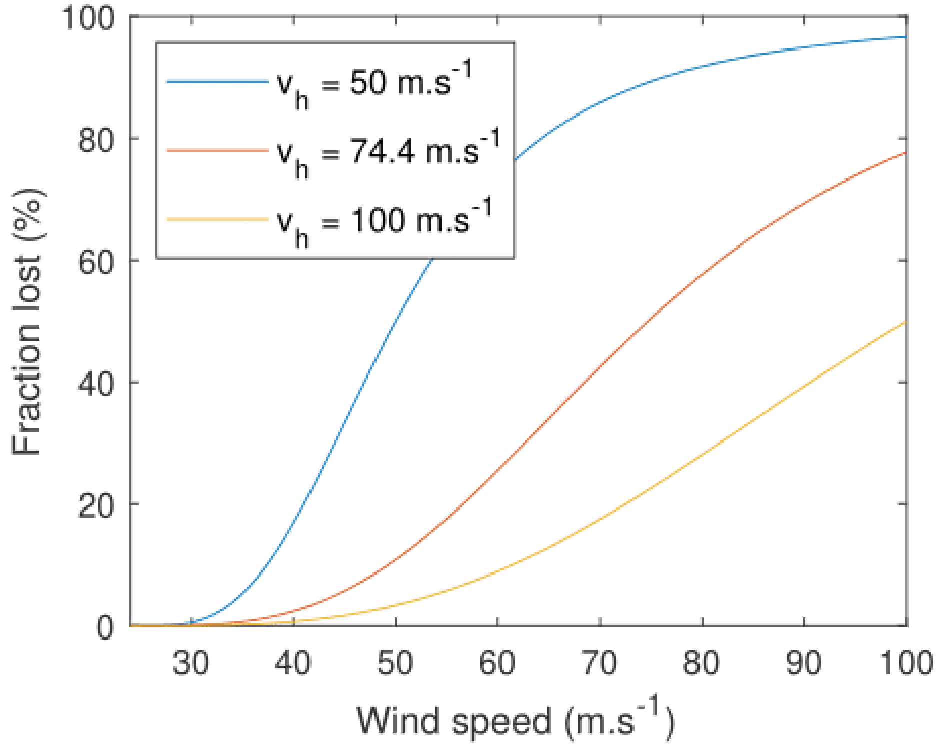
Generic damage function to calculate the fraction of property value lost per region

Function based on (Emanuel, 2011) depending on Regional Vulnerability hyperparameter v_h :

- v_h value of the wind for which 50% of property is destroyed
- **High v_h** $\Longrightarrow$ High resiliency (e.g. Japan)
- **Generic approach**: Calibration of v_h can be generalized to other grouping (infrastructure type, sector) and event types



Exposure

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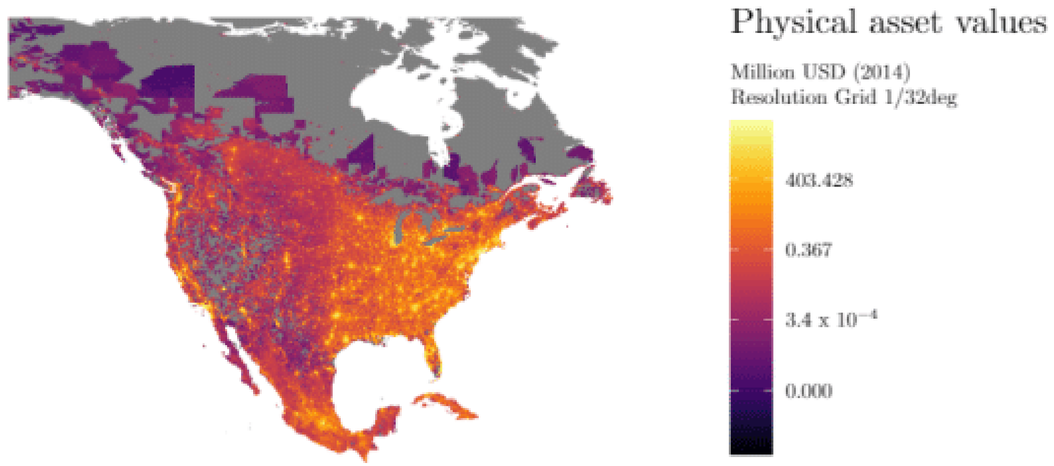
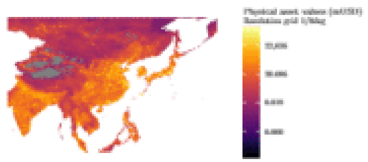
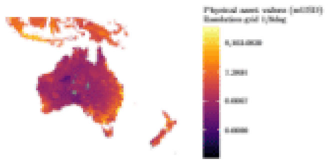
⇒ Current (Eberenz et al., 2020) and Projected (Jones & O'Neill, 2020; Riahi et al., 2017) Exposure







