



GWFF

GEOSPATIAL WORLD FORUM

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Sustainability linked Location Based Risks

May 2024

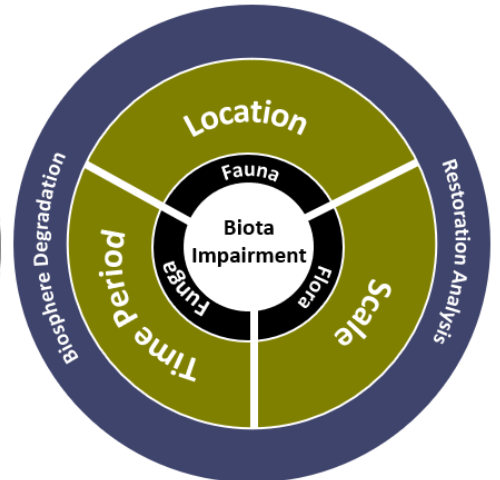
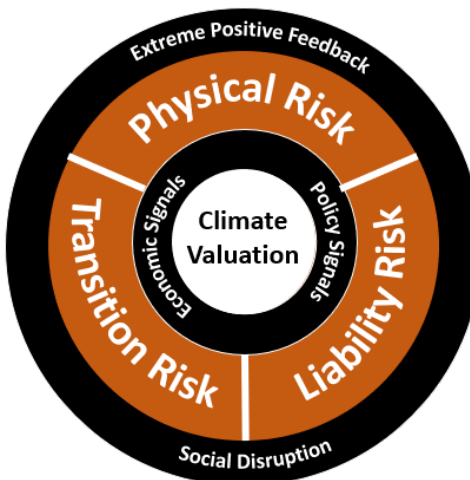
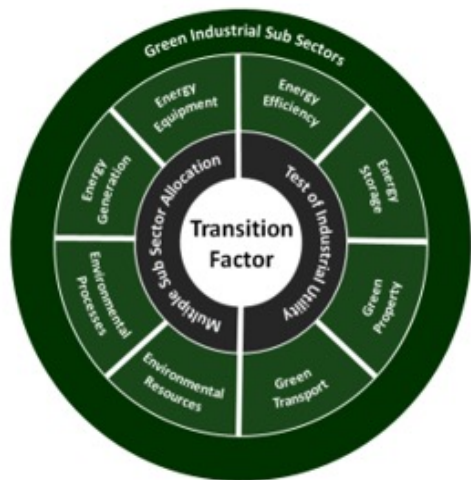
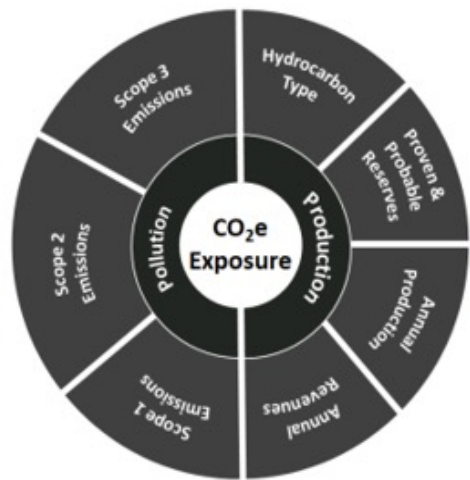
Prepared for: Geospatial World

LocVAR™

Location Value at Risk

The measurement & modelling of economic impairment to a legal entity or individual asset based on geographic location

Sustainability is driving the measurement of LocVAR in Financial Markets



How companies operate

Does the company adhere to legislation, procedures or commitments which through their application, enable it to avoid, mitigate or remediate any negative impacts its operations have on the environment, civil society or governance standards

ESG

Looking for warning signals & patterns of good-poor corporate behaviour

Do companies pollute

Does the company own hydrocarbon assets or emit pollutants linked to the greenhouse gas effect which, through their release into the atmosphere, represent a risk to the future stability of global climate and eco systems

Carbon

Trying to restrict the impact of CO₂e through markets & legislation

What companies produce

Does the company provide goods, products or services which, through their utility enables society to adapt, mitigate or remediate the impact of climate change, resource depletion or environmental erosion

Green

Measuring & modelling the risks & opportunities of the industrial transition

Are companies exposed

Does the company have direct & indirect economic exposure to the impacts of physical, liability & transition related risks created by climate change & its impact on the environment & society

Climate

Calculating exposure to newly defined climate risks

How companies impair

Does the company have the ability to analyse the impact of its current operations on the biosphere and what plans is it making to remedy this impairment

