
2026 SALT REPORT



**crux
investor**

PUBLISHED

MARCH 2026

CONTENTS

EXECUTIVE SUMMARY	4 - 6
INTRODUCTION: INFRASTRUCTURE COMMODITIES & MISPRICING OF ROAD SALT	7 - 11
THE END OF GLOBALISED PROCUREMENT: WHEN SECURITY OF SUPPLY OVERRIDES LOWEST COST	12 - 15
FROM UTILITY COMMODITY TO MARGIN-STRATIFIED MARKET	16 - 20
INVESTMENT CONSIDERATIONS & RISK FACTORS	21 - 23
BIBLIOGRAPHY	24 - 27
	END

EXECUTIVE SUMMARY

The Salt Deficit: Navigating North America's US\$2.6 Billion De-icing Market

Highway de-icing accounts for 41% of total US salt consumption—approximately 19.7 million tonnes annually, representing essential infrastructure spending that remains largely invisible to equity investors. Unlike cyclical industrial commodities, road salt demand follows winter weather patterns rather than economic conditions, creating defensive characteristics more comparable to water treatment chemicals and utility inputs than to typical mining sector investments.

Structural Import Dependence Reveals Chronic Undersupply

The US salt market exhibits persistent structural undersupply that has remained unaddressed for decades. Domestic production of 42 million tonnes in 2023 fell well below apparent consumption of 55 million tonnes, resulting in 25% net import reliance—a ratio that has ranged from 25-30% throughout the 2019-2023 period. Import sources during 2019-2022 concentrated among Canada (29%), Chile (28%), Mexico (12%), and Egypt (11%), embedding currency exposure, ocean freight volatility, and logistics complexity into the supply chain.

The domestic production base has effectively calcified: seven states - Kansas, Louisiana, Michigan, New York, Ohio, Texas, and Utah - account for approximately 95% of US output. Environmental and permitting constraints have prevented meaningful capacity expansion, and no new salt mine has been developed in North America in nearly three decades.

The Safety Mandate Floor Creates Inelastic Demand

USGS confirms that no economic substitutes or alternatives for salt exist in most applications. While calcium chloride, calcium magnesium acetate, and potassium chloride can substitute for highway de-icing, all carry significantly higher costs that preclude large-scale adoption. Cities do not conserve salt during mild periods - application occurs at the first sign of precipitation as a precautionary measure.

Critically, the number of winter weather events - including freezing rain, sleet, and snow - proves a better predictor of road salt demand than cumulative snowfall totals. Several low snowfall or icing events typically require more salt than a single large snowfall event, creating consumption variability independent of headline winter severity metrics.

Cost Curve Dynamics Favor Domestic Positioning

Production costs vary dramatically by method: vacuum and open pan salt averaged \$220/tonne in 2023, solar salt \$150/tonne, rock salt \$61/tonne, and salt in brine just \$8.50/tonne. Transportation represents an important cost factor, with ocean freight and inland logistics adding significant expense to imported product.

However, the chapter notes that imported salt can often be delivered at lower cost than domestic product due to lower production costs abroad, favorable currency exchange rates, and cheaper ocean freight relative to overland transportation - an advantage that potential 25% import tariffs would eliminate. Given low producer margins, such tariffs would pass through to customers, fundamentally reshaping competitive dynamics.

Policy Shifts Signal Emerging Domestic Preference

New York's Buy American Salt Act represents a policy framework that allows state agencies to give preference to domestically mined salt, permitting them to award contracts to domestic suppliers even if their bids were up to 10% higher than foreign competitors. However, rather than alleviating supply security concerns, this shift exposed severe domestic logistical vulnerabilities. Consequently, rather than expanding the domestic market, state officials are stepping back from utilizing the Buy American preference for upcoming contracts.

The Procurement Paradigm Shift: From Lowest-Bid to Supply Security

Decades of globalized lowest-bid road salt procurement are giving way to frameworks prioritizing supply chain reliability and domestic sourcing resilience. Climate volatility has elevated peak-demand risk, with extreme winter events causing delivery failures that cascade into public safety emergencies. Salt represents an essential infrastructure input with no practical substitutes for winter road maintenance, creating conditions where security of supply increasingly overrides delivered cost as the primary procurement criterion.

Market Structure and Domestic Production Concentration

The North American road salt market consumed approximately 55 million tonnes in 2023, with US domestic production reaching 42 million tonnes. Production concentrates in seven principal states—Kansas, Louisiana, Michigan, New York, Ohio, Texas, and Utah—which collectively account for 95% of domestic output. Twenty-five companies operate 63 production facilities across 16 states, employing four principal technologies: underground rock salt mining (46%), salt in brine production (33%), vacuum pan evaporation (11%), and solar evaporation (10%). This geographic concentration creates natural logistical advantages for domestic producers serving the 70% of US roads located in snowy regions.

Demand Inelasticity and Non-Discretionary Spending

Road salt demand exhibits pronounced short-term inelasticity driven by public safety mandates. Winter maintenance operations consume approximately 20% of state DOT budgets, representing over \$2.3 billion in annual expenditure. Research documenting a 30-mile Iowa roadway segment found accidents increased 1,300% and traffic volume decreased 29% during severe winter weather events when maintenance operations were affected. This safety imperative means price increases shift margins upstream to producers rather than suppressing demand volumes. Oregon's 2024 allocation of \$19 million in emergency General Fund resources to maintain highway and winter maintenance operations demonstrates jurisdictional willingness to absorb cost pressures rather than reduce service levels.

Legislative Protectionism as Market Catalyst

New York's Buy American Salt Act, signed December 22, 2022, establishes US-origin requirements for rock salt used under covered public contracts. The legislation conditions "lowest responsible and reliable bidder" and "best value" determinations on domestic sourcing compliance, subject to defined waivers for public interest, unreasonable costs, or insufficient quantity and quality. Sponsor memoranda cite estimates that salt mined or harvested in New York State adds \$3.00 in tax revenue per ton produced. This framework recognizes logistical optionality and supply chain resilience as economically valuable attributes, reducing downside price-compression risk and improving contract-renewal visibility for domestic producers.

Climate-Driven Demand Differentiation and Import

Displacement

US net import reliance declined from 30% in 2021-22 to an estimated 25% in 2023, reflecting shifting competitive dynamics. Climate change creates geographic differentiation in demand trajectories - increased winter precipitation in the Great Lakes and Northeast increasingly falls as rain in warming areas, while far-northern regions may experience higher snow accumulation from elevated atmospheric moisture. The 2025-26 La Niña outlook projects wetter conditions for traditional high-consumption markets including the Pacific Northwest, Great Lakes, and northern Alaska. Salt's low unit value (approximately \$61 per tonne average in 2023) and seasonal logistics constraints during peak winter demand create natural economic moats favoring proximate domestic production over distant import sources facing congestion risk during severe winter events.

The 80/120 Rule: Procurement Mechanics That Favor Logistics Flexibility

State DOT salt contracts—ranging from 322 tons (Oregon) to 960,000 tons (Ohio)—operate under volume flexibility provisions that create asymmetric risk profiles. The standard 80/120 structure requires agencies to purchase a minimum 80% of contracted quantities while obligating suppliers to deliver up to 120% on demand. Variations exist across jurisdictions: New York DOT operates at 70-150%, Ohio DOT at 90-110%, and New Jersey DOT at 50-120%.

This framework favors producers with logistics flexibility and proximity to end markets. Thirty-day delivery requirements and weather-driven demand spikes reward operational responsiveness. Research documents that tighter quantity limits reduce per-ton costs by shifting supply risk toward purchasing agencies—Iowa DOT achieved 3.37% price reductions when tightening from 70-110% to 80-110% bands.

Channel Economics: Where Margins Stratify

The salt market segments into three distinct economic tiers. Municipal procurement delivers volume but operates under competitive low-bid frameworks that cap margin upside. Federal regulations require awards to the lowest responsive bidder on fixed-price contracts, favoring operators with structural cost advantages.

Commercial bulk contracts offer stability without pricing power. Transportation costs often exceed product value, meaning delivered economics depend more on logistics efficiency than mine-gate pricing. Commercial buyers prioritize supply continuity, but pricing remains bounded by delivered-cost structures.

Retail packaged salt represents the margin breakout. Though chemically identical to bulk product, packaging, handling, and small-unit distribution create fundamentally different cost stacks reflected in materially higher producer-level selling prices. Distribution infrastructure access, not product differentiation, determines who captures this margin premium.

The Substitution Non-Threat

Alternative de-icers fail to threaten sodium chloride's dominant position despite performance advantages. Calcium chloride remains effective at extremely low temperatures where standard road salt becomes ineffective below 15°F. However, alternatives carry 3-5x cost premiums, documented concrete degradation risks through chemical reactions causing cracking and strength loss, and equipment compatibility barriers.

Sodium chloride brines showed no chemical damage effects in concrete testing, reinforcing why rock salt remains the default for routine winter maintenance. Operational improvements, particularly pre-treatment brining, have already achieved widespread adoption, suggesting limited incremental substitution potential. The regulatory direction favors efficiency optimization rather than material substitution.

Pricing Without Price Discovery

Salt pricing occurs through negotiated physical transactions rather than exchange trading. Pre-season contracts awarded April-July lock fixed prices before winter onset, limiting within-season price responsiveness. Multi-year contracts may include annual renegotiation clauses and fuel adjustment provisions.

Rock salt average unit values increased modestly from \$59.90/metric ton (2019) to approximately \$61/metric ton (2023) on an f.o.b. mine basis—a gradual appreciation pattern consistent with mature physical markets.

Severe winters stress the system: the 2007-2008 cycle saw low DOT prices jump from \$50 to \$63/ton amid nationwide shortages from depleted stockpiles, Mississippi flooding, and hurricane-damaged Louisiana operations.

Weather Events Drive Demand, Not Economic Cycles

Salt investment requires different analytical frameworks than conventional commodities. The primary demand driver is winter weather events - freezing rain, sleet, and snow, rather than snowfall totals or macroeconomic activity. U.S. de-icing consumption fell 5% between 2018 and 2019 based purely on winter severity differences, demonstrating volatility independent from economic cycles.

Concentrated Supply Creates Pricing Advantages

North American salt production operates through limited established facilities, constraining rapid output expansion during severe winters. When strong demand pushes production toward rated capacities, this concentration supports pricing power. Salt is not exchange-traded and lacks benchmark pricing, creating dynamics distinct from financially traded commodities.

