Kestrel Sustainability Intelligence™

RESILIENCE TAXONOMY FOR U.S. INFRASTRUCTURE

As the market's expectations for resilience sharpen, Kestrel aims to lead with clarity and transparency. Our resilience taxonomy reflects insights gained from benchmarking over 15,000 series of municipal bonds, giving us an unmatched understanding of where resilience is strong, where it is emerging and what are the best practices for resilient infrastructure in each sector. We are sharing this information to help all market participants navigate resilience more confidently and consistently.

In our view, resilient infrastructure and systems provide benefits to issuers, investors and communities alike. Resilience protects financial performance by reducing the likelihood of costly disruptions, supports continuity of essential services, and strengthens overall market stability. It is fiscally responsible, non-partisan and central to long-term value creation.

What questions do you have about resilience in US infrastructure? We welcome your questions and discussion.

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CONTENTS

INTRO TO KESTREL SUSTAINABILITY INTELLIGENCE™

Kestrel benchmarks financed activities for sustainability and transparency. Our complete methodology for evaluating debt instruments can be accessed at kestrelesg.com/methodology.

Five Sustainable Finance Principles Underpin Our Approach

Our science-based approach to assessing sustainability has been shaped by research, regulation, and globally recognized initiatives. Kestrel's analytical framework centers on five Sustainable Finance Principles:

E

1. **Transition to a decarbonized economy** – In every sector, there are immediate ways to decarbonize and best practices to reduce greenhouse gas emissions. Presence or absence of these best practices helps indicate if investments are transition-aligned.
2. **Integrate resilient and sustainable design features** – Issuers can adapt and plan for multiple physical risks. Infrastructure should be designed for resilience to these risks.
3. **Preserve, enhance, or restore natural capital** – The UN has declared a biodiversity state of emergency. Depletion and lack of stewardship of water, soil, air, plants, and animals is intimately linked to the changing climate. Ecosystem services, food security, human health, and community well-being all hinge on sound management of natural resources.

S

4. **Promote a more equitable society and a just transition** – Inequality persists in many forms in the US and will continue to incite hardships and division without comprehensive policy changes and attention to social equity when prioritizing activities for financing. A more equitable society is also a prerequisite for a well-functioning and sustainable economy.

G

5. **Disclose activities, impacts and risks** – Transparency ensures accountability to constituents and investors alike. Adequate disclosure regarding financed activities is needed to fully understand risks and impacts.

How We Apply Our Methodologies

Kestrel Sustainability Intelligence consists of analysis and scores that reflect the presence or absence of best practices for sustainability in financed activities. When we review debt instruments and the activities they finance, we identify whether sector-specific, operationally feasible best practices for sustainability are present. The sector-specific best practices for sustainability are called *material factors*.

In certain situations, the best practices also represent resilience features. Resilience features are actions being taken to reduce exposure to physical and transition risks. In some sectors, key resilience features contribute to the Environmental (E) or Social (S) score. In other sectors, resilience features are simply identified. The Transparency (G) score reflects the quality of transparency and disclosure pertaining to the financed activities.

Benchmarking for Sustainability

While evaluation methods can vary between sectors, the general philosophy behind our Sustainability Scores™ is universal. In general, debt instruments financing projects that include sector-specific best practices for sustainability will score higher than those that do not. Best practices, quantitative thresholds, and commitments of issuers can look different depending on the sector, but the same general concept applies. In this way, Kestrel Sustainability Intelligence is a benchmark for sustainability and transparency, allowing for comparison within and across sectors.

• Issuer has not incorporated sector-specific best practices for sustainability	• Issuer incorporates some sector-specific best practices for sustainability, but not as part of the bond-financed projects	• Sector-specific best practices for sustainability are directly incorporated into projects financed by the bonds
• No bond proceeds are allocated to projects that demonstrate sector-specific best practices	• Minor portion of bond proceeds allocated to projects that demonstrate sector-specific best practices	• Major portion of bond proceeds allocated to projects that demonstrate sector-specific best practices
• Issuer has not demonstrated a commitment to incorporating sector-specific best practices	• Issuer has demonstrated a relatively weak commitment to incorporating sector-specific best practices	• Issuer has demonstrated a strong commitment to incorporating sector-specific best practices

Coverage and Delivery

Kestrel's coverage of the US municipal bond market to date exceeds $3T par. We prioritize municipal bonds over $20M in the primary market, subscribers' portfolios and requests, and bonds in the Bloomberg Municipal Aggregate Index. Our analyses of primary market bonds are available prior to the sale dates. With custom solutions, Kestrel evaluates infrastructure and projects financed with loans and private investments, as well as certain sovereign, sub-sovereign and multi-national development agencies' bonds.

