

Asset-level Data and Spatial Finance Use Cases for the Cement and Steel Sectors



Introduction

This report summarizes the user research that accompanied the creation of the Spatial Finance Initiative's (SFI), open asset-level databases for the cement and steel industries. This work was undertaken by SFI partners (Satellite Applications Catapult, Oxford Sustainable Finance Programme, Alan Turing Institute) and Astraea Inc. It is part of the GeoAsset project, which is a public goods endeavour focused on making accurate, comparable, and comprehensive asset-level data tied to ownership publicly available across all major sectors and geographies. The work of GeoAsset is a core part of SFI's mission to mainstream geospatial data and analysis into finance.

The report provides an overview of the wide range of use cases identified for asset-level data and analysis from engagements with potential users and partners. For the purpose of this report these insights have been anonymised and summarized per theme and per user group.

Asset-level data for cement and steel industries project overview



Credit: Google

Background

Steel and cement production are two of the most emissions intensive industries, accounting for around 6.7% and 8% of global CO₂ emissions, respectively. They have significant environmental impacts beyond carbon, including the substantial energy requirements and the significant amount of natural resources consumed during production. As such, a global transition strategy to environmental sustainability, including net zero by mid-century, requires a complete understanding of these sectors.

Importance

Detailed and complete data on physical assets are required in order to adequately assess environment-related risk and impact exposure and the diffusion of these risks and impacts through the financial system. It is a crucial building block for a wide range of use cases and spatial finance applications.

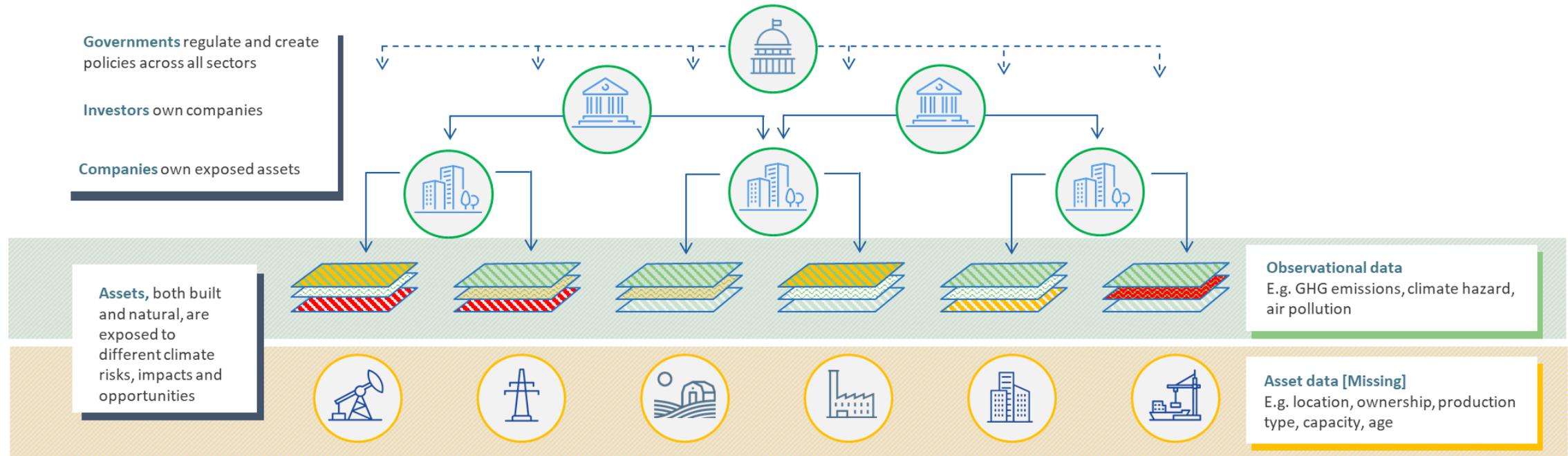
Objective

This project aims to create an open-source asset-level database (ALD) for the cement and iron & steel sectors including exact details on asset location, production process and capacity, utilisation rate and ownership.