Scenario-based local physical asset value

$$\text{Exposure} = (\text{Growth of GDP per capita})^{\alpha_1}$$
$$\times\ (\text{Local population change in SSP})^{\alpha_2}$$
$$\times\ \text{LitPop Current Local Exposure}$$

where α_1 and α_2 capture future adaptation:

- $\alpha \neq 1 \implies$ **Exposure does not grow** at the same rate as GDP or population
- $\alpha < 1 \implies$ country adapt to extreme events

Estimating damage along track

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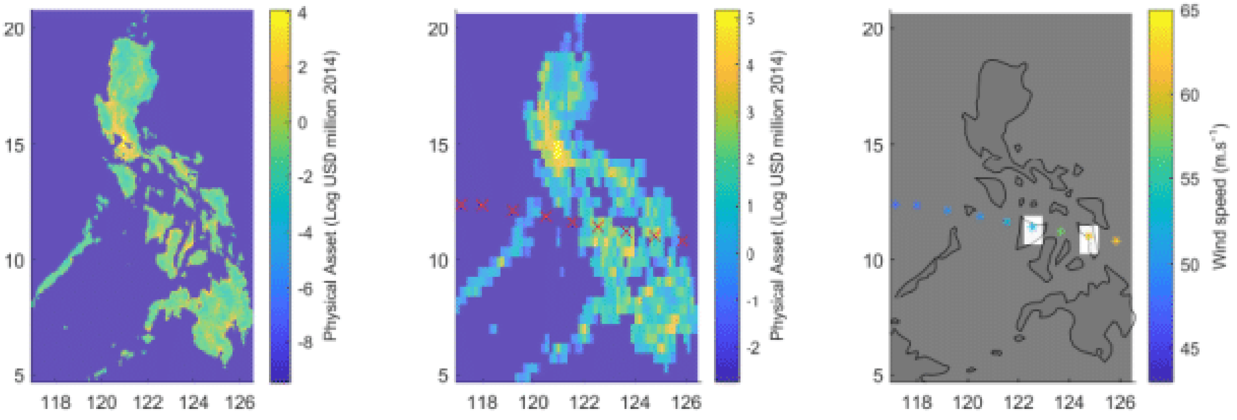
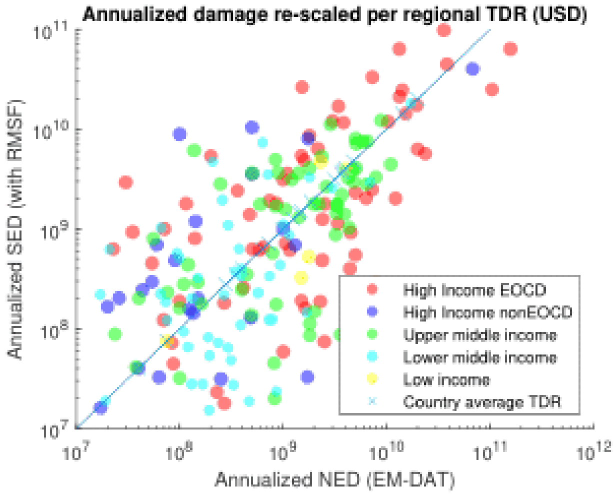