Subscribers receive the full suite of Kestrel Sustainability Intelligence by API. Kestrel Sustainability Scores on bonds in the secondary market are available on Bloomberg and Investortools.

WHERE TO FIND RESILIENCE INFORMATION IN KESTREL SUSTAINABILITY INTELLIGENCE

Resilience features, if present, are identified in three fields:

Kestrel Data Field	Description
Summary of Analysis	Key resilience features in the financed activities are noted in the Summary
Sustainability Themes	Certain Sustainability Themes denote resilience. These include Climate Resilience & Adaptation; Climate Change / Transition Planning; and Sustainable Design
UN SDGs	UN SDG goals and targets are assigned for resilience. These include: • Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries • Target 13.2: Integrate climate change measures into national policies, strategies and planning

DEFINITIONS: CLIMATE RISKS AND RESILIENCE

The risks associated with climate change are complex, but for simplicity, they may be divided into physical and transition risk.

Physical risk means potential for material, operational, or programmatic impairment of economic activity or infrastructure due to impacts attributable to climate change and other natural hazards or threats. Physical climate risks that intersect with US infrastructure mainly include extreme heat/cold, wildfire and smoke, flooding, severe storms, sea level rise, storm surge and drought. Other geophysical risks include earthquakes, subsidence, landslides, and volcanic. Physical risks can be direct (sea level rise affects coastal roads) or indirect (extreme heat causes power outages).

Transition risk is the risk associated with the uncertain financial impacts that could result from the transition to a low carbon economy. Transition risks can arise when organizations fail to prepare for broader market transitions. Kestrel's Sustainability Scores also reflect transition alignment. Transition risks in public buildings include the risk that existing energy systems become obsolete due to policy, technology or market changes. Transition risk in transportation includes the possibility that future changes alter how transportation assets perform.

Resilience is a characteristic that can improve the ability to withstand physical risks. It may add robustness, redundancy, flexibility or recovery capacity. Resilience in infrastructure equates to hardening, moving, upsizing, elevating, adding redundancy, and/or intentionally designing to withstand future climate-related or geophysical impacts. Creating more resilient infrastructure is a means to adapt to changing conditions, thus, there is **overlap with climate change adaptation** measures. Some climate change impacts may be already occurring while others are likely to occur in the future.

> At the community level, resilience may be improved by ensuring equitable access, pre-disaster planning that is inclusive and building local capacity to respond to climate change impacts.
>
> At the organization level, resilience in practice includes *demonstrated actions* to anticipate, prepare for, and adapt to changing conditions.

Resilience as a Financial Consideration

For investors who integrate physical climate risk into investment strategies and decisions, Kestrel Sustainability Intelligence provides clear insights on sustainability and resilience features that mitigate climate risk. Our granular research can unlock hidden value as markets move toward pricing both physical risks and transition risks. Sustainability and resilience are likely to become material drivers of asset valuations as the growing frequency of extreme weather events affects insurance markets and federal emergency support. Analysis suggests returns of $4 to $10 for every $1 spent on infrastructure resilience.[1]

RESILIENCE INDICATORS IN UNITED STATES INFRASTRUCTURE

The indicators described below represent significant, meaningful changes to infrastructure that improve resilience to physical climate risk.

Indicators of Resilience to Physical Risks

Level	***Resilience Indicator***
Community Level	• Equitable access to resilience programs • Local capacity-building related to resilience • Pre-disaster planning • Emergency preparedness • Flood and wildfire monitoring systems • Up-to-date, modern building codes and standards
Organization Level	• Completed vulnerability assessments • Adopted resilience plans • Resilience factors integrated into decision-making • Local coordination for emergency response • Contingency plans for loss of access and operations

[1] "Strengthening the Investment Case for Climate Adaptation: A Triple Dividend Approach, 2025, https://www.wri.org/research/climate-adaptation-investment-case; and "Adapt Now: A Global Call for Leadership on Climate Resilience," Global Commission on Adaptation, 2019, https://gca.org/wp-content/uploads/2019/09/GlobalCommission_Report_FINAL.pdf.