Approach

The project team used a combination of manual and machine learning techniques to analyse satellite, geospatial and web-based datasets to extract asset-level information in a transparent and repeatable way.

What is spatial finance and asset-level data?



Spatial finance and asset-level data

'Spatial finance' is the integration of geospatial data and analysis into financial theory and practice. Combining earth observation and remote sensing with AI can transform the availability of information in our financial system, and change how risks, opportunities, and impacts are measured and managed by financial institutions and civil society. By incorporating geospatial data into financial decision making, spatial finance provides an opportunity to enhance transparency within the financial system for both practitioners and data providers. At its most basic level, asset-level data provides the accurate location and definition of ownership of a commercial asset, which is a fundamental building block to make geospatial analysis relevant for finance, policymakers or NGOs. Asset-level insights can be aggregated at the company, portfolio, or country level.

Types of asset-level data

Foundational asset-level data or 'asset data' includes information about an asset which is relatively static such as location, ownership, capacity, age. Etc.

Observational asset-level data includes information about local conditions that change much more frequently over time such as pollution, productivity, land cover, etc. This type of data is typically collected or derived from sensors. The combination of both types of asset-level data allows for actionable and timely analysis.

Use cases

User research insights from engagements throughout the project have been summarized per use case theme:

- Improving engagements and evidence for activists and analysts
- Driving sustainable dis/investment
- Quantifying the need for industrial process technology transformation

And have been listed per user type:

- Financial institutions and regulators
- Financial and ESG analytics and consultancies
- Civil society, research and academia
- Geospatial analytics providers

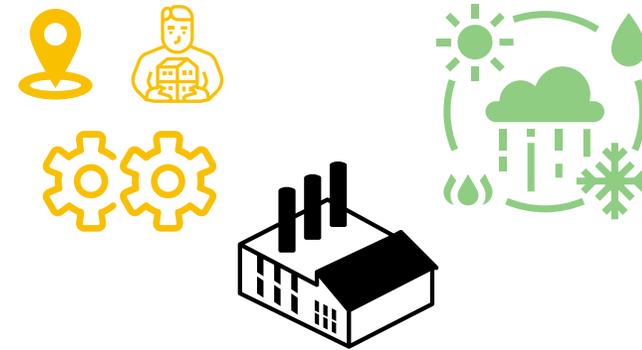
Users and use cases

In summary, anybody with an interest - *financial, environmental, reputational or otherwise* - in the performance or impact of a physical asset – *natural or manmade* - could utilise foundational and observational data on that asset to derive insight helping to inform their strategy, decisions and actions.

Different users' objectives range from understanding, reducing or mitigating impacts of projects to profiting from exclusive data that might better forecast operational performance of facilities and in-turn profitability of their operating companies.

Asset-level data is a key enabler of 'green' agendas; detailed and complete data on physical assets is required to adequately assess environment-related risk, opportunity and impact exposure and the diffusion of these risks and impacts through the financial system.

For example, tracking whether companies, portfolios, sectors, or regions are aligned with international agreements and commitments – like the 2015 Paris Agreement. Asset-level data makes it significantly easier to track climate mitigation efforts against target transition strategies.



Supplying Foundational and
Observational Data on a Physical
Asset



To Data
Users

+



Who have
Objectives, agendas
and goals



Leads to better informed actions
as a result of better insight.

Steel & cement asset-level data use cases summary

Asset-level data can transform (heavy) industries through both financial and non-financial pressures across different use cases. We summarised our research in a single narrative focused on greenhouse gas emissions, with use cases enabling each other.

Asset-level data provides granular information on specific facilities, which helps **analysts and activists target and improve corporate engagements on emissions**. By identifying the companies and locations with the highest emissions, and therefore impact on local population health, biodiversity and climate change, engagements can be localised and better targeted. Previously, this information was not easily available for those who needed it or the (impact) information was aggregated at the company/country level. Manufacturers themselves, their customers and the local/regional decision makers can now be engaged with meaningful, impartial 3rd party data on specific issues. Customers like VW Automotive are already making commitments to coal free-steel and decision makers can seek to drive policy change.