NatCap

Modelling degradation to the biosphere from industrial activity

1995

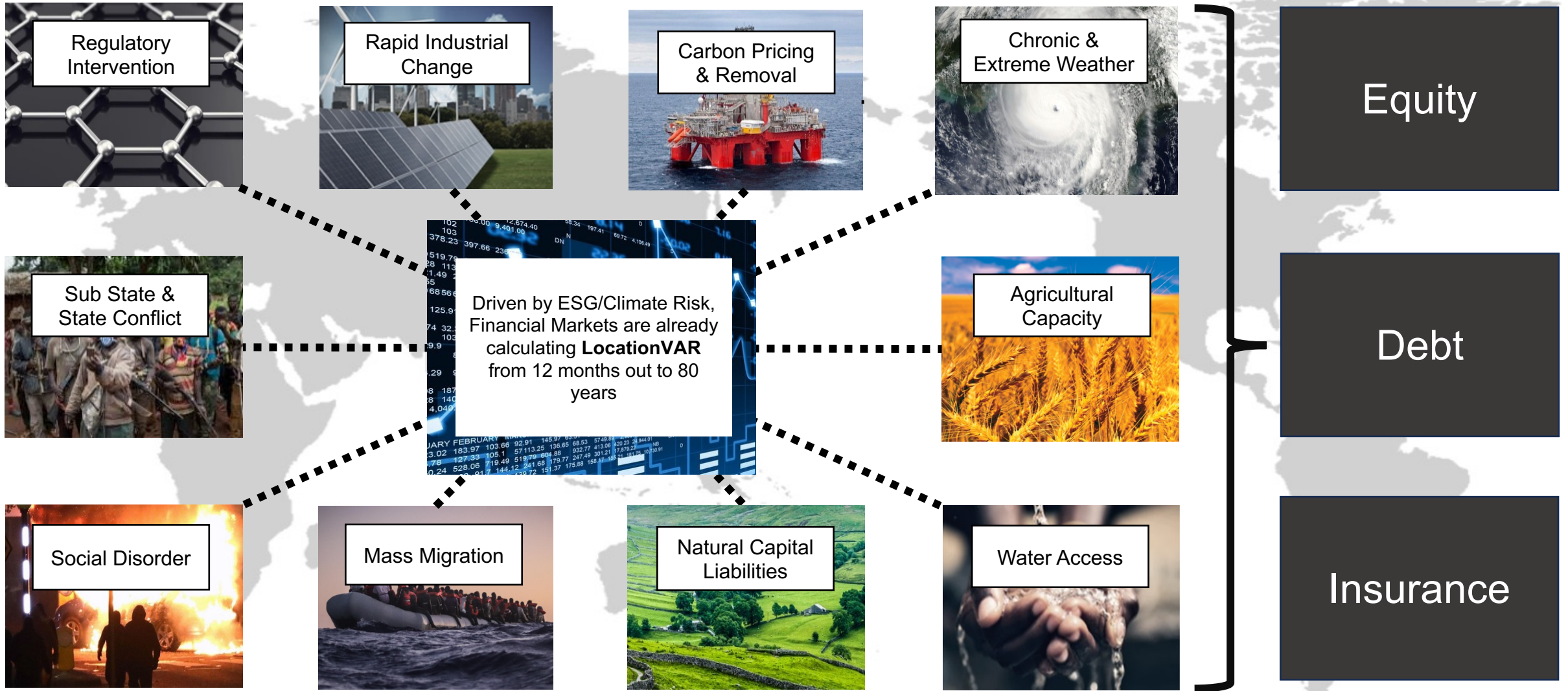
2014

2016

2018

2023

The cost of capital will change based on location



Rising Regulatory Obligations: ~30 countries (70% plus of the global GDP) today



UK Companies Act 2006 Section 172
The impact of the company's operations on the community and environment

UK Streamlined Energy & Carbon Reporting 2019
Streamlined energy & mandatory Carbon Reporting

UK Carbon Reduction Programme 2021
UK Govt. contractors with a £5m relationship must submit a NetZero business plan

UK TCFD 2021
Company level Climate metrics for large listed companies

UK Sustainability Disclosure Standards 2024
Company level ESG & Climate metrics in line with IFRS S1 & IFRS S2

UK Carbon Border Adjustment Mechanism 2027

EU Non-Financial Reporting Directive 2014
Company level ESG metrics

EU Taxonomy 2021
Company level green activities

EU Corporate Sustainability Reporting Directive 2023
Company level ESG metrics replacing NFRD

EU Corporate Sustainability Due Diligence Directive 2024
Company supply chains for Environmental & Human Rights issues

EU Carbon Border Adjustment Directive 2023/4
Importers of key products are subject to a requirement to purchase carbon credits as if the products were sourced from the EU

EU Directive on Environmental Protection 2023
Substantial upgrade to the Directive on Environmental Protection with the number of offences rising from 9 to 18 including use of raw materials & products created in breach of the rules by EU companies.

Swiss Ordinance on Climate Disclosures 2023/4
Company level climate metrics for large listed companies based on the TCFD

India Companies Act 2013
Board reporting on energy conservation

India BRSR Framework 2021
Company level ESG metrics for large listed companies

Singapore Exchange Climate Disclosures 2023/4
Company level climate metrics for large listed companies based on the TCFD

China Securities Regulatory Commission 2022
Reporting of environmental violations by public companies

Shanghai and Shenzhen Stock Exchanges 2022
Companies must publish an ESG report

AASB ASRS July 2024
Three phase implementation covering companies of certain size on climate related disclosures

New Zealand Exchange Climate Disclosures 2023
Company level climate metrics for large listed companies based on the TCFD

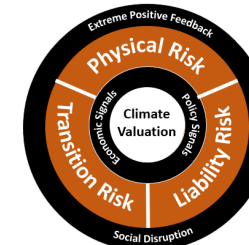
US SEC The Enhancement and Standardization of Climate-Related Disclosures for Investors 2023/4
Company level climate metrics & emissions metrics for large listed companies indirectly derived from the TCFD

California SB 253 & 261
SB 261 requires covered entities to prepare, publish and submit a climate-related financial risk report on or before January 1, 2026, and biennially thereafter.