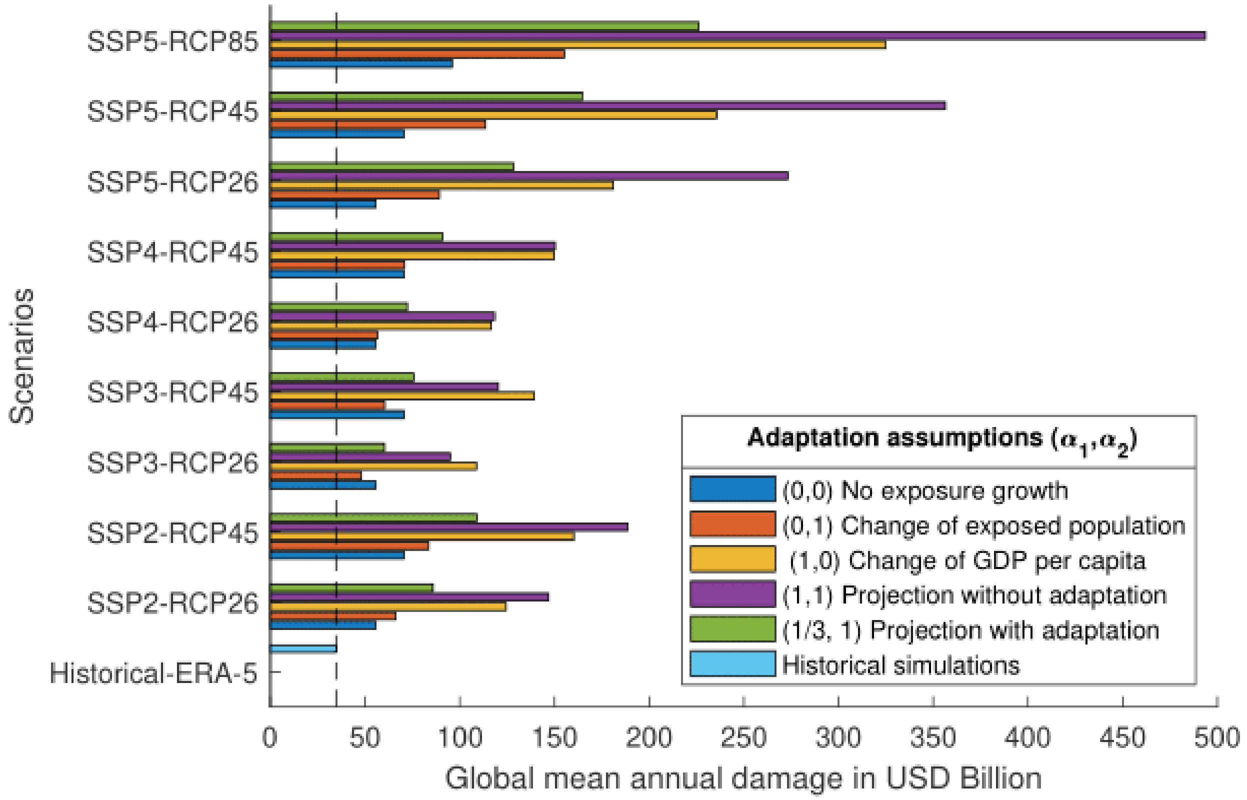
For each step generated of the synthetic base

$$\text{Simulated Damage} = \sum_{\text{Along Tracks steps}} \text{Exposure} \times \text{Damage function}(\text{Simulated Wind speed, Regional Vulnerability})$$

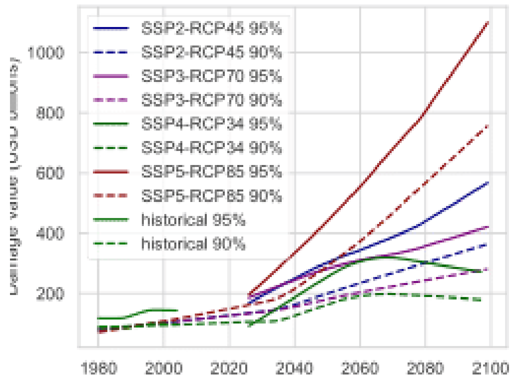
$$\text{Annual Regional Damage} = \sum_{\text{Over synthetic TCs}} \text{Simulated Damage}$$

Results

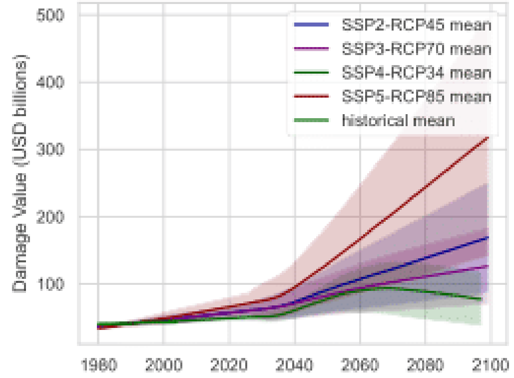
Average global annualized damage simulations



Damage 90^{th} and 95^{th} percentiles



Average damage and CI ($25\text{-}75^{th}$)



ROUNDTABLE

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WHAT DATA ARE WE MISSING TO BUILD A SUSTAINABLE FUTURE?

FOCUS ON 2 R&D PROJECTS TO FILL IN THE ESG DATA GAP

Imène
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CONFERENCE

WHAT DATA ARE WE MISSING TO BUILD A SUSTAINABLE FUTURE?

