

BioSpace25 - Biodiversity insight from Space
10 - 14 February 2025 | ESA-ESRIN | Frascati - Italy



ASSET LOCATION DATA TO UNLOCK AND SCALE EO FOR NATURE FINANCE

Christophe Christiaen, Stephanie Walton
13th of February 2025

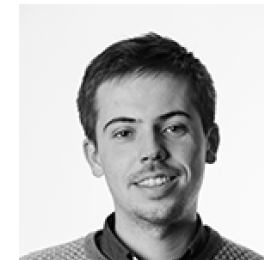
OXFORD SUSTAINABLE FINANCE GROUP

Multi-disciplinary centre for research and teaching in sustainable finance with a vision of *aligning finance with sustainability to tackle global environmental and social challenges*

Research group of >30 staff, researchers and PhD students led by Dr Ben Caldecott

Research topics:

- Data science and machine learning
- Nature finance
- **Spatial finance**
- Transition finance



SUSTAINABLE FINANCE

Green/Sustainable Finance is about:

- Aligning the financial system with global sustainability
= *Greening Finance*
- Financing the transition to global sustainability
= *Financing Green*

Mainstream financial markets - Total financial assets of financial corporations in the *EU* in 2023: **€86 220 billion**

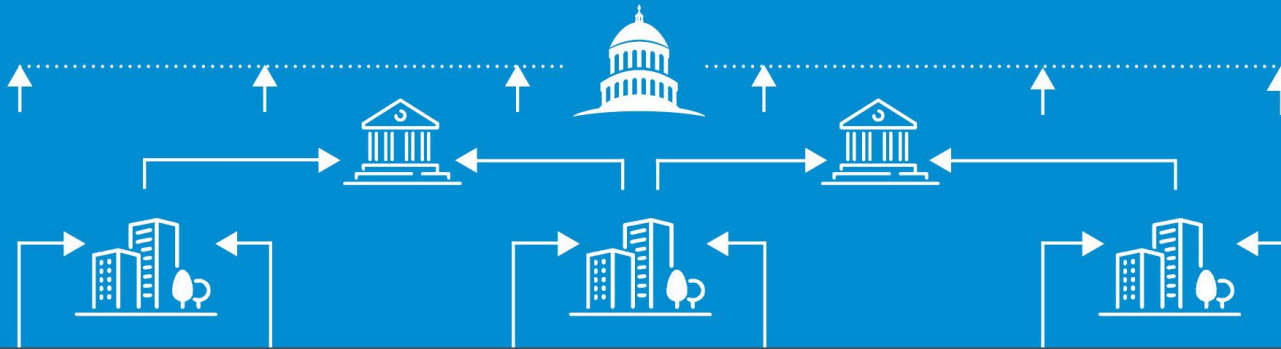
Environmental markets – Total value of traded carbon credits in voluntary carbon markets *globally* by 2023: **€10 billion**

SPATIAL FINANCE AND ASSET-LEVEL DATA

Governments regulate and create policies across all sectors

Investors own companies

Companies own exposed assets



Assets, both built and natural, are exposed to different types of risks, impacts and opportunities which are best understood in their local, spatial context



MODELLED DATA
E.g. Climate hazard, land use, biodiversity intactness, species distribution



OBSERVED DATA
E.g. Optical image, radar image, multispectral image (e.g. GHG emissions)



ASSET DATA
E.g. location, ownership, production type, capacity, fuel, age

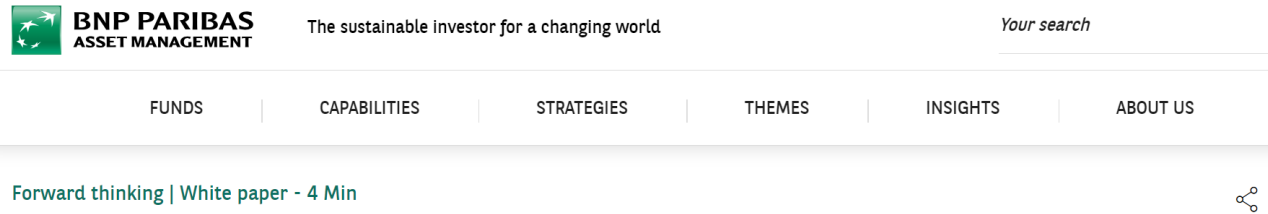
NATURE-RELATED FINANCIAL RISKS



ASSET DATA AVAILABILITY

Limited access to information at the level of firms' physical assets – their location, financial value, non-financial information (e.g., capacity, role in value chain). This means many studies use average sector values and proxy locations (e.g., central office instead of each production plant), which can lead to a mis-estimation of economic and financial shocks.

Source: BNP Paribas Asset Management white paper, 2023,
Asset-level data is crucial to avoid underestimation of physical climate risk

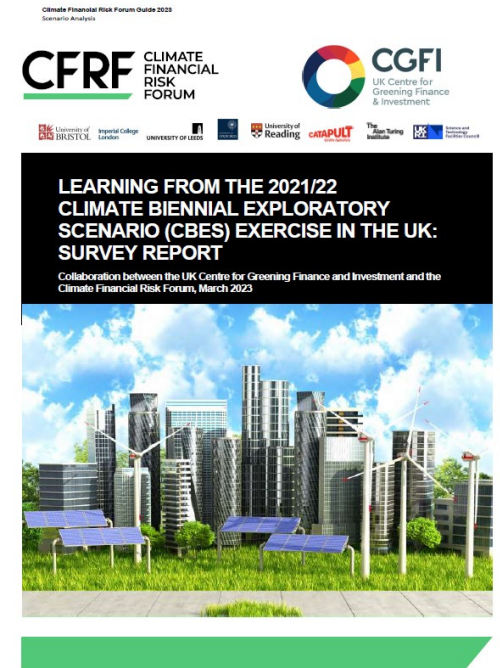


BNP PARIBAS ASSET MANAGEMENT The sustainable investor for a changing world Your search