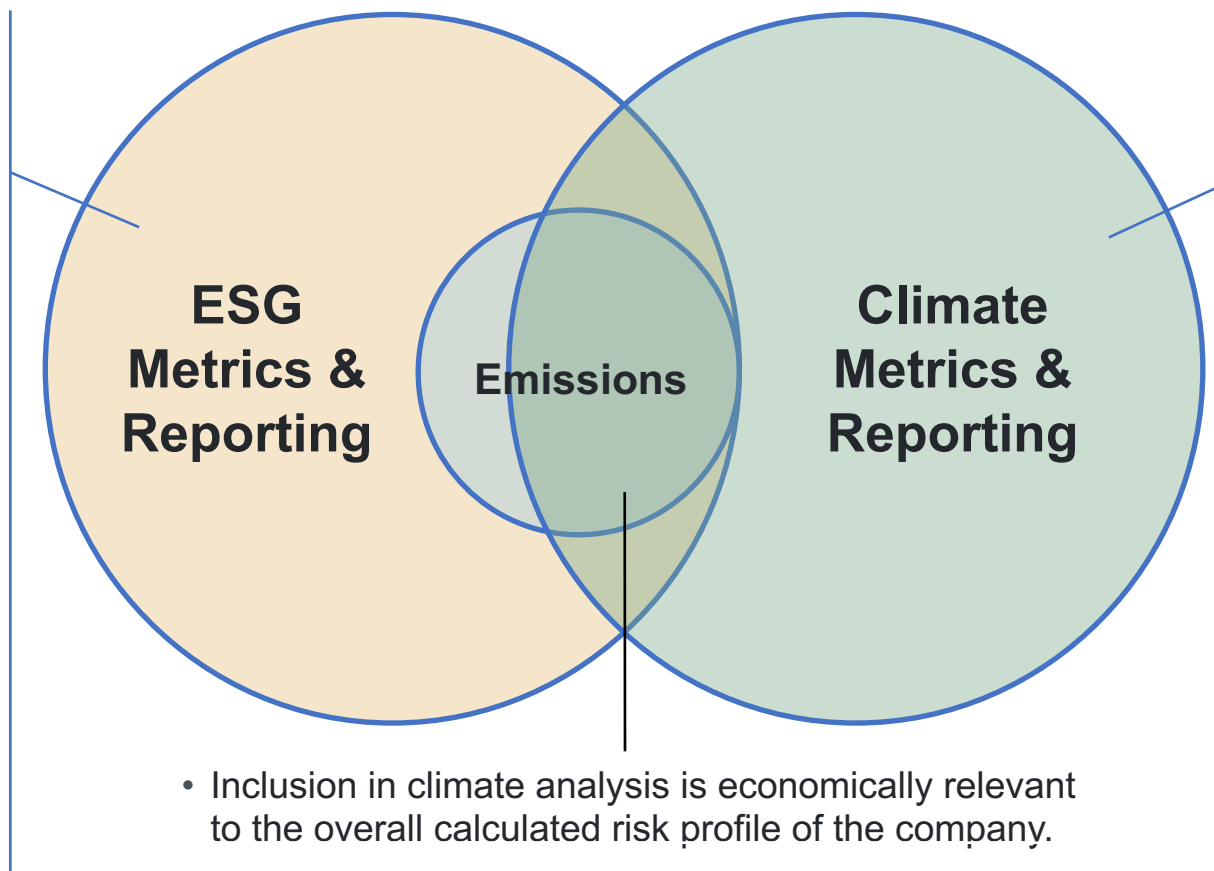
Securities and Exchange Commission (CVM) and Ministry of Finance. Ecological Transformation Plan 2026
Company level climate metrics for large listed companies based on the IFRS S1 & IFRS s2

Important Note:
This does not include the multiple Supranational & Industry based voluntary reporting frameworks including the UN SDGs [Sustainable Development Goals].

Climate and ESG are distinct in complexity, implications and obligations



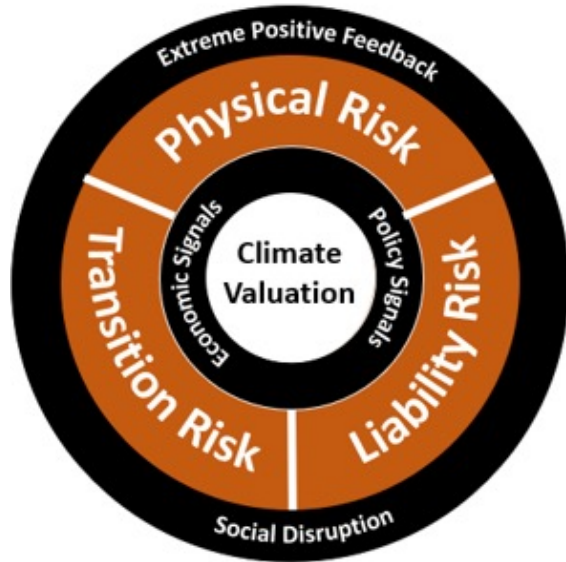
- **A failure to measure, model & adjust to ESG risks will not have severe economic consequences**
- ‘Soft Risk’ relevance for most data points
- Metrics not calculated as an economic impairment to company value
- Regulatory focus on data collection & reporting
- Regulation does not require calculated economic risk analysis
- Generates historic & current time series
- Limited pricing and market signals
- Not used in macroeconomic analysis
- Limited cost of capital implications
- Multi-jurisdictional regulation but very limited in the US



- Inclusion in climate analysis is economically relevant to the overall calculated risk profile of the company.
- Limited macro-economic implications within ESG metrics

- **A failure to measure, model & adjust to climate risks could have severe economic consequences**
- ‘Hard Risk’ relevance for all data points
- Metrics calculated as an economic impairment to company value
- Regulatory focus on analysis as well as data collection & reporting
- Regulation requires calculated economic risk analysis
- Generates historic, current & forward-looking time series
- Delivers pricing and market signals
- Used in macroeconomic analysis
- Already impacting the cost of capital
- Detailed US & multi-jurisdictional Regulation

Climate Change physical risks are location specific



- Heat & Cold
 - Mean surface temperature
 - Extreme heat
 - Cold spell
 - Frost
- Wet & Dry
 - Mean precipitation
 - River flood
 - Heavy precipitation and pluvial flood
 - Landslide
 - Aridity
 - Hydrological drought
 - Agricultural and ecological drought
 - Fire weather
- Wind
 - Mean wind speed
 - Severe wind storm
 - Tropical cyclone
 - Sand and dust storm