Guillaume **RICHET-BOURBOUSSE**

Lead of the climate companies service - Banque de France

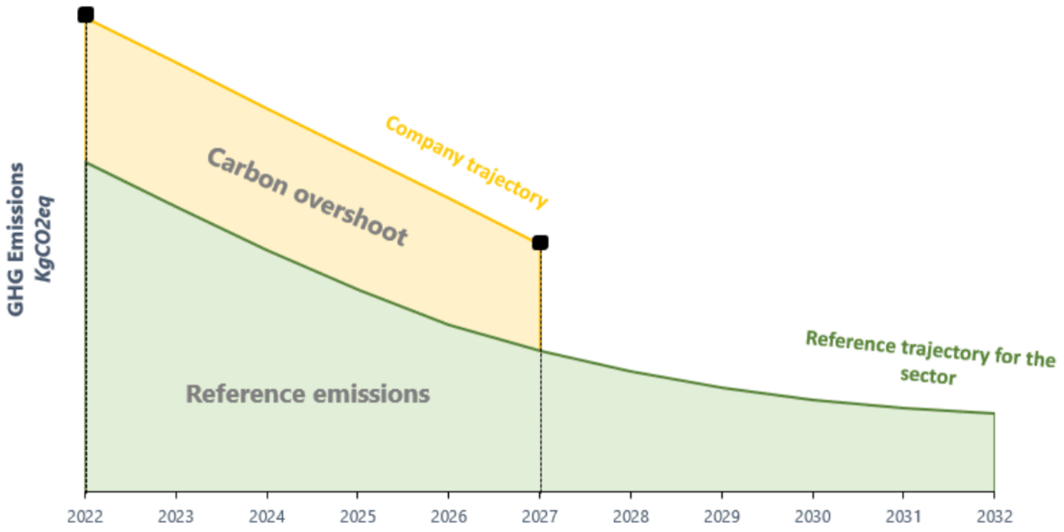
WHAT DATA ARE WE MISSING TO BUILD A SUSTAINABLE FUTURE?

Guillaume Richet-Bourbousse
Climate Indicator Project – Head of division

BANQUE DE FRANCE
EUROSYSTÈME

BANQUE DE FRANCE CLIMATE INDICATOR

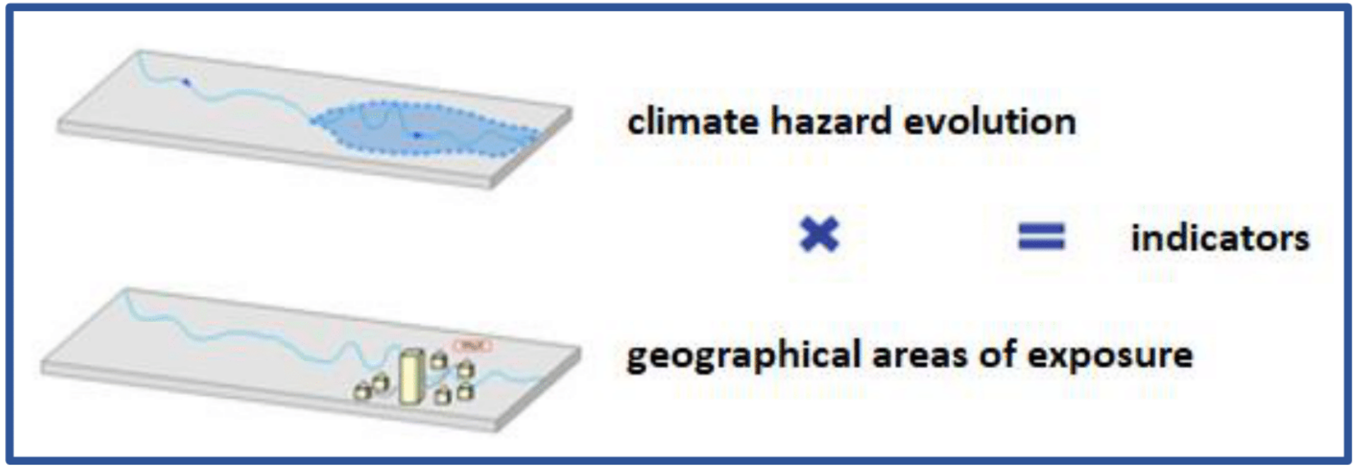
Transition Risk Indicator	**Physical** Risk Indicator	**Maturity** Indicator



Level of awareness

Readiness for transition and adaptation

Degree of action implementation



WHAT DATA DO WE NEED?