Once identified and quantified, asset-level data or reports from activists and analysts provide evidence for use cases that **drive sustainable dis/investment**. Within this group, Paris-agreement-aligned portfolio comparisons/corrections and shareholder-led resolutions drive sustainability-minded engagement and the movement of funds towards less emission intensive or lower physical climate risk manufacturers. Institutional investors and agencies can harness higher-resolution, bottom-up environmental, social and governance (ESG) research using asset-level

1. Identify and quantify high impact facilities, owners and connected decision makers



2. Begin to drive investments away from 'problem' companies and towards 'positive' companies



3. Present investment opportunities to transform industries that maintain capacity, jobs and profitability while reducing emissions.

data, which provides a better footprint of a holding company throughout its subsidiaries and joint ventures. This research prompts re-investment driven by e.g. climate/transition risk, biodiversity impact and enables investors to evidence their own progress towards climate goals to shareholders. For state-controlled companies, sovereign debt can be revaluated based on impartial data.

This realignment of funds and sustainability-minded engagement drives manufacturers, investors and policymakers to **quantify the need for manufacturing process technology transformation**. Using facility technology and age, analysts and investors can identify which facilities have potential to maintain capacity and jobs whilst reducing emissions; or where investments are at risk of becoming 'stranded'. Many western steel manufacturers are already planning a transition away from coal powered furnaces to electric or hydrogen. This will affect demand in energy markets for that region. Analysing asset-level data identifies which regions may require sustainable energy developments to satisfy this new demand.

Greenhouse gas emissions is the most important issue facing the steel and cement industries; however the asset-level datasets can enable many more use cases focused on different types or risks or impacts.

Steel & cement asset-level data use cases summary



1. Improving engagements and evidence for activists and analysts *on emissions, on health or biodiversity impacts*

Asset-level data provides analysts and activists with granular information on specific facilities, which leads to use case **Group 1 – Better evidence for more informed and effective engagement with corporates, investors or policymakers.** By identifying the companies and locations with the highest emissions, and therefore impact on local population health, biodiversity and climate change, engagements can be localised and better targeted. Previously, this information was not readily available for those who needed it or the (impact) information was aggregated at the company/country level. Manufacturers themselves, their customers and the local/regional decision makers can now be engaged with meaningful, impartial 3rd party data on specific issues. Customers like Volkswagen Automotive are already making commitments to coal free-steel and decision makers can seek to drive policy change after analysing the data.



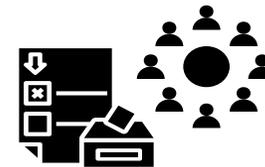
How do activists engage stakeholders on emissions?



Eleanor Hutchinson
NGO Climate Risk Policy Campaigner*

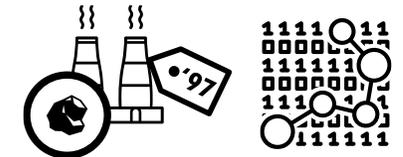
As a campaigner I will present corporates, investors or government officials with data to persuade policy change. Data and analysis may include health impacts, derived GDP impacts but is ultimately reliant on strong facility level data.

Asset-level data gives me the evidence I need to build campaigns and target specific regions, facilities and companies to make our engagements most effective and move the needle on important factors. **We do this by...**



...Creating shareholder resolutions at annual general meetings (AGM).

One such example is ShareAction's [resolution at the Barclays 2020 AGM](#) (shown above). This resolution caused the bank to create its own climate action plan that was voted through, committing the bank to faster Paris alignment. Detailed data on the facilities that Barclays investments are tied to, is crucial to provide an evidence base for this type of resolutions.



...Creating online tools to make data accessible and impactful.

One such example is the [European Coal Exit Tracker](#), which lists the 'Dirty 30'. The Dirty 30 are the 30 most polluting coal power facilities in Europe. With facility level data campaigners have successfully engaged local communities, estimated healthcare costs and impacts and made the issue local, rather than national.

