Managing Climate Transition Risks:

Spatial Finance and Open Data Solutions

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OXFORD SUSTAINABLE FINANCE GROUP

UNIVERSITY OF OXFORD

27th October 2022

Outline

- Short introduction of the Oxford Sustainable Finance Group
- What are climate risks and why do they matter?
- ‘Alternative data’ and open data in operation:
  - Spatial Finance
  - Global Resilience Index Initiative
- Q&A

Short introduction – who are we?

SHORT INTRODUCTION

OXFORD SUSTAINABLE FINANCE GROUP

- The world's largest research group focussing on sustainable finance
- **Research themes**
  - Climate and Environmental Analytics
  - Machine Learning & Data Science
  - Spatial Finance
  - Stranded Assets and Transition Finance
  - Future of Engagement

- **Relevant Initiatives**
  - Centre for Greening Finance and Investment
  - Public and Third Sector Academy for Sustainable Finance

CGFI
UK Centre for Greening Finance & Investment

UK CENTRE FOR GREENING FINANCE AND INVESTMENT

University of Bristol | Imperial College London | University of Leeds | University of Oxford | University of Reading | Catapult Satellite Applications | The Alan Turing Institute | UKRI Science and Technology Facilities Council

CGFI

CGFI Team

CORE TEAM

University of Oxford

The Alan Turing Institute

University of Bristol

Imperial College London

University of Leeds

University of Reading

Catapult Satellite Applications

Spatial Finance Initiative

UKRI Science and Technology Facilities Council

CROSS-CUTTING PARTNERS

UKRI UK Research and Innovation

UKRI Natural Environment Research Council

UKRI Innovate UK

National Centre for Atmospheric Science

Met Office

UNEP FI Finance Initiative

CDP

UN Climate Change Conference UK 2021

Department for Work & Pensions

One Planet Summit Sovereign Wealth Funds

Icebreaker One

oasis

IIGCC

CDC Investment works

UK Finance

Department for Business, Energy & Industrial Strategy

CCLI Commonwealth Climate and Law Initiative

World Bank Group

CCRI Coalition for Climate Resilient Investment

Flood Re

DF Insurance Development Forum

Climate Bonds

A4S Accounting for Sustainability

ECMWF

Green Finance Institute

PROFESSIONAL BODIES

Chartered Banker

Institute and Faculty of Actuaries

CISI Chartered Institute for Securities & Investment

CFA Society United Kingdom

INNOVATION HUBS

Grantham Institute

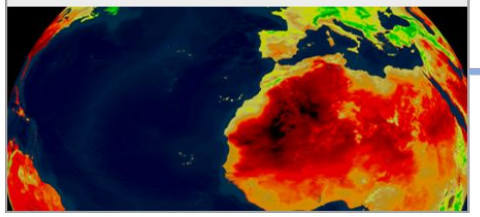
Ri

NEXUS University of Leeds

CGFI

Flagship Overview

Physical Climate Risks



Environmental Risks

Transition Risks

1: Property & Weather

2: Infrastructure & Supply Chains

3: Litigation & Environmental Damages

4: Transition Risk & Carbon Pricing

5: Enabling Disclosure (TCFD/TNFD)

Risk Pricing

Stress Testing

Portfolio Risk Management

Credit Risk

Reporting

Scenario Analysis

Capital Allocation

Changing Behaviour

Strategic Asset Allocation

Disclosure

Banks

Re/Insurance

Pensions, Investors & Asset Managers

Central Banks & Supervisors

International Financial Institutions

Public Financiers

University of Bristol · Imperial College London · University of Leeds · University of Oxford · University of Reading · Catapult Satellite Applications · The Alan Turing Institute · UKRI Science and Technology Facilities Council

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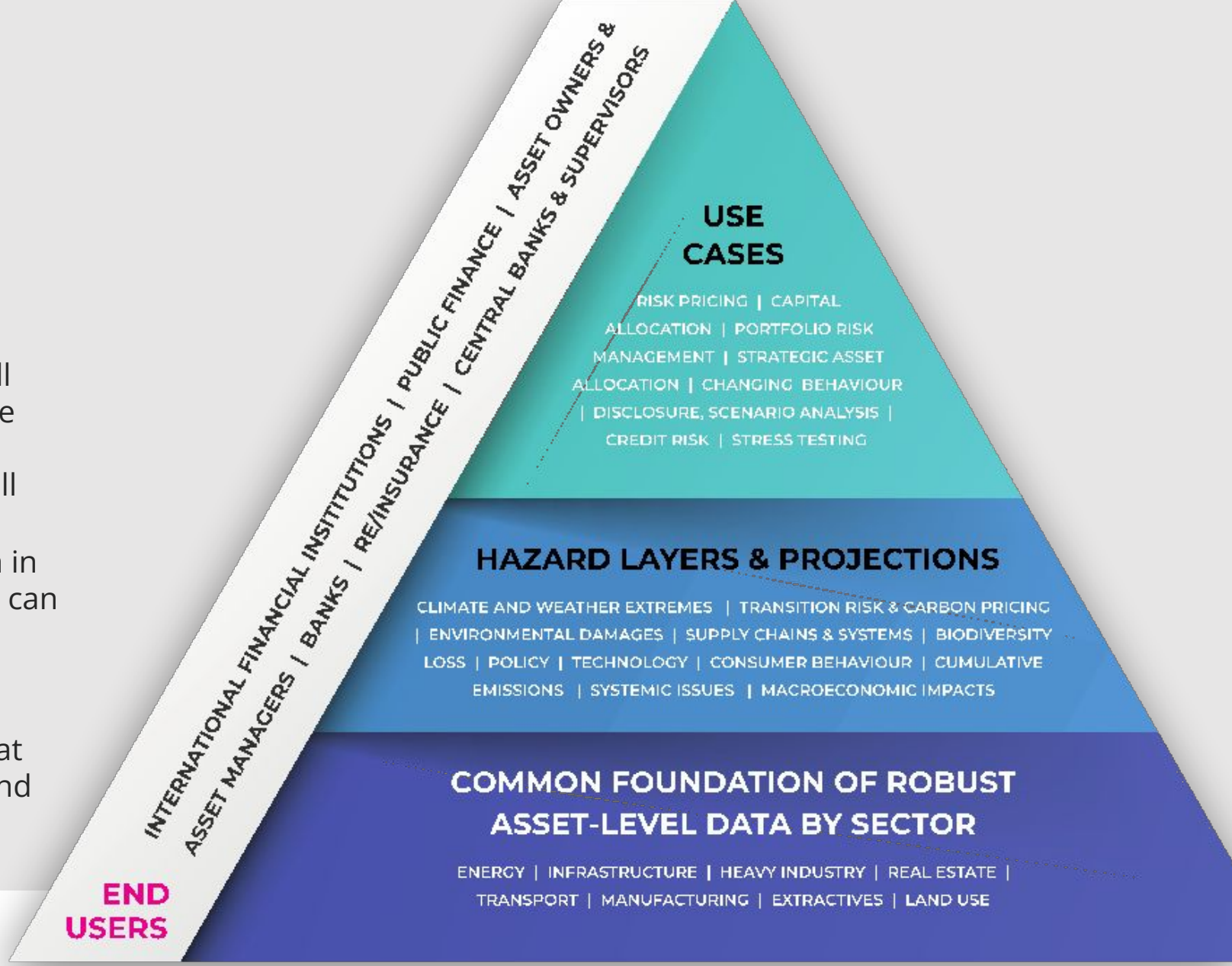
SCALABLE FOUNDATIONS

From across the flagship projects, the CGFI will draw out products, learning, and good practice that will be shared in the form of standards, guidance, data and analytical products that will be openly available to all.

Each flagship will share a common foundation in being based upon robust asset-level data that can be aggregated up to inform asset-specific, portfolio-level, or macro-financial stability considerations.

Together they form a set of building blocks that cover the key risks, use cases, asset classes, and users, covering trillions of assets.



University of Bristol · Imperial College London · University of Leeds · University of Oxford · University of Reading · Catapult Satellite Applications · The Alan Turing Institute · UKRI Science and Technology Facilities Council

Executive Education

- Training current and future leaders is one of our theories of change
- We offer a full range of programmes, including open-enrolment executive education and customised programmes delivered in-person or online
- We also provide undergraduate and graduate teaching and supervision for students enrolled at the University of Oxford.
- Across OxSFG and P3SA in the last 12 months we have provided capacity building to close to 2,000 participants from more than 300 organisations and 110 countries.

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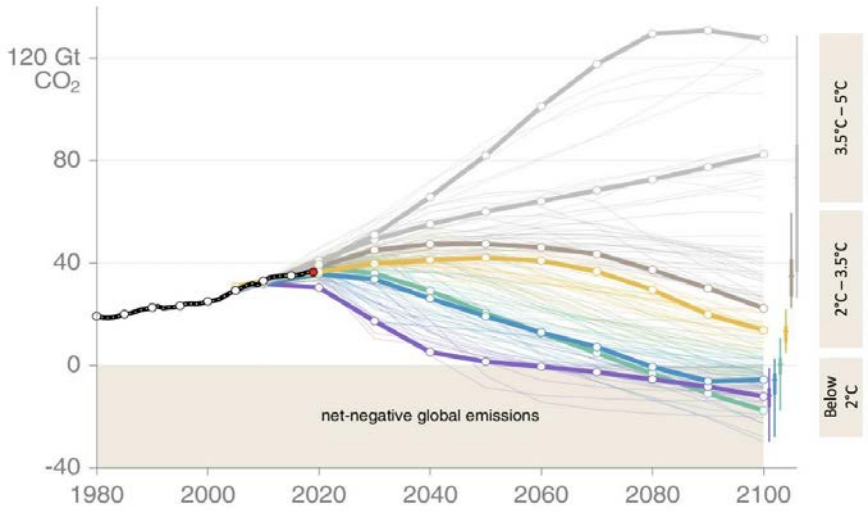
PUBLIC AND THIRD SECTOR ACADEMY FOR SUSTAINABLE FINANCE

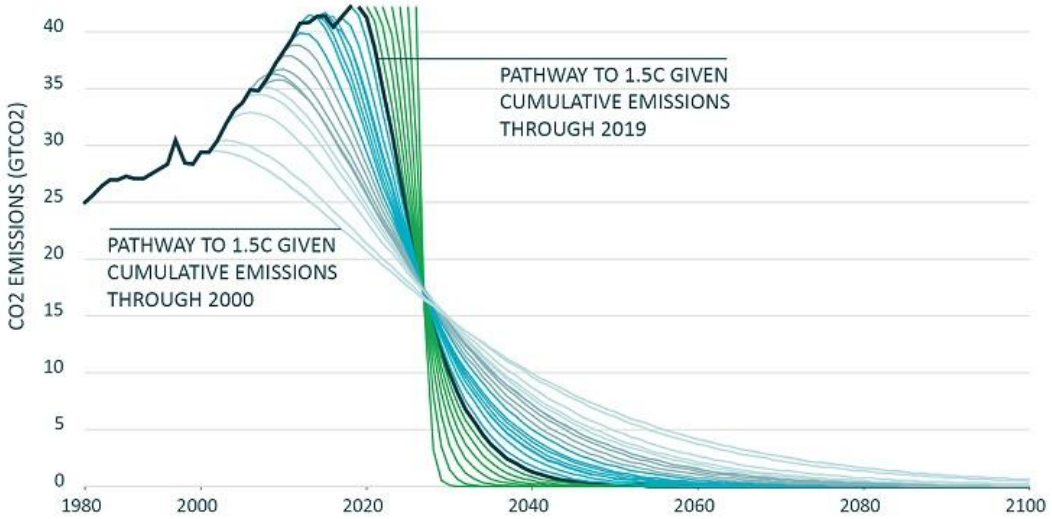
P3SA

UNIVERSITY OF OXFORD

What are climate risks and why do they matter?

Symbiotic relationship between physical and transitional risks

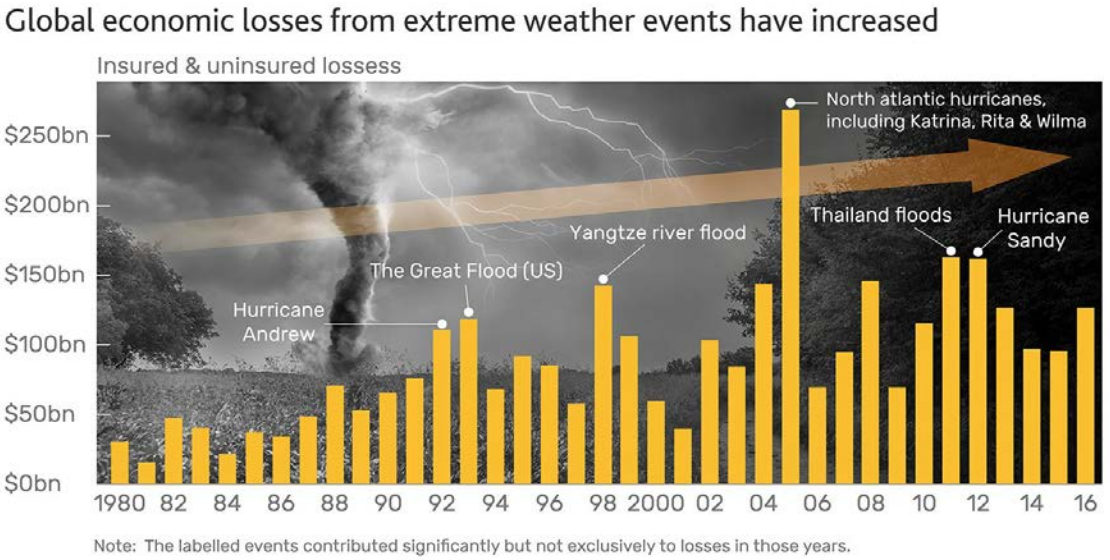




Source: Climate Policy Initiative (2019); Bank of England (2020)

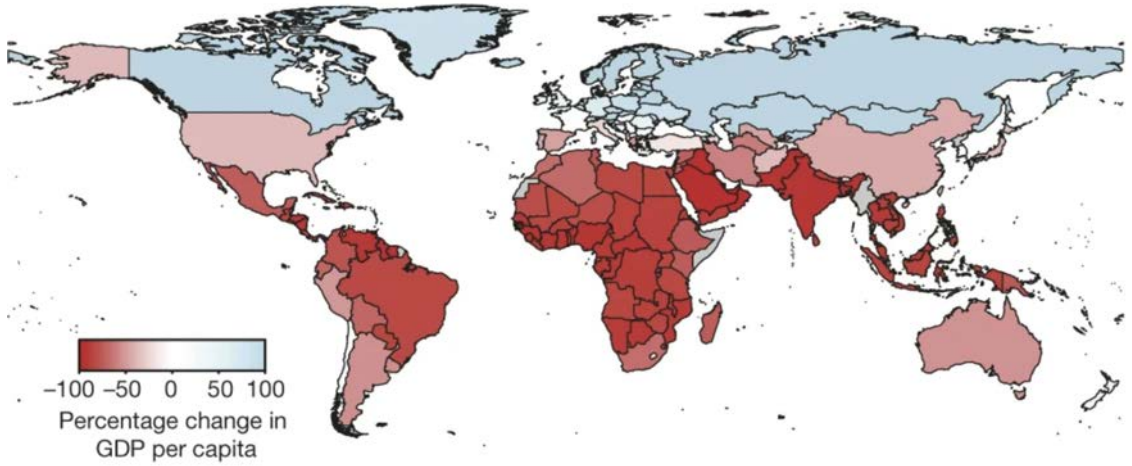
Physical risks - impact on property and productivity