Climate Change Introduces Regional Complexity

Long-term warming suggests uneven market impacts rather than uniform demand decline. Winter hazard types may shift regionally, potentially increasing freezing rain events in the Midwest and Northeast while affecting other areas differently. Investor exposure becomes location-specific rather than sector-wide.

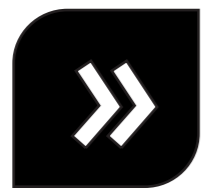
Valuation Requires End-Use Differentiation

Conventional approaches treating salt production as homogeneous produce misleading conclusions. Salt serves distinct end markets; highway de-icing, food processing, water treatment, each with different demand characteristics. De-icing fluctuates with weather while industrial volumes remain stable regardless of winter conditions.

Public Safety Supports Essential-Use Profile

Highway de-icing represents the largest US salt end use, linking demand to public safety rather than discretionary consumption. Combined with long-lived reserve bases and concentrated supply, salt assets present an investment profile requiring analytical approaches distinct from traditional commodity frameworks.

INTRODUCTION



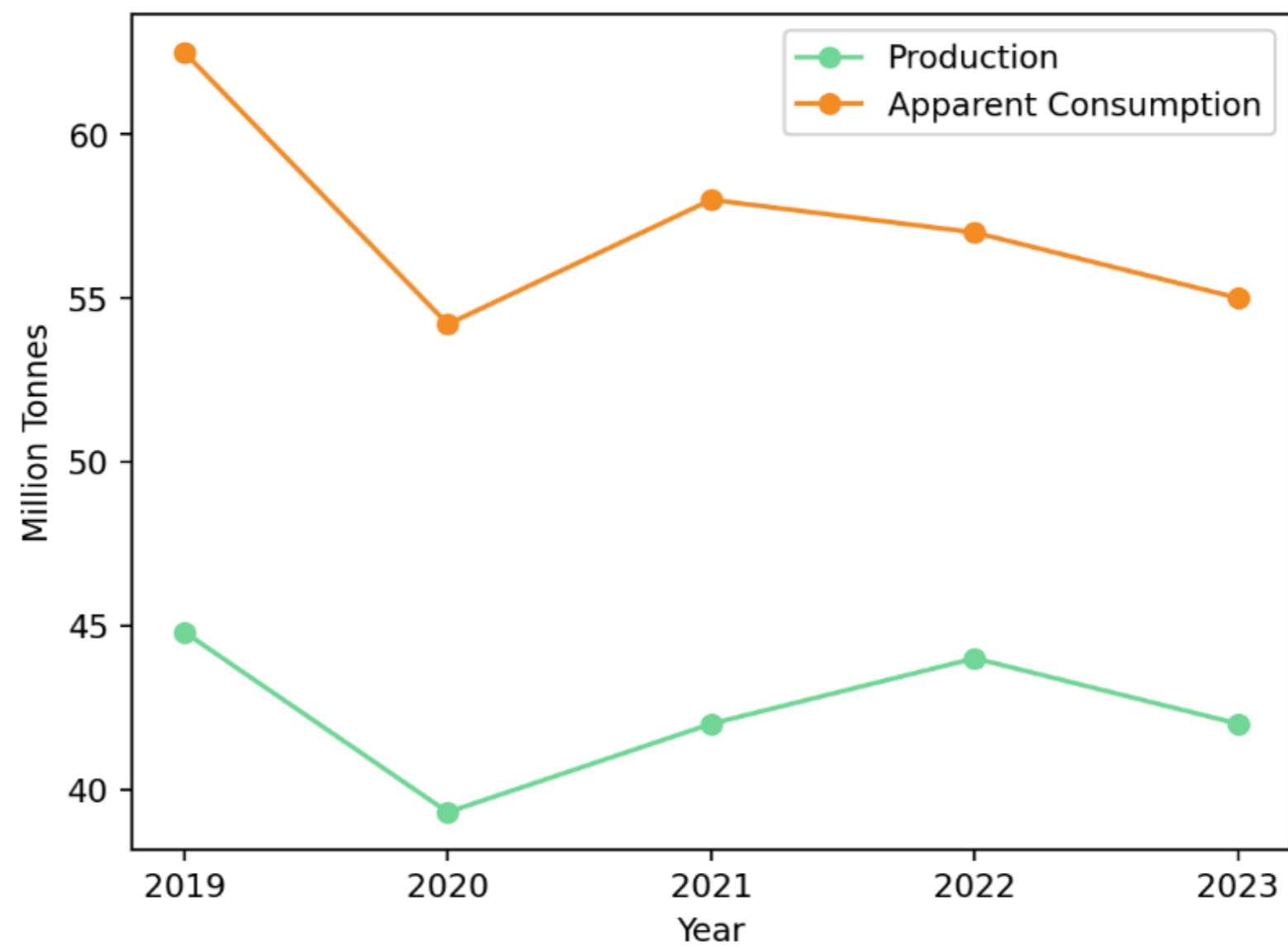
Top 3 Questions/Focus Areas:

- 1. Why has the US salt market maintained persistent 25-30% import dependence despite predictable demand, and what structural factors prevent domestic supply from closing this gap?** - The chapter examines the gap between US domestic production and apparent consumption, revealing how geographic concentration, environmental permitting constraints, and decades of underinvestment have calcified the domestic supply base. It maps the import source composition and analyzes why this arrangement represents structural rather than cyclical undersupply.
- 2. How does salt's demand profile as a "safety mandate commodity" create pricing power and defensive investment characteristics distinct from cyclical industrial commodities?** - The chapter establishes salt's unique demand characteristics within the infrastructure commodity category, exploring why highway de-icing operates under a safety-mandate floor immune to economic cycles. It examines USGS findings on substitution economics and analyzes how precautionary application behavior creates inelastic demand patterns comparable to utility inputs rather than discretionary industrial materials.
- 3. What cost curve dynamics and import logistics vulnerabilities create margin stability advantages for domestic producers versus import-dependent supply chains?** - The chapter details the wide cost curve across production methods and analyzes how imported salt embeds multiple cost variables—currency exposure, ocean freight volatility, and timing mismatches against unpredictable winter demand. It examines potential tariff impacts and the structural advantages domestic operations hold in margin stability during periods of macro stress.

Infrastructure Commodities and Mispricing of Road Salt

In 2023, highway de-icing accounted for approximately 41% of total US salt consumption. Based on reported US consumption of 48 million tonnes, highway de-icing represented approximately 19.7 million tonnes of salt usage in the United States.¹

Salt demand for highway de-icing is driven by winter weather patterns and transportation safety requirements rather than economic cycles. Consumption of de-icing salt is influenced primarily by the number of winter weather events, including freezing rain, sleet, and snow.²

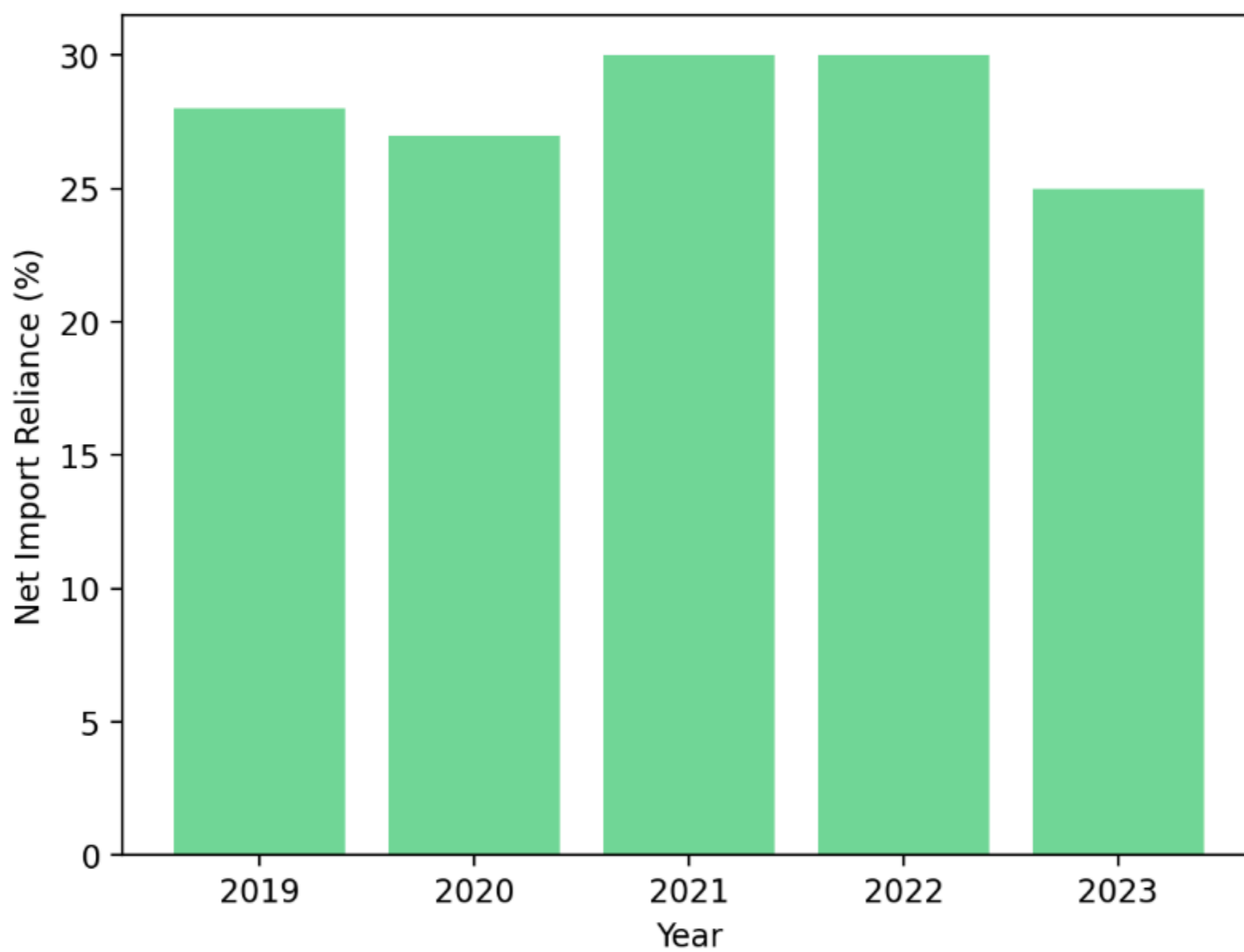


US Salt Production vs Apparent Consumption (2019-2023). Source: Crux Investor Research

US salt production has varied over the five-year period from 2019-2023, ranging from 39.3 million tonnes to 44.8 million tonnes. Apparent consumption ranged from 54.2 million tonnes to 62.5 million tonnes during this period.³

Yet the sector faces a structural tension: Salt demand for highway de-icing is driven primarily by weather patterns rather than price or economic factors. The number of winter weather events, including freezing rain, sleet, and snow, is the primary predictor of road salt demand.