Steel & cement asset-level data use cases summary



2. Driving sustainable dis/investment *through facility emission or physical climate risk analysis*

Once identified and quantified, asset-level data or reports from these activists and analysts provide evidence for financial institutions in use case **Group 2 – Driving sustainable dis/investment**. Within this group, Paris-agreement-aligned portfolio comparisons/corrections and shareholder-led resolutions drive sustainability-minded engagement and the movement of funds towards e.g. less emission intensive or lower physical climate risk manufacturers. Institutional investors and agencies can harness higher-resolution, bottom-up environmental, social and governance (ESG) research using asset-level data, which provides a true footprint of a holding company throughout its subsidiaries and joint ventures. This research prompts re-investment driven by e.g. climate/transition risk, biodiversity impact and enables investors to evidence their own progress towards climate goals to shareholders. For state-controlled companies, sovereign debt is being revaluated based on impartial data.



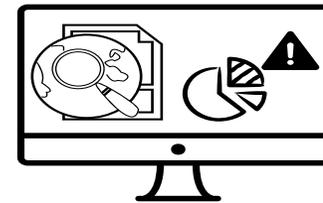
How do individuals drive sustainable dis/investment?



Campbell Hutton
ESG Analyst

As an analyst I'm looking for evidence and data on profitable and ethical investments that align with ESG standards and other targets, such as the Paris Agreement for my clients so they know the impact of their portfolios.

Our industry has two core customers – (1) investors seeking ethical, climate positive investments with evidence; and (2) investors seeking to mitigate the risks associated with climate related changes (Both physical and regulatory) on their investment portfolios. Our data evidences their ability to align their portfolios to these goals. **We do this by...**



...Developing investor reporting and insight analysis dashboards that can display ESG data, generate alerts and help investors quantify the environmental impacts or climate risk within their portfolios.

One such example is TransitionZero's financial analytics that combine observational and foundational asset-level data with sector expertise to support zero carbon transition decisions.



... Creating tailored ESG reports on a specific company, project or region, used to support investment decisions. As these are often produced on a short notice this leads to a reduced confidence in accurately capturing a target company/project's true 'footprint'.

TransitionZero's Turning the supertanker report provides coal fired power plant emission estimates and coal plant closure predictions to support China's clean power transition and net zero ambitions.

Steel & cement asset-level data use cases summary



3. Quantifying the need for industrial process technology transformation through ‘stranded asset’ risk or health impacts

This realignment of funds and sustainability-minded engagement drives manufacturers, investors and policymakers to use case **Group 3 – Quantifying the need for manufacturing process technology transformation**. Using information about facility level characteristics such as technology or age, analysts and investors can identify which facilities have potential to maintain capacity and jobs whilst reducing emissions; or where investments are at risk of becoming ‘stranded assets’ and lose all their value. Many western steel manufacturers are already planning a transition away from coal powered furnaces to electric or hydrogen driven steel making. This will also affect demand in energy markets for that region. Using asset-level data identifies which regions may require sustainable energy developments to satisfy this new demand.



How do analysts identify technology transformation opportunities?



Andy Meza
Senior Industrial Capital Analyst

Every 20-30 years, large industrial plants will have the chance to repair, upgrade or install new technologies at the heart of the value-adding process, for example changing from blast to electric arc furnace.

We want to understand which facilities are coming up for upgrading soon, so we can campaign for and understand the opportunity to maintain jobs and capacity, while also transforming to a lower emission intensive production method.
We do this by...



... Analysing furnace type and age using facility level data, where available. As older plants tend to emit more emissions, we've performed economic modelling to show that not upgrading facilities can lead to unprofitable projects, driven by rising carbon prices and policy pressures.

One example of a relevant open database in this space is [Leadit's Green Steel Tracker](#) centralising low-carbon investment announcements in the steel industry.



... Modelling new electricity demand if plants transitioned, which in turn can be used to justify new green power generation projects

... Publishing technology pathways to show investors and industry how they can reach climate goals, retaining investment interest while meeting new green investor interests.