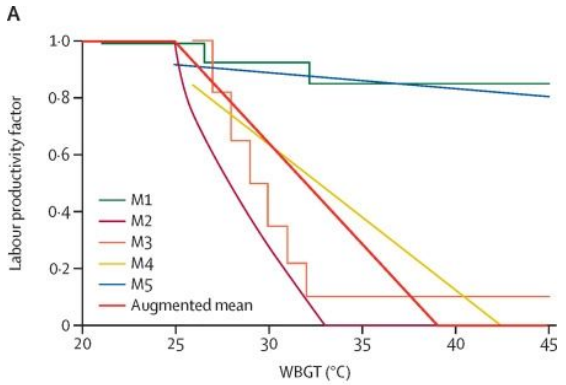
- First order risk of climate change
- Extreme weather events such as flooding, droughts and storms, as well as other types of hazards. These risks are often intensified in a **non-linear, compound manner**
- Important to not underestimate the threat of the **systemic risk** brought by climate change
  - Frequency and severity of tail events
  - Asset repricing
  - Shrinking of historically stable premium and profit pools



Source: Bank of England 2019

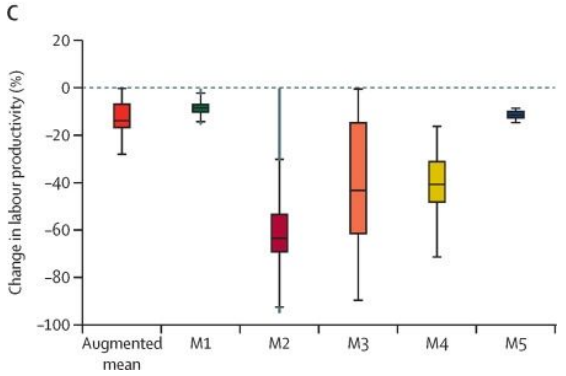
Physical risks - impact on productivity





B

Study	Response variable	Spatial scale
M1: Pilcher et al[20] (2002)	Psychological performance—eg, reaction time, tracking, or memory tasks	Global
M2: Dunne et al[17] (2013)	Individual capacity to safely perform heavy labour under heat stress	Global
M3: Kjellstrom et al[18] (2014)	Reduction of hourly work capacity for heavy work following the ISO standard	Global
M4: Sahu et al[7] (2013)	Work output per hour of rice farmers calculated by number of rice bundles laid down	India
M5: Li et al[19] (2016)	Time efficiency measures; direct, indirect, and idle time of rebar construction workers	China



Source: Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. *Nature*, *527*(7577), 235-239.; Dasgupta, S., van Maanen, N., Gosling, S. N., Piontek, F., Otto, C., & Schleussner, C. F. (2021). Effects of climate change on combined labour productivity and supply: an empirical, multi-model study. *The Lancet Planetary Health*, *5*(7), e455-e465

Compound risks with nature degradation & biodiversity loss

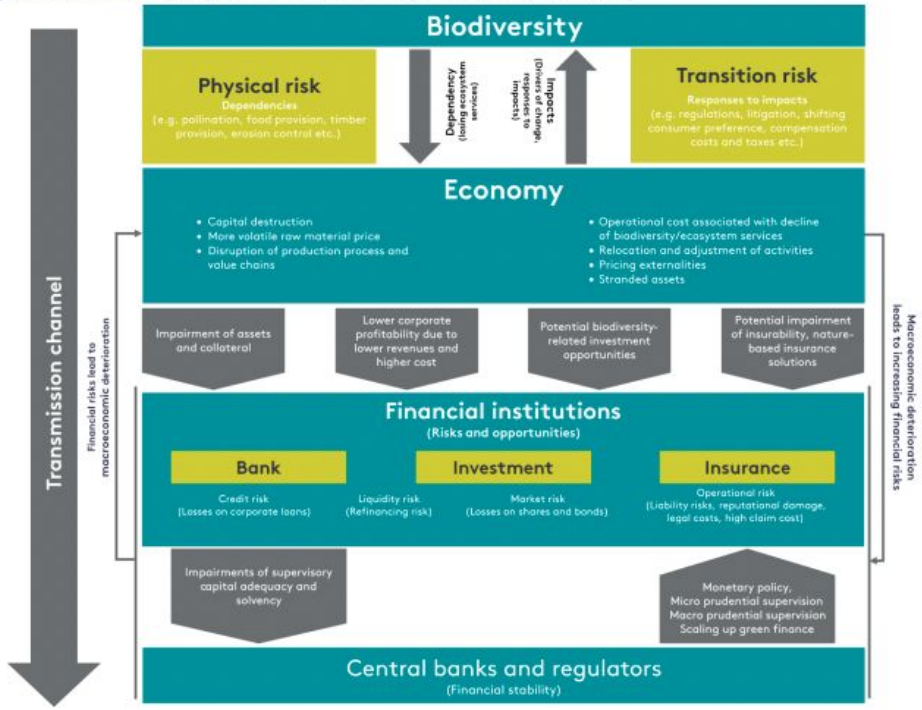
- Rapid decline of biodiversity and degradation of natural ecological system is posing risk to the economic system
- WEF estimates that USD 44 trillion of economic value generation are moderately or highly dependent on nature
- Biodiversity and climate risks are often **compounded**

Source: Fermilab N.D.

Double materiality

- An occasion paper published by INSPIRE and NGFS conceptualised biodiversity-related financial risk as a '**double materiality**'
- Stability of the financial system is highly reliant upon the stable provision of ecosystem services
- Current investment behaviours are driving the loss of nature and biodiversity
- Initiative efforts to estimate nature-related biodiversity risks has been undertaken by the central banks of France and the Netherlands, as well as by the Taskforce for Nature-based Financial Risk Disclosure

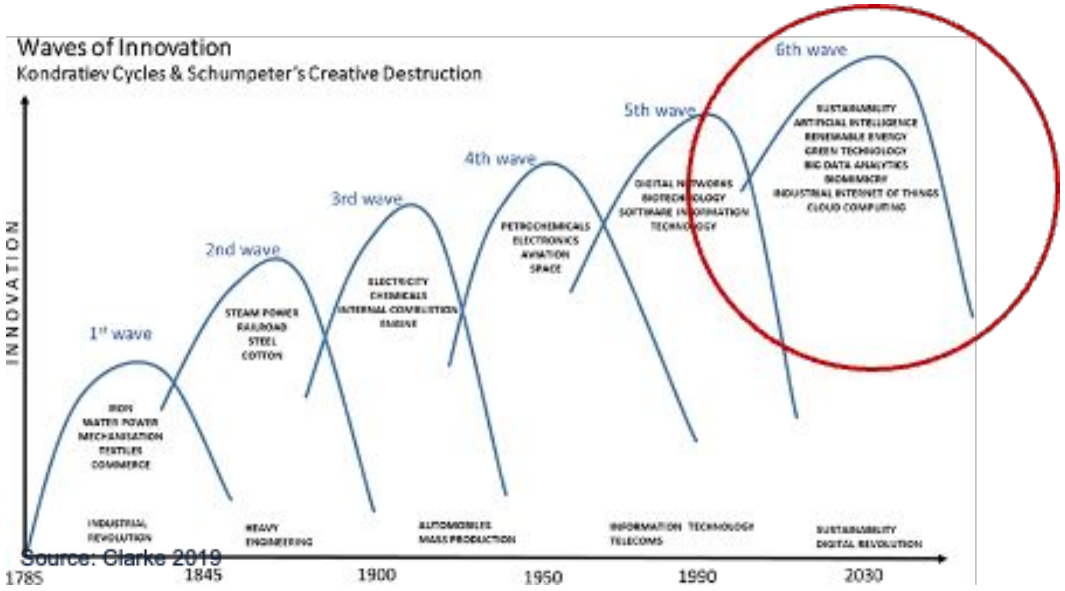
Figure 3: **The relationship between biodiversity and financial stability**



The illustration shows where and how central bank responsibilities are affected by the dynamics between biodiversity loss, financial stability, price stability, and the stability of individual financial institutions.
Source: NGFS-INSPIRE

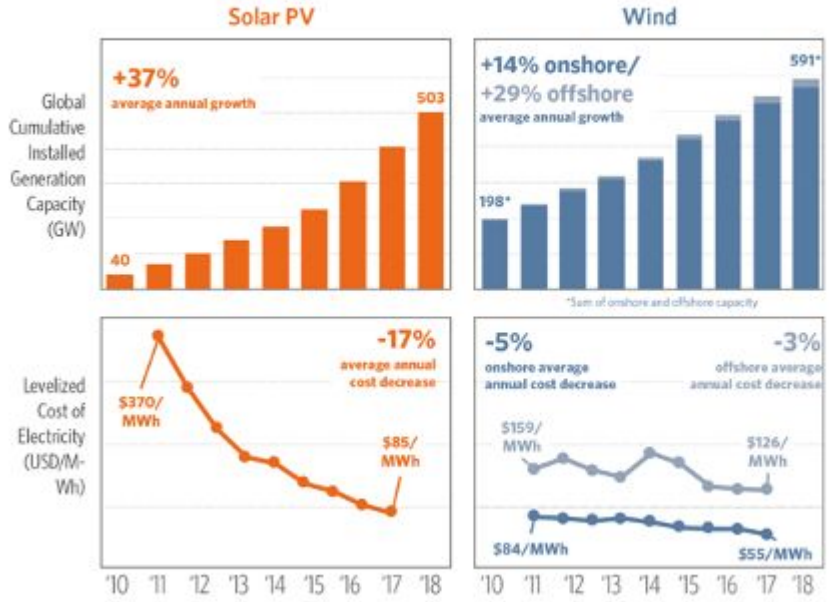
Source: NGFS-INSPIRE (2020)

Technological risks



Source: Clarke 2019

Global installed capacity and levelized electricity cost, solar PV and wind, 2010-2018

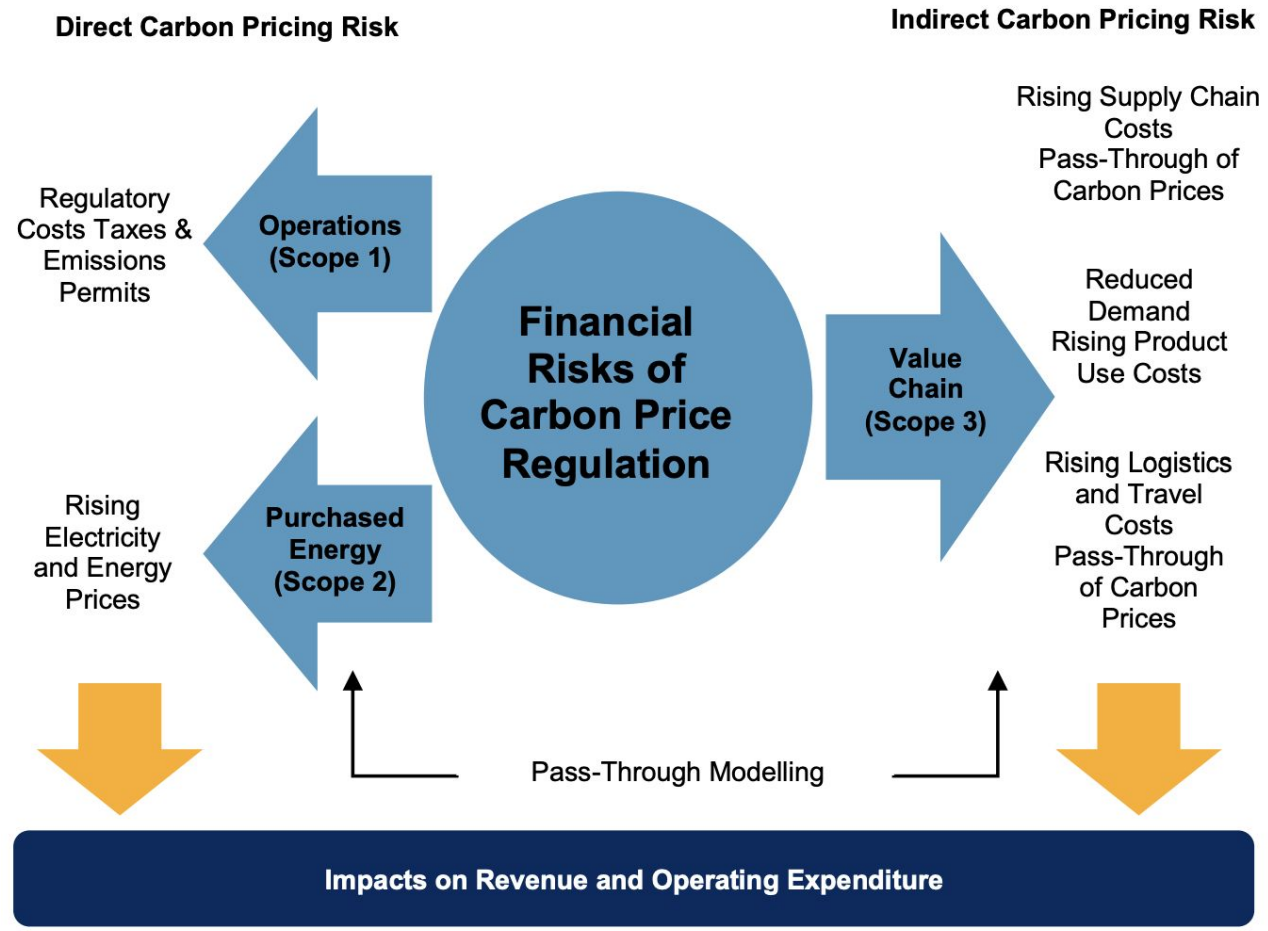


Source: Climate Policy Initiative (2019)

Regulatory risks

- In 2015, Bank of England was the first central bank to highlight the climate-related risks faced by the insurance sector, with the view of informing supervisory changes
- NGFS found that 94% of its members have established international organization to address climate-related risks, 78% have included climate-related risks in their supervisory activities and 64% have already/in the process of implementing climate-related risk assessments
- Increased regulatory pressure and liability risk

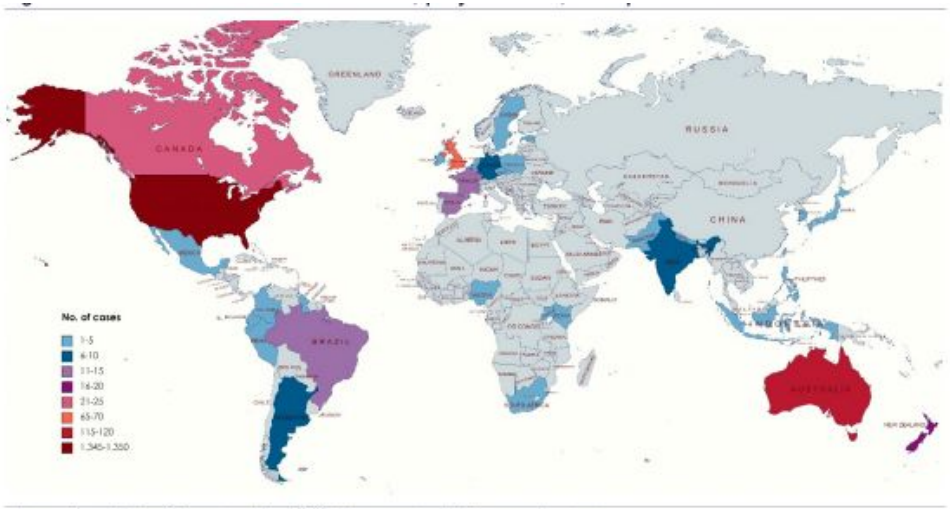
Policy risk: Carbon Pricing



Source: Trucost. Data as of December 2017. Chart is provided for Illustrative purposes.