- Snow & Ice
 - Snow, glacier and ice sheet
 - Permafrost
 - Lake, river and sea ice
 - Heavy snowfall and ice storm
 - Hail
 - Snow avalanche
- Other
 - Air pollution weather
 - Atmospheric CO₂ at surface
 - Radiation at surface
- Coastal
 - Relative sea level
 - Coastal flood
 - Coastal erosion
 - Marine heatwave
 - Ocean acidity

- Open Ocean
 - Mean ocean temperature
 - Marine heatwave
 - Ocean acidity
 - Ocean salinity
 - Dissolved oxygen

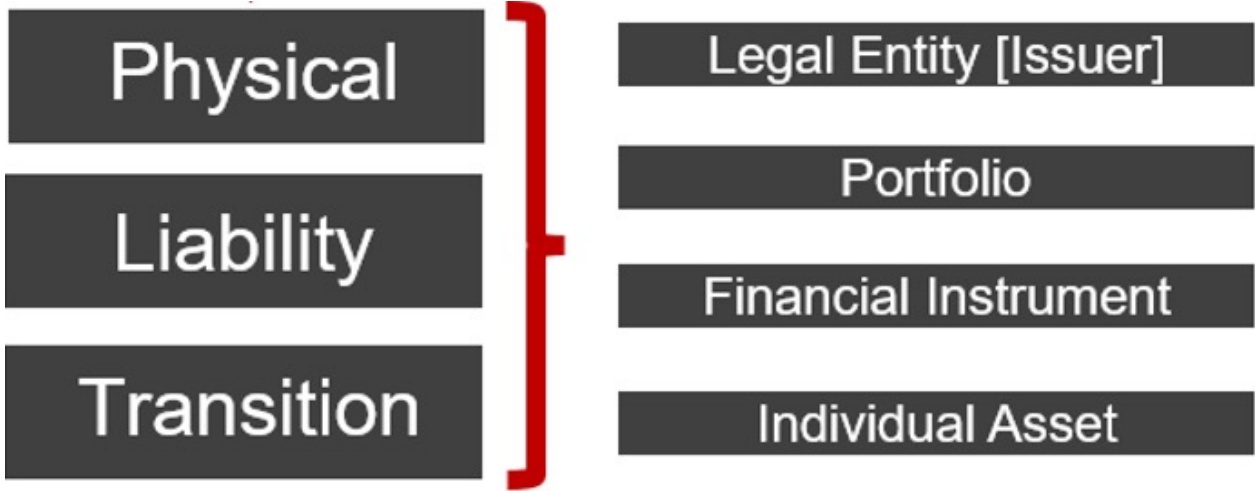
¹ <https://www.ipcc.ch/assessment-report/ar6/>

Are companies exposed

Does the company have direct & indirect economic exposure to the impacts of physical, liability & transition related risks created by climate change & its impact on the environment & society