User groups and their use cases



Financial institutions and regulators

Organisations engaged as part of our user research include commercial banks, asset and investment managers, pension funds, stock exchanges, investment advisory firms and financial regulators.



Civil society, research and academia

Organisations engaged as part of our user research include NGO's, think tanks, universities and research institutes



Financial and ESG analytics and consultancy

Organisations engaged as part of our user research include credit rating agencies, financial data providers, ESG data and rating providers, management consultancies and specialist consultancies



Geospatial analytics providers

Organisations engaged as part of our user research include satellite data providers, data platform and geospatial analytics companies

Use case examples

Financial institutions and regulators

In our user research we have engaged with numerous users across public and private sector to explore their asset-level data use cases. The use cases identified from financial institutions and regulators can be summarised as follows:

Physical climate risk assessments

- Overlay asset-level data with hazard maps or perils information under current and future climate scenarios for portfolio companies or direct clients
- Test physical (and transition) climate risk stress at the asset-level under different Bank of England's Climate Biennial Exploratory Scenarios
- Fill in gaps of publicly disclosed asset-level data from portfolio companies to support climate risk reporting
- Improve climate value at risk assessments to test and inform investment or exclusion strategies in emerging markets

Carbon and emissions accounting

- Measure, account and report carbon emissions for portfolio companies when no information is disclosed by the company itself, allowing for scenario analysis, target setting and progress monitoring at the financial institution level
- Link emissions (modelled, observed or reported) to sustainability data offerings such as indices

Multi ESG risk and impact assessments

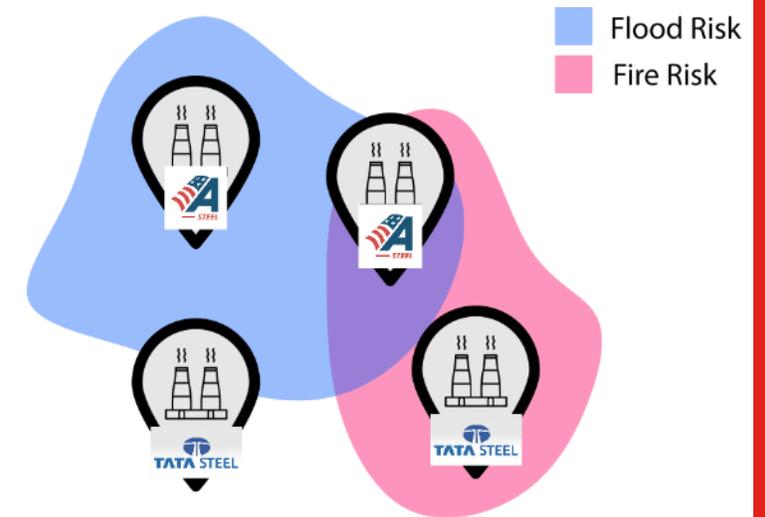
- Create bespoke models and insights into various ESG risks, impacts for companies across different sectors
- Inform ESG investment/exclusion strategies in emerging markets

Engagement and outreach

- Engage with portfolio companies on mitigation of physical and transition climate risks
- Engage with portfolio companies that have activities in or near natural heritage, protected areas or biodiversity hotspots.
- Communicate with consumers and retail investors about real economy impacts of their investments, pensions or savings

Policy implications and stranded assets

- Inform sector wide trade policies based on a better understanding of national and regional capacities and over/under supply
- Understand stranded asset and transition risks and its implications on future trade flows



Example illustration of climate hazards mapped against facilities with respective owners; in this example Tata steel's assets are less exposed to physical climate risks than American steel' assets.

Use case examples

Financial and ESG analytics and consultancies

In our user research we have engaged with numerous users across public and private sector to explore their asset-level data use cases. The use cases identified from financial and ESG analytics providers and consultancies can be summarised as follows:

Physical climate risk assessments

- Overlay asset locations on climate hazard maps to understand risk exposure and changes in risk exposure over time under alternative climate scenarios
- Assess future financial damages because of climate change and associated climate adaptation building or retrofitting costs
- Integrate climate value at risk into ESG and credit ratings
- Increase industry coverage of existing internal asset-level databases or replace proprietary databases with open ones to allow communications about analytical methodologies and datasets used with less restrictions

Transition climate risk and alignment

- Granular understanding of transition climate risk associated with portfolio companies.