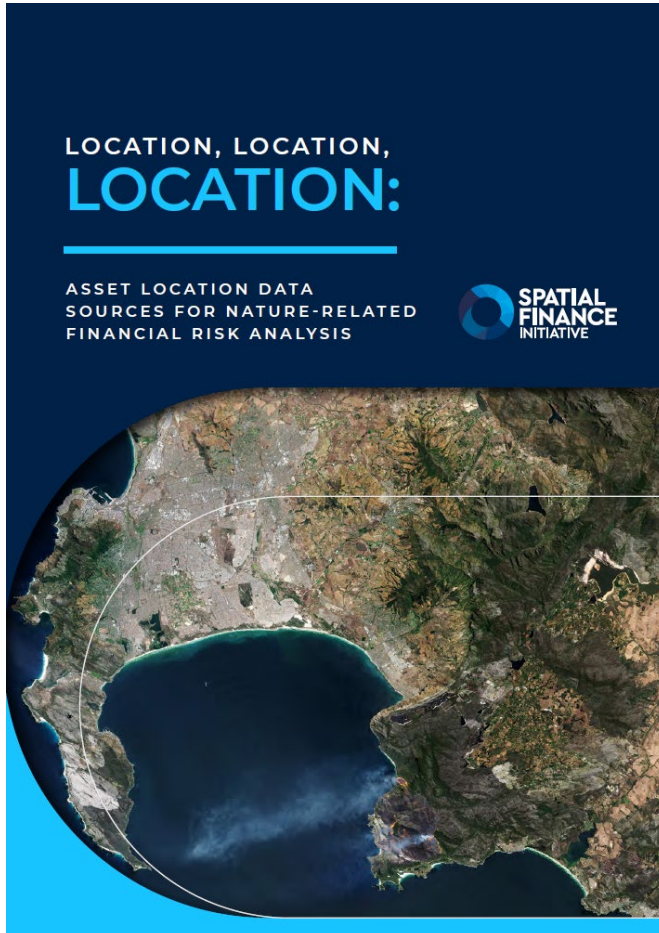
FUNDS | CAPABILITIES | STRATEGIES | THEMES | INSIGHTS | ABOUT US

Forward thinking | White paper - 4 Min

Asset-level data is crucial to avoid underestimation of physical climate risk



ASSET LOCATION DATA SOURCES

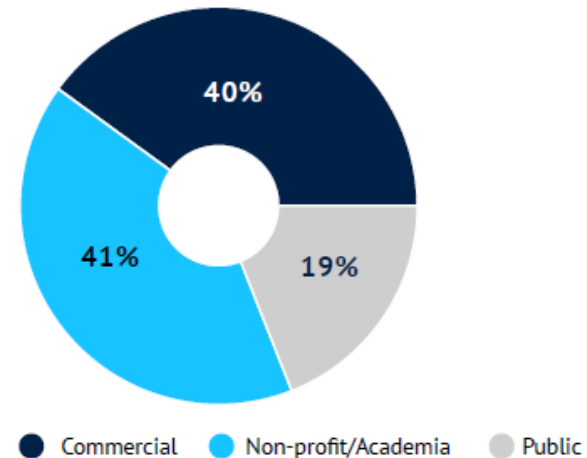


Three sources of asset location data:

- Corporates
- Public bodies
- 3rd party (data) providers

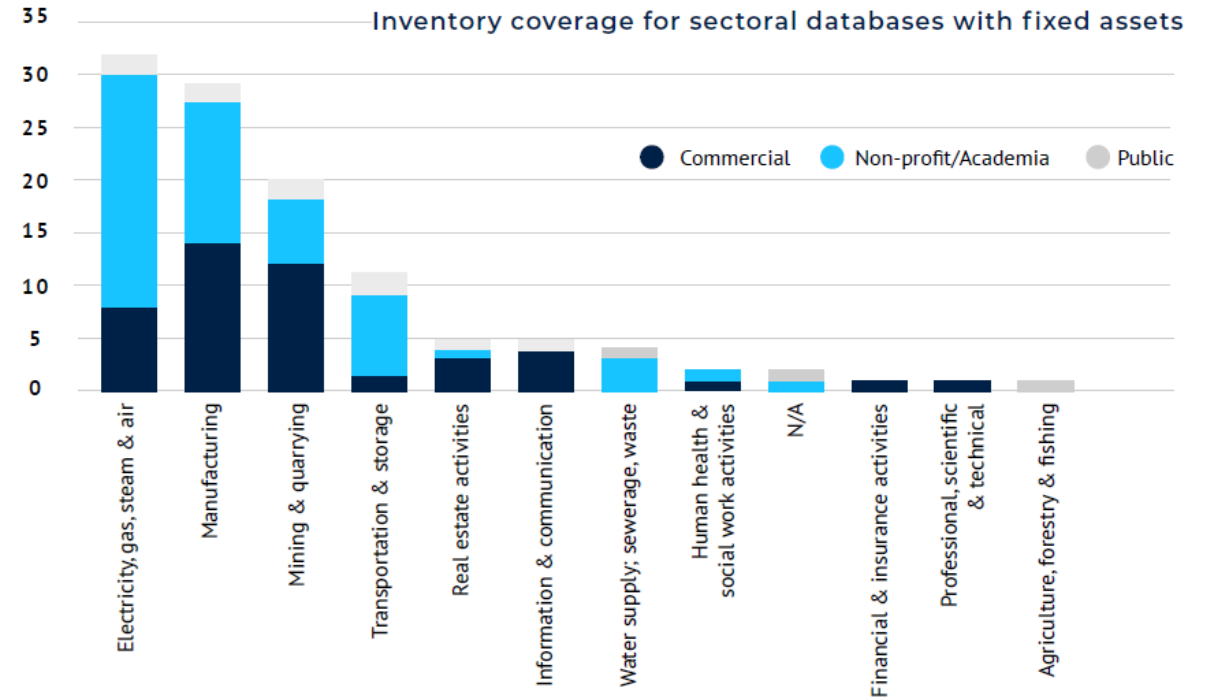
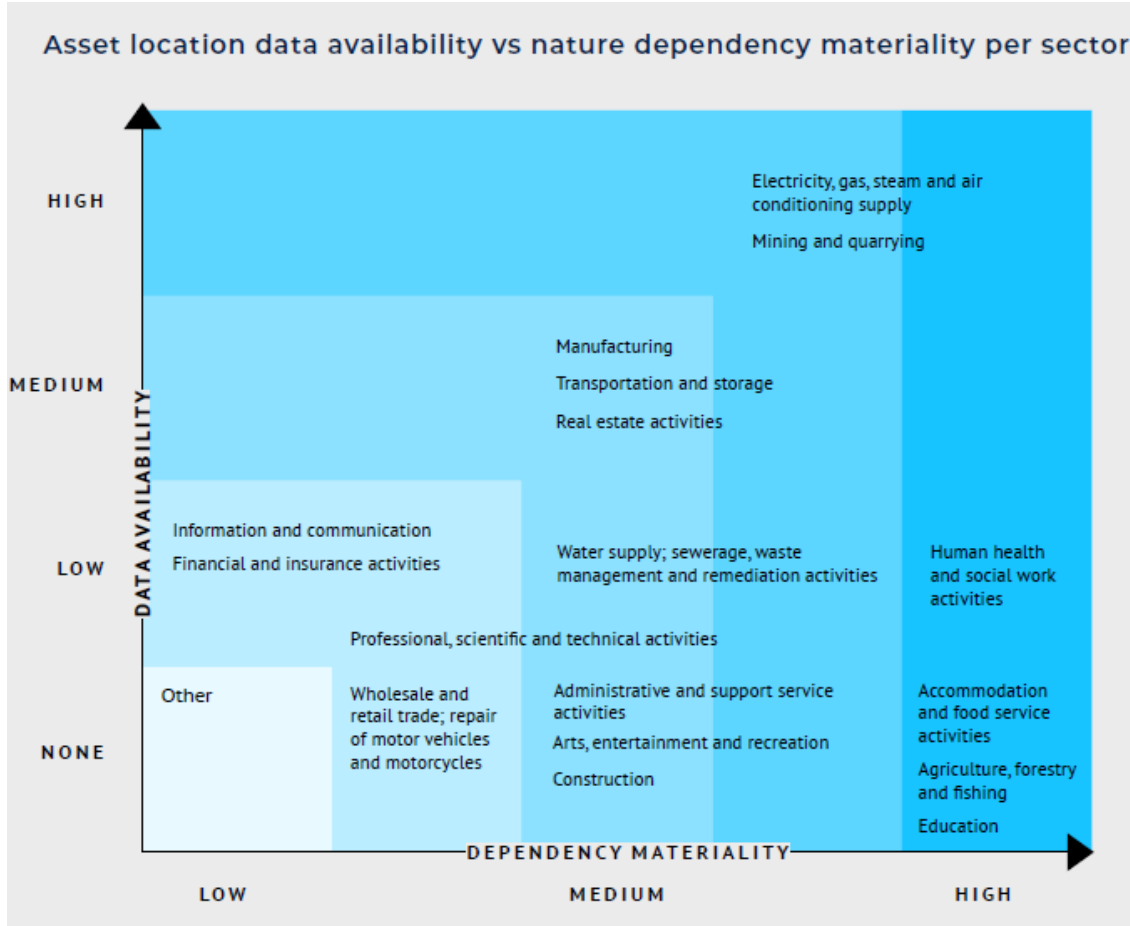
Inventory of 145 asset databases