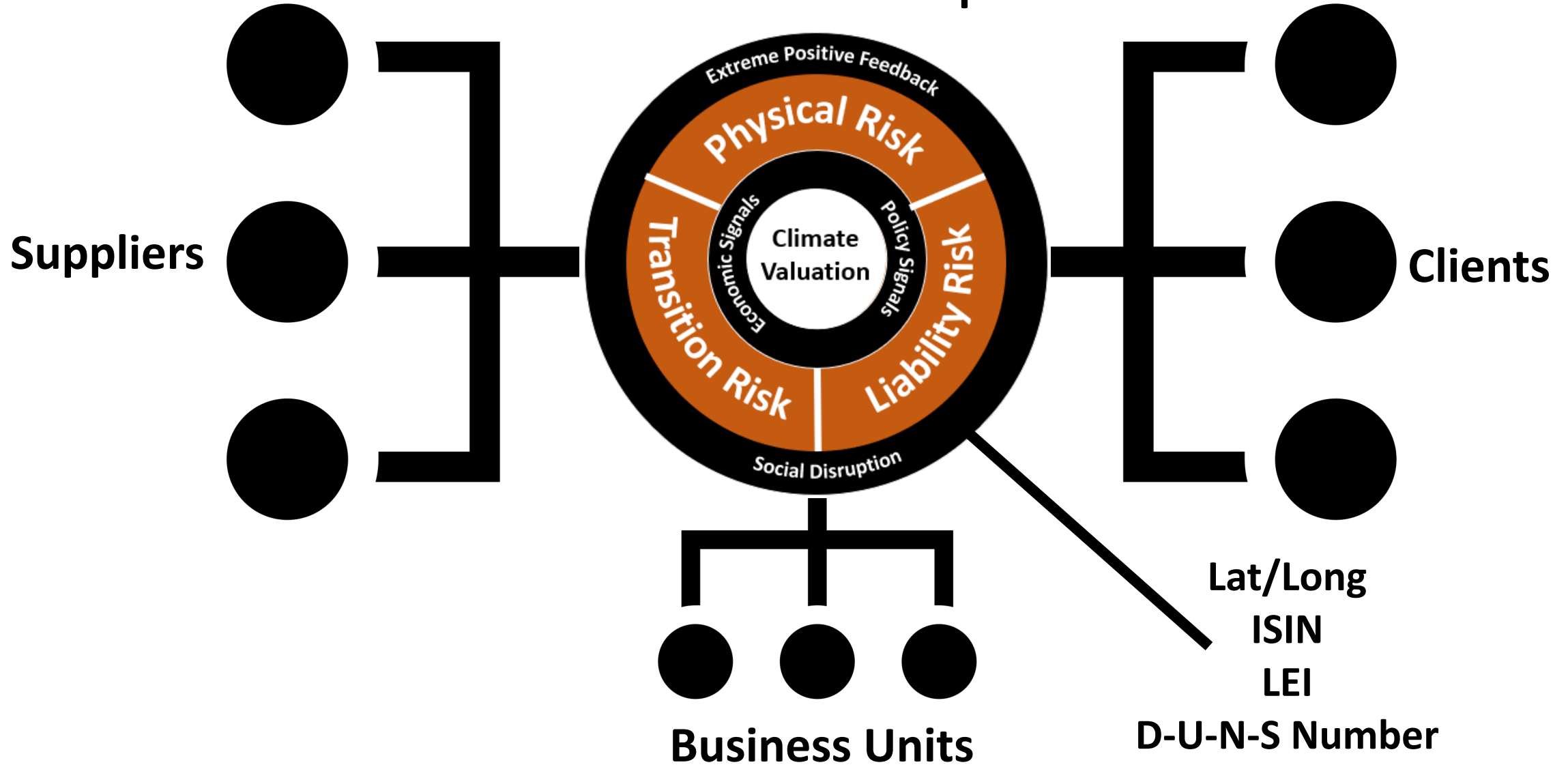
Climate

Calculating exposure to newly defined climate risks



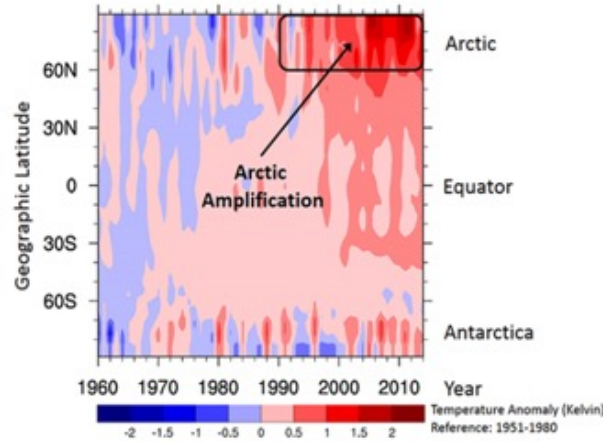
The number of Legal Entities/Individual Assets is substantial – linking them is key

Public & Private Companies

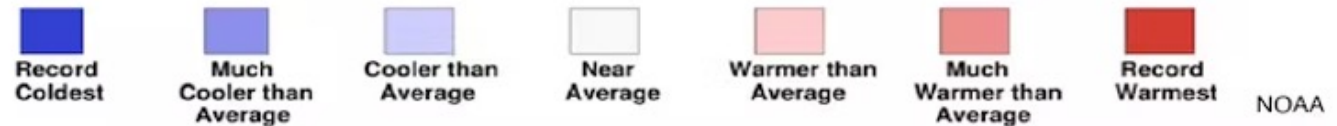
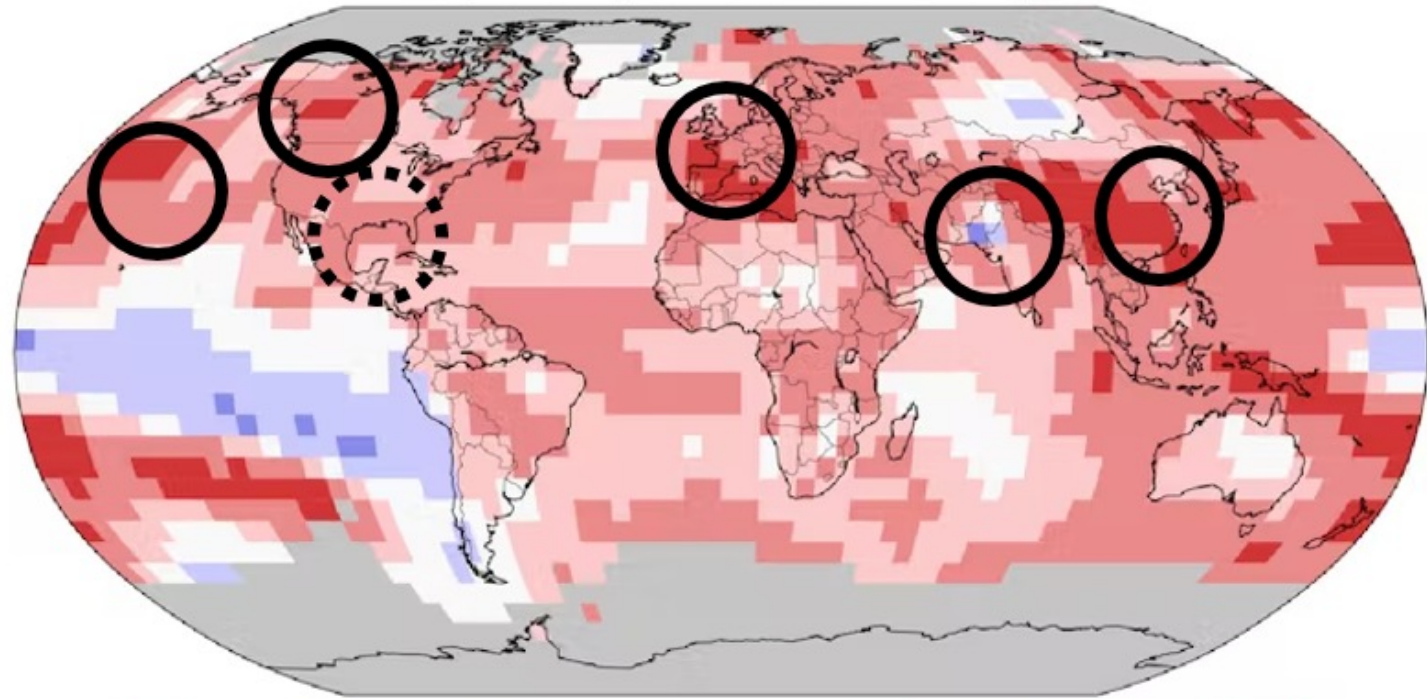


Increasing extreme events will shorten the decision cycle in Financial Markets

Are 'heat domes' the first climatological extreme event that has become chronic as a result of anthropological climate change?