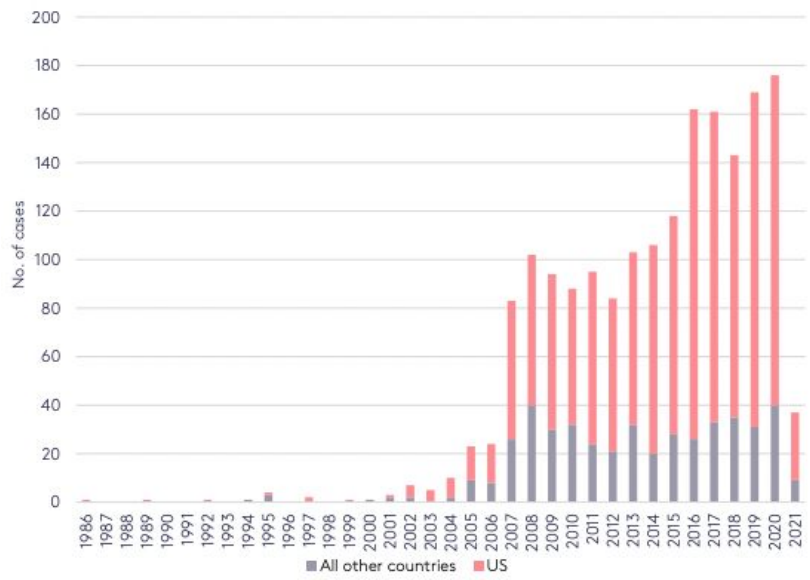
Litigation risk

- At the wake of the 2017 North Atlantic hurricane season, there is growing interest in attributing the causes and liabilities of extreme weather events. Marjanac and Patton (2017) observed that “advancements in attribution science are poised to alter significantly the legal landscape for climate-related suits” (Marjanac and Patton 2017: 266)
- The latest scientific developments could overcome historic challenges of inadequacy of causal evidence (Stuart-Smith et al. 2021)



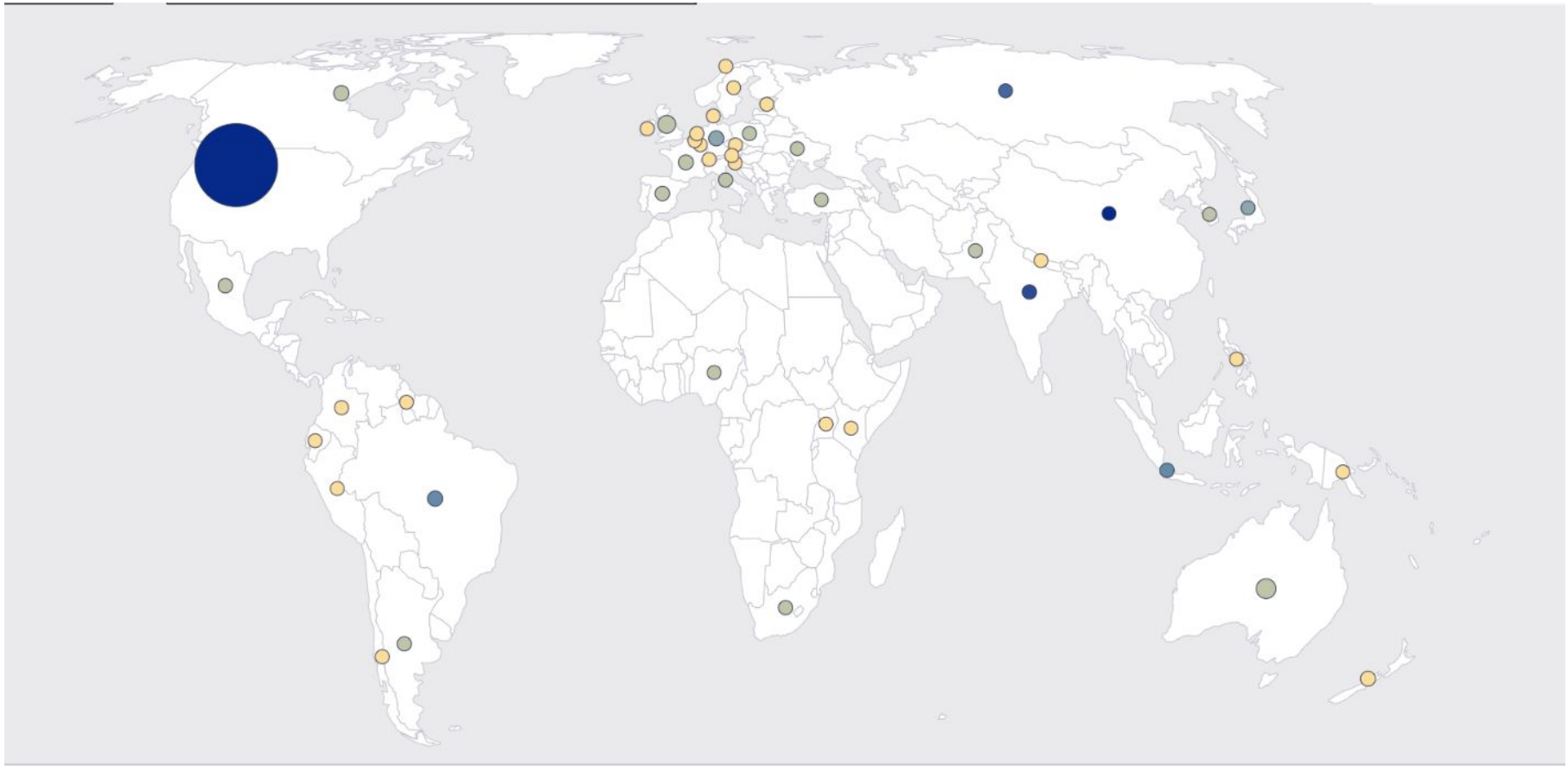
Notes: Cumulative figures to May 2021. Map created with mapchart.net.
Source: Authors based on CCLW and Sabin Center data

Figure 1.1. Total cases over time, US and non-US, to 31 May 2021



Source: Setzer and Hingham 2021

Relationship between emissions and litigation risks



Source: LSE Grantham Institute N.D.

Reputational risk

- Shifting societal awareness and demand for corporate responsibility over climate and other sustainability issues
- Firms can suffer from severe publicity backlash for greenwashing or involving in environmentally damaging activities

Climate Capital HSBC Holdings PLC + Add to myFT

HSBC ads banned for misleading consumers about green credentials

UK watchdog rules series publicising tree planting and net zero emissions plans failed to disclose fossil fuel financing

The ruling by the Advertising Standards Authority sets a precedent for the financial sector

Image source: Financial Times; The Guardian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What are some examples of innovation approaches to climate risk?

Stress-test exposure against projected climate risks

- BoE's 2021 Climate Biennial Exploratory Scenario test explores the resilience of the UK financial system to the physical and transition risks
- Assume high peak carbon price, severe levels of global warming (3.3°C) and limit credit for management action
- The design of the BoE test make it likely that some insurers will breach their solvency levels
- Learning exercise to build climate-modelling capacity, better understand risk exposure and assist in risk management

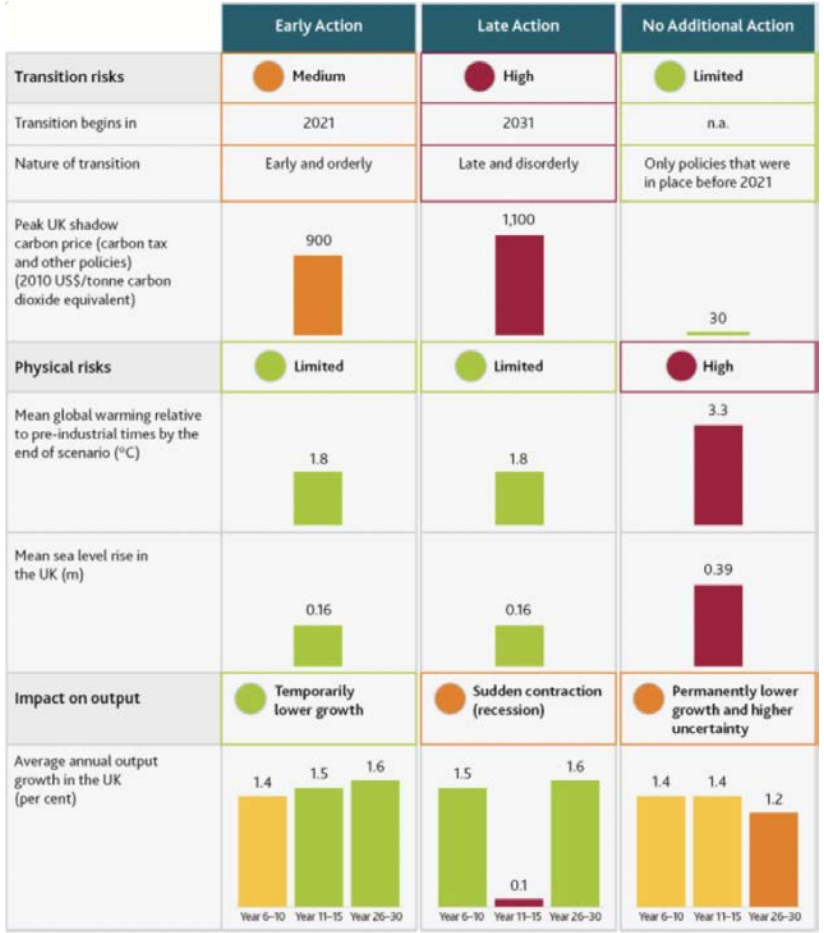

Image source: Bank of England 2021

Contribute to risk mitigation and adaptation

- Innovative products and policies can help customers mitigate both *acute* and *chronic* risks
  - Parametic pricing
  - Catastrophe bonds
  - Resilience bonds
  - Start Network: providing funding for predictable crises

Build resilient portfolios

- Insurers can build greater resilience by adjusting their exposure to climate risk, e.g. re-considering the frequency and likelihood of catastrophic events and diversifying their portfolio, taking into account of non-historic data
- A study by AXA (2021) show that 60% of risk managers fear that certain geographies or activities will become uninsurable
- Insufficient data and capacity to interpret climate data limits the accuracy of loss estimates, especially compound risks

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Towards an asset-level based approach

Changing resource landscapes

Shale gas abundance, water scarcity, phosphate availability

Resource landscapes

Falling clean technology costs

Massive cost reductions in renewables and battery technology. Impressive cost curves and learning rates supported by small-scale modular approaches

Clean technology costs

Evolving social norms

From fossil fuel divestment through to consumer preferences for provenance standards, Fairtrade, and organic

Social Norms

ASSET

Government regulation

Introduction and ratchet of carbon pricing, air pollution regulation, product standards, remediation requirements

Regulation

Environmental Change

Physical climate change, drought, flooding, storm events, biodiversity loss

Litigation and changing statutory interpretations

Causing harm, failing to manage risk, and failing to disclose appropriately open company directors and other fiduciaries to legal challenges. Changes in law exacerbate risk.