ESG risk exposure and screening

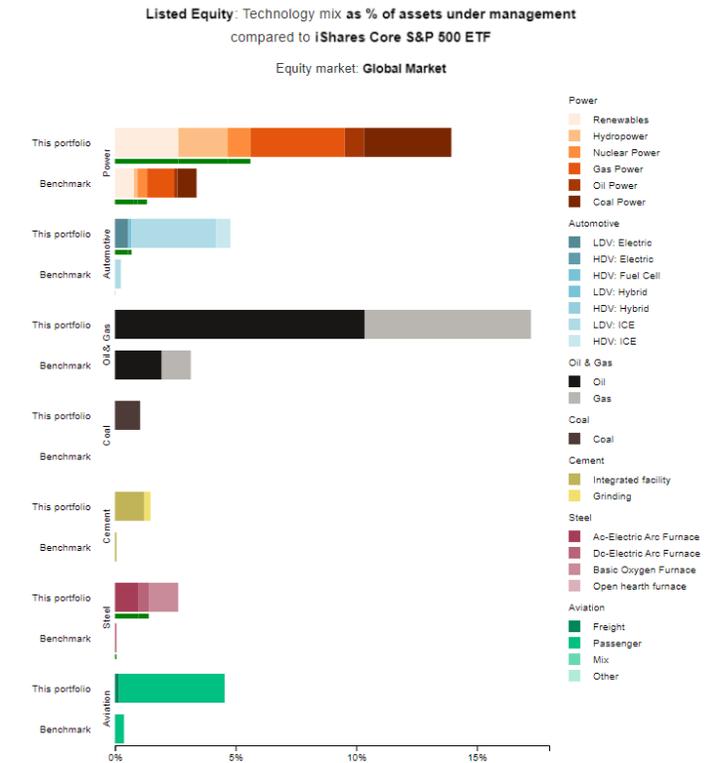
- Translate climate, water or production risk into financial impacts to create forward looking exposure curves
- Incorporate asset-level datasets alongside other alternative datasets into investment sustainability screening tools
- Combine asset-level data with satellite data to generate insights into highly material issues, specific to individual sectors.

Benchmarking

- Benchmark sustainability performance of corporate clients against their industry peers
- Benchmark climate or ESG risk exposure of a company against its peers and test performance implications of excluding that company from a portfolio

Commodities research

- Improve internal research capabilities for publicly traded commodities such as steel



Sample report illustration of portfolio alignment analysis from 2DII's PACTA tool; The analysis is based on forward-looking asset-level data in key climate relevant sectors
Credit: 2 Degrees Investing Initiative

Use case examples

Civil society, research and academia

In our user research we have engaged with numerous users across public and private sector to explore their asset-level data use cases. The use cases identified from civil society, research and academia can be summarised as follows:

Campaigning and policy influencing

- Inputs and evidence to support industrial decarbonisation campaigns targeting governments and corporates
- Overlay with pollution datasets to understand pollution sources and inform campaigns to tackle these issues
- Identify and prioritise key players for direct engagement or shareholder interventions
- Understand (technology/capex) reinvestment cycles for heavy industry at the asset-level to identify intervention points for policy/investment supporting cleaner production technologies