Indicators by Sector	
Sector	***Resilience Indicator***
All Sectors	• Resilience prioritized in project planning • Envision sustainability certification or commitment to Envision planning process • Flood elevation design • FEMA flood-resilience criteria, ASHRAE guidelines for mechanical systems resilience and/or ASCE 7 standard for structural loads used in design
Roads, Tunnels, Highways, Bridges	• Agency prioritizes resilience in project plans and capital plans • Harden and stabilize roads against landslides, rockfalls, erosion • Elevate roadways • Change pavement materials to withstand high heat • Upgrade wood guardrail posts to steel • Increase size or quality of culverts • Stabilize slopes • Wildfire and emergency evacuation routes • Bridge upgrades designed to accommodate sea level rise and/or changing river flow dynamics • Bridge designs consider potential effects of extreme heat on pavement and steel • Upsize or expand stormwater infrastructure for increased precipitation
Multi-modal Transportation	• Shade structures, tree planting and benches added to trails, walkways and bikeways for extreme heat • Harden and stabilize trails against landslides, erosion • Green infrastructure integrated for flood resilience • Expanded evacuation routes

Indicators by Sector	
Sector	***Resilience Indicator***
K-12 Schools (Public and Charter)	• Buildings designed as community resilience hubs • FEMA-rated storm shelters for students • Fire-resistant materials used in construction • Defensible space management • Reflective roofing • Air filtration for smoke • Stormwater infrastructure upsized • Green space used for stormwater management • Shade structures on playgrounds • Backup power capacity • Seismic retrofits on older buildings • Bidirectional electric bus chargers with vehicle-to-grid capabilities
Higher Education	• Buildings include storm shelters • Elevate critical systems • Microgrids and backup power capacity • Seismic retrofits on older buildings • Green space used for stormwater management • Universities are like small cities. See indicators in other sectors.
Airports	• Flood elevation design of buildings and runways • Elevate critical systems • Perimeter floodwalls • Buildings include storm shelters • Seismic retrofits or enhanced seismic design • Enhanced wind-load design • Runways extended for adaptation to heat • Redundant power systems • Microgrids, battery storage • Hardened emergency operations centers

Indicators by Sector	
Sector	***Resilience Indicator***
Drinking Water	• Establish multiple sources of water supply • Redundant power systems • Microgrids, battery storage • Hardened emergency operations centers • Elevate critical systems • Elevate wellheads • Seismic strengthening • Interconnections with neighboring utilities for emergency supply • Heat resistant equipment • Fire-resistant structures • Relocate intakes or coastal infrastructure • Plan for water allocations for firefighting • Reduce wildfire risk on managed watershed land • Water resource planning considers climate scenarios
Wastewater	• Floodwalls and berms • Flood elevation design for buildings and infrastructure • Elevate critical systems • Storage basins or equalization tanks • Green infrastructure to reduce stormwater flows • Redundant power systems • Microgrids, battery storage • Relocate infrastructure from flood zones • Watertight manholes or raised manhole rims • Seismic strengthening • Cooling upgrades for electrical rooms and blowers • Extend outfalls

Indicators by Sector	
Sector	***Resilience Indicator***
Electric Utilities	• Steel or composite poles • Undergrounding power lines • High Temperature Low Sag (HTLS) conductors • Sensors and monitoring systems • Elevated equipment • Water-resistant buildings • Wildfire-resistant buildings • Microgrids and distributed energy systems • Equipment rated for high fire and wind conditions • Infrastructure designed to operate in extreme temperatures • Generators at critical facilities • Seismic bracing • Diversified fuel sources • Long-duration energy storage • Enhanced vegetation management • Hydropower projections incorporate changing snowmelt patterns
Healthcare	• FEMA flood-resilience criteria, ASHRAE guidelines for mechanical systems resilience and/or ASCE 7 standard for structural loads used in design • Flood elevation design • Elevated equipment • Stormwater detention and/or green infrastructure • Defensible space management • Hardened HVAC systems • Microgrids and battery storage • Redundant water and power connections • Redundant, smoke protected air intakes • Seismic upgrades • Relocation

Kestrel has a nuanced understanding of resilience for infrastructure in the US. The indicators listed above range from minor additions to projects to drivers of comprehensive capital planning efforts. Presence of these indicators, regardless of scale, demonstrates an issuer's acknowledgement and planning for climate change impacts and other physical risks.

What questions do you have about resilience in US infrastructure? The Kestrel team is collaborative, and we aim to serve the market. Please get in touch if there is something we can do for you. info@kestrelesg.com.

About

Kestrel Sustainability Intelligence™ for municipal markets helps set the market standard for sustainable finance. We do this through verification and our comprehensive Sustainability Intelligence.

Kestrel is a leading provider of external reviews for green, social and sustainability bond transactions. We evaluate corporate and municipal bonds in all sectors worldwide for conformance with international green and social bond standards.

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