However, domestic production has consistently fallen below apparent consumption, with net import reliance at 25% in 2023.⁴ US net import reliance for salt has varied over recent years. Net import reliance was 28% in 2019, 27% in 2020, 30% in 2021, 30% in 2022, and 25% in 2023.⁵



US Net Import Reliance for Salt (2019-2023). Source: Crux Investor Research

Demand Characteristics and the Safety Mandate Floor

USGS states that no economic substitutes or alternatives for salt exist in most applications. For de-icing applications specifically, calcium chloride, calcium magnesium acetate, hydrochloric acid, and potassium chloride can be substituted for salt, but at a higher cost.⁶ No alternative currently exists that can match salt's effectiveness, availability, and cost profile for large-scale road treatment.⁷

This places salt alongside other infrastructure commodities with similar demand characteristics: water treatment chemicals, road aggregates, and utility inputs.⁸

Cities do not conserve salt during mild periods. Application occurs at the first sign of precipitation as a precautionary measure, and if conditions change, the process repeats. US salt consumption has varied over the five-year period from 2019-2023.⁹

Winter Severity Normalization and Demand Variability

Road salt consumption correlates more closely with the frequency of winter weather events than with cumulative snowfall totals. The USGS observes that several low snowfall or icing events usually require more salt for highway de-icing than a single large snowfall event.¹¹

Supply-Demand Balance Under Scenario Analysis

US salt consumption and import patterns vary with winter weather severity. For the 2022-23 winter, temperatures were near or above average with lower or average precipitation throughout most of the traditional US snowbelt. During this period, rock salt imports decreased compared to 2022, and stockpiles of domestically sourced salt were sufficient to meet demand in many areas.

The North American Supply Structure and Its Constraints

The value of salt sold or used in the United States in 2023 was estimated to be \$2.6 billion.¹² US salt imports for consumption were 16 million tonnes, and net import reliance was 25% of apparent consumption. US domestic salt production has consistently fallen below apparent consumption over recent years. Net import reliance ranged from 25% to 30% of apparent consumption during 2019-2023, with US imports totaling 16.0 million tonnes in 2023. Salt was produced by 25 companies operating 63 plants in 16 States in 2023.¹³

Salt production in the United States is geographically concentrated. Seven States-Kansas, Louisiana, Michigan, New York, Ohio, Texas, and Utah-accounted for about 95% of total US production.¹⁴ Environmental and permitting constraints limit new development, and investment in domestic capacity expansion has been minimal over the past two decades. The result is a market where no new salt mine has been developed in North America in nearly three decades.

Where North America Sits on the Cost Curve

Global salt production reached an estimated 270 million metric tonnes in 2023, with production concentrated among a small number of major producing nations. China leads global production at 53 million tonnes, followed by the United States at 42 million tonnes and India at 30 million tonnes. Germany (16 million tonnes), Canada (14 million tonnes), and Australia (12 million tonnes) are also major producing nations. The top six producing countries collectively accounted for 187 million tonnes, representing approximately 67% of global production.¹⁵

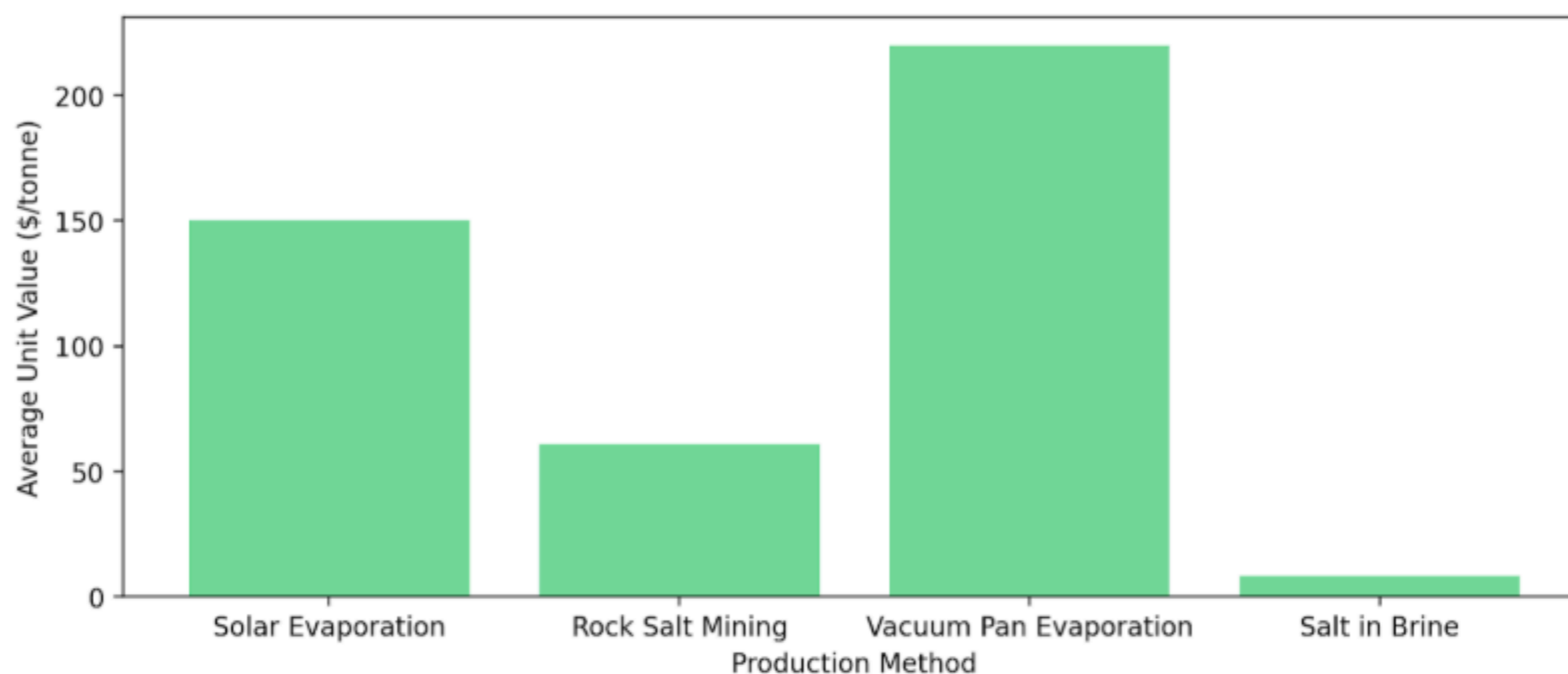
Cost Curve Positioning by Production Method

Salt is produced by four methods: solar evaporation, rock salt mining, solution mining, and vacuum pan evaporation. These methods have significantly different production costs, with average 2023 US unit values ranging from \$8.50 per tonne for salt in brine to \$220 per tonne for vacuum and open pan salt.

Solar evaporation of seawater or natural brines is generally practiced only in arid climates where the evaporation rate exceeds the precipitation rate. carries the lowest production costs. Solar evaporation of seawater or natural brines is generally practiced only in arid climates where the evaporation rate exceeds the precipitation rate.¹⁶

Of the four production methods - solar evaporation, rock salt mining, solution mining, and vacuum pan

evaporation - only rock salt mining directly supplies US highway de-icing markets. Solar and vacuum pan methods serve chemical and food-grade applications respectively, while brine is consumed almost entirely by chemical producers. Cost comparisons across all four methods are not interchangeable for de-icing supply analysis¹⁷



Salt Production Cost Curve by Method (2023). Source: Crux Investor Research

As of 2023, vacuum and open pan salt averaged approximately \$220 per tonne, solar salt \$150 per tonne, rock salt \$61 per tonne, and salt in brine \$8.50 per tonne.¹⁸

The Import Dependence Mechanism

Transportation conditions (including port/channel depth and the cost impacts of packaging/handling) can constrain imports and raise delivered costs.¹⁹ US domestic salt production of 42 million tonnes fell below apparent consumption of 55 million tonnes in 2023, resulting in net import reliance of 25% of apparent consumption. This net import reliance has persisted, ranging from 25% to 30% over the 2019-2023 period.²⁰ This arrangement embeds multiple cost layers: ocean freight, port handling, inland logistics, and currency exposure.²¹

Logistics, Lead Times, and the Import Timing Mismatch

Salt procurement bidding processes typically occur during the spring and summer months, with some state agencies opening bids as early as April and others as late as July. Pre-season delivery arrangements are often structured into procurement contracts as a best management practice; winter weather remains unpredictable.²² A single severe storm system can consume weeks of supply across multiple municipalities simultaneously.

Procurement Frameworks and Risk Tolerance

Emerging policy frameworks in some jurisdictions weigh supply reliability and domestic sourcing.²³ New York's Buy American Salt Act redefines procurement criteria to require salt be mined in the United States, and permits state agencies to award contracts to domestic suppliers whose bids are within 10 percent of the lowest price.²⁴

Import Supply Configuration

Under severe weather conditions, domestic producers struggle to deliver necessary volumes, making import access essential for supply security. Canadian and Mexican supply represented 41% of US salt imports by volume during 2019-2022.²⁵ Salt imports currently enter the United States tariff-free under Normal Trade Relations.²⁶

Potential 25% import tariffs would be passed through to customers given low producer margins. Chile represented 28% and Egypt represented 11% of US salt import sources by volume during 2019-2022.²⁷

Market Volatility, Currency Risk, and Margin Stability

Imported salt embeds cost variables that introduce margin uncertainty: currency exchange rates affect import costs²⁸; transportation costs, including ocean freight, are affected by energy prices.²⁹ These variables create price volatility for end-users and margin compression risk for importers during periods of macro stress.