Emissions modelling

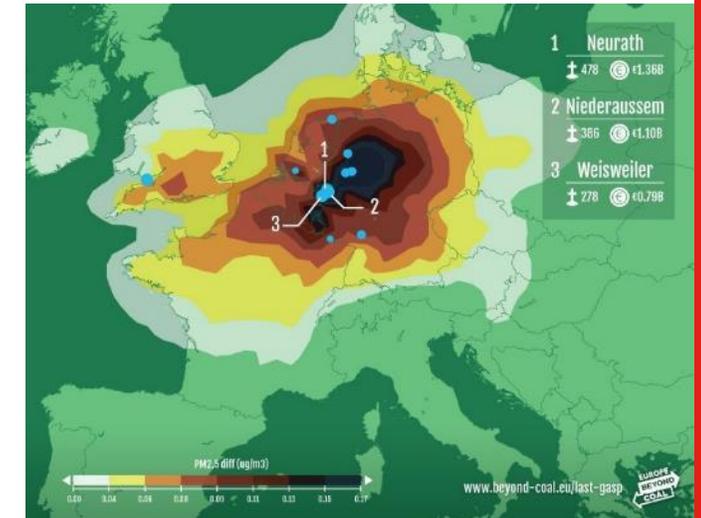
- Measure, model or monitor greenhouse gas emissions across high impact sectors
- Quantify future carbon emissions locked into current active assets in hard to abate industries

Transition planning and monitoring

- Develop climate accountability frameworks on a sector by sector basis, through bespoke sectoral methodologies
- Understand alignment of heavy industry sectors and their investors with climate targets (e.g. Paris agreement)
- Develop sustainable development strategies, models and instruments for in specific sectors

Research

- Increase understanding and transparency around emissions associated with (building) materials
- Understand biodiversity risks and impacts of the sectors by overlaying asset-level data with protected area or endangered species information or develop bespoke impact methodologies
- Understand water risks and pressures by overlaying asset-level data with water risk layers and scenarios
- Understand physical climate risk exposure for publicly listed companies



Coal fired power station health impact modelling illustration from

Ember's Last Gap report; The analysis is based on coal fired power station asset-level data.

Credit: Ember

#1 RWE

Modelled coal plant health impacts for 2016:

- 1,880 Premature Deaths
- 30,000 Asthma symptom days in children
- 690 Chronic bronchitis cases in adults
- 1,320 Hospital admissions due to respiratory or cardiovascular symptoms
- 500,000 Work days lost
- €5.4 Total health cost (high case / € billion)

Use case examples

Geospatial analytics providers

In our user research we have engaged with numerous users across public and private sector to explore their asset-level data use cases. The use cases identified from geospatial analytics providers can be summarised as follows:

Physical climate risk insights

- Provide physical climate risk insights under current and future climate scenarios by overlaying geospatial data layers on asset-level data
- Translate physical climate risk into asset valuation and cashflow impacts

Direct emissions monitoring

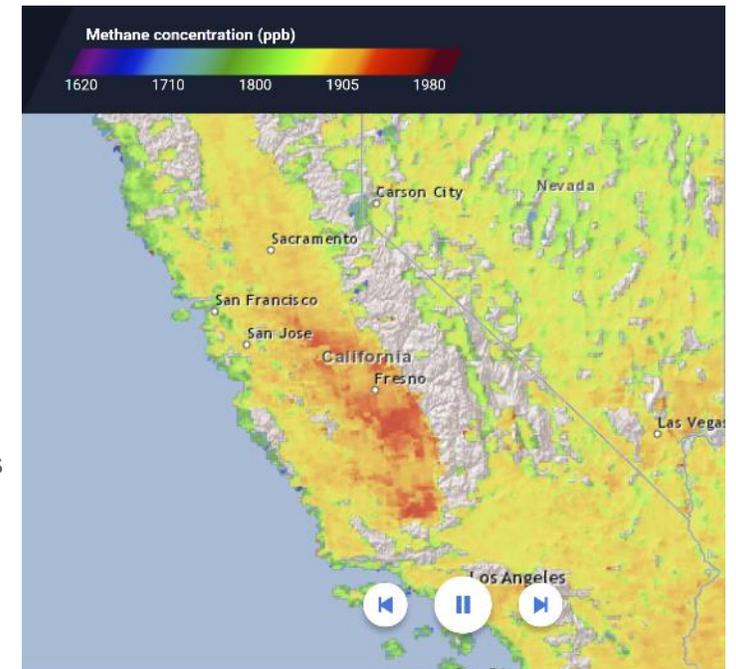
- Overlay asset-level data with satellite observed greenhouse gas emission datasets and attribute emissions to individual assets and their owners