Surface temperature percentiles for June-August 2022



The rapid Arctic warming, 4 times faster than the global average, is impacting the Jetstream & causing 'heat domes' to form.

- 2020 x1 heat dome in Canada & USA
- 2021 x2 heat domes in China plus Canada & North West USA
- 2022 x5 heat domes globally
- 2023 x4 heat domes globally

The June-August 2022 global land and ocean surface temperature was 1.6 degrees Fahrenheit (0.89 Celsius) above the 20th-century average of 60.1 F (15.6 C). It tied with 2015 and 2017 as the fifth-warmest in the 143-year temperature record. NOAA

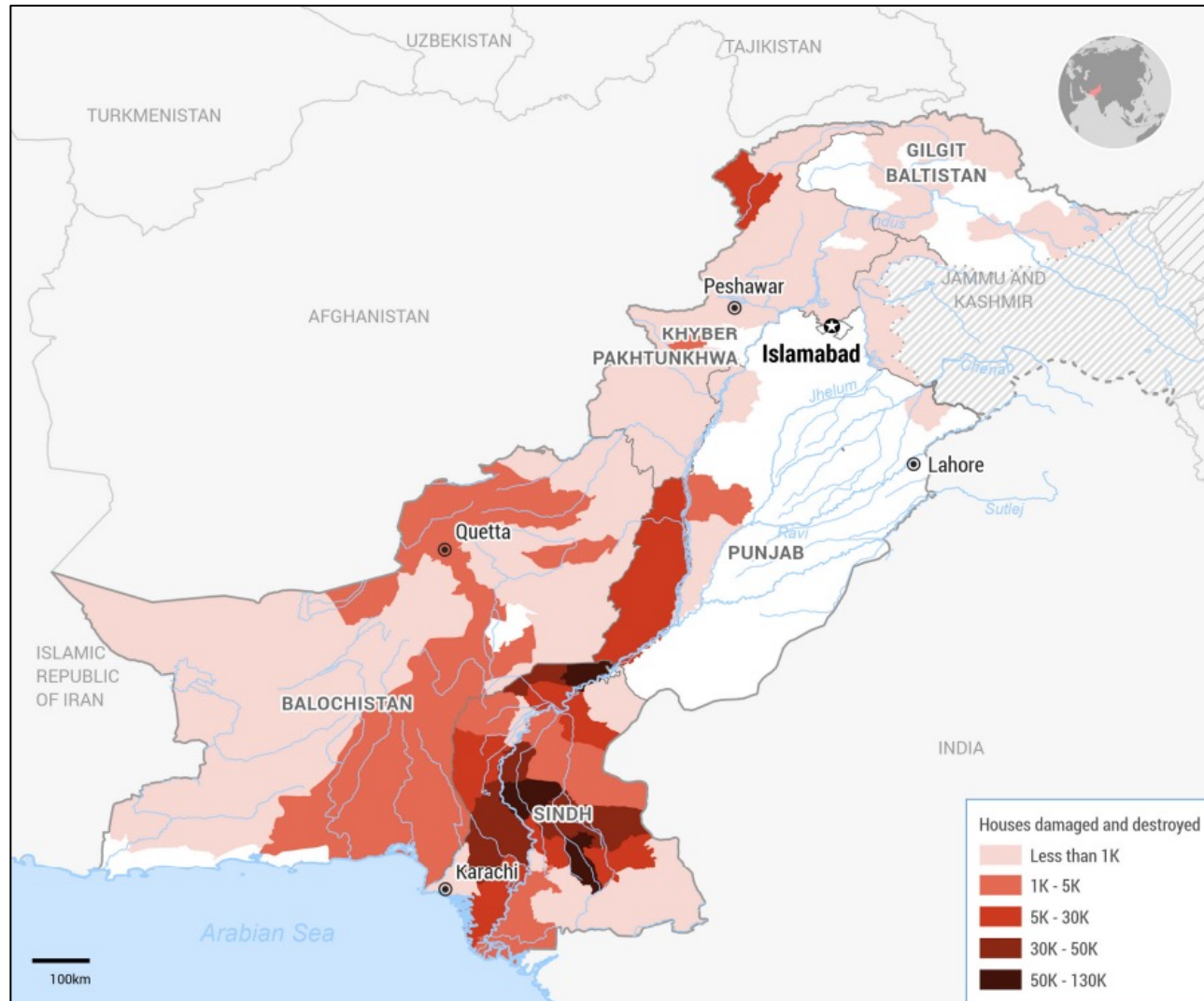
The 2022 Pakistani extreme heat [dome] & precipitation event

As of 25 August 2022 the structural damage to residential infrastructure from the extreme heat / extreme precipitation event caused by Wave Number 5 was unprecedented, even in a country used to significant and dangerous flood events linked to the monsoon.

Despite the well-understood mechanisms of heat waves and heavy rainfall, current knowledge on the abrupt transitions from deadly heat waves to devastating downpours remains unclear as they are usually treated as isolated events.

Such consecutive events are projected to occur more frequently in China under a warming climate. When multiple extremes occur [leveraged by 'internal/natural variability'] in rapid sequence, their impacts cascade to cause disproportionate damages.