Domestic cost structures tied to local-currency operations, predictable power pricing, and direct logistics to end markets offer potential advantages in margin stability. Transportation is an important cost factor for salt. Prices reported are at the mine/plant level (f.o.b.), and transportation adds to final delivered costs.³⁰

Generally, imported salt can be delivered at lower cost than domestic product because production costs are lower abroad, currency exchange rates are more favorable, and ocean freight rates are less expensive than overland transportation.³¹

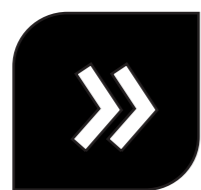
TL;DR

Highway de-icing consumes 41% of US salt production, approximately 19.7 million tonnes annually, yet remains largely invisible to equity investors despite its size, predictability, and essential infrastructure role. This chapter reveals a structurally undersupplied market where domestic production (42 million tonnes) consistently falls short of apparent consumption (55 million tonnes), forcing 25-30% import reliance that has persisted for years.

The investment case rests on three pillars: inelastic demand driven by winter weather events rather than economic cycles, with USGS confirming no economic substitutes exist; a frozen supply structure where no new North American mine has been developed in nearly three decades; and cost curve advantages favoring domestic producers over import-dependent competitors exposed to currency, freight, and tariff risks.

Procurement timing creates additional vulnerabilities, contracts are bid in spring/summer while winter demand remains unpredictable, and severe storms can consume weeks of supply across multiple municipalities simultaneously. Policy shifts like New York's Buy American Salt Act signal emerging domestic sourcing preferences. The result is a commodity with utility-like demand characteristics, structural supply constraints, and potential margin expansion as import economics deteriorate, a mispriced infrastructure play hiding in plain sight.

THE END OF GLOBALISED PROCUREMENT



Top 3 Questions/Focus Areas

- 1. How is climate volatility reshaping road salt procurement from lowest-bid frameworks toward supply chain security and domestic sourcing resilience?** - The chapter examines how extreme winter events are disrupting traditional procurement models, driving a fundamental shift from globalized lowest-cost sourcing toward frameworks that prioritize delivery reliability and domestic supply chain resilience. It analyzes the concentration of US production capacity and explores how emerging legislative frameworks are beginning to recognize supply security as an economically valuable procurement criterion.
- 2. What demand characteristics make road salt a defensive, inelastic infrastructure input immune to typical commodity demand destruction?** - The chapter establishes road salt's essential nature through quantified public safety impacts and budget allocation data from state transportation departments. It demonstrates how the non-discretionary nature of winter maintenance spending creates pricing dynamics where cost increases flow upstream to producers rather than suppressing demand volumes.
- 3. How do shifting precipitation patterns under climate change create geographic differentiation in road salt demand trajectories?** - The chapter analyzes the complex relationship between warming temperatures, changing precipitation patterns, and regional salt demand. It explores how climate dynamics are creating divergent demand trajectories across different geographic markets and examines near-term weather outlooks for traditional high-consumption regions.

When Security of Supply Overrides Lowest Cost

For decades, municipal de-icing procurement operated under a lowest-bid framework.³² Road salt was sourced globally based solely on delivered cost, with limited consideration for supply chain reliability, domestic economic impact, or strategic sourcing risk. That framework is breaking down as climate volatility increases peak-demand risk, with extreme winter events causing delivery failures³³ that cascade into public safety crises.

Salt represents an essential infrastructure input with limited practical substitutes for winter road maintenance.³⁴ Salt delivery failures carry immediate operational consequences. Winter maintenance operations account for roughly 20% of state DOT budgets, spending more than \$2.3 billion annually. Research has documented that for a 30-mile roadway segment in Iowa, accidents increased by 1300% and traffic volume decreased by 29% during severe winter weather events when maintenance operations were affected.³⁵

The North American Road Salt Market

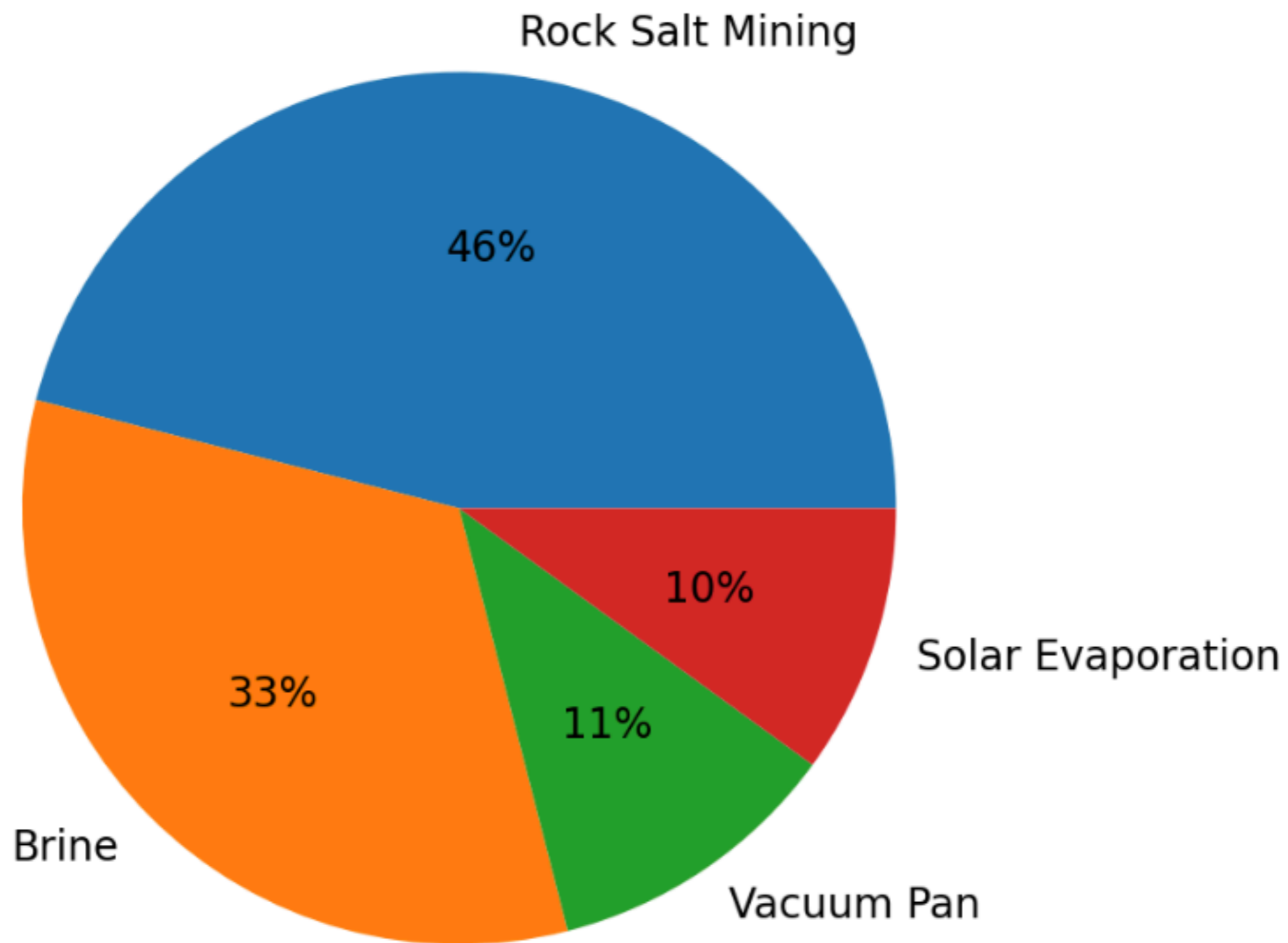
Road salt, predominantly sodium chloride (NaCl),³⁶ constitutes the primary de-icing agent used by state, provincial, and municipal transportation departments across North America.³⁷ The U.S. Geological Survey reports domestic production of 42 million tonnes in 2023,³⁸ with total consumption including imports reaching approximately 55 million tonnes.³⁹ Road salt demand is concentrated in regions experiencing winter precipitation. Approximately 70% of US roads are located in snowy regions, with nearly 70% of the US population living in these regions.⁴⁰

Approximately 70% of US roads are located in snowy regions, with nearly 70% of the US population living in these regions. The top salt-producing states include Michigan, New York, and Ohio in the Great Lakes and Northeast regions, along with Kansas, Louisiana, Texas, and Utah, which collectively produced about 95% of US salt in 2023.⁴¹ These regions experience high frequency of winter weather events requiring surface treatment.

State departments of transportation and municipal authorities represent the primary procurement entities,⁴² with demand characterized by contractual commitments established prior to winter season onset.⁴³

Production Asset Distribution

The domestic supply base concentrates in seven principal producing states: Kansas, Louisiana, Michigan, New York, Ohio, Texas, and Utah. These jurisdictions collectively account for approximately 95% of US salt production. Twenty-five companies operate 63 production facilities across 16 states.⁴⁴



US Salt Production by Method (2023). Source: Crux Investor Research

Production methods divide across four principal technologies. Rock salt extraction through underground mining represents 46% of output. Salt in brine production, primarily serving the chemical industry, accounts for 33% of volume. Vacuum pan evaporation yields 11% of production, while solar evaporation contributes 10%.⁴⁵

Historical Snowfall and Ice Event Correlation with Salt Consumption

The 2022-23 winter season experienced near or above-average temperatures with lower or average precipitation, which affected salt demand. For much of the 2022-23 winter, temperatures were near or above average with lower or average precipitation throughout most of the traditional US snowbelt. The 2023-24 season, influenced by an El Niño weather pattern for the first time in four years, favored warmer-than-average temperatures across the northern continental tier.⁴⁶

Weather conditions during the 2022-23 winter, with near or above-average temperatures and lower or average precipitation, resulted in essentially unchanged demand from state transportation departments compared to the previous year, with stockpiles of domestically sourced salt sufficient to meet demand in many areas. Weather conditions affect salt demand levels, as documented by USGS observations that mild winters with reduced winter weather events result in lower demand from transportation departments and sufficient existing stockpiles.⁴⁷

Demand Forecasting Under Climate Scenarios

Less snow does not necessarily translate to less precipitation. Across the Great Lakes and Northeast, precipitation has increased in winter, but warmer temperatures mean more falls as rain rather than snow. For areas in the far north where temperatures remain conducive to snowfall, increased atmospheric moisture can translate to higher snow accumulation.⁴⁸ These dynamics create geographic differentiation in demand trajectory that investors should consider when evaluating regional exposure.