Litigation and liability

Environmental Change

- **SYSTEMIC/CORRELATIONS**
- **MISPRICED/IGNORED**
- **INTERDISCIPLINARY, NON-LINEAR, LACK TRACK RECORD**
- **CURRENT, NOT DISTANT**

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ASSETS

EXPOSED TO DIFFERENT ENVIRONMENTAL RISKS AND OPPORTUNITIES

COMPANIES

OWN EXPOSED ASSETS

ASSET MANAGERS AND BANKS

OWN COMPANY DEBT AND EQUITY

ASSET OWNERS

ALLOCATE CAPITAL TO ASSET MANAGERS OR ACT AS ASSET MANAGERS THEMSELVES

POLICYMAKERS AND REGULATORS

MANAGE MICROPRUDENTIAL RISK, SYSTEMIC RISK, ECONOMIC GROWTH, AND WANT TO IMPLEMENT NDCs SUCCESSFULLY


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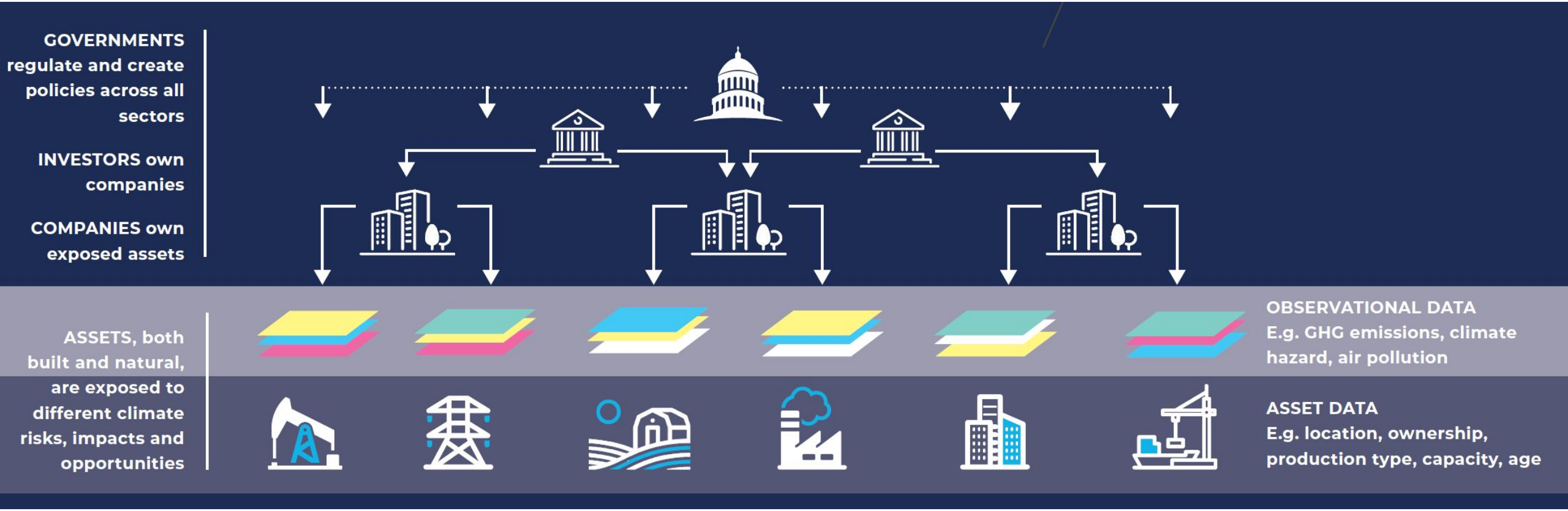
Spatial Finance

SPATIAL FINANCE INITIATIVE

SPATIAL FINANCE AND ASSET-LEVEL DATA



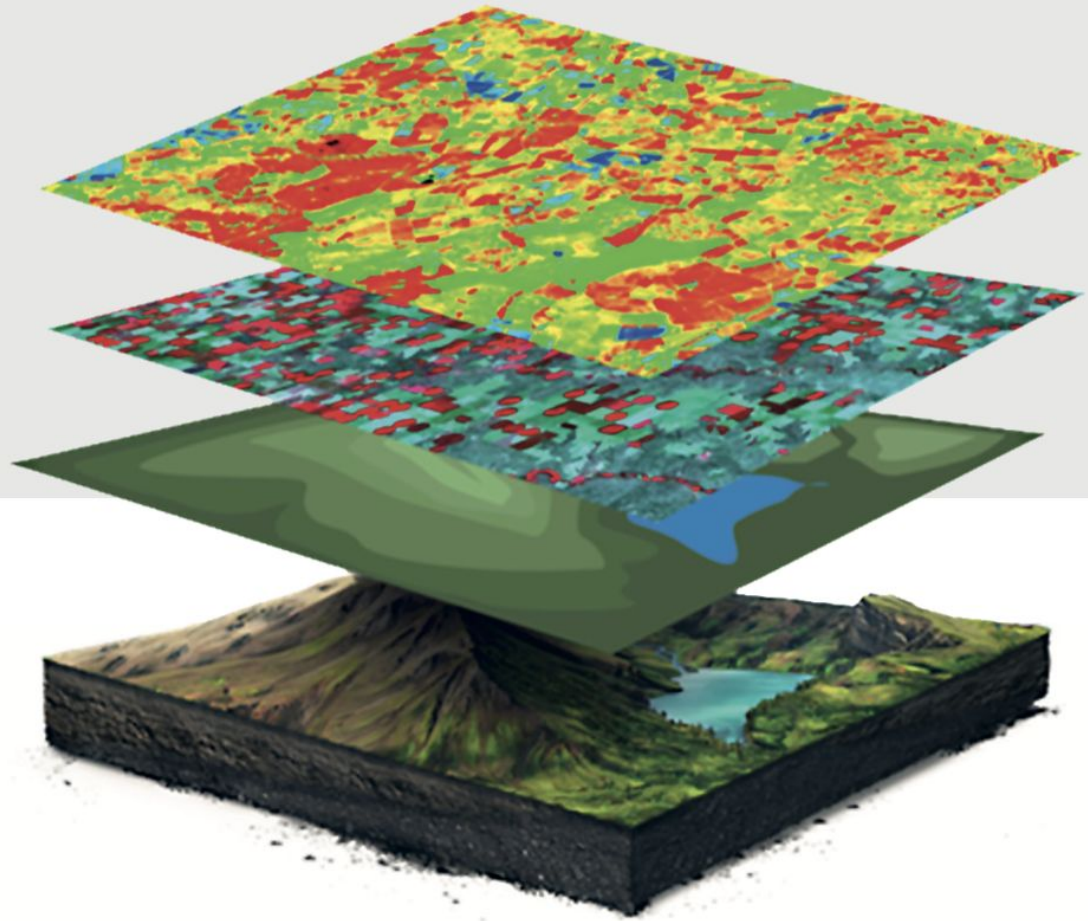
SPATIAL FINANCE INITIATIVE IS PART OF CGFI UK Centre for Greening Finance & Investment

The UK Centre for Greening Finance and Investment (CGFI) is a national centre established to accelerate the adoption and use of climate and environmental data and analytics by financial institutions internationally. It will unlock opportunities for the UK to lead in greening finance and financing green.

ULTIMATE VISION

Financial institiutions able to access and use climate and environmental data and analytics for:

- Any point on earth
- Past, present, and future
- Every major sector
- Material climate and environmental factors

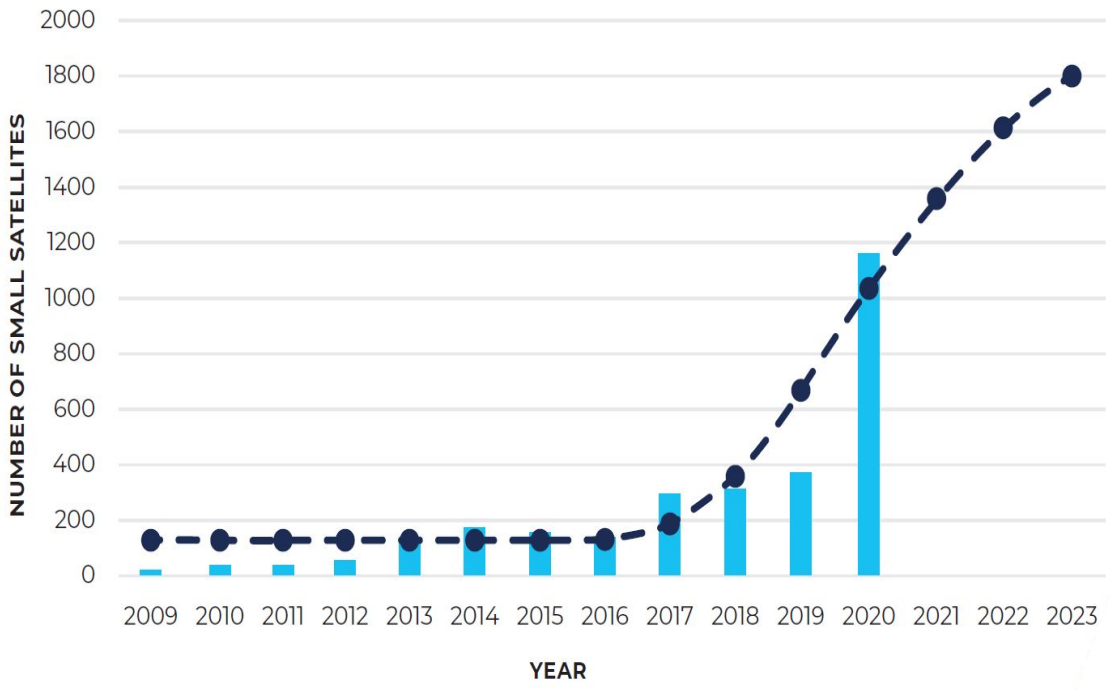


SUCCESS WILL MEAN

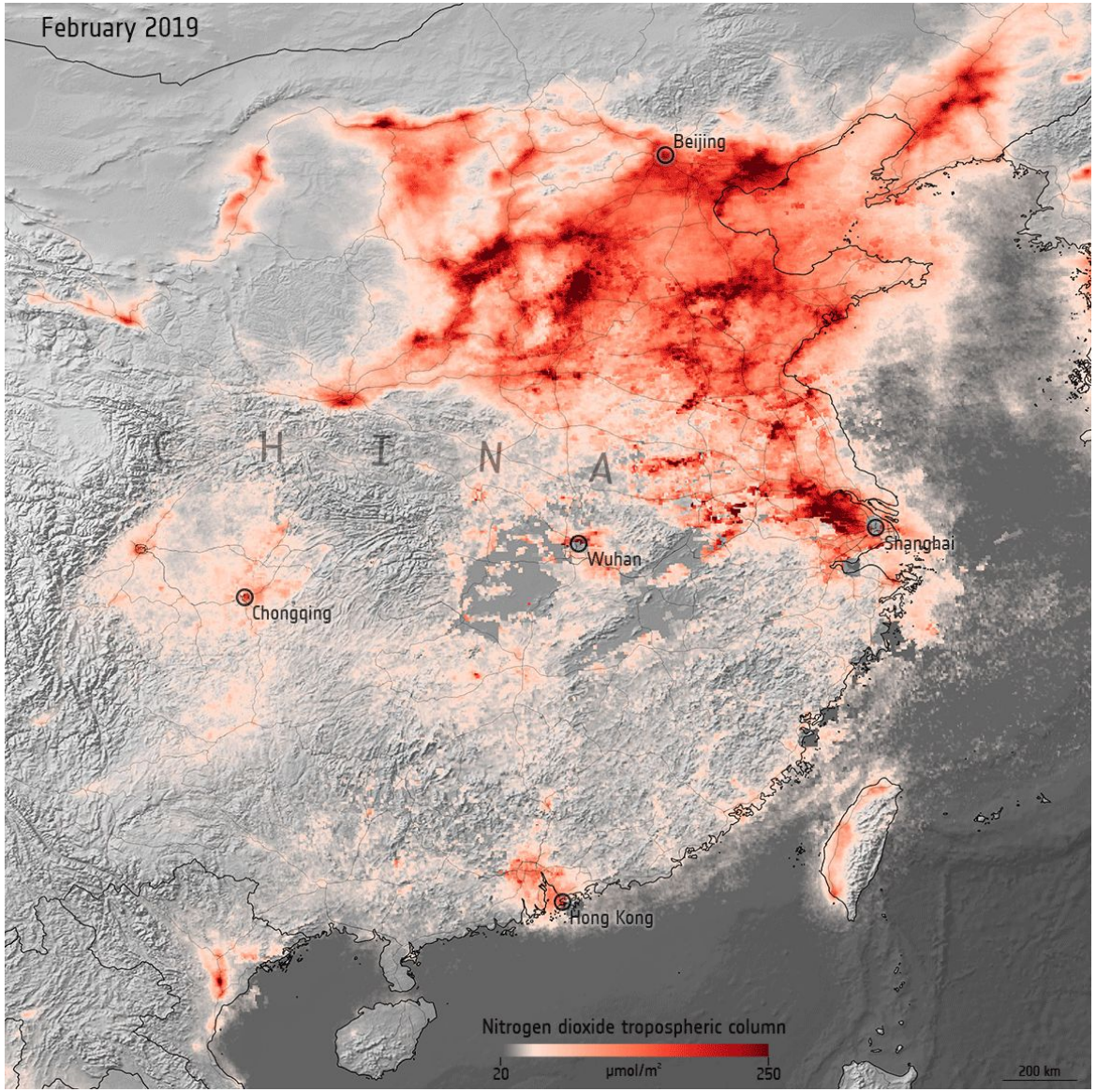
- Enhanced solvency of financial institutions
- Reallocation of capital towards green
- Resilient global financial system
- Realise the opportunity for UK plc

SPATIAL FINANCE INITIATIVE

OBSERVATIONAL DATA



Number of small satellites launched, historical (columns) and modelled (line)
Credits: Satellite Applications Catapult