Inventory breakdown by data source



Source: Planet

ASSET LOCATION DATA AVAILABILITY



GEOASSET: OPEN ASSET DATABASES



Beef Abattoirs

119 facilities across the 5 largest international meatpackers

Download



Cement

3,117 cement production plants worldwide

Download



Iron and Steel

1,598 iron and steel production plants worldwide

Download



Petrochemicals

303 ethylene facilities worldwide;
295 base chemical facilities in Europe and North America

Download



Paper and Pulp

3,403 pulp and paper production facilities worldwide

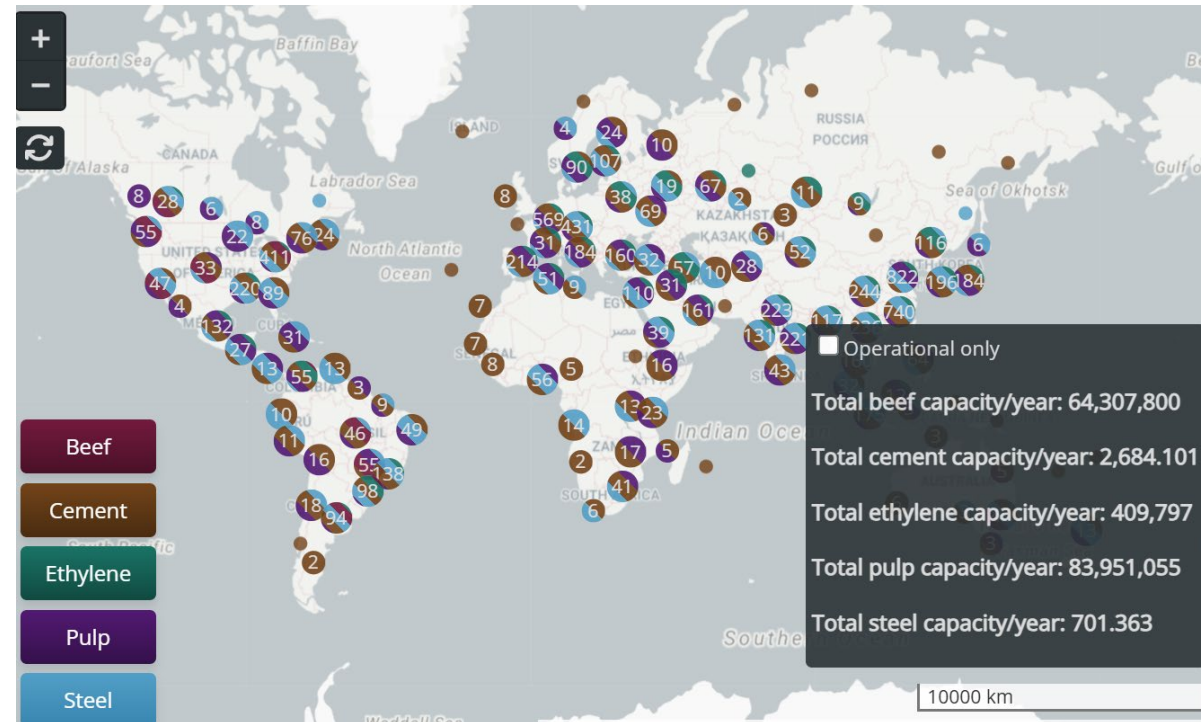
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Waste Management