The 2025-26 winter outlook projects continued La Niña conditions, with NOAA forecasting wetter-than-average conditions for the northern tier including the Pacific Northwest, Great Lakes region, and northern Alaska, while drier conditions affect the southern tier from the Four Corners to the Southeast.⁴⁹ Such patterns favor demand in traditional high-consumption markets while reinforcing the essential nature of salt supply for regions experiencing persistent winter weather.

Price Inelasticity and Demand: Stress-Testing the Thesis

Road salt demand exhibits pronounced inelasticity in the short term due to public safety mandates. Winter road maintenance accounts for approximately 20% of state DOT budgets, representing over \$2.3 billion in annual expenditure.⁵⁰ Significant safety impacts during severe winter weather events when maintenance operations are affected. For a 30-mile roadway segment in Iowa, accidents increased by 1300% and traffic volume decreased by 29% during severe winter weather events.⁵¹

Non-Discretionary Procurement Behavior

The crash impacts of improved pavement friction depend on facility type. In urban arterials and rural multilane highways, a 10-point increase in SFN40 can result in a 23–25% reduction in crashes.⁵²

Price increases shift margins upstream rather than suppress volumes. Winter maintenance operations require roughly 20% of state DOT budgets, spending more than \$2.3 billion annually. Transportation departments must maintain winter operations despite cost variations.⁵³ Oregon allocated \$19 million in one-time General Fund resources in 2024 to continue essential highway and winter maintenance activities after experiencing budget constraints. Such budget flexibility demonstrates the essential nature of winter maintenance spending.

Efficiency-Driven Reductions in Salt Use

Reductions in roadway de-icing salt use have occurred historically. A range of operational practices are designed to improve application efficiency rather than reduce winter maintenance activity such as equipment-based controls, including open-loop and closed-loop spreader controllers, that improve application rate control and reduce material over-application⁵⁴

Pre-wetting solid salt with liquid de-icers improves performance and can reduce material usage. Pre-wetting can enhance the performance of solid materials and allows for optimum use of chemicals while minimizing adverse effects. Transportation agencies have adopted pre-wetting as a standard practice to improve application effectiveness.⁵⁵

Anti-icing strategies-applying liquid de-icers before precipitation events-improve winter maintenance effectiveness. Anti-icing is the practice of preventing the formation or development of bonded snow and ice by timely applications of a chemical freezing-point depressant. This approach has been adopted as a best practice for improving operational efficiency.⁵⁶ These operational improvements represent best-practices rather than demand reduction, and they have been adopted industry-wide, suggesting limited incremental efficiency gains remain available.

Legislative Protectionism: Policy Frameworks as Market Re-Rating Catalysts

New York's Buy American Salt Act (S.9441/A.7919-A) was signed on December 22, 2022 (Chapter 729). The Act establishes US-origin requirements for rock salt used or supplied under covered public contracts, and it conditions 'lowest responsible and reliable bidder'/'best value' determinations on compliance with those requirements, subject to defined waivers (public interest, unreasonable costs, insufficient quantity/quality). In the sponsor memo for the legislation, New York State cites an estimate that salt mined or harvested in New York State adds \$3.00 in tax revenue per tonne produced.⁵⁷

This reduces downside price-compression risk and improves contract-renewal visibility. Domestic assets are competing within a framework that recognizes logistical optionality and supply chain resilience as economically valuable attributes.

Displacement Risk for Overseas Supply

USGS reports US net import reliance for salt as a percentage of apparent consumption: 28% (2019), 27% (2020), 30% (2021), 30% (2022), 25% (2023e)). Transportation costs can affect the ability to import and export salt competitively, and lists major US import sources over 2019–22.⁵⁸

Cost Structures, AISC & Geography as an Economic Moat

The US average unit value of de-icing salt production was approximately \$61 per tonne in 2023.⁵⁹ Seasonal capacity constraints during winter months, when demand peaks, can stress logistics networks precisely when reliable supply proves most critical. Congestion risk amplifies during severe winter events when multiple consuming regions simultaneously draw on import channels.

Inventory Positions and Other Jurisdictional Risks

State departments of transportation maintain winter maintenance materials for seasonal operations. Research documents that winter maintenance operations require roughly 20% of state DOT budgets, spending more than \$2.3 billion annually. DOTs manage material stockpiles as part of winter maintenance planning, though specific procurement strategies vary by jurisdiction.⁶⁰ The balance between inventory carrying costs and supply security creates ongoing tension in procurement strategies. Just-in-time approaches reduce storage expense but increase exposure to supply chain disruptions during peak demand periods.

United States trade policy has exhibited increasing protectionist tendencies in recent years, with tariffs functioning as asymmetric risk for importers. Salt imports to the United States face no tariff under current trade regulations.⁶¹

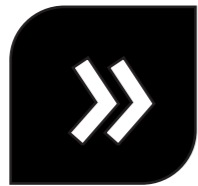
TL;DR

Road salt procurement is transitioning from globalized lowest-bid frameworks toward security-of-supply prioritization as climate volatility increases peak-demand delivery failure risk. The US consumed approximately 55 million tonnes in 2023, with domestic production of 42 million tonnes concentrated across seven states (Kansas, Louisiana, Michigan, New York, Ohio, Texas, Utah) representing 95% of output. Twenty-five companies operate 63 facilities using four production methods: underground mining (46%), salt in brine (33%), vacuum pan evaporation (11%), and solar evaporation (10%).

Road salt exhibits pronounced demand inelasticity due to public safety mandates—winter maintenance accounts for 20% of state DOT budgets (\$2.3 billion annually), with documented accident increases of 1,300% during affected maintenance operations. Price increases shift margins upstream rather than destroy demand.

Legislative protectionism is emerging as a market catalyst. New York's Buy American Salt Act (December 2022) establishes US-origin requirements conditioning contract awards on domestic sourcing compliance. This reduces import competition and improves contract visibility for domestic producers. US import reliance declined from 30% in 2021-22 to an estimated 25% in 2023. Climate-driven precipitation shifts create geographic demand differentiation, with 2025-26 La Niña conditions favoring wetter northern-tier markets where traditional high-consumption patterns persist.

FROM UTILITY COMMODITY TO MARGIN-STRATIFIED MARKET



Top 3 Questions This Chapter Answers

- 1. How does the 80/120 procurement rule in municipal salt contracts create structural advantages for producers with superior logistics positioning and proximity to end markets?** - The chapter examines how state DOT contract volume flexibility provisions allocate asymmetric risk between buyers and suppliers, explaining why delivery capability and proximity to end markets—rather than mine-gate pricing—determines competitive positioning in bulk municipal supply.
- 2. Why do retail packaged salt economics diverge fundamentally from bulk commodity pricing, and what role does distribution access play in margin capture?** - The chapter establishes how chemically identical salt commands materially different producer-level pricing across channels, identifying distribution infrastructure and downstream channel access as the hidden constraints that determine margin capture in retail salt economics.
- 3. Why don't alternative de-icers (calcium chloride, magnesium chloride, calcium magnesium acetate) threaten sodium chloride's dominant market position despite performance advantages in extreme cold?** - The chapter analyzes the cost, infrastructure, and performance trade-offs that keep sodium chloride as the default material for routine winter maintenance, demonstrating why operational efficiency improvements have already captured most substitution potential.

Why the 80/120 Rule Creates a Structural Advantage for Local Supply

The largest volume segment in the North American salt market remains municipal and state government procurement. State Department of Transportation (DOT) salt contracts vary widely in both scale and structure. Research on state DOT procurement practices shows annual contract volumes ranging from as little as 322 tons (Oregon DOT) to as much as 960,000 tons (Ohio DOT), with contract durations typically spanning one to five years.⁶² In the United States, these agreements are often governed by the 80/120 supply rule, under which the purchaser provides a target volume representing its estimated need and guarantees payment for 80% of that target volume, while the contractor guarantees delivery up to 120% of the target volume if requested.⁶³

Certain contracts also specify delivery timing requirements (for example, references to a Thirty-Day Delivery requirement), which can shape how quickly additional product can be supplied when orders increase⁶⁴ This introduces asymmetric risk for suppliers depending on their logistics flexibility.

Public Sector Procurement: Volume at the Expense of Margins

State and local government procurement for federal-aid projects generally follows competitive bidding procedures, though specific criteria vary by jurisdiction and contract type. Federal regulations for federal-aid construction projects support competitive procurement methods. State transportation agencies' procurement procedures for federal-aid construction contracts include requirements for a clear and accurate description of

the technical requirements for the material, product, or service to be procured.⁶⁵ For sealed bid procurement (the preferred method for construction), federal regulations require that a firm fixed-price contract (lump sum or unit price) is awarded to the responsible bidder whose bid is the lowest in price. However, federal procurement also permits alternative methods including best-value selection and qualifications-based selection.⁶⁶ This dynamic caps margin upside and favors producers with low operating costs.