Supply chain insights

- Support clients in understanding ESG impacts across their supply chains

Commodities intelligence

- Derive (steel) commodity pricing signals based on productivity indicators for major (steel) producing assets
- Derive ESG performance indicators based on earth observation datasets and use asset-level databases to attribute those to individual companies



*Illustration of methane concentrations in the atmosphere as observed by the European Space Agency's Sentinel 5P satellite through GHGSat **PULSE** tool;
Credit: GHGSat, ESA*

■ Data Access

SFI global open cement and steel databases

And other open asset-level databases

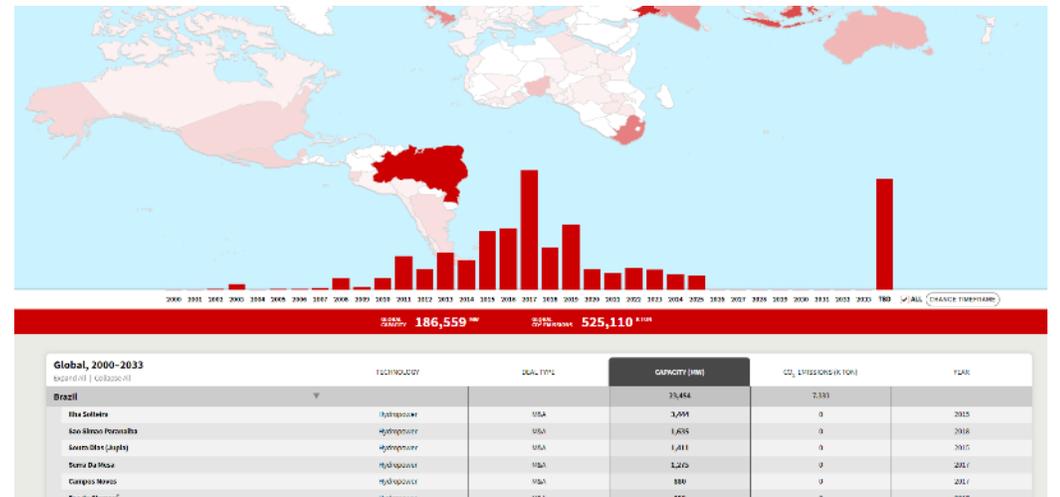
The SFI cement and steel asset-level databases are available for direct download through the [Spatial Finance Initiative](#) website. They are licensed under a [Creative Commons Attribution 4.0 International License](#), allowing for applications with non-profit or commercial purposes.

Various other organisations have created or actively maintain open asset-level databases for different economic sectors with different scopes ranging from facility, to transaction to commitment information. Some examples include:

- [Global Energy Monitor \(GEM\)](#): GEM catalogues worldwide fossil fuel projects in a database of wiki pages and aggregated in ‘trackers’ covering coal fired power stations, fossil infrastructure, coal mines, gas plants and more. The [Global Steel Plant Tracker](#) provides information on global crude steel production plants, and includes information on every plant currently operating at a capacity of one million tonnes per year (mtpa) or more of crude steel. SFI is actively working with the GEM team to align both databases for easier integration.
- [Global Tailings Portal](#): Grid-Arendal’s free, searchable database contains detailed information on more than 1,800 mine tailings dams around the world, based on mining companies disclosures, in response to requests from [institutional investors](#).
- [Boston University Global Development Policy Centre](#): Datasets underpinning the Centre’s research are made openly available, such as a [database](#) of overseas power plants financed through Chinese foreign direct investment.
- [Green Steel Tracker](#): Developed by the Stockholm Environment Institute and LeadIT, the tracker captures public announcements of low-carbon investments in the steel industry at the asset level.



GEM Global Steel Plant Tracker map. Credit: Global Energy Monitor



China’s Global Power Database map. Credit: Boston University Global Policy Development Centre

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