1,490 wastewater treatment plants in Europe

Download

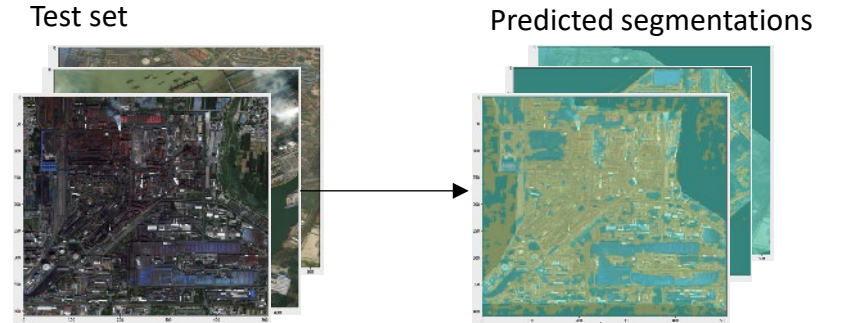
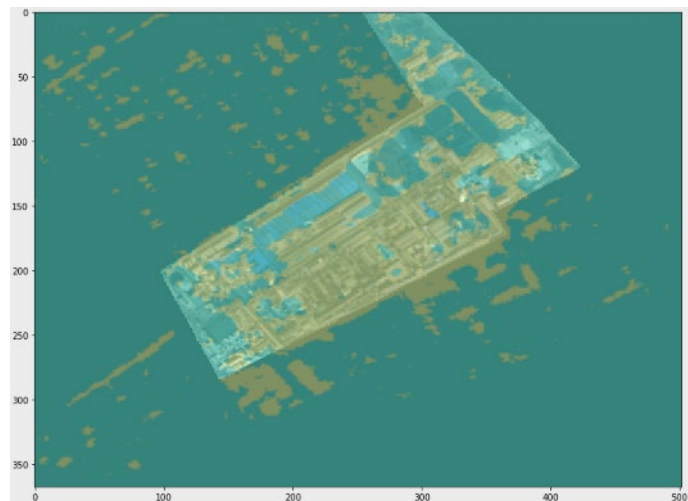
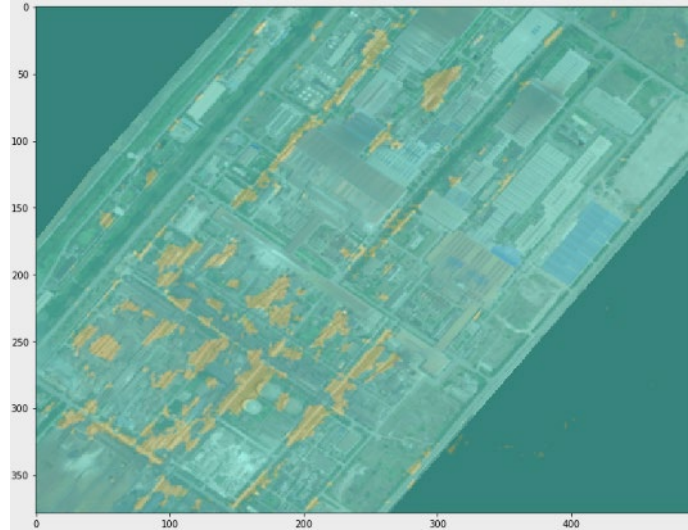
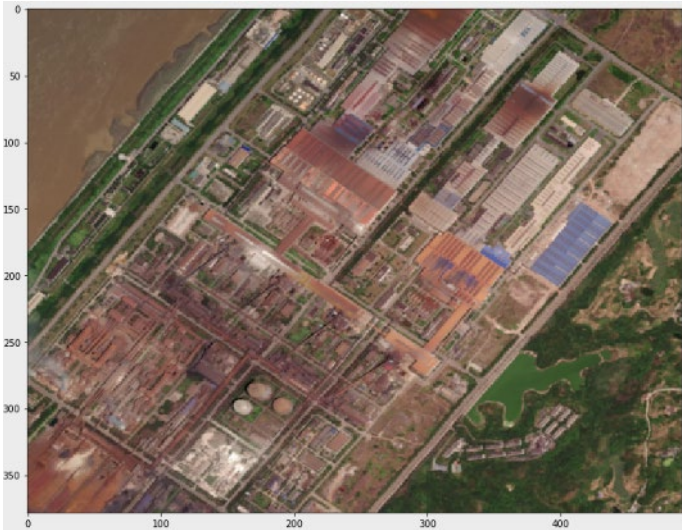