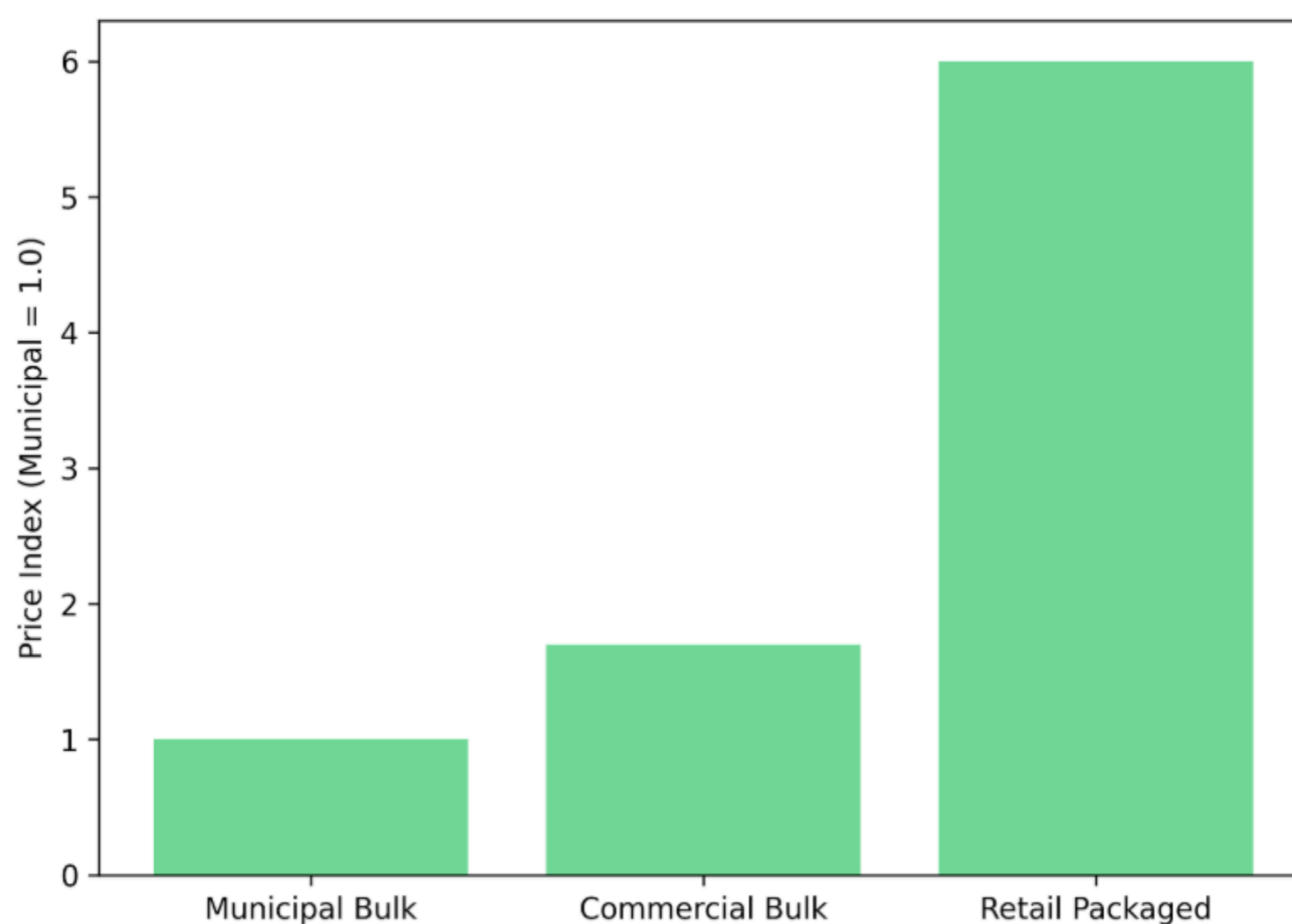
Commercial Bulk: Stability Without Pricing Power

Mid-sized commercial contracts sit between spot transactions and large municipal procurement, typically serving industrial users and private operators through direct and distributor channels. Salt sales flowing through wholesalers and retailers (including grocery and institutional distribution), alongside direct industrial demand that spans diverse applications such as oil and gas exploration, metal processing, pulp and paper, textiles, and other industrial uses.⁶⁷

In this environment, commercial buyers tend to prioritize continuity of supply and delivered reliability, but pricing outcomes remain tightly bounded by a delivered-cost structure where transportation can be a dominant variable. Shipping costs can be material relative to the product itself, meaning commercial bulk economics are often governed less by the mine-gate price than by distance to end markets and logistics efficiency.⁶⁸ Materially different average unit values across salt types at the producer (f.o.b. mine/plant) level, highlighting how “bulk” forms are generally positioned at lower unit values than higher-processed products, reinforcing why contract stability does not automatically translate into pricing power.⁶⁹

Retail Packaged Salt: Where the Economics Break Away

The retail segment operates under entirely different economics as reflects a fundamentally different cost stack than bulk supply, because packaging, handling, and distribution in smaller units add incremental costs that are reflected in higher selling prices at the producer level.⁷⁰ Values reported at the producer level vary by salt type and form, with packaged/processed products typically positioned above bulk equivalents.⁷¹



Salt Pricing by Channel (Indexed). Source: Crux Investor Research

Margin Mix as a Variable

Municipal procurement of road salt exhibits seasonal demand directly related to winter weather severity and the frequency of winter weather events, with peak demand during winter months and supply shortages sometimes occurring during severe winters.⁷² Retail purchases are often event-driven, triggered by immediate weather forecasts, rather than contractually scheduled, creating natural diversification in cash flow timing.

Why Alternatives Don't Break the Salt Thesis

Sodium chloride (salt) is an inexpensive, widely available, and effective ice-control agent. Calcium chloride and calcium magnesium acetate can be substituted for salt in de-icing, but at a higher cost.⁷³ Calcium chloride and calcium magnesium acetate, hydrochloric acid, and potassium chloride can be substituted for salt in de-icing, but at a higher cost. No economic substitutes or alternatives for salt exist in most applications.⁷⁴ Thus chloride-based de-icers will continue to be the primary de-icers for winter highway maintenance.

Performance Limitations in Extreme Cold

De-icing effectiveness varies significantly with temperature. Sodium chloride (salt) is an inexpensive, widely available, and effective ice-control agent. It does, however, become less effective as temperatures decrease below 15 degrees Fahrenheit (-9.5 degrees Celsius).⁷⁵

Different de-icing salts behave very differently in cold weather. Calcium chloride can remain liquid at extremely low temperatures, while magnesium chloride freezes at higher temperatures than calcium chloride but still performs better in very cold conditions than standard road salt. By contrast, sodium chloride (ordinary road salt) becomes much less effective once pavement temperatures fall below about 15°F, unless it is combined with calcium chloride to improve performance.⁷⁶

Government-funded transportation research also shows that calcium chloride and magnesium chloride can chemically react with concrete. These reactions can cause cracking, increased permeability, and a loss of concrete strength over time. The same study found that sodium chloride brines did not produce these chemical damage effects in concrete.⁷⁷

In practical terms, this helps explain why sodium chloride remains the default material for routine winter road maintenance across much of North America. While specialty chlorides can improve performance during extreme cold, their potential impact on concrete and more limited use in standard operations mean they are typically applied selectively rather than used as a full replacement for standard road salt.

Adoption Barriers and Evidence on Marginal Substitution

Equipment compatibility, storage requirements, and regulatory approval create switching costs that favor continued use of proven sodium chloride formulations. The use of salt brine for road de-icing has increased in recent years. Regular rock salt can be dissolved to create a salt brine solution, which is used as pretreatment prior to ice or snow accumulation.⁷⁸ Research into the use of salt brine and overall reduction in salt usage for winter precipitation cleanup has resulted in less road salt consumption at some locales.⁷⁹ These operational improvements have been widely adopted, suggesting limited incremental substitution potential remains.

ESG as an Emerging Factor in Procurement Decisions

Environmental considerations are beginning to appear in public procurement frameworks in select jurisdictions, particularly through the adoption of environmentally preferable purchasing (EPP) policies. These policies are designed to allow environmental attributes to be considered alongside traditional procurement criteria when goods and services are evaluated.⁸⁰

Water Quality Standards and Runoff Regulations

Chloride from road salt application is known to accumulate in surface water and groundwater systems, particularly in regions with sustained winter de-icing activity. At elevated concentrations, chloride poses risks to aquatic ecosystems. The US Environmental Protection Agency (EPA) identifies chloride as toxic to freshwater aquatic life when concentrations exceed 230 milligrams per liter (mg/L), which is established as the federal chronic aquatic life criterion for water quality.⁸¹

While the EPA's 230 mg/L threshold serves as the national benchmark, individual states may adopt additional water quality standards or impairment listings based on local monitoring data and regulatory frameworks. These state-level actions reflect growing regulatory attention to chloride accumulation in freshwater systems, even where federal criteria are not formally exceeded.⁸²

New Hampshire provides a documented example of how chloride concerns can translate into regulatory and operational responses. State water quality assessments identified increasing numbers of surface waters impaired by chloride over time, prompting regulatory review and policy response. In response, New Hampshire implemented a Salt Reduction Initiative focused on operational improvements rather than reduced roadway safety standards. This program incorporated equipment upgrades, improved application monitoring, and alternative material testing, resulting in a measurable reduction in road salt usage while maintaining winter road safety.^{83 84}

The significance lies not in near-term demand destruction, but in the regulatory direction of travel, having a pattern in which environmental constraints are addressed through efficiency, optimization, and improved application practices, rather than outright elimination of road salt use. These initiatives signal an increasing emphasis on accountability and optimization within winter maintenance practices, which may influence procurement standards and operating requirements over time.

Distribution as the Hidden Constraint in Retail Salt

Sodium chloride sold into retail channels is chemically similar to bulk salt used in industrial or municipal applications. The primary distinction lies in how the product is processed, packaged, transported, and distributed.⁸⁵

When salt is packaged and shipped in smaller units, costs increase materially and are reflected in higher reported selling prices at the producer level. The higher prices are therefore associated with handling, packaging, and distribution requirements rather than intrinsic differences in the salt itself. Access to downstream channels and logistics plays a significant role in determining realized prices, particularly for packaged products.⁸⁶

Price Discovery in Absence of Exchange Trading

Because salt is a bulk, low-value commodity, its pricing is shaped primarily by physical transactions rather than financial markets. Price formation occurs through negotiated sales to end users, including public-sector procurement and private contracts, rather than through transparent exchange trading.⁸⁷

Tender Data and Delivered Price Indices

USGS data provide indicative average unit values by salt production method, illustrating clear price differentiation at the producer level. As of 2023, reported average unit values show that vacuum and open-pan salt command significantly higher prices than solar salt, while rock salt and salt in brine are positioned at the lower end of the value spectrum. The reported prices reflect mine-gate or plant-level values and exclude transportation, storage, and handling costs. Transportation can represent a substantial portion of total delivered cost, in some cases exceeding the value of the salt itself. As a result, delivered pricing varies materially by location and logistics, even when underlying mine-gate prices are similar. The dynamic reinforces the importance of proximity to end markets and distribution infrastructure in determining realized economics across the salt supply chain.⁸⁸

Long-Term Price Appreciation Pattern

Average unit value of rock salt sold or used in the United States increased modestly between 2019 and 2023. In 2019, the reported average unit value of rock salt was \$59.90 per tonne, rising to approximately \$61 per tonne by 2023. These figures reflect producer-reported values on a free-on-board (f.o.b.) mine or plant basis and provide a long-term view of pricing at the production level rather than delivered or retail prices. Rock salt pricing in the United States has exhibited gradual, incremental change over time, consistent with a mature physical market characterized by stable demand and limited exposure to speculative price dynamics.^{89 90}

Seasonal Pricing Patterns and Contract Structures

Road salt procurement by state and local government agencies typically occurs through annual competitive bidding processes conducted prior to winter season onset. Transportation agencies commonly advertise and award salt contracts between April and July,⁹¹ in advance of the October-November winter weather season.