Quantitative data

	Transition risk	Physical risk
Real Estate	« Stock » of square meters, associated GHG emissions in CO2eq, « flow » of square meters, year of implementation	SIRET (identification number), meteorological data, scenario of increased temperature and associated impact in terms of climate hazards
Electricity producer	Installed and to be installed production capacity in GWh, load factor in %, associated GHG emissions in CO2eq, year of implementation	
Transportation	Activity in t.km/p.km, associated GHG emissions in CO2eq, fleet variation (number, type of fuel/energy used, …), year of implementation	

Financial data

OPEX / CAPEX in KEUR, outstanding amount of the project, type of financing, amount still to be funded

Qualitative data

How do you assess your GHG emissions?
How climate change is embedded in your strategy?
What type of insurance coverage?
Level of « climate change literacy » (global awareness, regulation knowledge including beyond climate, …)?
Adaptation strategy and funding?
…

WHAT DATA DO WE HAVE SO FAR?

Source: ILB

WHAT DATA ARE WE MISSING?

Already available within BDF

- ADEME
- BEGES
- AIE
- C4F
- ISS
- Asset Impact
- CDP
- DRIAS
- …

To come

- CSRD - reports !
- …

→

Bridging the gap on tangible actions

- Direct data collection with each company
- Direct discussion with each company
- In the future, streamlining the data collection in order to lower as much as possible the reporting burden for companies

BANQUE DE FRANCE

EUROSYSTÈME

CLIMATE PHYSICAL RISK: BIODIVERSITY

MISSING DATA FOR A SUSTAINABLE FUTURE

Maria-Eugenia **SANIN**

Associate Professor - Paris-Saclay University;
Associate Researcher - Energy & Prosperity Chair and Climate Economics Chair

Climate physical risk: Biodiversity
Missing data for a sustainable future

Maria-Eugenia Sanin [1,2,3]

[1]Climate Economics Chair; [2]Energy and Prosperity Chair; [3]Paris Saclay University

Huang, Y., Creti, A., Jiang, B. and Sanin, ME, **Biodiversity Risk, Firm Performance, and Market Mispricing** (February 1, 2024)

CEC Dauphine | PSL

Chaire Énergie et Prospérité

CEPS Centre for Economics at Paris-Saclay

What is financial climate risk?

In **September 29, 2015**, Mark Carney's foundational speech delivered at Lloyd's of London as the Governor of the Bank of England:

"Climate change poses significant risks to global financial stability"

3 types of risk:

- **Physical risks** : events such as floods and storms that could damage property and disrupt trade. Ex: SwissRe Institute (2024) - 200 billions in property damage annually in 36 main economies.
- **Transition risks**: stemming from the shift towards a low-carbon economy, including asset repricing and stranded assets. Ex: Semieniuk et al. (2022) - 1.4 trillion USD in oil & gas assets globally are at risk of becoming stranded.
- **Liability risks**: Legal costs from claims against those responsible for climate change-related damage. Ex: *L'Affaire du Siècle*, 2018.

Lead to the development of **Task Force on Climate-related Financial Disclosures** (TCFD).

Biodiversity loss is one form of climate physical risk

European Environment Agency (2020): *"the loss of biodiversity can exacerbate climate-related risks, as ecosystems with reduced biodiversity are less able to provide essential services like carbon sequestration, water filtration, and protection against natural disasters"*.

- Economic system´s **dependence on biodiversity**
  - Flammer et al. (2023): More than half of the world's GDP dependens on nature and the services it provides.
  - Cardinale et al. (2012): Effects of biosphere degradation spillover to the whole economy.

Difficult to consider in economic calculus and pricing

- In France
  - French Biodiversity Strategy in 2023
  - "**42% of the value of securities held by French financial institutions** *comes from issuers that are highly dependent on ecosystem services*" - Svartzman et al. (2021) BdF.

- **Difficult pricing** of biodiversity risk
  - Garel et al. (2023): Biodiversity transition risks have been gradually priced after the Kunming-Montréal conferences.
  - Giglio et al. (2023): Market participants do not incorporate the current pricing of biodiversity risks in equity markets.

Biodiversity Index in PLADIFES

We build a novel Biodiversity Index for 35 countries over the last 50 years and we estimate their trend to proxy biodiversity physical risk exposure.

PLADIFES – AXIS 1
INSTITUT LOUIS BACHELIER | PARC

Country level Biodiversity index

By combining biodiversity-capacity and biodiversity-footprint data from the National Ecological Footprint dataset, from the Ecological Footprint Initiative, Huang et al. created a biodiversity index for **35 countries**, available from **1991 up to 2020**. This data can be used to perform several kind of economical/financial analysis, for example when matched with firm level information.

Firms highly exposed to climate physical risk have lower profitability and market returns (Hong et al. (2019), Kumar et al. (2023), Pankratz et al. (2023)). **We show this is also true for biodiversity risk:**

1. Firms' profitability significantly depend on the biodiversity risk exposure.
2. Financial market has not yet efficiently priced biodiversity loss as a risk source (like climate physical risk).
3. Heterogeneous impact of biodiversity physical risk in terms of sectors' and firms' specific characteristics.