Nitrogen dioxide emissions over China
Credits: ESA

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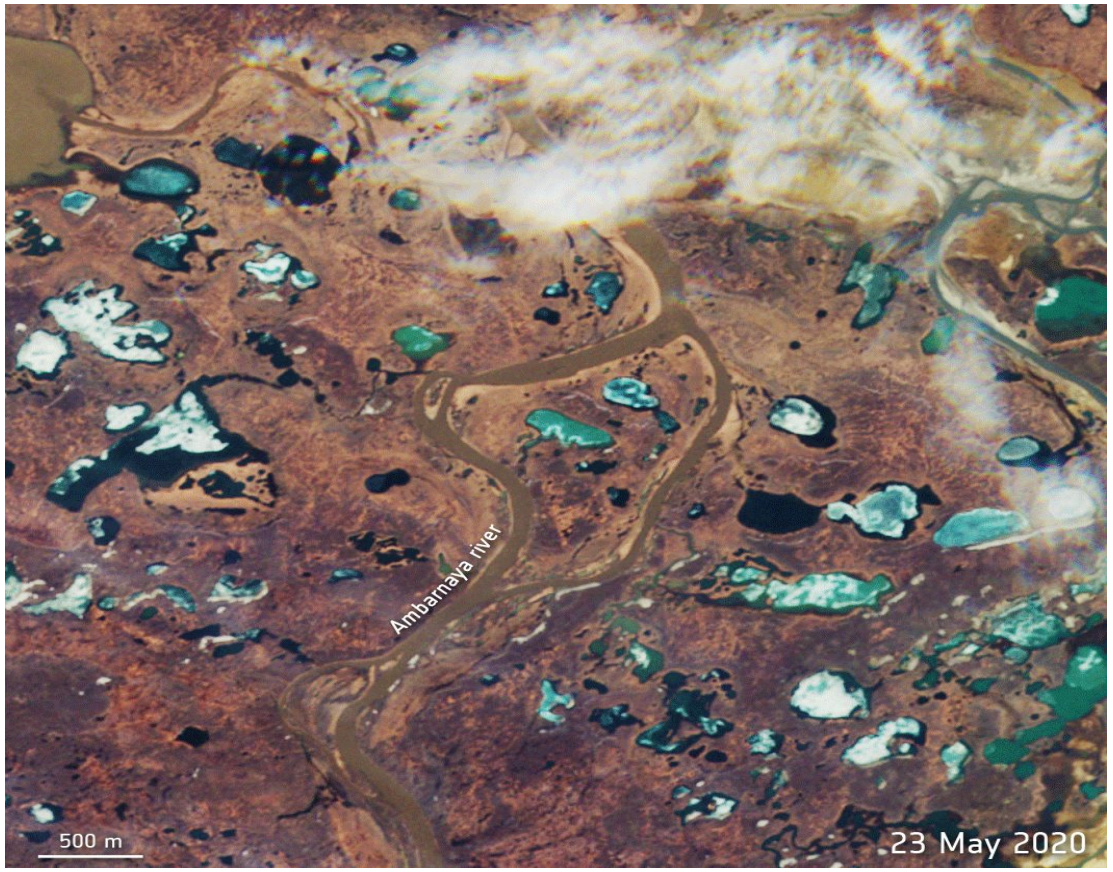
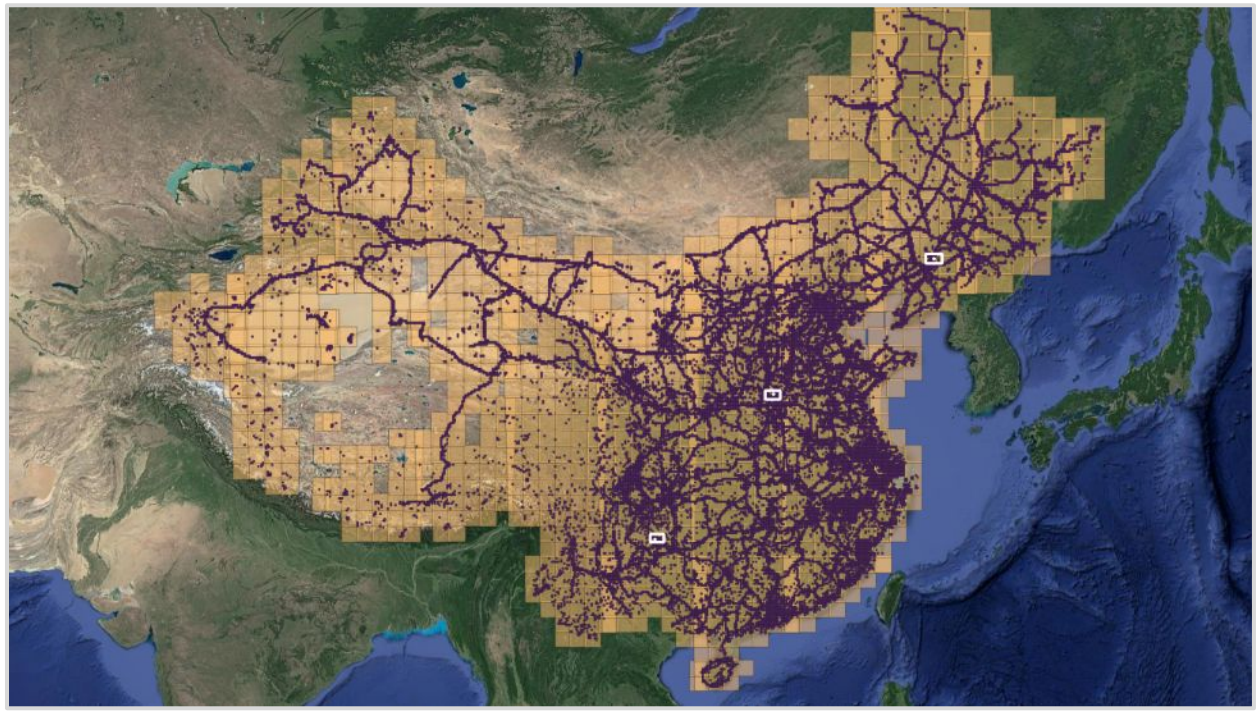
OBSERVATIONAL DATA

Deforestation in Colombian Amazon
Credits: Planet Labs Inc



Arctic oil spill Russia
Credits: ESA

GEOASSET: DIGITAL FOOTPRINT OF GLOBAL ECONOMY



New Plant

Known Plant

False Positive

Source: Spatial Finance Initiative, Astraea Inc

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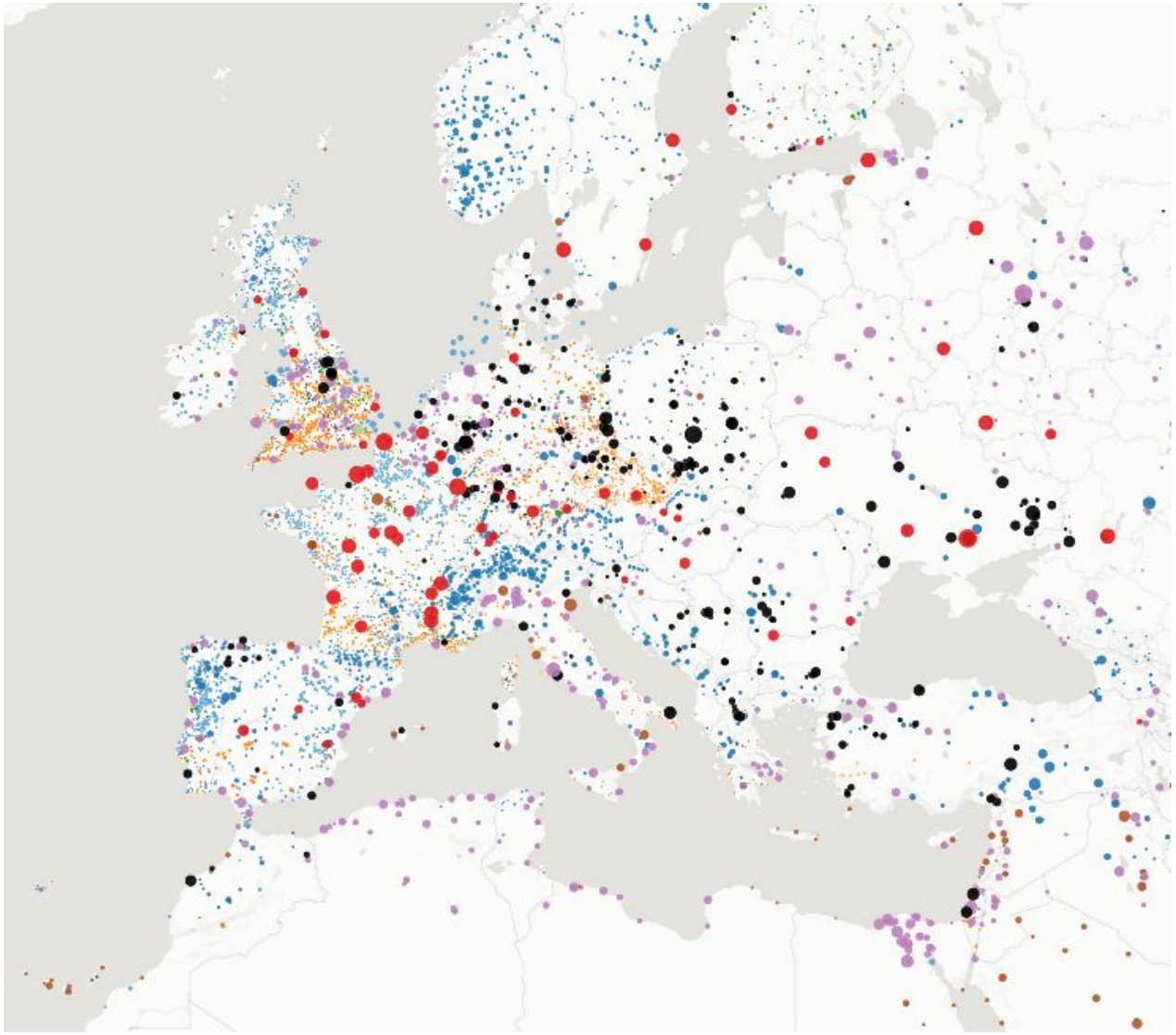
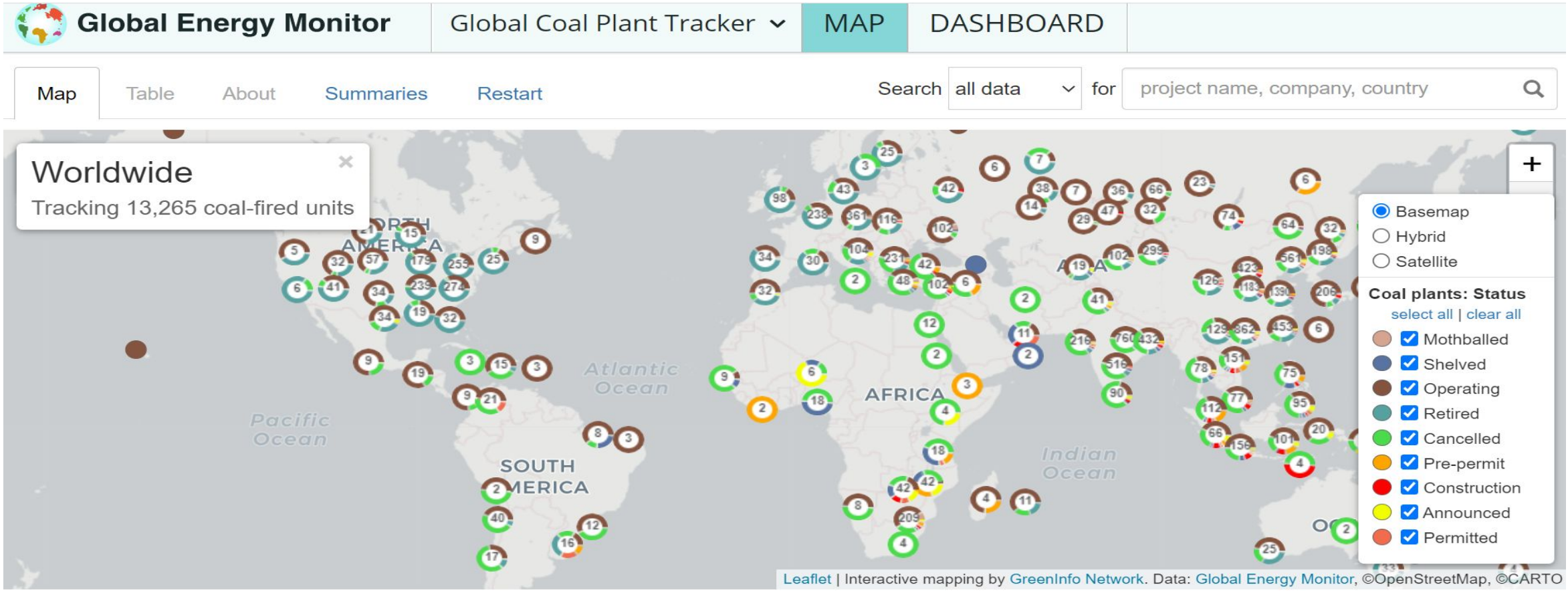
ASSET DATA



Global Power Plants Database
Credits: Global Energy Observatory, Google, KTH Royal Institute of Technology in Stockholm, Enipedia, World Resources Institute. 2018

ASSET DATA



Global Coal Plant Tracker
Credits: Global Energy Monitor

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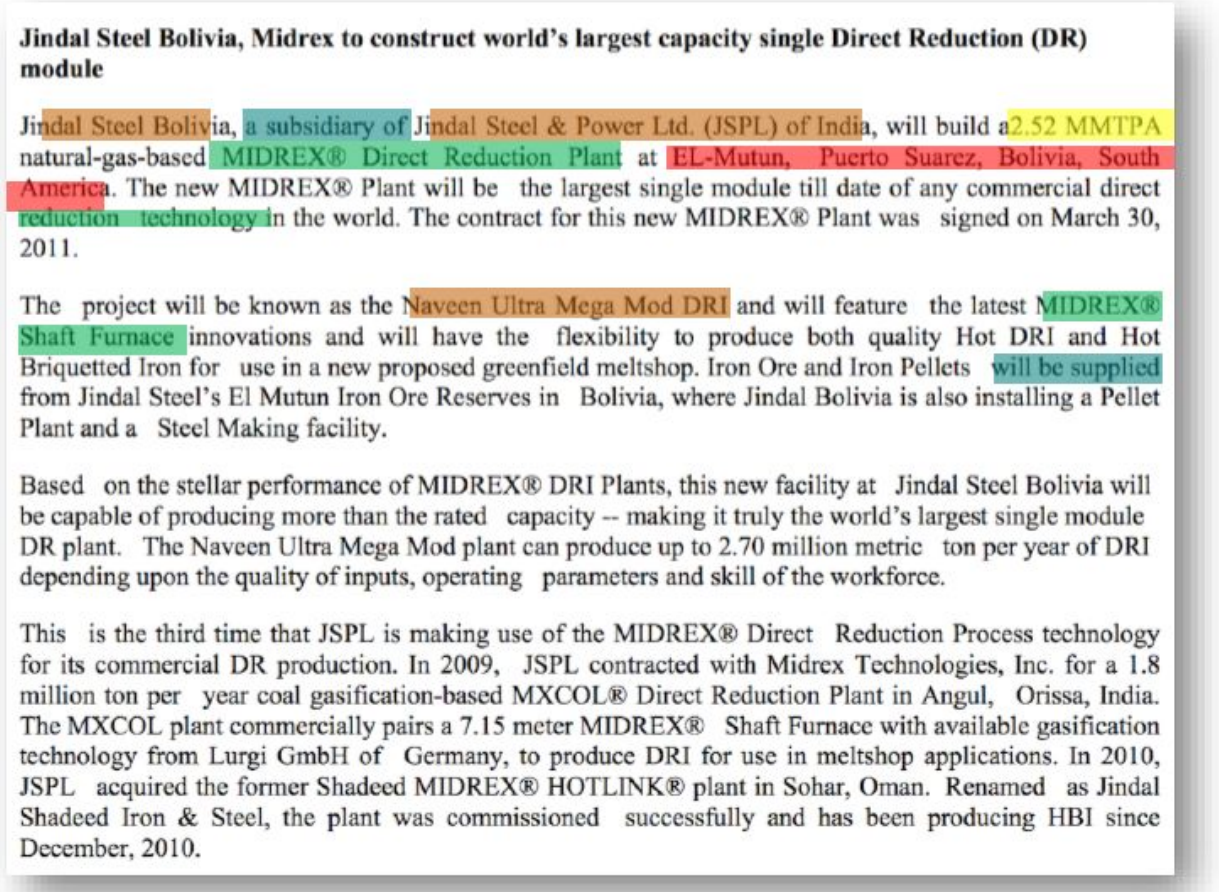
ASSET CHARACTERISATION



Jindal Steel Bolivia, Midrex to construct world's largest capacity single Direct Reduction (DR) module

Jindal Steel Bolivia, a subsidiary of Jindal Steel & Power Ltd. (JSPL) of India, will build a2.52 MMTPA natural-gas-based MIDREX® Direct Reduction Plant at EL-Mutun, Puerto Suarez, Bolivia, South America. The new MIDREX® Plant will be the largest single module till date of any commercial direct reduction technology in the world. The contract for this new MIDREX® Plant was signed on March 30, 2011.