The event released 720mm of rain over 2 days, which was more than the annual average for the region. At the height of the event, 380mm of rain fell in 6 hours



670,328

Total houses destroyed and damaged

452,098

Total houses damaged

218,230

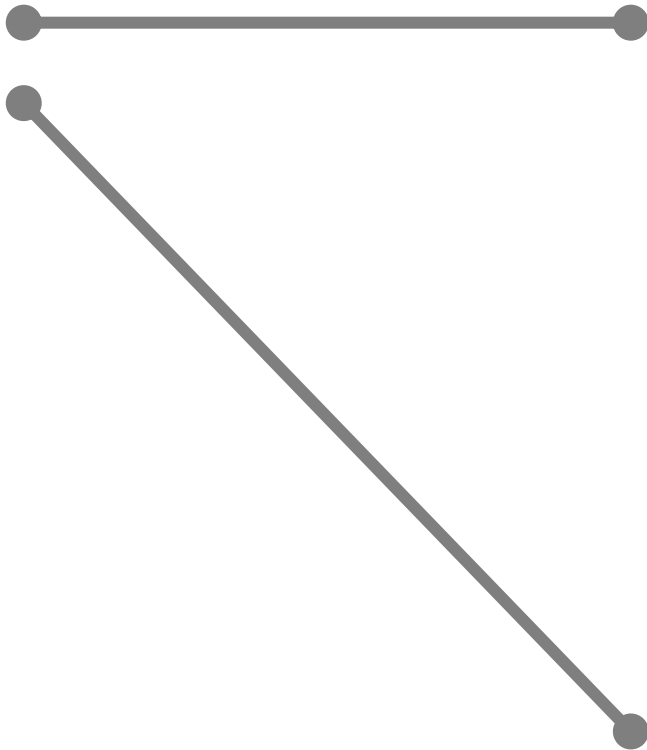
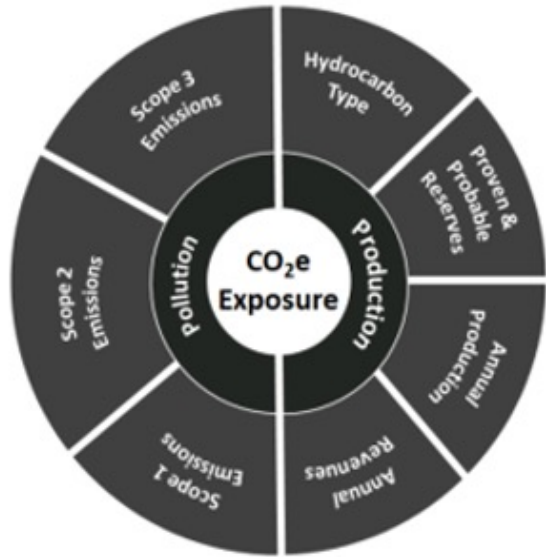
Total houses destroyed

c1,400 Killed

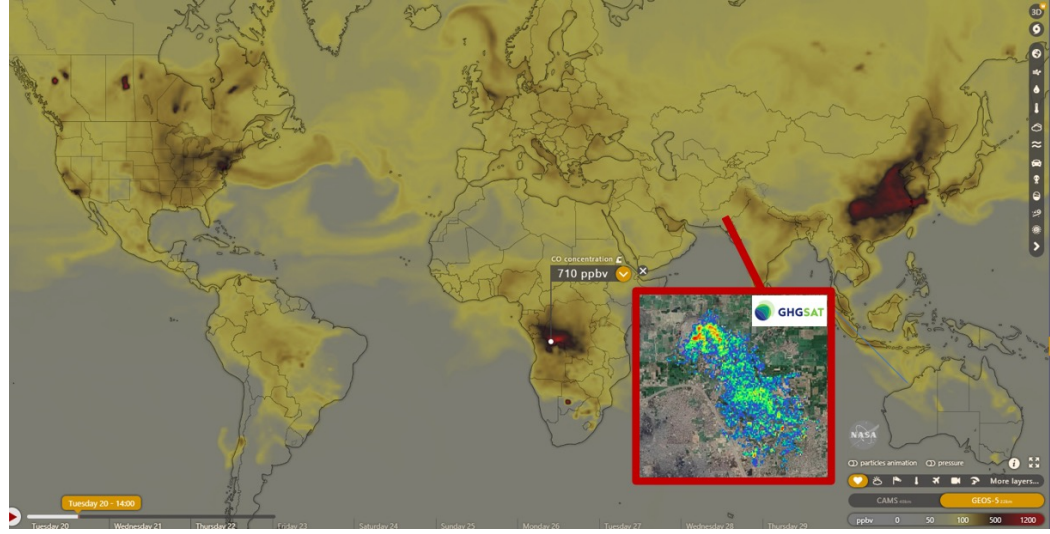
c\$40bn of Economic Damage

<https://reliefweb.int/report/pakistan/pakistan-monsoon-flood-houses-destroyed-and-damaged-25-august-2022>
The chart highlights the loss of homes as a direct result of the extreme heat/precipitation event that commenced on

Verification is also a key attribute of LocVAR



Emissions Profiling



Emissions Profiling Image, Copyright @2024, GHGSat, All Rights Reserved

Do companies pollute

Does the company own hydrocarbon assets or emit pollutants linked to the greenhouse gas effect which, through their release into the atmosphere, represent a risk to the future stability of global climate and eco systems