Biodiversity footprint measure

$$\text{Biodiversity Footprint}_{c,t} = \frac{\mathsf{P}_{c,t}}{\mathsf{Y}_{w,t}}$$

$\mathsf{P}_{c,t}$ is the production (or harvest) in tons/year in country "c" in one land-use category; $\mathsf{Y}_{w,t}$ is the world average yield for this land-use category in tons/hectare/year;

Land-use categories included:

1. **Fishing Grounds**: Area of marine & inland waters used to produce fish, invertebrates, & aquatic plants that were captured or cultured
2. **Built-up land**: Area of land occupied by human-built infrastructure, including housing & other buildings, roads & paved areas, & urban greenspace
3. **Cropland**: Area of cropland used to grow food & fibre crops
4. **Grazing land**: Area of grassland needed to feed livestock beyond the feed supplied by crops
5. Forest Products: Area of forests harvested for timber products & pulpwood
6. **Forest carbon up-take**: Area of forests needed to sequester anthropogenic CO2 from combustion of fuels including for electricity generation & for the production & transportation of globally traded goods, minus the proportion of anthropogenic emissions sequestered in the same year by the world's oceans

Biodiversity capacity measure and Biodiversity Index

$$\text{Biodiversity Capacity}_{c,t} = \frac{\mathsf{A}_{c,t}\mathsf{Y}_{c,t}}{\mathsf{Y}_{w,t}}$$

$A_{c,t}$ is the area in country "c" for this land-use category; $Y_{c,t}$ is the national average yield for this land-use category in tons per hectare and year; and the rest are the same as before

Biodiversity Index:

$$\text{Biodiversity Index}_{c,t} = \frac{\text{Bio-Capacity}_{c,t}}{\text{Bio-Footprint}_{c,t}} = \frac{\mathsf{A}_{c,t}\mathsf{Y}_{c,t}}{\mathsf{P}_{c,t}}$$

Superior to 1 means that biological resilience outweighs the destruction of biodiversity by production activities, and vice versa. We closely follow Dasgupta (2021): "ensure that our demands on nature do not exceed its supply and that we increase nature's supply relative to its current level."

Identifying the Biodiversity conservation trend

Biodiversity Trend:

$$\text{Biodiversity Index}_{c,t} = \beta_{0,c} + \beta_{1,c}t + \beta_{2,c}\text{Biodiversity Index}_{c,t-1} + \epsilon_{c,t}$$

1. "Trend" term $\beta_{1,c}$ captures the unexpected change over time of the biosphere. Thus represents **physical risk exposure** (Hong et al., 2019)
2. Following Isbell et al. (2015), Biodiversity can only be restored over a very long horizon. (30-year rolling estimation)
3. In our paper we attribute our firms to the group that least affected by biodiversity loss (Q5 - low exposure) and to those most affected by biodiversity degradation with the lowest biodiversity trends (Q1 - high exposure).