GEOASSET: OPEN GLOBAL ASSET DATABASES

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	uid	city	state	country	iso3	country_code	region	sub_region	latitude	longitude	accuracy	status	plant_type	production_type
2	GACTAFG0001	Pol-e Khomri	Baghlan	Afghanistan	AFG	4	Asia	Southern Asia	35.9658	68.686338	Exact	Operating	Integrated	Wet
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	
5	GACTAGO0002	Cacuaco	Luanda	Angola	AGO	24	Africa	Sub-Saharan Africa	-8.796392	13.42678	Exact	Operating	Integrated	Dry
6	GACTAGO0003	Lobito	Benguela	Angola	AGO	24	Africa	Sub-Saharan Africa	-12.342644	13.581766	Exact	Operating	Grinding	
7	GACTAGO0004	Sumbe	Kwanza-Sul	Angola	AGO	24	Africa	Sub-Saharan Africa	-11.185243	14.030804	Exact	Operating	Integrated	Dry
8	GACTAGO0005	Ícolo e Bengo	Benguela	Angola	AGO	24	Africa	Sub-Saharan Africa	-9.101295	13.567408	Exact	Operating	Integrated	Dry
9	GACTAGO0006	Benguela	Benguela	Angola	AGO	24	Africa	Sub-Saharan Africa	-12.537825	13.496729	Exact	Operating	Grinding	
10	GACTALB0001	Rrethi i Lezhës	Qarku i Lezhës	Albania	ALB	8	Europe	Southern Europe	41.83677	19.63345	Exact	Operating	Grinding	
11	GACTALB0002	Rrethi i Krujës	Qarku i Durrësit	Albania	ALB	8	Europe	Southern Europe	41.503079	19.743606	Exact	Operating	Integrated	Dry
12	GACTALB0003	Rrethi i Krujës	Qarku i Durrësit	Albania	ALB	8	Europe	Southern Europe	41.549091	19.725338	Exact	Operating	Integrated	Dry
13	GACTALB0004	Rrethi i Elbasanit	Qarku i Elbasanit	Albania	ALB	8	Europe	Southern Europe	41.120103	20.045136	Exact	Operating	Integrated	
14	GACTARE0001	Eastern Region	Abu Dhabi	United Arab Emirates	ARE	784	Asia	Western Asia	24.003398	55.438602	Exact	Operating	Integrated	Dry
15	GACTARE0002	Al Ain	Abu Dhabi	United Arab Emirates	ARE	784	Asia	Western Asia	24.137441	55.733956	Exact	Operating	Integrated	Dry
16	GACTARE0003	Dubai	Dubai	United Arab Emirates	ARE	784	Asia	Western Asia	24.998572	55.134171	Exact	Operating	Grinding	
17	GACTARE0004	Ghalilah	Ras al Khaimah	United Arab Emirates	ARE	784	Asia	Western Asia	25.972745	56.070834	Exact	Operating	Integrated	Dry
18	GACTARE0005	Dubai	Dubai	United Arab Emirates	ARE	784	Asia	Western Asia	25.00427	55.12941	Exact	Operating	Grinding	
19	GACTARE0006	Ras Al-Khaimah	Ras al Khaimah	United Arab Emirates	ARE	784	Asia	Western Asia	25.548753	55.986541	Exact	Operating	Integrated	Dry
20	GACTARE0007	Dibba Al Fujairah	Fujairah	United Arab Emirates	ARE	784	Asia	Western Asia	25.552944	56.226827	Exact	Operating	Integrated	Dry
21	GACTARE0008	Ras Al-Khaimah	Ras al Khaimah	United Arab Emirates	ARE	784	Asia	Western Asia	25.558872	55.985251	Exact	Operating	Integrated	Dry
22	GACTARE0009	Abu Dhabi	Abu Dhabi	United Arab Emirates	ARE	784	Asia	Western Asia	24.315716	54.495748	Exact	Operating	Grinding	
23	GACTARE0010	Eastern Region	Abu Dhabi	United Arab Emirates	ARE	784	Asia	Western Asia	24.040157	55.593386	Exact	Operating	Grinding	
24	GACTARE0011	Dubai	Dubai	United Arab Emirates	ARE	784	Asia	Western Asia	25.157152	55.242025	Exact	Operating	Integrated	Dry
25	GACTARE0012	Adhen Village	Ras al Khaimah	United Arab Emirates	ARE	784	Asia	Western Asia	25.386639	55.968218	Exact	Operating	Integrated	Dry
26	GACTARE0013	Ghalilah	Ras al Khaimah	United Arab Emirates	ARE	784	Asia	Western Asia	25.975192	56.068896	Exact	Operating	Integrated	Dry
27	GACTARE0014	Ghalilah	Ras al Khaimah	United Arab Emirates	ARE	784	Asia	Western Asia	25.964045	56.069847	Exact	Operating	Integrated	Dry
28	GACTARE0015	Al Sajaa Industrial Area	Sharjah	United Arab Emirates	ARE	784	Asia	Western Asia	25.296089	55.617005	Exact	Operating	Integrated	Dry

3,117 cement production assets accounting for ~90% of global cement production capacity