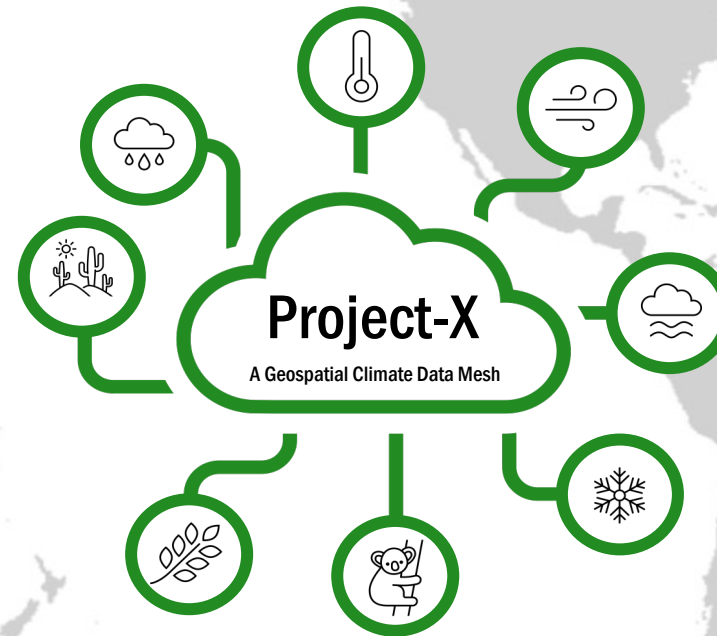
Carbon

Trying to restrict the impact of CO₂e through markets & legislation

Use of Proceeds



Creating one common framework with OS-Climate <https://os-climate.org/>



OS-Climate, Project-X Climate Data Registry



The Project-X Platform is a lightweight geospatial temporal mesh that offers a uniform global grid, a geospatial viewer, and climate data marketplace that makes it easy to find and consume any type climate data

Diverse User Community

Data scientists, climate specialist, risk specialists, business user, and developers are our target audience.

Geospatial / Temporal Viewer

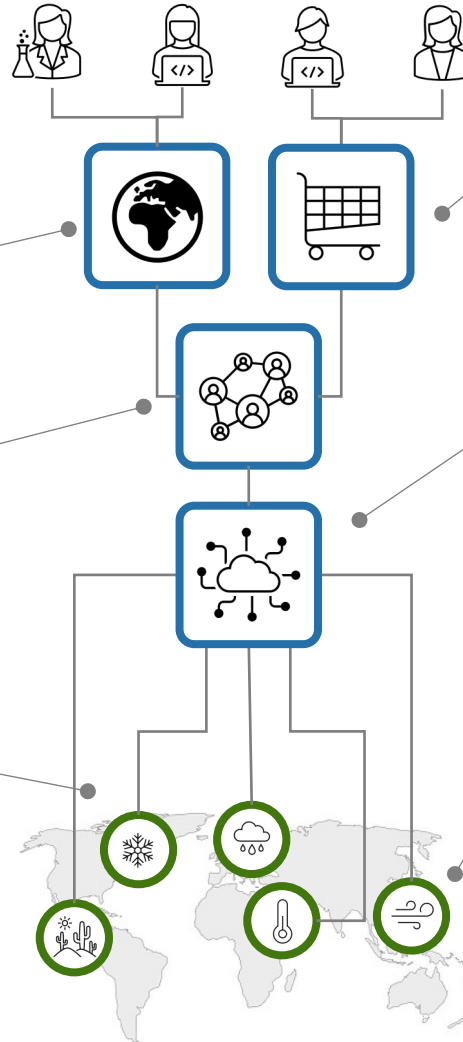
Most climate data and related analytics requires geospatial and temporal capabilities; The Registry is optimized for geospatial temporal data visualization and analytics.

Lightweight Registry

A lightweight and scalable DNS-like registry provides pathways to global data products.

Global Data Products

Data products can be owned by anyone and can consist of any climate related data (assets, demographics), at any scale; We provide templates for geospatial temporal data products



Two-Sided Marketplace / User Portal

A self-serve platform coupled to a 2-sided marketplace (supports data consumers and publishers) allows consumers can find and consume data on their own; climate data product owners can self-register and self-publish their data products.

Geospatial Temporal Data Mesh

A scalable, secure, and reliable data mesh connects climate data products globally into a geospatial temporal grid; Components provide translation to uniform geospatial and temporal grids

Federated “Certification” and Governance Engine

Like the ASA/ANSI, a “brand” is provided for those data products that comply to desired levels of trustworthiness and standards; Compliance and reporting on compliance is delegated to climate data product owners; Lineage and Provenance is integrated into each data product.

OS-Climate Project-X Data Landscape



Project-X contains data for climate, asset, demographic, biodiversity, and any related geospatial / temporal data required to perform high quality and trusted physical risk and transition risk analysis

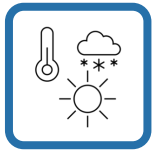
Geospatial Temporal Data Mesh

Uniform and standard grid of cells for climate / geospatial data, available at any resolution, for any period.

- Project-X provides a uniform coordinate system, based upon Uber's popular H3 schema, for all climate data.
- Each H3 cell maps climate data into a uniform grid at varying resolution – from millions of square kilometers to under 1 square meter.
- Standard, verifiable, and transparent methods are used to interpolate sparse climate data into a uniform mesh.

Climate Data

Precipitation, temperature, flood, drought, sea level data, and more



Biodiversity Data

Forestry, agriculture, animal, species



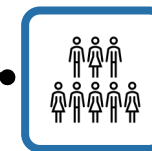
Asset Data

Public and private asset directory



Demographic Data

Population centers, country, region, locales

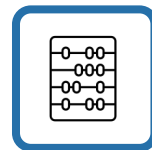


Value-Added Future Capability "Plug-Ins"

Material amounts of data, including assets, models, and valuation calculations may be proprietary. Our goal is to allow third-parties (for example, academic institutions) to offer public calculation engines and "certified" climate models

Calc Engines

Compute capacity to calculate valuations/models



Model Inventory

Public and private "certified" model Inventory



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