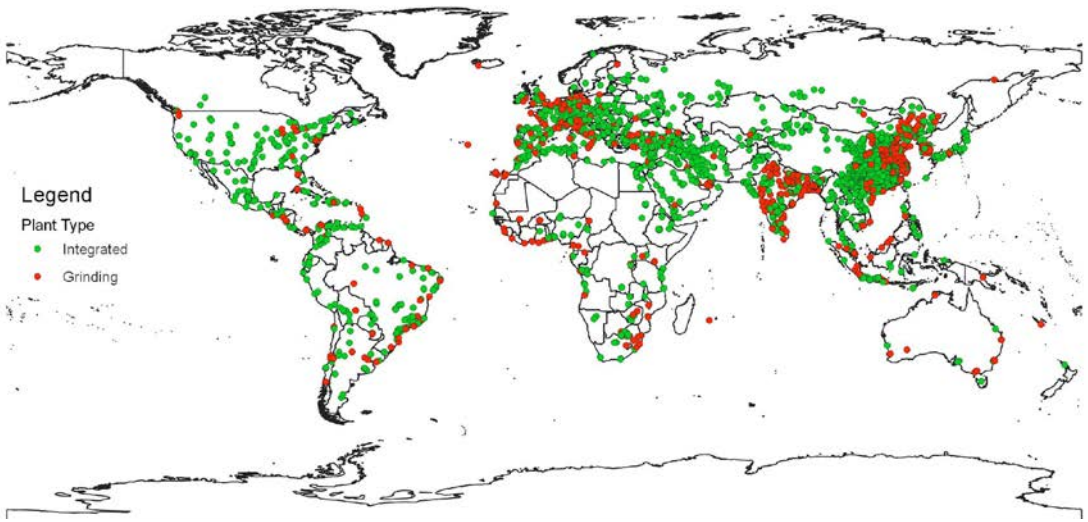
The project will be known as the Naveen Ultra Mega Mod DRI and will feature the latest MIDREX® Shaft Furnace innovations and will have the flexibility to produce both quality Hot DRI and Hot Briquetted Iron for use in a new proposed greenfield meltshop. Iron Ore and Iron Pellets will be supplied from Jindal Steel's El Mutun Iron Ore Reserves in Bolivia, where Jindal Bolivia is also installing a Pellet Plant and a Steel Making facility.

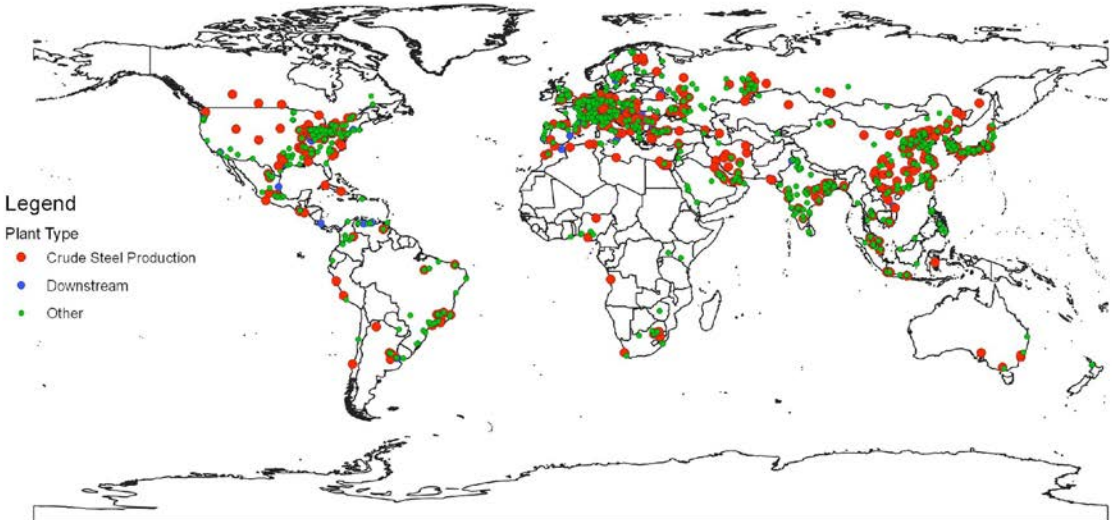
Based on the stellar performance of MIDREX® DRI Plants, this new facility at Jindal Steel Bolivia will be capable of producing more than the rated capacity -- making it truly the world's largest single module DR plant. The Naveen Ultra Mega Mod plant can produce up to 2.70 million metric ton per year of DRI depending upon the quality of inputs, operating parameters and skill of the workforce.

This is the third time that JSPL is making use of the MIDREX® Direct Reduction Process technology for its commercial DR production. In 2009, JSPL contracted with Midrex Technologies, Inc. for a 1.8 million ton per year coal gasification-based MXCOL® Direct Reduction Plant in Angul, Orissa, India. The MXCOL plant commercially pairs a 7.15 meter MIDREX® Shaft Furnace with available gasification technology from Lurgi GmbH of Germany, to produce DRI for use in meltshop applications. In 2010, JSPL acquired the former Shadeed MIDREX® HOTLINK® plant in Sohar, Oman. Renamed as Jindal Shadeed Iron & Steel, the plant was commissioned successfully and has been producing HBI since December, 2010.

- Facility
- Entity Relation
- Production capacity
- Innovation/Technology
- Location

CEMENT AND STEEL PRODUCTION ASSETS





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1	uid	city	state	country	iso3	country_code	region	sub_region	latitude	longitude	accuracy	status	plant_type	production_type	capacity	capacity_source
2	GACTAFG0001	Pol-e Khomri	Baghlan	Afghanistan	AFG	4	Asia	Southern Asia	35.9658	68.686338	Exact	Operating	Integrated	Wet	0.36	https://prd-wret.s3
3	GACTAFG0002	Injil	Herat	Afghanistan	AFG	4	Asia	Southern Asia	34.322144	61.953503	Exact	Under Construction				
4	GACTAGO0001	Luanda	Luanda	Angola	AGO	24	Africa	Sub-Saharan Africa	-8.766173	13.316051	Exact	Operating	Integrated		1.2	https://prd-wret.s3
5	GACTAGO0002	Cacuaco	Luanda	Angola	AGO	24	Africa	Sub-Saharan Africa	-8.796392	13.42678	Exact	Operating	Integrated	Dry	1.83	Estimated
6	GACTAGO0003	Lobito	Benguela	Angola	AGO	24	Africa	Sub-Saharan Africa	-12.342644	13.581766	Exact	Operating	Grinding		0.35	https://prd-wret.s3
7	GACTAGO0004	Sumbe	Kwanza-Sul	Angola	AGO	24	Africa	Sub-Saharan Africa	-11.185243	14.030804	Exact	Operating	Integrated	Dry	1.4	https://prd-wret.s3
8	GACTAGO0005	Ícolo e Bengo	Bengo	Angola	AGO	24	Africa	Sub-Saharan Africa	-9.101295	13.567408	Exact	Operating	Integrated	Dry	4	https://prd-wret.s3
9	GACTAGO0006	Benguela	Benguela	Angola	AGO	24	Africa	Sub-Saharan Africa	-12.537825	13.496729	Exact	Operating	Grinding		0.7	https://prd-wret.s3
10	GACTALB0001	Rrethi i Lezhës	Qarku i Lezhës	Albania	ALB	8	Europe	Southern Europe	41.83677	19.63345	Exact	Operating	Grinding		0.5	https://prd-wret.s3
11	GACTALB0002	Rrethi i Krujës	Qarku i Durrësit	Albania	ALB	8	Europe	Southern Europe	41.503079	19.743606	Exact	Operating	Integrated	Dry	1.33	https://prd-wret.s3

Global Database of Cement Production Assets & Global Database of Iron and Steel Production Assets
Credits: Spatial Finance Initiative
https://www.cgfi.ac.uk/spatial-finance-initiative/geoasset-project/geoasset-databases/

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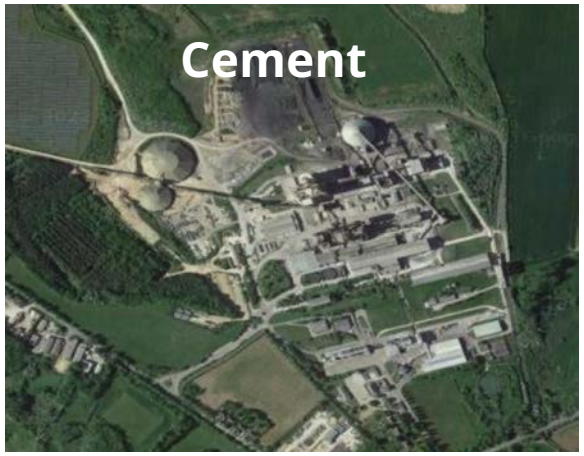
GEOASSET INDUSTRIES



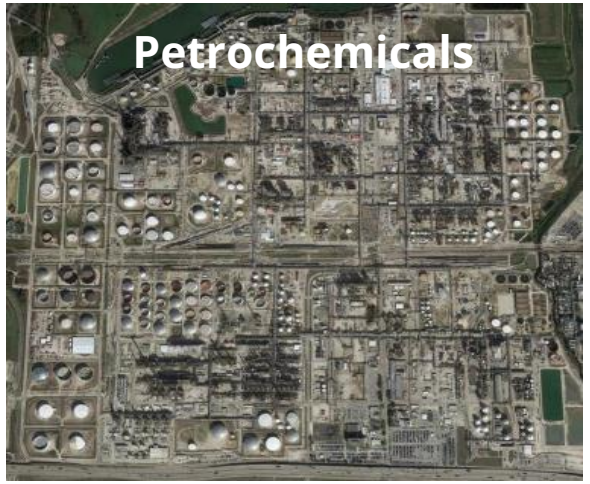


Image credits: Google

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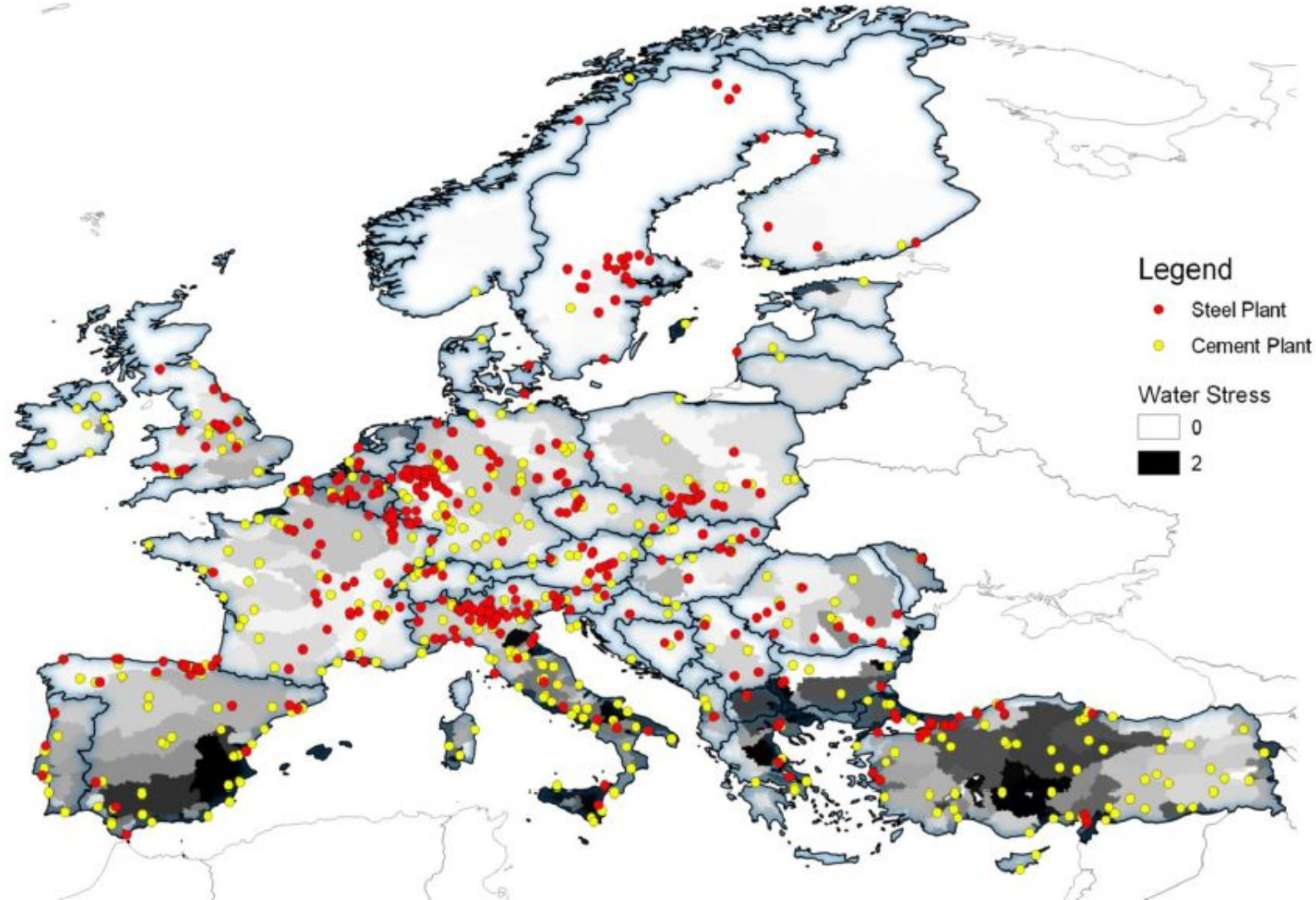
SPATIAL FINANCE INITIATIVE

PHYSICAL RISK

- Using the location information and physical risk layers it is possible to derive the physical risk exposure to both sectors, with a higher degree of granularity than has been possible with existing asset-level datasets

- On the right is a representation of this process where water stress risk in Europe has been overlayed on the steel and cement plant locations

- These physical risk metrics can then be aggregated up to company/country/portfolio/global level to better understand overall risk