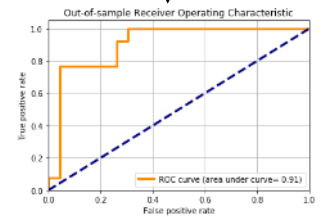
EO FOR ASSET IDENTIFICATION



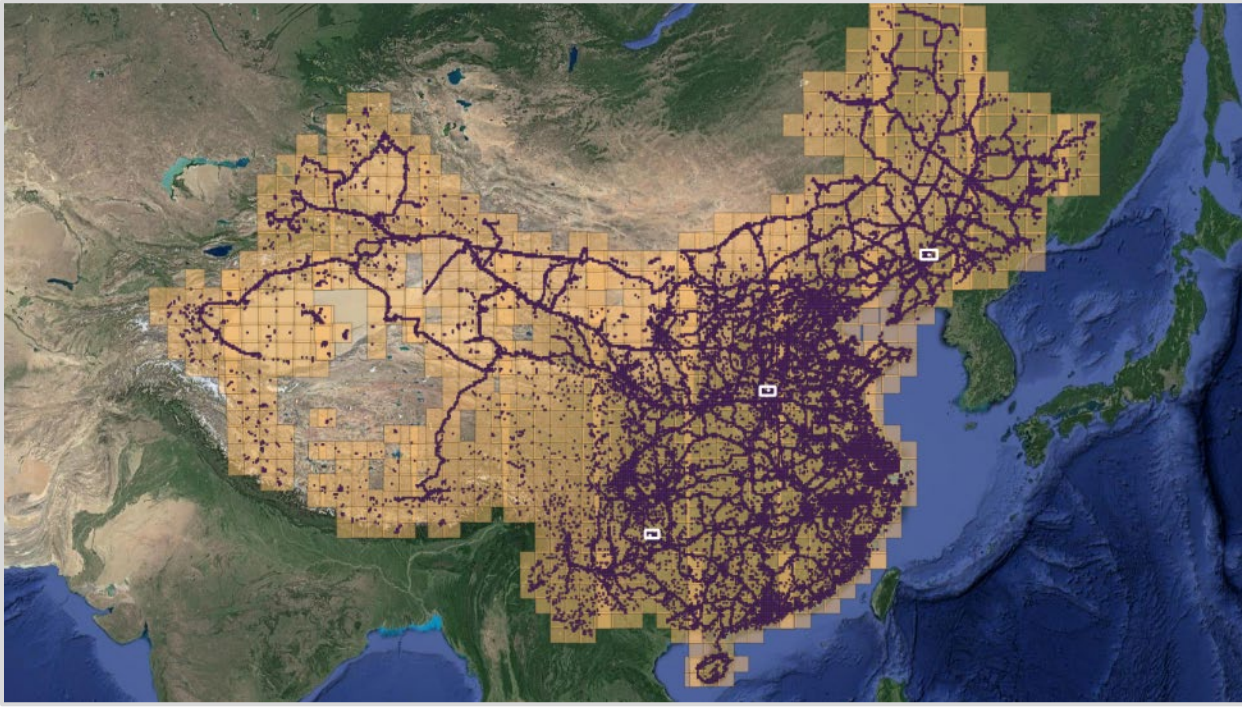
Per-image scores

S_1, S_2, \dots, S_{36}

Quantify test set performance



EO FOR ASSET IDENTIFICATION



New Plant



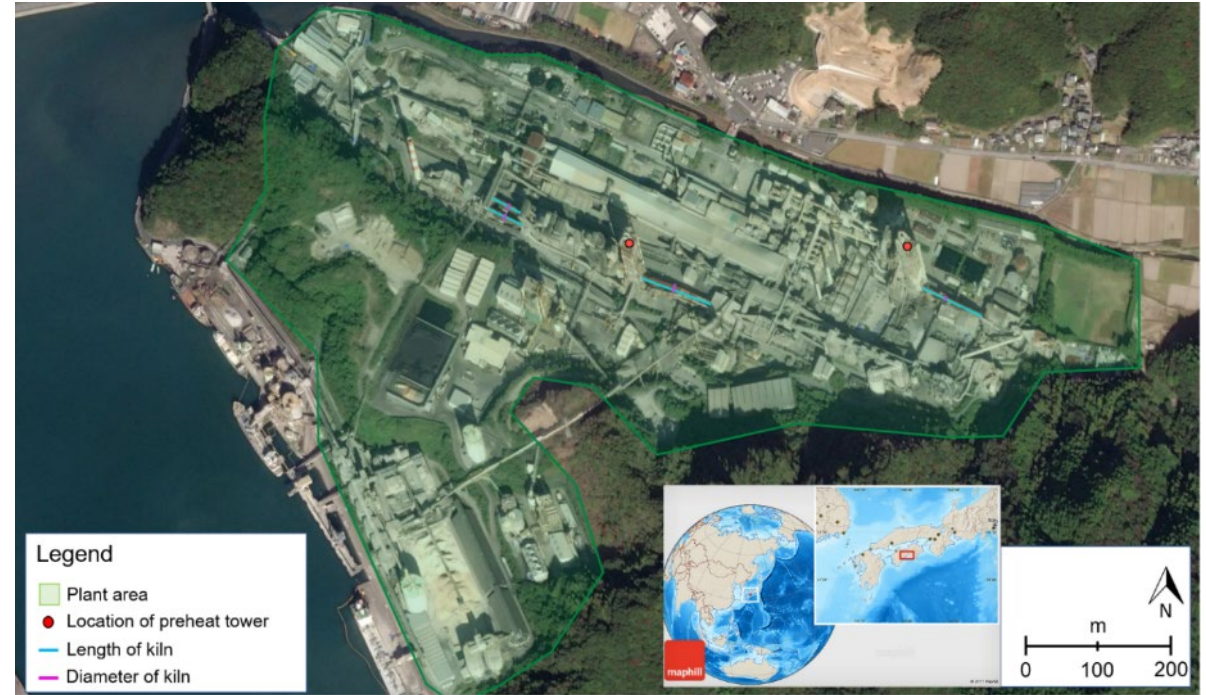
Known Plant



False Positive

Source: Spatial Finance Initiative, Astraera Inc

EO FOR ASSET CHARACTERISATION



Source: Image © 2021 Maxar Technologies

EO FOR ASSET CHARACTERISATION

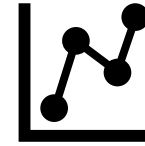
Cargill | Dodge City, KS | 1991-2024



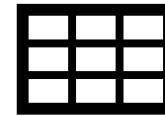
Media Reports



Financial Filings



'Capacity'
Regression



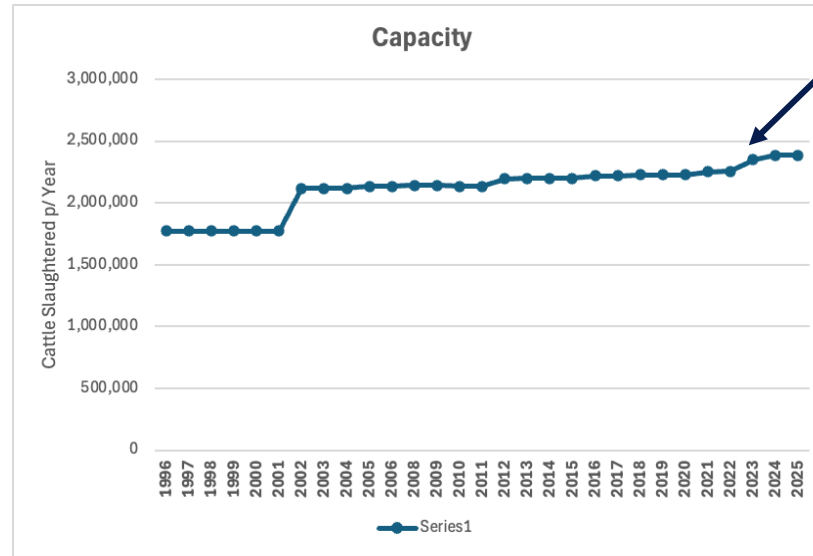
Payback Period