Spatial Distribution of Biodiversity Index

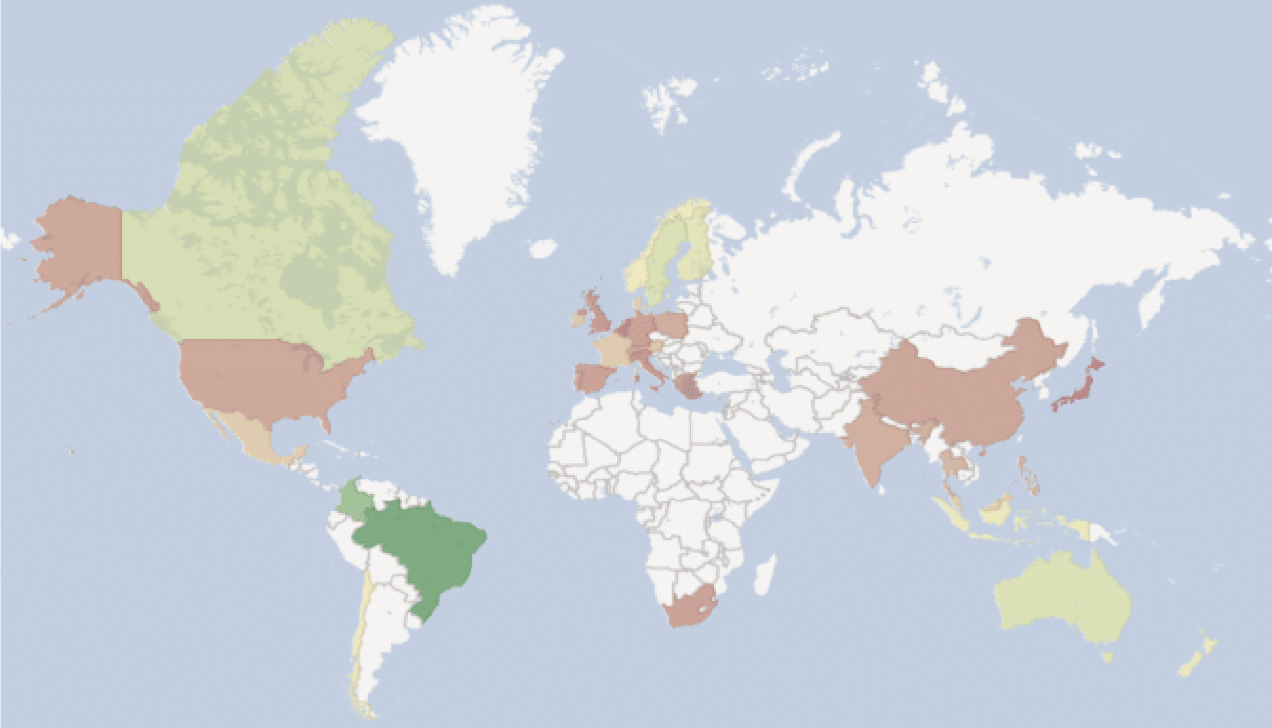


Figure 1: Average Biodiversity Index for each country. Countries with a Biodiversity Index above 1 are shaded in green, with deeper greens indicating higher values. Below 1 are shaded in red, while yellow shows intermediate value 1.

Biodiversity has degraded for most countries in the last 50 years.

Spatial Distribution of Biodiversity Trend (Physical Risk)

