The eyes have it

Adriana Hamacher reports on how the finance sector is increasingly using information from satellite imaging in risk analysis and to verify companies' green credentials

It's more than 75 years since the first image of Earth from space was taken. The camera sat between the fuel tanks of a V-2 rocket, which had been launched from the New Mexico desert. That grainy image marked the start of the space race.

Now, a race for sustainable finance data is beginning, sparked by improvements in the data captured by Earth observation and monitoring networks. These combine with breakthroughs in cloud computing and artificial intelligence (AI) to enable powerful analytical tools that can generate industry- or company-specific insights and indicators in near real-time.

Insurance providers have long made use of satellite data to model flood and hurricane risks. But it can do much more. For example, during the Covid-19 pandemic it was used by hedge funds to gain insight into the condition of wheat fields in Ukraine and car production in China. Analysts predict that spatial finance – the marriage of geospatial data and analytical techniques – will become deeply embedded in risk analysis across the financial industry, supporting decisions in energy, the built environment, agriculture and more.

Greater transparency

Green and sustainability-linked bond issuance topped $1tn this year, with analysts expecting it to more than quadruple by 2025. Meanwhile, money held in sustainable mutual funds and environmental, social and corporate governance (ESG)-focused exchange-traded funds rose globally by 53% in 2021 to $2.7tn. While both numbers are still a fraction of the 'conventional' markets, they are starting to matter.

> **All the data discovered can and should be tied back to tradeable securities, and I think that's the future**

They would matter more if the promise of climate-related and ecologically sound investment weren't marred by the potential for greenwashing, largely because of the lack of transparency over an asset's green credentials.

"Our customers are looking for data and insights to help them verify information, decode risk related to

environmental and social impact, and unlock opportunities," says Andrea Blackman, Global Head of Moody's ESG Solutions, which announced a partnership with Planet, a leading provider of Earth observation data, earlier this year.

Crucially, instead of relying on companies proactively to disclose and report on sustainability, spatial finance offers companies, financial services providers and regulators a way to verify some green credentials objectively. Is a company's palm oil production linked to deforestation, for example? The answers to such questions allow for a clearer understanding of ESG-related risks across a company's entire value chain.

> *We are finding the most interest is in using Earth observation data to monitor in near real-time*

Broadly, the data used in spatial finance includes any economic indicator that can be measured from space or by terrestrial sensors. The result is granular, asset-level data that ties information about a particular physical asset, such as a power plant or a rapeseed field, to its ownership and location, highlighting supply chain issues and dependencies.

"While it's not financial information, it's company-fundamental information about their assets," says Mark Taylor, Vice-President of Energy Transition at Kayrros, which aggregates and analyses public, satellite and geolocation data to measure climate and environmental impacts.

Earlier this year, the company raised $44m to bolster its emissions detection and tracking work, using the data to uncover physical risk – whether a fossil asset is leaking methane, for instance, or whether site development is proceeding to plan.

"All of this asset data, all of this physical data that can be analysed geospatially or remotely, it can and should be tied back to tradeable securities, and I think that's the future," Taylor says.

The spatial data initiative

Delivering on the promise of spatial data is an immense task, as the European Central Bank found last year. Its analysis of physical risk exposure for an economy-wide stress test set out to overcome some of the difficulties around data availability. It developed what it calls "an unprecedented database that combines climate and financial information for millions of firms worldwide".

But a database of that ambition and size has holes. Spatial finance promises to fill in many gaps but it still lacks much reliable asset-level and supply-chain data, and the data that is available can be poorly adapted to financial applications, according to a 2020 report by the WWF and the World Bank. The hope is that, over time, collaborations between academic institutions, non-government organisations and the private sector will help fix that.

"The global, objective data that satellites give you can help the financial sector manage its processes and practices and understand the impacts of where its investments are and the effects that the businesses they're invested in are having," says Sam Adlen, Chief Strategy Officer at the UK's Satellite Applications Catapult. The technology company is part of the consortium involved in the Spatial Finance Initiative, which launched in 2017 and is now integrated into the UK's Centre for Greening Finance and Investment.

The Bank of England has been part of pilot schemes, according to Adlen, and researchers at the Bank of America and the University of Oxford have teamed up for a project to integrate nature-related factors into financial decision-making.

There's good reason why banks can't go it alone: the degree of complexity involved in spatial finance is comparable to the Human Genome Project. It calls for cloud computing, machine learning and expertise that may be difficult for financial institutions to develop at scale in-house. Many are turning to intermediaries such as Kayrros and Canada-based Climate Engine.

Climate Engine was founded in 2014 with support from Google Earth Engine, a cloud-based, Earth data-processing system. Its objective is to help organisations, including the Bank of Canada, to reduce their climate risk exposure and its approach is to fuse Earth observation and economic data using multi-parallel processing in Google's cloud. In this way, it's possible "to leverage the power of finance for climate action in a more effective way", says the company's President, Jamie Herring.

"We've had a lot of banks come to us because they want to help their clients identify these risks and be good partners and fiscally responsible managers," he says.

But, according to Herring, it's problematic to use spatial finance to meet long-term goals, such as those identified by the Task Force on Climate-related Financial Disclosures. Factors such as fluctuating exchange rates and changes in population and socio-economic structures are hard things to predict as far ahead as 2050, which means that the longer-term models are built using guesswork.

"Where we're finding the most interest is in using Earth observation data to monitor in near real-time," says Herring. "It's really fine-grained, local or management-relevant scales that are key for finance."

Delivering on the promise

Some financial institutions, such as Lombard Odier, are early movers. The Swiss bank turned to spatial finance after economic damage from wildfires in Australia. It determined that the disaster could have been predicted using the technology. Since then, spatial finance has been integrated as a key part of its decision-making.

> **Banks are deciding how they integrate spatial finance into their processes and how to meet different ESG targets**

Others are following suit. "The major banks are all deciding now how they integrate spatial finance into their processes, and how they meet all their different ESG targets and the different stress test requirements being pushed down by the Bank of England. They're all deciding whether they should build out capabilities themselves or outsource it," says Adlen.

In the US, for example, challenger bank Cogni is working with the UK-based start-up Connect Earth on embedding sustainability features into its products. Cogni's users can access graphs that show their carbon footprint and where their emissions come from.

But providing actionable insights will mean gathering a lot of data that can be analysed in useful ways. It's expected that AI technologies will be combined with blockchain to allow for spatial finance applications to scale cost-effectively and transparently.

The future could bring geospatially enabled smart contracts where ecosystem credits or offsets for carbon or water could be created or verified. Some organisations are already linking advanced spatial data technologies with blockchain applications and sustainability.

Spatial finance may still be in its infancy but the technology has the potential to be a market differentiator and, in short order, a basic requirement. ■

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