Source: WRI Aqueduct

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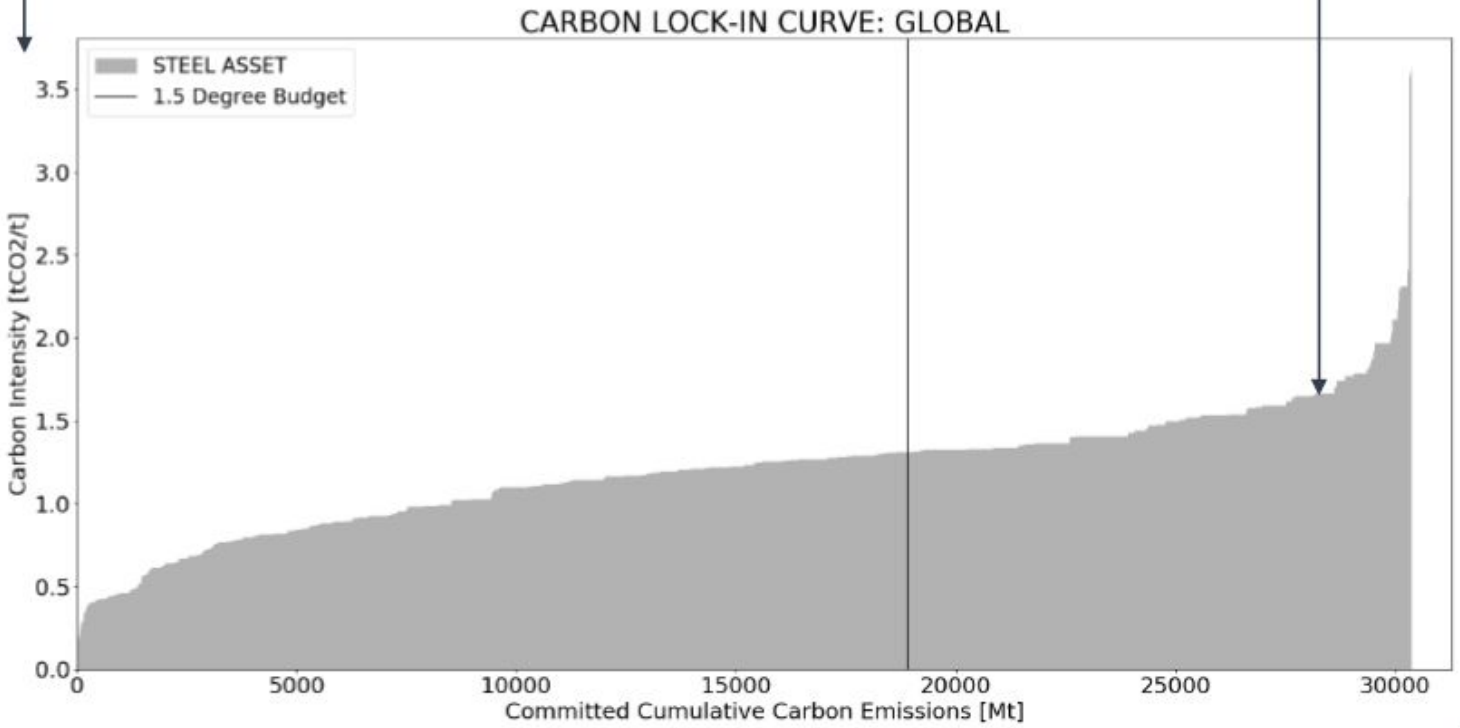
TRANSITION RISK – CARBON LOCK-IN CURVES

- Steel plants on the x-axis are ordered by an ordering metric on the y axis.
- This graph is ordered by carbon intensity which is emissions produced per tonne of steel produced.

- The black vertical line is the carbon budget.
- A carbon budget is the cumulative amount of CO_2 emissions permitted over a period to keep within a certain temperature threshold.
- Steel plants to the right of the black line are incompatible with that carbon budget

- The x-axis shows an estimate of what the cumulative emissions of all steel plants globally are likely to produce over their remaining life.
- Each bar represents a crude steel production asset.
- The width of each line represents the amount of carbon emission associated with each steel production asset.



24.8% of GLOBAL crude steel producing assets incompatible SR 1.5°C
18.6% of GLOBAL crude steel capacity incompatible SR 1.5°C

- SR 1.5°C is the IPCC's latest estimate of a carbon budget that corresponds to 1.5°C with a 66% probability.

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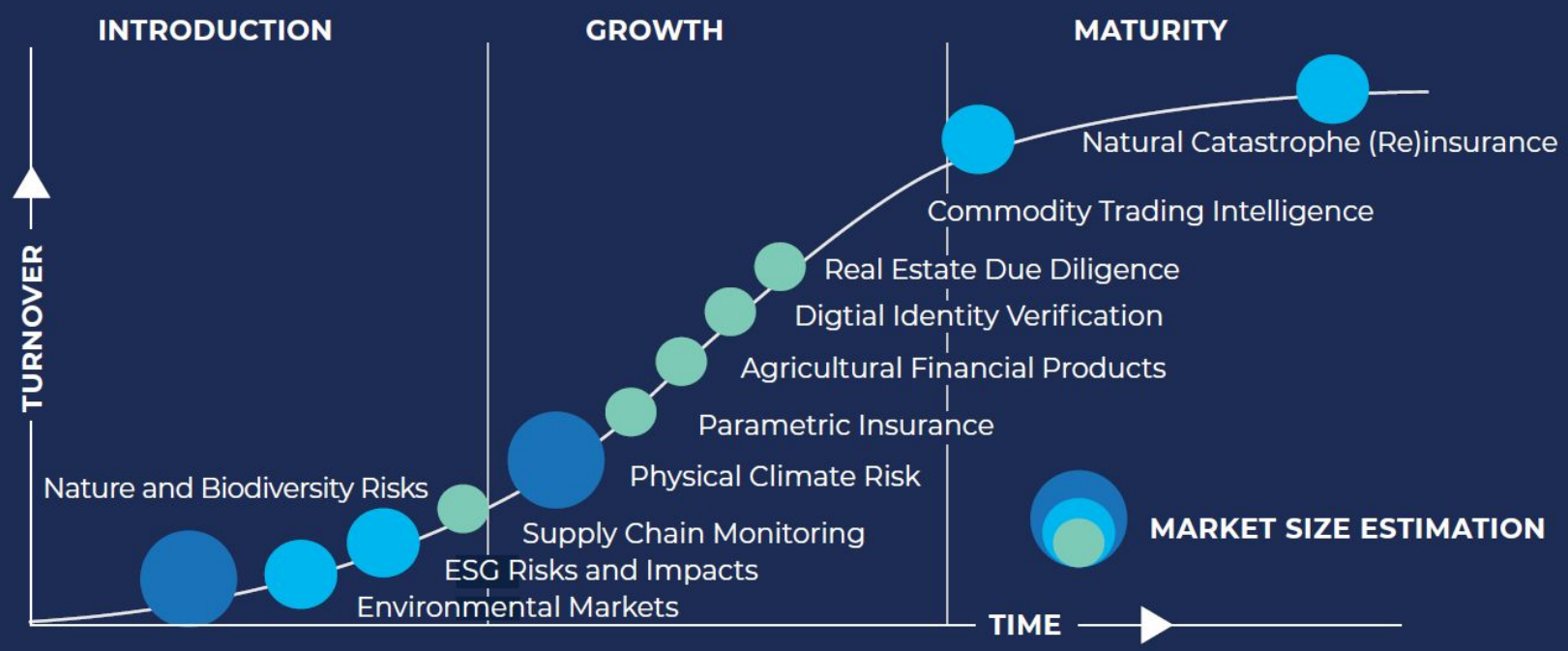
SPATIAL FINANCE APPLICATIONS & INNOVATION



Global Resilience Index Initiative

GLOBAL RESILIENCE INDEX INITIATIVE

GLOBAL RESILIENCE INDEX (GRI) INITIATIVE

CREATING A COMMON LANGUAGE OF RISK

Embedding risk within global financial flows and decisions at all levels to drive resilience and resilient investment

GEM GLOBAL EARTHQUAKE MODEL working together to assess risk

UNDRR UN Office for Disaster Risk Reduction

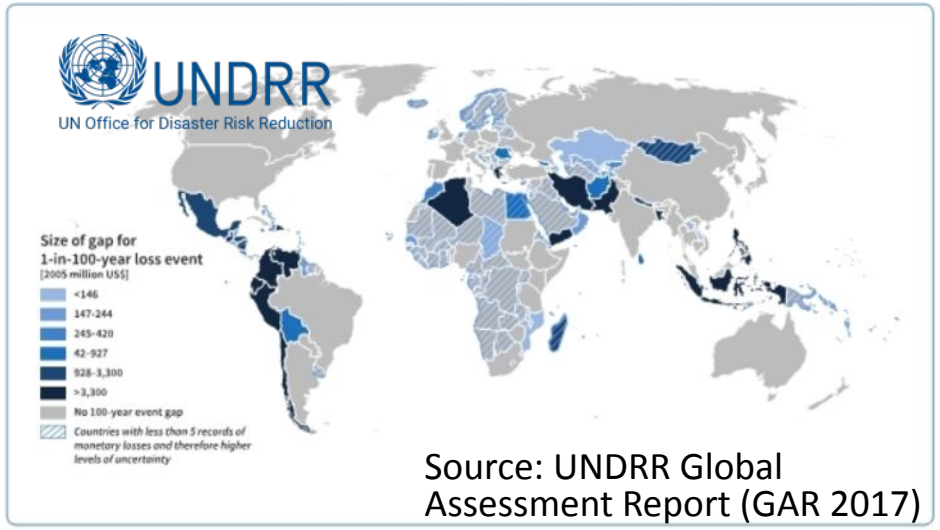
Coalition for Climate Resilient Investment

CDRI Coalition for Disaster Resilient Infrastructure

CGFI UK Centre for Greening Finance & Investment

IDF Insurance Development Forum

GRII builds upon the UN's Global Assessment Report 2017. A multi-agency effort to create the first public good, globally consistent, multi-hazard catastrophe risk model.



Source: UNDRR Global Assessment Report (GAR 2017)

GLOBAL RESILIENCE INDEX INITIATIVE

GEM
GLOBAL EARTHQUAKE MODEL
working together to assess risk

Proven public-private-academic model, focussed on standards and interoperability

RACE TO RESILIENCE
UN CLIMATE CHANGE CONFERENCE UK 2021
IN PARTNERSHIP WITH ITALY

UNDRR UN Office for Disaster Risk Reduction
Coalition for Climate Resilient Investment
CDRI Coalition for Disaster Resilient Infrastructure
CGFI UK Centre for Greening Finance & Investment
DF Insurance Development Forum

GLOBAL RESILIENCE INDEX (GRI) INITIATIVE

OPEN PHYSICAL RISK DATA AND ANALYTICS

Key GRII features and confront persistent challenges in climate and wider resilience

A COMMON LANGUAGE OF RISK across public, private, finance and civil society

CONSISTENT RISK METRICS – systemic risks, supply chains, trade, natural capital

SHARED ANALYTICS, allowing risk to be integrated into decision making

GLOBALLY CONSISTENT and integrated across hazards, assets, and timescales

INTEGRATED EXPERTISE – based on last decade of cross sector collaboration

OPEN TO ALL, public good. Inspired by UN GAR17 and Global Earthquake Model

UNDRR UN Office for Disaster Risk Reduction
Coalition for Climate Resilient Investment
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IDF Insurance Development Forum

PUBLIC – PRIVATE COLLABORATION TO BUILD A COMMON LANGUAGE AND UNDERSTANDING OF RISK

DF Insurance Development Forum

Public-private partnership co-chaired by World Bank – UNDP – Insurance Industry

CDRI Coalition for Disaster Resilient Infrastructure

Partnership of national governments, UN agencies, MDBs and private sector

CCRI Coalition for Climate Resilient Investment

Public-private partnership institutional investors, financial institutions, ratings agencies, knowledge organisations

CGFI UK Centre for Greening Finance & Investment

UNDRR UN Office for Disaster Risk Reduction

GEM GLOBAL EARTHQUAKE MODEL working together to assess risk

Open platform for collaboration

Contributing institutions to date:

SPATIAL FINANCE INITIATIVE

GEM GLOBAL EARTHQUAKE MODEL working together to assess risk

Nasdaq

Fathom

eci

SUSTAINABLE FINANCE PROGRAMME SSEE

UNIVERSITY OF OXFORD

oasis

JBA risk management

Milliman

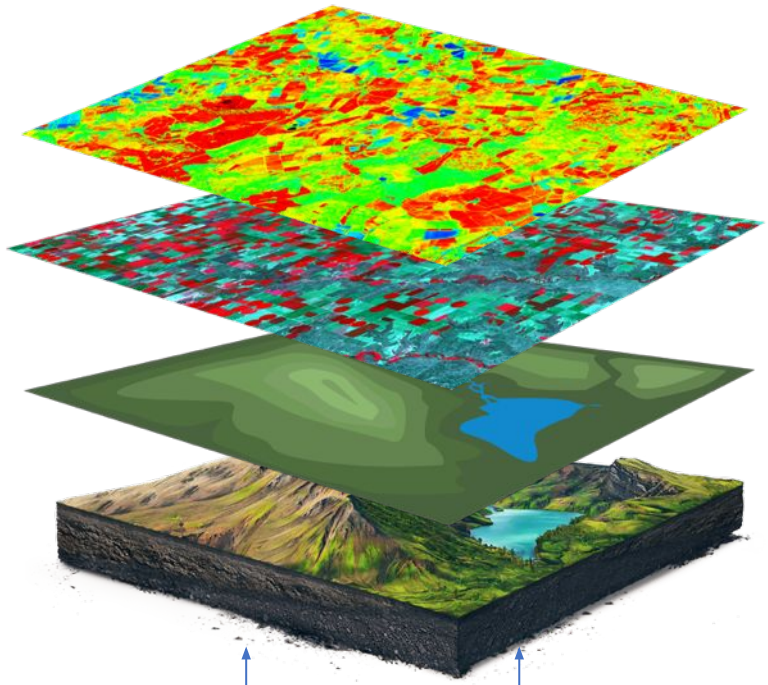
DAFNI Data & Analytics Facility for National Infrastructure

GLOBAL RESILIENCE INDEX (GRI) INITIATIVE
OPEN PHYSICAL RISK DATA AND ANALYTICS

Vision:

Finance and investment, IFIs government, civil society and firms able to access and use globally consistent, transparent acute physical risk data for:

- Every point on the planet
- Covering all material risks
- Present and future



An open platform of high-quality, consistent, global hazard, exposure and risk data covering material risks:

Combines best-in-class data from multiple contributing organisations to generate sub-national risk metrics: exposures, average annual loss, EPs

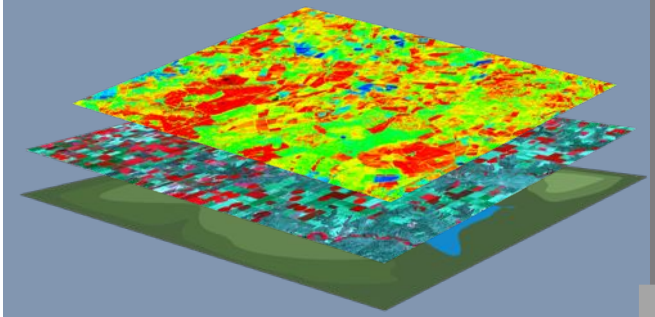
'plug and play' interoperability

Strategically fills gaps: tail risks (acute risks), system-level risks, supply chains, indirect economic losses