'Committed'
Nature
Impact

ASSET RISK/IMPACT MODELLING

Tyson | Amarillo, TX



\$200 million capital injection in 2022

Payback Period:
~14 years

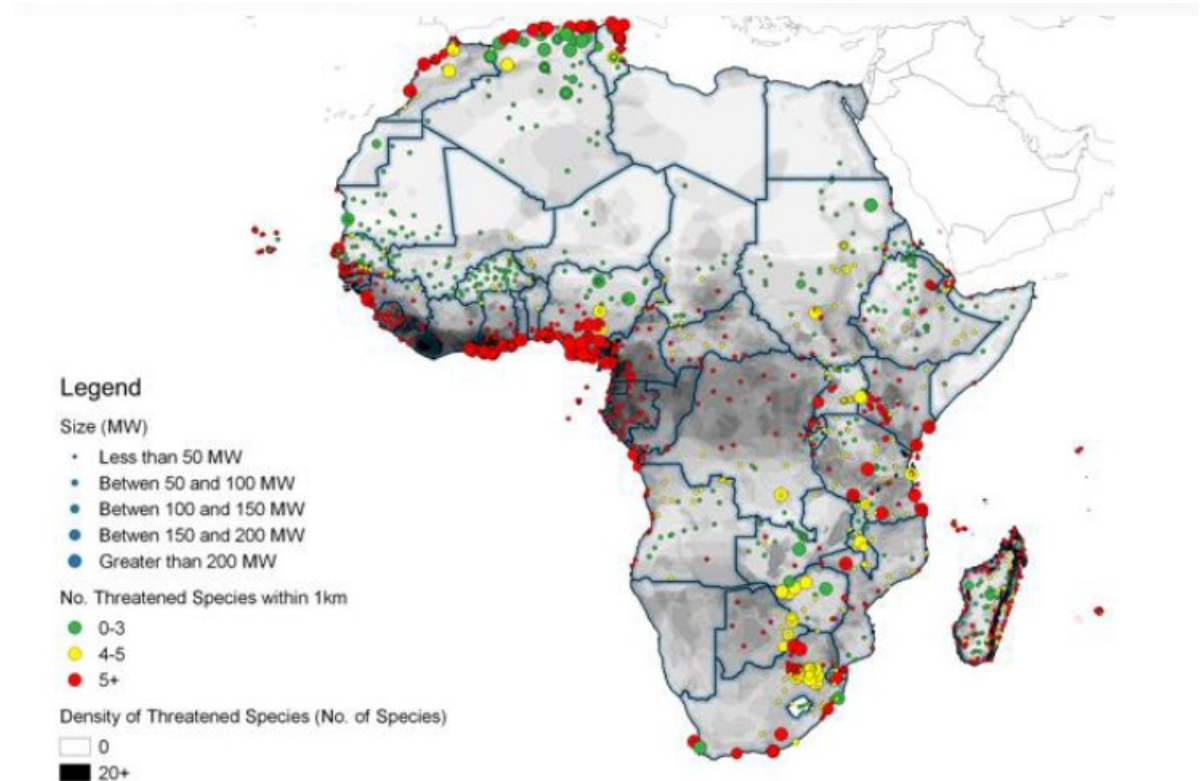
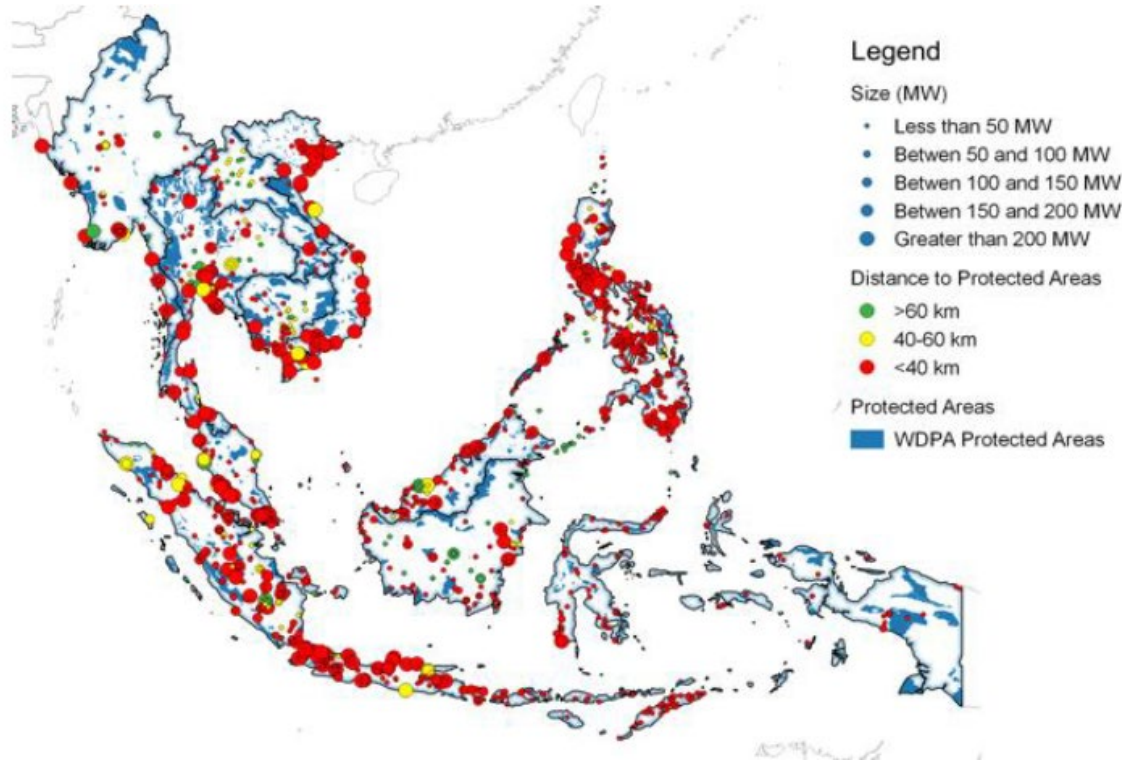
2025 Capacity:
2.3 million cattle p/ year

CH4 emissions p/ year from inputs:
11.7 million co2eq

Committed Emissions:
163 million co2eq



APPLICATIONS: RISK SCREENING



Power plants locations analysed against distance to protected areas and density/number of threatened species

APPLICATIONS: INVESTOR ENGAGEMENT

ACTIAM employs satellite data to combat deforestation

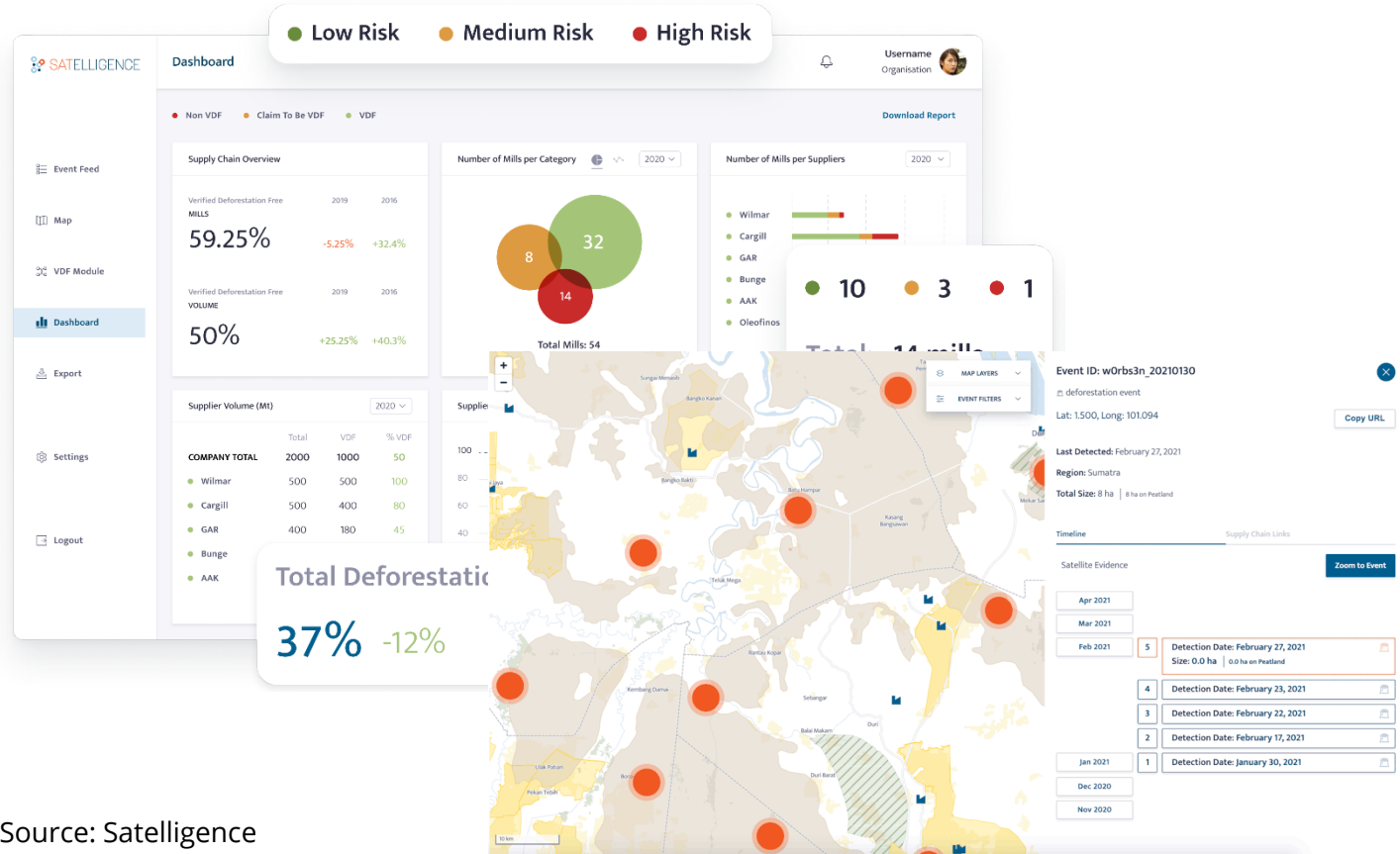
— 16 September 2019 , Next step towards sustainable investing