Contract Duration and Renewal Structures

Fourteen of twenty-five surveyed state agencies use one-year contracts with renewal options, while five agencies use straight single-year contracts requiring annual rebidding.⁹² Road salt contracts commonly include volume flexibility provisions to accommodate weather-driven demand variability. Multiple state transportation agencies employ 80/120 contract structures^{93 94} requiring agencies to purchase a minimum of 80% of the contracted quantity while obligating vendors to supply up to 120% of the contracted amount. Other documented ranges include 70-150% (New York DOT), 70-110% (Iowa DOT in 2014/15), 90-110% (Ohio DOT), and 50-120% (New Jersey DOT). Nine of twenty-five surveyed agencies reported no quantity limits.⁹⁵

Risk Allocation and Pricing Effects of Quantity Limits

Volume flexibility provisions allocate risk between agencies and suppliers. Minimum purchase requirements provide suppliers with baseline revenue predictability, while maximum supply obligations ensure agencies can obtain additional salt during severe winter conditions exceeding normal usage patterns.⁹⁶ Research by state transportation agencies indicates that tighter quantity limits can reduce per-ton costs by shifting supply risk toward purchasing agencies - Iowa DOT documented a 3.37% average price decrease when tightening limits from 70-110% to 80-110%.⁹⁷

Pre-Season Pricing Mechanisms and Contractual Constraints

Road salt pricing is primarily determined through pre-season contracts awarded months before winter onset.⁹⁸ Contract terms typically lock in fixed prices for the season, with limited provisions for adjustment.⁹⁹ Multi-year contracts may include annual price renegotiation clauses,¹⁰⁰ and some contracts incorporate fuel adjustment provisions that allow per-ton prices to vary with diesel fuel costs.¹⁰¹ These pre-established contractual commitments limit immediate price responsiveness to within-season supply-demand conditions.

Severe Winter Events and System Stress

During mild winters, excess inventory accumulates and suppresses near-term pricing; Severe winters that exceed contracted salt quantities create supply challenges for transportation agencies. During the severe 2007-2008 winter and subsequent 2008 procurement cycle, widespread salt shortages occurred nationwide. Multiple factors contributed to reduced availability: record winter salt consumption depleted stockpiles, Mississippi River flooding delayed barge deliveries, hurricane damage in Louisiana affected mining operations, and production capacity constraints limited supply response.¹⁰² During the 2008 procurement, 31 Iowa DOT locations received no bids initially, and average statewide prices increased from \$50 per ton (2007) to \$63 per ton (2008).¹⁰³ Contract provisions typically allow agencies to purchase from secondary bidders at higher costs when primary vendors cannot deliver.¹⁰⁴

Asset Longevity & Retail Credibility

Retail buyers prioritize supply security differently than municipal procurement officers. State and municipal road salt procurement typically employs competitive low-bid processes that award contracts based on price competitiveness.¹⁰⁵ Most surveyed transportation agencies use some form of low-bid procurement approach to select vendors.¹⁰⁶ Contract terms typically range from one to five years, with fourteen of twenty-five surveyed state agencies using one-year contracts with renewal options, and five agencies requiring annual rebidding.¹⁰⁷

TL;DR

North American salt markets operate as a margin-stratified system where channel positioning - not product differentiation - determines profitability. Municipal procurement represents the largest volume segment but operates under competitive low-bid frameworks with 80/120 volume flexibility provisions that cap margin upside and favor low-cost operators with logistics flexibility. Transportation costs can exceed the salt's value, making proximity to end markets the primary competitive variable.

Retail packaged salt operates under entirely different economics. Though chemically identical to bulk product, packaging and small-unit distribution create materially higher producer-level prices. Distribution infrastructure access - not mine-gate pricing - determines margin capture.

Alternative de-icers pose no structural threat to sodium chloride dominance. Calcium chloride and magnesium chloride offer superior cold-weather performance but at higher cost, with documented concrete degradation risks and equipment compatibility barriers. Operational efficiency improvements (pre-treatment brining) have already been widely adopted, limiting remaining substitution potential.

Pricing occurs through negotiated contracts rather than exchange trading, with pre-season awards locking terms months before winter onset. The 80/120 contract structure allocates weather-driven volume risk between buyers and suppliers, with tighter quantity limits documented to reduce per-ton pricing by shifting risk toward purchasing agencies. Severe winters stress the system, as demonstrated by the 2008 shortage cycle.

INVESTMENT CONSIDERATIONS & RISK FACTORS



Top 3 Questions/Focus Areas

- 1. How does weather-driven demand fundamentally differentiate salt from conventional commodity investments, and what does this mean for portfolio allocation?** - The chapter examines how winter weather events—rather than snowfall totals or economic cycles—serve as the primary demand driver for de-icing salt, creating utilization variability disconnected from traditional macroeconomic indicators.
- 2. What supply-side constraints and market structure characteristics give salt producers pricing dynamics distinct from exchange-traded commodities?** - The chapter explores the concentrated production base among established North American operators, capacity limitations during severe winters, and the absence of commodity exchange trading or benchmark pricing.
- 3. How might climate change reshape regional de-icing demand patterns, and what analytical frameworks should investors apply to salt asset evaluation?** - The chapter addresses projected shifts in winter hazard types across different geographies and why conventional commodity producer valuation approaches may inadequately capture salt's differentiated demand characteristics.

Weather Events as the Primary Driver of De-icing Salt Demand

The weather-dependent demand pattern differs from industrial minerals whose consumption typically correlates with manufacturing output.¹⁰⁸ State and local transportation departments procure de-icing salt annually based on winter weather forecasts and stockpile requirements.¹⁰⁹ Procurement levels vary with winter weather forecasts, previous season severity, and existing stockpile levels.¹¹⁰

Year-over-Year Consumption Variability and Stockpile Management

US salt consumption exhibits year-over-year variability driven by winter weather severity. For example, US consumption of salt for ice control and road stabilization was 22.9 million tonnes in 2018, decreased 5% to 21.8 million tonnes in 2019, and varied in subsequent years based on winter weather patterns.¹¹¹ Year-over-year demand variability affects stockpile management by state and local transportation departments. USGS data shows that demand from transportation departments varies with winter severity and existing stockpile levels. For instance, following less intense winter seasons, governments reportedly had remaining stockpiles and reduced need to replenish supplies for subsequent seasons.¹¹²

Cyclical in the salt market differs from the economic cycles that govern base metals or energy commodities, but demand variability remains material due to dependence on winter weather conditions. U.S. Geological Survey data indicate that because most rock salt is used for de-icing, operating rates at rock salt facilities fluctuate with the severity of winter weather, introducing variability that is not directly linked to broader macroeconomic cycles.¹¹³ As a result, investors must consider whether portfolio exposure can accommodate weather-driven operating variability that may not track conventional economic indicators.

Supply Constraints and Pricing Power

U.S. Geological Survey data show that salt production in North America is concentrated among a limited number of established operators and facilities, and that during periods of strong de-icing demand, production levels can approach or exceed rated capacities.^{114 115} This concentration limits the industry's ability to rapidly expand supply in response to severe winters. The absence of granular institutional data on new capacity additions underscores the reliance on existing operations to meet incremental demand during high-severity winter conditions.

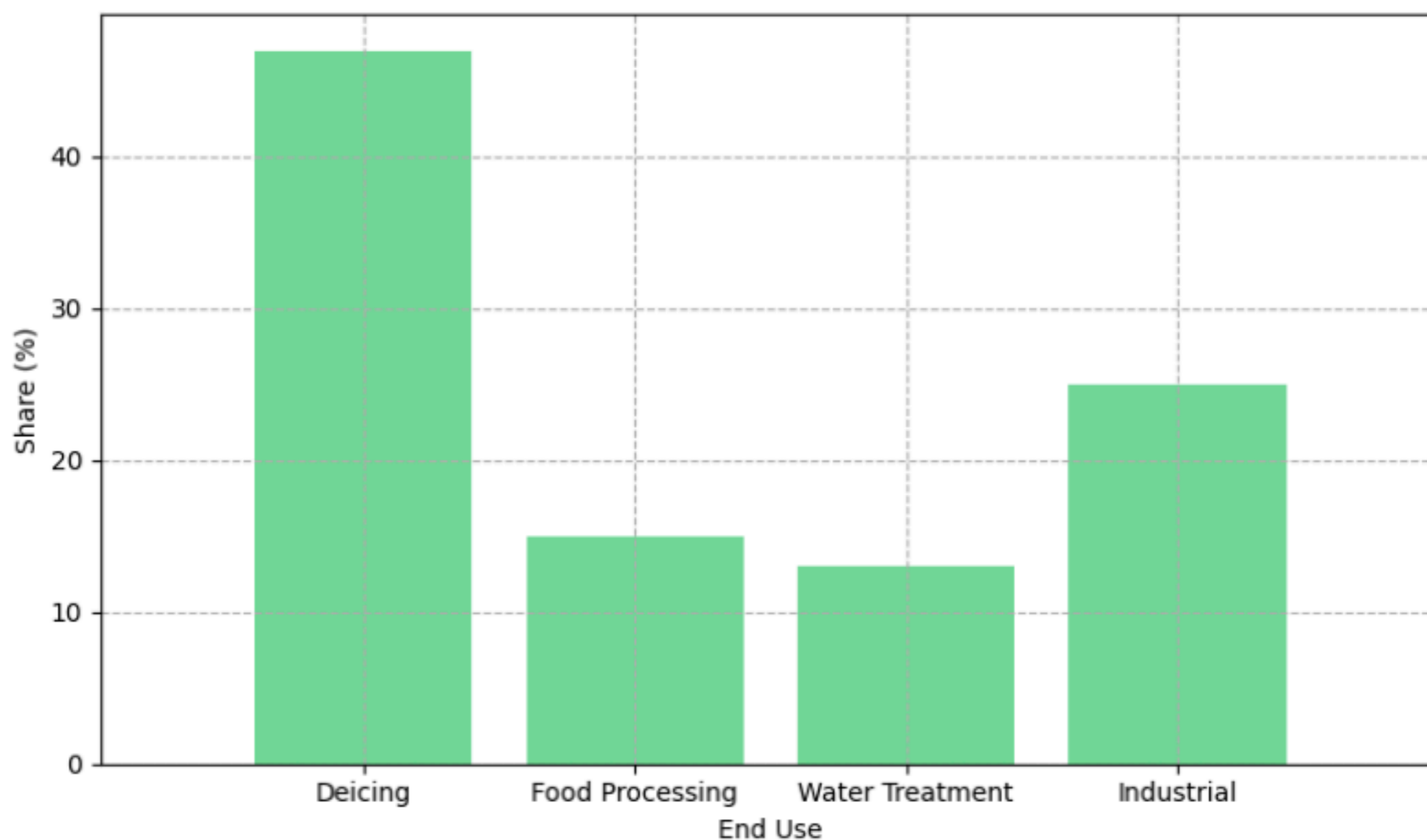
Climate Trend Implications

Long-term warming is projected to reduce Northern Hemisphere snow cover and shift winter hazard patterns in ways that vary by region.¹¹⁶ FHWA notes that warming may reduce snow in some US regions while also changing winter hazard types (including the potential for more freezing rain/sleet in parts of the Midwest and Northeast, and heavy snow from winter cyclones in other regions), implying winter maintenance needs may evolve unevenly across geographies.¹¹⁷ Climate change is also projected to increase the frequency and intensity of heavy precipitation, which can compound winter operational challenges depending on local conditions.¹¹⁸