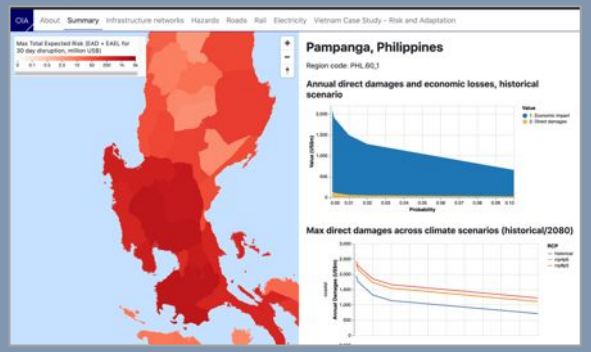
Standards and transparent methods

GLOBAL RESILIENCE INDEX INITIATIVE

OpenGRI DATA REPOSITORY



GRI INTERFACE



GLOBAL/REGIONAL

- GLOBAL/REGIONAL RISK FINANCING MECHANISMS
- GLOBAL RISK MONITORING
- DISCLOSURE
- REPORTING
- PORTFOLIO RISK MGMT
- SYSTEMIC-LEVEL RISK
- HUMANITARIAN

NATIONAL

- RISK IDENTIFICATION
- MACRO-PRUDENTIAL
- FINANCIAL PROTECTION
- ADAPTATION PLANNING
- PRIORITISING RESILIENCE INVESTMENTS

SUB-NATIONAL/ ASSET-LEVEL

- MICRO-PRUDENTIAL
- RISK ANALYTICS
- RISK PRICING
- RISK MONITORING

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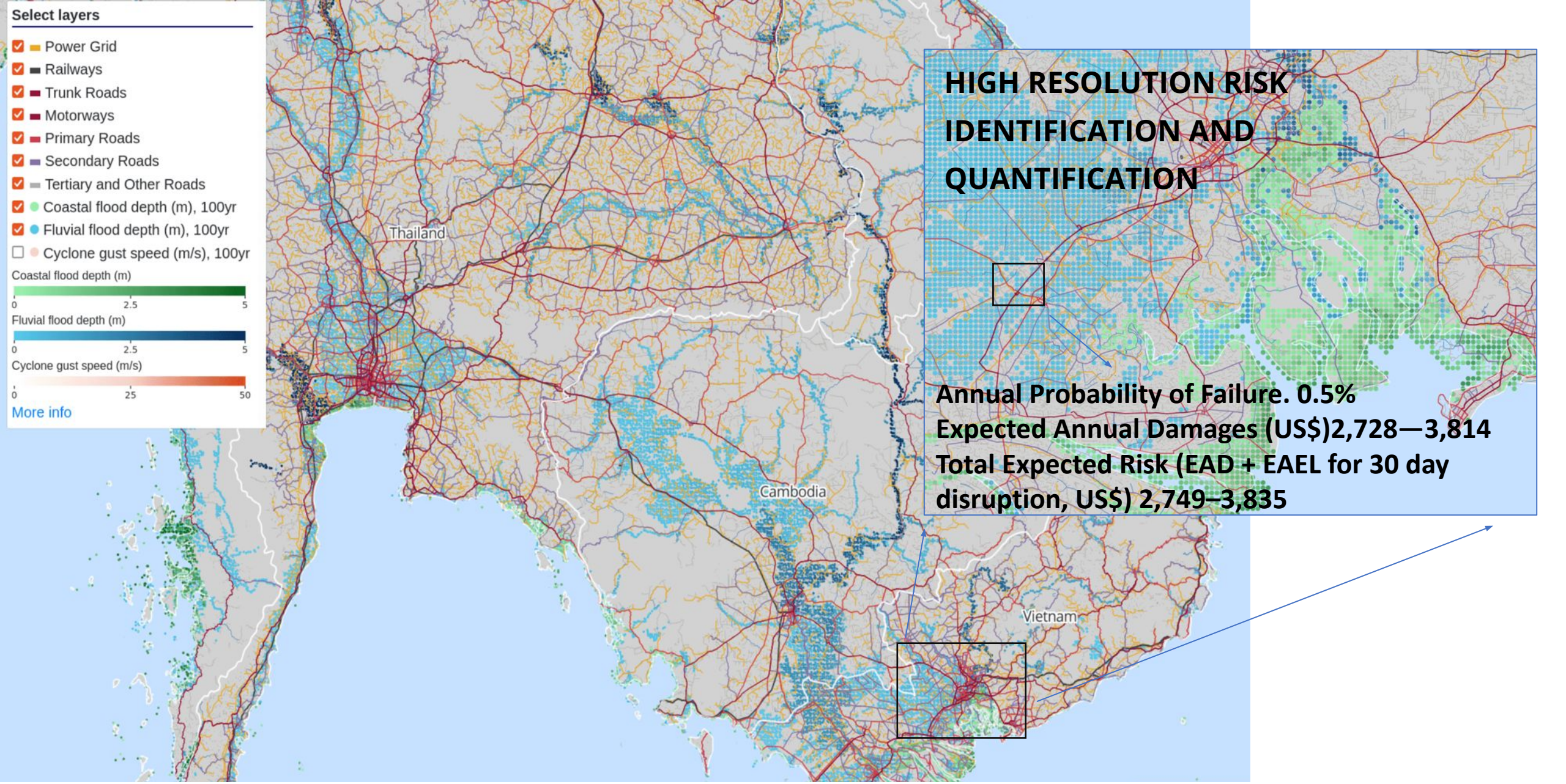

WORLD BANK GROUP

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ROADMAP AHEAD

GLOBAL RESILIENCE INDEX INITIATIVE

LAUNCH AT COP26

DEMONSTRAT OR PLATFORM

SET-UP AND GOVERNANCE

SUMMER 2022

LAUNCH OF FULL OPEN REPOSITORY AND INDICES COP27

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WEATHER

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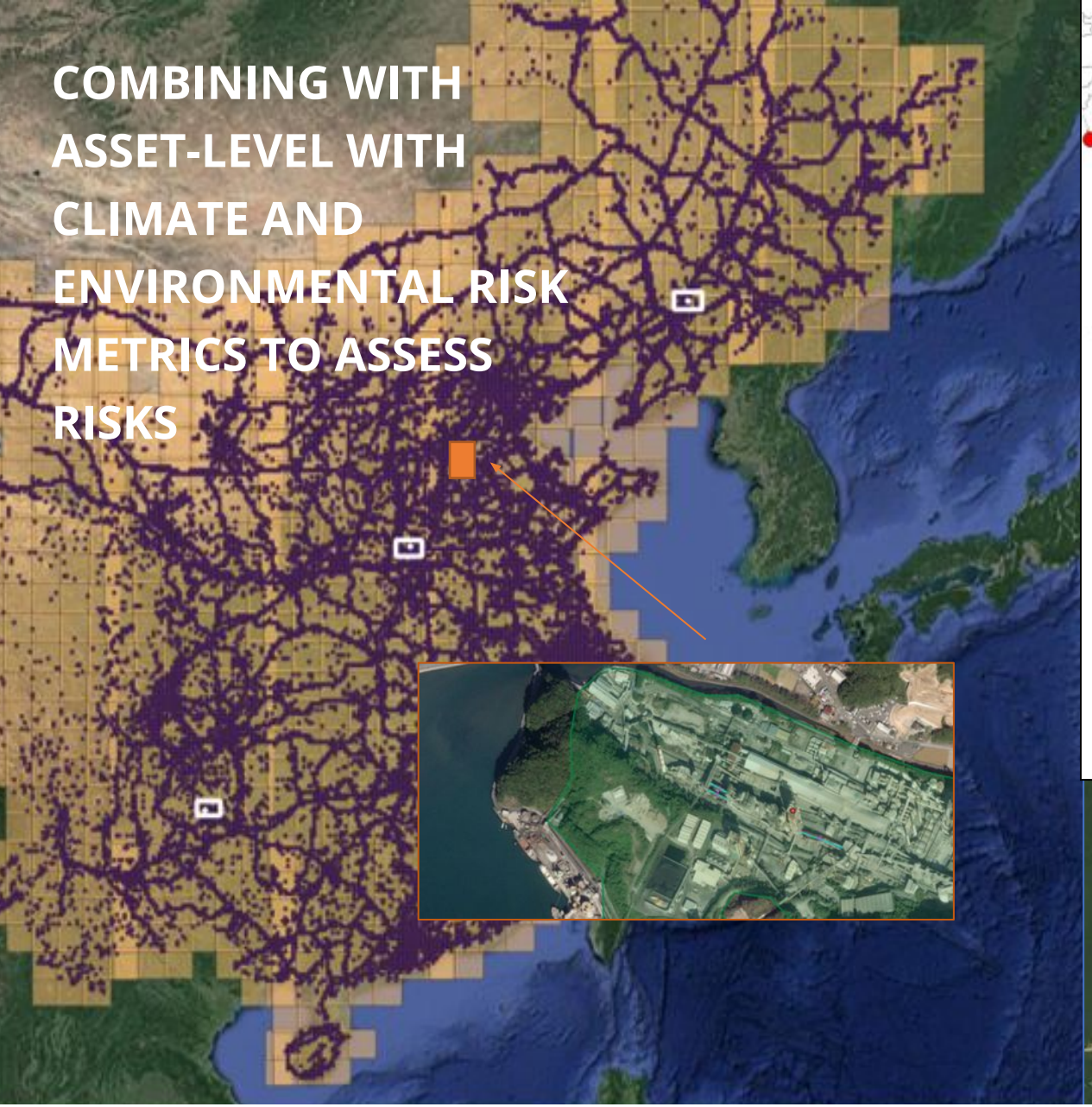
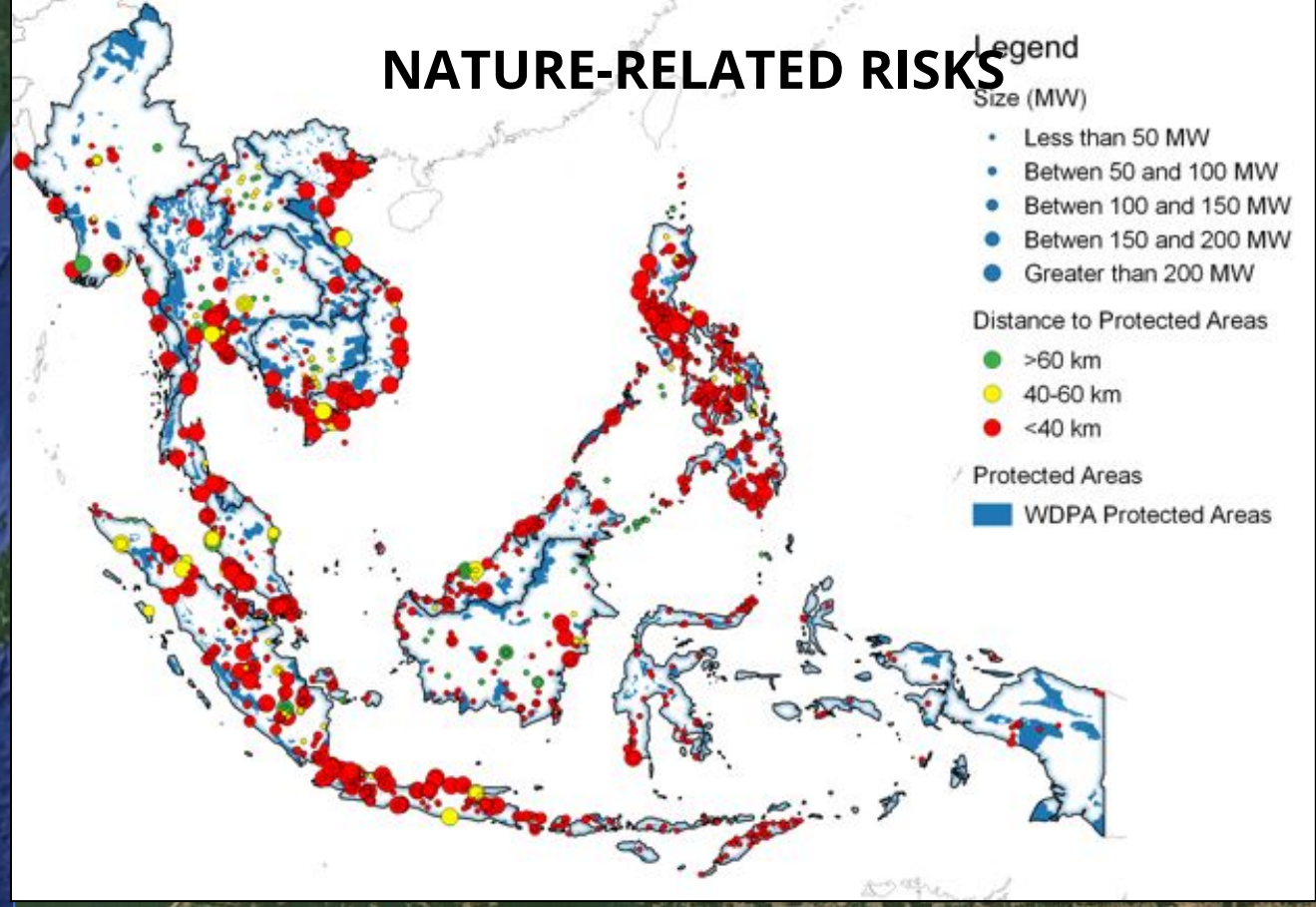
COMBINING WITH ASSET-LEVEL WITH CLIMATE AND ENVIRONMENTAL RISK METRICS TO ASSESS RISKS



NATURE-RELATED RISKS



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References

The concepts and model results presented here are documented in the study report:

- Pant, R., Russell, T., Glasgow, G., Verschuur, J., Gavin, H., Fowler, T. & Hall, J.W. (2021). *Analytics for Financial Risk Management of Critical Infrastructure in Southeast Asia – Final Report.* Oxford Infrastructure Analytics Ltd., Oxford, UK. (Available on request from the World Bank)

The tool being used to visualize the model outputs is developed and documented here:

- github.com/oi-analytics/oi-risk-vis

The Southeast Asia analytics are produced using the code here:

- github.com/oi-analytics/seasia

CONCLUDING THOUGHTS

The insurance sector needs to fully understand its exposure to projected climate risk and take action to build resilience

Assessing risks and impact from the asset level provides a more granular and comprehensive approach to identifying and attributing risk and impact to individual companies, investment portfolios and sovereigns. Earth Observation, artificial intelligence tools and network modelling allow us to extract and process vast amounts of data, creating comparable, verified global datasets

Public-private-academia collaborations and knowledge co-production are highly valuable


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