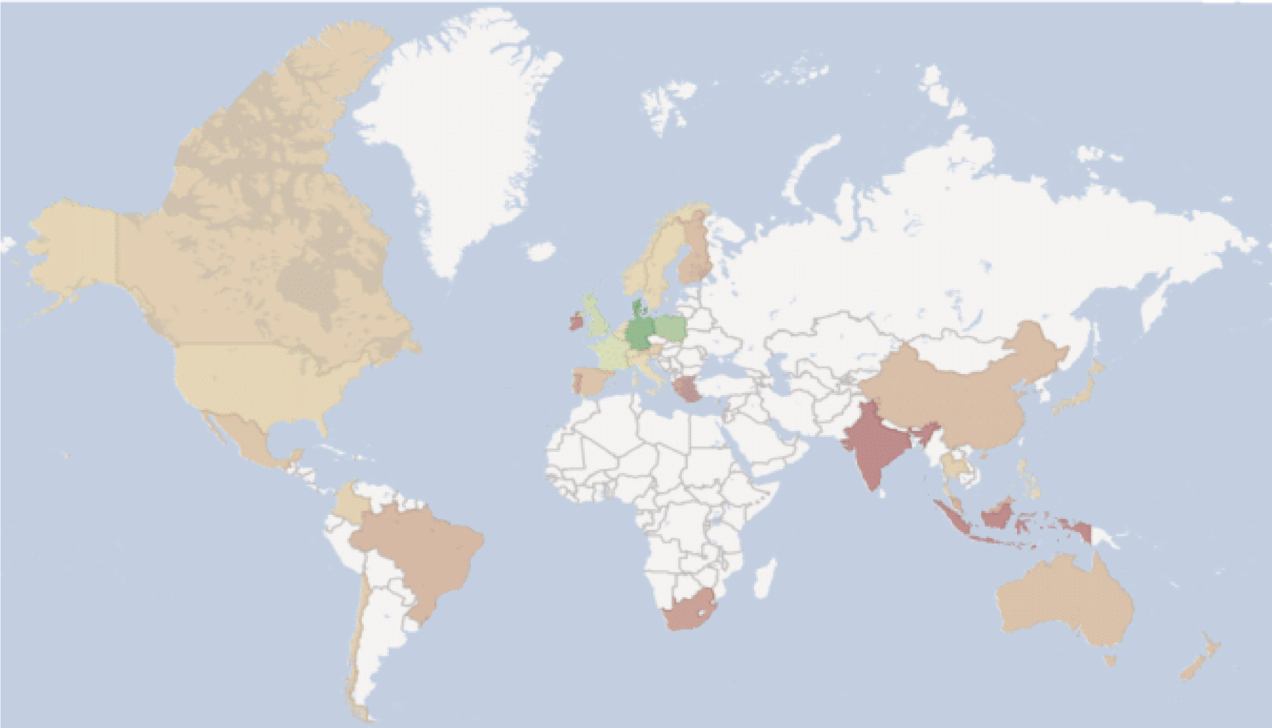
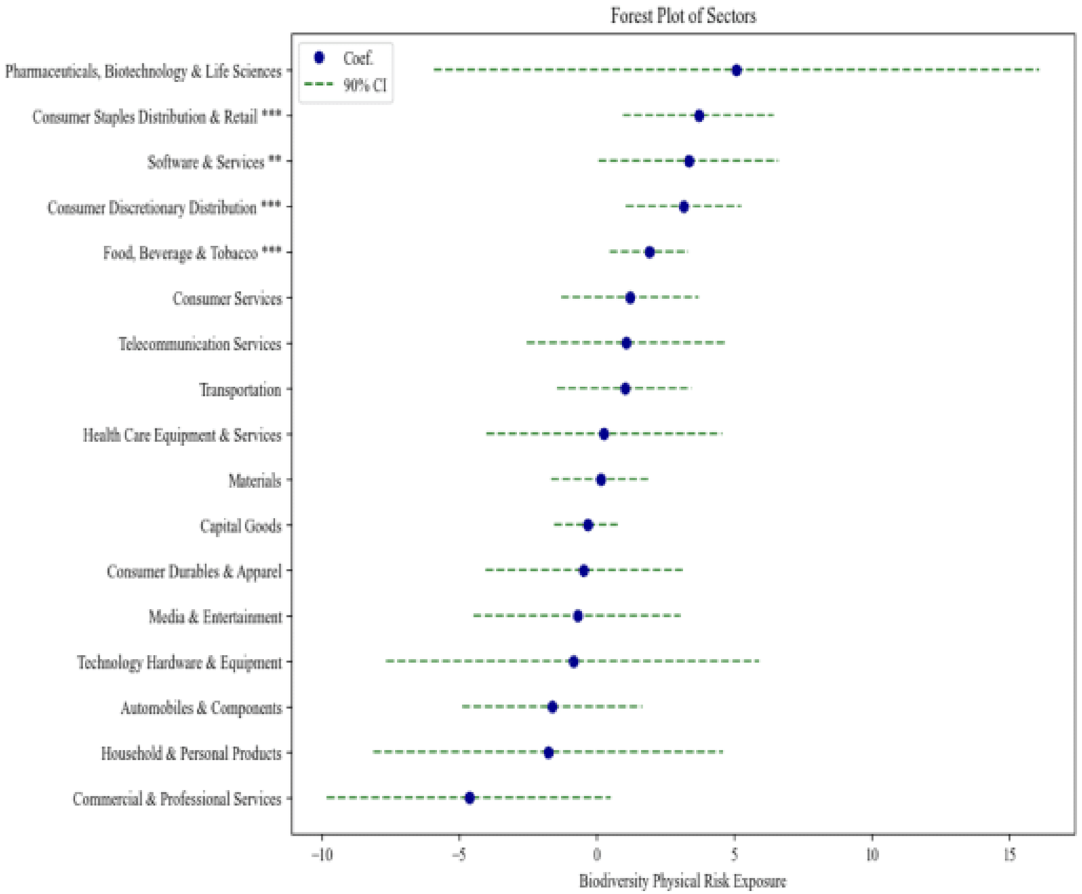


Figure 2: Average (30 year-rolling) estimated Trend of Biodiversity Index for each country. Biodiversity Trend above 0 are shaded in green, and vice versa.

Biodiversity loss should be considered a risk source in the long term and the databse in PLADIFES can be used for that.

Let me share one research result using this data

The biodiversity risk is broad but it indeed its impacts depend on the sector´s exposure to it.



Thank you!

Contact me at: eugenia.sanin@univ-evry.fr

Huang, Y., Creti, A., Jiang, B. and Sanin, ME, **Biodiversity Risk, Firm Performance, and Market Mispricing** (February 1, 2024)

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CONFERENCE

THE NEXT FRONTIERS IN SUSTAINABLE FINANCE:

Research and Data Needs

KEYNOTE SPEAKERS

Thibaud **BARREAU**

ESG Data Officer - Institut Louis Bachelier

Capucine **NOBLETZ**

Post doctoral researcher - Institut Louis Bachelier x Banque de France

Mohamed **FAHMAOUI**

Data Engineer - Institut Louis Bachelier

Théo **LE GUENEDAL**

Lead Prospective and Climate Research - Innovation Lab - Amundi Technology

ROUNDTABLE

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