Investors representing over €1.8 trillion in assets urge companies to advance no-deforestation efforts

Source: Actiam

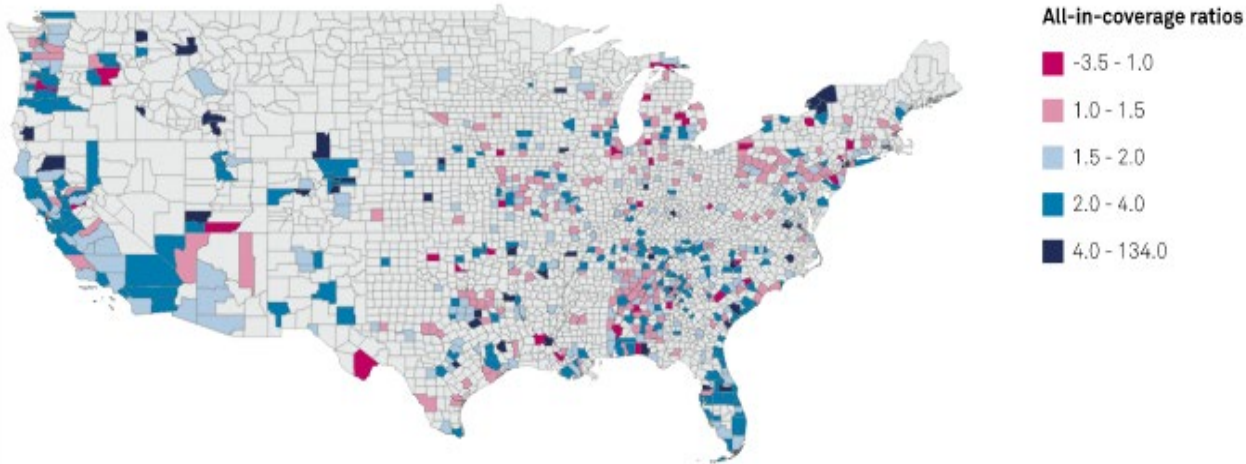
— 05 November 2020 , Action to end deforestation



Source: Satellgence

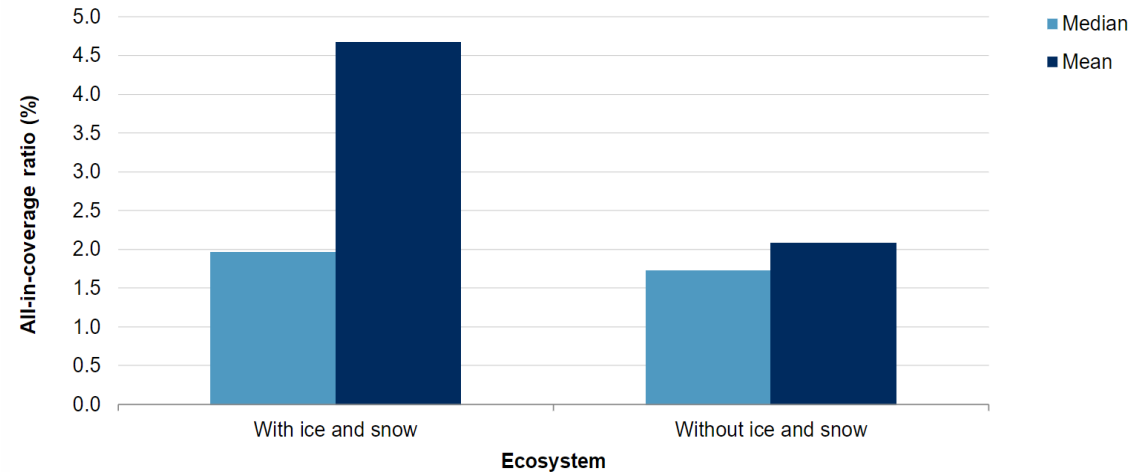
APPLICATIONS: CREDIT RISK

All-In-Coverage Ratios Of U.S. Counties' Water Utilities



Source: S&P Global Ratings.
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U.S. Public Water Utilities' Credit Metrics May Be Supported By Natural Water Storage In Ice And Snow



Source: S&P Global Ratings.
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FUTURE WORK AND RECOMMENDATIONS



Future work

- Create databases for new high impact industries
- Connect asset-level data with EO based proxies for environmental risks/impacts
- Connect asset-level data with ecosystem service maps and environmental accounts

Recommendations to ESA for future R&D and policy-related activities

- Importance of ready to use products and analysis-ready data for non-expert users
- Connecting EO data and derived products with other open public asset/environmental data
- Research funding to integrate non-spatial economic, financial and industrial data with EO

THANK YOU

<https://www.cgfi.ac.uk/spatial-finance-initiative/>

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