

Ground Transport & Linear Asset Infrastructure Use Case



Rail networks, electrical transmission grids, pipelines, and freeways are all vulnerable to climate change. Jupiter’s high-resolution analytics help private and public sector asset owners pinpoint and mitigate physical climate risk.

The length of linear assets drives the complexity and dynamism of physical climate risk

Linear assets—any asset whose length plays a critical role in its maintenance—abound in the private- and public-sector transportation, oil and gas, and electrical utilities industries. A holistic approach to resiliency and risk management of these assets encompasses their associated features that make up the total network.

For example:

Industry	Linear asset	Associated infrastructure along the network
Freight and passenger rail	Tracks Track beds	Switches; bridges, tunnels, trestles; freight terminals and depots; maintenance facilities; layover yards
Highways (public sector) Trucking/freight lines (private sector)	Roads	Ramps; drainage infrastructure; bridges; over- and underpasses; signage Warehousing and distribution centers; maintenance facilities
Oil and gas	Pipelines	Tunnels
Electric utilities	Above-ground and/or underground high-voltage electrical lines	Pylons; tunnels; substations; transformers

Far-reaching asset networks, and their critical infrastructure, pose unique and multidimensional climate resiliency challenges to those who own and manage them. Extreme heat and cold degrade, damage, or disrupt railway tracks and track beds. High winds impact electrical transmission lines and pylons, and high-profile bridges and trestles. Riverine, coastal, and pluvial flooding plague almost every linear asset network, including highways and their infrastructure. Impacts vary by geography and location, and by the nature of the asset itself.

Assessing and managing physical climate risk to these assets—and disclosing material impacts to regulators when called upon—demands detailed analysis based on best-in-science climate models; a broad, even global, geographic scope; quantification of impacts of multiple perils under flexible emissions scenarios and time horizons; and transparent, verifiable data modeling methodologies.

Jupiter delivers high-resolution analysis of potential physical climate risk

Jupiter ClimateScore™ Global helps owners of linear assets and critical infrastructure quantify impacts of acute and chronic physical risk from climate change from weather conditions and extreme events. [ClimateScore Global](#) produces 90-meter (295-foot), portfolio-scale probabilistic projections for any point (Antarctica excepted) on the planet's land surface, over multiple time horizons at five-year intervals through 2100, and across three different emissions scenarios. It offers actionable insights into how perils such as flooding, extreme heat and cold, high winds, wildfire, drought, hail, and extreme precipitation will affect those assets, and how those impacts will change over time.

ClimateScore Global employs dozens of the scientific community's most respected climate models, coupled with machine learning, land use and elevation data, and models for tropical cyclones, hydrology, wildfire, severe weather, and evapotranspiration.

Jupiter's rich expertise in modeling climate risk to linear assets and infrastructure

Jupiter solutions are used worldwide across the private and public sectors. The company provides physical risk climate analytics to at least one of the world's five largest firms in asset management, banking, insurance, oil and gas, mining, power, and construction, as well as to agencies of the United States government, including the Department of Defense. It also maintains strategic partnerships with some of the world's largest accounting, consulting, engineering, and insurance firms, as well as defense contractors, who serve customers directly using Jupiter analytics.

Jupiter has successfully engaged with transportation and electric utilities companies to enable them to assess the vulnerabilities of their portfolios of linear assets and infrastructure to flooding, heat and cold, and high winds.

It recently collaborated with a major global design, engineering, and management consulting firm to quantify the susceptibility to extreme heat of a North American Class I freight railway's track network. Continuously-welded steel rail is installed at location-specific "neutral" or "stress-free" temperature, which in much of continental North America ranges between 90°F (32°C) and 110°F (43°C). High climatic temperatures, exacerbated by the friction of wheels passing over the rails, create thermal expansion, which can cause the track to buckle and throw the rails off gauge—slowing train speeds, and even causing derailments. Severe heat can also cause expansion of wooden ties (sleepers), impacting the railway's performance and safety.

ClimateScore Global modeled impacts of extreme heat on the railway's portfolio of hundreds of lines. It flagged the points along its network that would exceed risk thresholds during extreme heat waves (three or more consecutive days above 95°F/35°C), and those subjected to highest-risk heat exposure (thirty or more days above the heat threshold in a given year), over different emissions pathways in five-year increments between now and 2050. In addition, Jupiter and its partner helped the railway identify future flood risk for its maintenance yards and facilities.

Jupiter has also [engaged directly with electrical utilities](#) to improve the resiliency of their linear assets.

- Hawaiian Electric used Jupiter’s data, climate modeling, and analytics to pinpoint vulnerable assets, develop a targeted resilience plan, harden its infrastructure, and develop disclosures in line with the TCFD (Task force on Climate-related Financial Disclosures).
- Terna—which manages almost 75,000 km (46,500 miles) of high-voltage transmission lines across Italy—used the asset-level analysis of Jupiter WindScore™ to model potential impacts of high winds on its overhead power lines and infrastructure, to assess potential damage, meet regulatory requirements, and inform their capital investment strategy. WindScore is part of Jupiter’s very-high-resolution (as granular as 1-3 meters) [ClimateScore Planning](#) suite of peril-specific solutions.

See Jupiter ClimateScore Global in action

Contact Jupiter today to [schedule a demo](#) of ClimateScore Global. Jupiter is the global market, science, and technology leader in physical climate analytics for risk management and resiliency planning. For more information, please visit jupiterintel.com.