Because projected winter hazards differ by region (including Arctic amplification and declining snow cover), exposure is likely to be location-specific rather than uniform across markets.¹¹⁹

Project Economics and Margin Optimization

Salt assets are often evaluated using generalized commodity producer frameworks. Salt production is distributed across de-icing, food processing, water treatment, and other industrial uses, rather than a single homogeneous market.¹²⁰ Analytical approaches that implicitly treat all production volumes as economically equivalent may therefore fail to reflect differences in end-use exposure documented in institutional statistics.



US Salt Demand by End Use Source: Crux Investor Research

Discounted cash flow assumptions that rely solely on aggregate production volumes and average pricing obscure this end-use differentiation. USGS data show that demand for salt used in de-icing fluctuates with winter severity, while non-de-icing uses such as food processing and water treatment are not driven by weather variability.¹²¹ Sensitivity analyses that focus exclusively on bulk de-icing volumes therefore may not capture the full range of demand characteristics reflected in institutional end-use data.

An emphasis on near-term production metrics can also obscure the relevance of reserve longevity. U.S. Geological Survey publications document that salt deposits are typically large and long-lived, with production continuing for decades at many operations.¹²² While institutional sources do not quantify "credibility advantages," they do establish that salt supply is derived from assets with extended operating lives relative to

many other extractive industries.

Conclusion: Analytical Considerations

The North American road salt market exhibits characteristics that differ from those of many mining sector investments, reflecting demand tied to public safety and winter road maintenance rather than discretionary industrial consumption. U.S. Geological Survey data indicate that highway de-icing represents the largest end use of salt in the United States, linking demand primarily to winter weather conditions rather than broader economic activity. Statistics show a long-term increase in the average unit value of salt sold or used in the United States, reflecting essential-use demand and constrained supply conditions rather than participation in exchange-traded or speculative markets. USGS publications further note that salt is not traded on commodity exchanges and lacks widely disseminated benchmark pricing, contributing to pricing dynamics that differ from financially traded commodities.¹²³

Weather-Driven Utilization and Capacity Requirements

Weather-driven demand variability creates operational characteristics that differ from traditional commodity cycles. USGS reports that because most rock salt is used for de-icing, operating rates at rock salt facilities fluctuate with the severity of winter weather, requiring producers to maintain capacity to meet severe winter demand while facing lower utilization during mild seasons.¹²⁴ Salt is consumed across multiple applications beyond de-icing, including food processing, water treatment, and industrial uses, providing diversification across demand drivers documented in institutional statistics. Environmental and regulatory considerations warrant monitoring, although institutional sources do not indicate policies that eliminate the need for road salt. Best management practices, such as improved application controls and anti-icing strategies, that can increase efficiency and reduce unnecessary application without removing the underlying requirement for salt to maintain roadway safety.¹²⁵

TL;DR

Salt represents an unconventional mining investment where demand is driven by winter weather events rather than economic cycles. The number of freezing rain, sleet, and snow events—not total snowfall—determines rock salt consumption, creating year-over-year variability disconnected from conventional economic indicators.

Supply is concentrated among limited established operators, constraining rapid capacity expansion during severe winters and supporting pricing power. Unlike most commodities, salt lacks exchange trading or benchmark pricing.

Climate change introduces regional complexity: warming may reduce snow cover in some areas while shifting hazard types toward more freezing rain elsewhere. Investors must recognize that salt serves multiple end markets—de-icing, food processing, water treatment—each with distinct demand drivers. Valuation frameworks treating all production as economically equivalent miss this differentiation. The public-safety-driven nature of highway de-icing creates an investment profile distinct from traditional extractive industries.

BIBLIOGRAPHY

- [1] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [2] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [3] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. Salient Statistics-United States table. USGS, p. 150.](#)
- [4] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [5] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. Salient Statistics-United States table. USGS, p. 150.](#)
- [6] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 151.](#)
- [7] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 151.](#)
- [8] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, pp. 150-151.](#)
- [9] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. Salient Statistics-United States table. USGS, p. 150.](#)
- [10] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. Salient Statistics-United States table. USGS, p. 150.](#)
- [11] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [12] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [13] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, pp. 150-151.](#)
- [14] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [15] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. World Production table. USGS, p. 151.](#)
- [16] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [17] [Bolen, W.P. \(2023\). Salt \[Advance Release\]. In 2018 Minerals Yearbook, Vol. I — Metals and Minerals. US Geological Survey, p. 63.2.](#)
- [18] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt, Prices section. USGS, p. 150.](#)
- [19] [U.S. Geological Survey. Minerals Yearbook 2019: Salt \(Advance Release\), published Feb 15, 2025.](#)
- [20] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. Salient Statistics table. USGS, p. 150.](#)
- [21] [US Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [22] [Nixon, W.A. and DeVries, R.M., Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Project 14-10, November 2015](#)
- [23] [Governor Kathy Hochul, "Governor Hochul Signs Buy American Salt Act into Law to Support New York Jobs and The State's Economy," December 22, 2022](#)
- [24] [New York State Senate Bill S.9441/A.7919-A, New York State Finance Law § 162-A, 2022; Amended by Chapter 72 of the Laws of 2023](#)
- [25] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [26] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [27] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [28] [Kostick, Dennis S., US Geological Survey Minerals Yearbook-Salt, 2000](#)
- [29] [Bolen, Wallace P., US Geological Survey Mineral Commodity Summaries-Salt, January 2024](#)
- [30] [Kostick, Dennis S., US Geological Survey Minerals Yearbook-Salt, 2000; Bolen, Wallace P., US Geological Survey Mineral Commodity Summaries-Salt, January 2024](#)
- [31] [Kostick, Dennis S., US Geological Survey Minerals Yearbook-Salt, 2000](#)
- [32] [Connecticut General Assembly Office of Legislative Research, Road Salt and Sand, 1994 Ohio Department of Transportation, Purchasing & Procurement, accessed 2026](#)
- [33] [Nixon, Wilfrid A., and R. Mark DeVries, Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report Project 06742/CR14-10, November 2015](#)
- [34] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [35] [NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013](#)
- [36] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)

- [37] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024, Federal Highway Administration, Manual of Practice for an Effective Anti-Icing Program, Report No. FHWA-RD-95-202, June 1996, US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [38] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024, p. 150](#)
- [39] [US Geological Survey, Mineral Commodity Summaries 2024, published January 2024](#)
- [40] [NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013](#)
- [41] [NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013, US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [42] [Nixon, W.A. and DeVries, R.M., "Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations," Clear Roads Project 06742/CR14-10, November 2015, NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013](#)
- [43] [Nixon, W.A. and DeVries, R.M., "Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations," Clear Roads Project 06742/CR14-10, November 2015](#)
- [44] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [45] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [46] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [47] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [48] [NOAA / National Weather Service \(Weather.gov\), Winter 2025-26 Outlook \(page text quoting NOAA climate content\), accessed 2026.](#)
- [49] [NOAA / National Weather Service \(Weather.gov\), Winter 2025-26 Outlook \(page text quoting NOAA climate content\), accessed 2026.](#)
- [50] [NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013](#)
- [51] [NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013](#)
- [52] [Federal Highway Administration \(FHWA\), Characterizing Road Safety Performance Using Pavement Friction, 2023](#)
- [53] [NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013](#)
- [54] [Federal Highway Administration \(FHWA\), Road Weather Management Performance Measures Update, 2019.](#)
- [55] [Federal Highway Administration, Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, Publication No. FHWA-RD-95-202, June 1996](#)
- [56] [Federal Highway Administration, Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, Publication No. FHWA-RD-95-202, June 1996](#)
- [57] [New York State Assembly, Bill Search and Legislative Information — A07919 \(2021-2022\), 2022.](#)
- [58] [U.S. Geological Survey, Mineral Commodity Summaries: Salt, 2024.](#)
- [59] [US Geological Survey, Mineral Commodity Summaries 2024 - Salt, January 2024](#)
- [60] [NCHRP Project 20-07, Task 318, "Revised Chapter 8, Winter Operations and Salt, Sand and Chemical Management," Transportation Research Board, 2013](#)
- [61] [US Geological Survey, 2025, Mineral Commodity Summaries 2025 - Salt](#)
- [62] [Nixon, W.A. and DeVries, R.M., Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations, Clear Roads CR14-10, Minnesota Department of Transportation, November 2015](#)
- [63] [Washington State Department of Enterprise Services, Master Contract Competitive Solicitation – No. 11021... \(Solicitation Amendments\), 2022.](#)
- [64] [Washington State Department of Enterprise Services, Master Contract Competitive Solicitation – No. 11021... \(Solicitation Amendments\), 2022.](#)
- [65] [Federal Highway Administration, Guidelines on Preparing Engineer's Estimate, Bid Reviews and Evaluation, October 2021](#)
- [66] [1] 2 CFR 200.320(b)(1), as cited in Federal Procurement guidance; [2] Federal Highway Administration, P3 Toolkit: Publications - Primers
- [67] [U.S. Geological Survey, Salt \(Minerals Yearbook 2002\)](#)
- [68] [U.S. Geological Survey, Minerals Yearbook 2019: Salt \(Advance Release\).](#)
- [69] [U.S. Geological Survey, Salt Data Sheet – Mineral Commodity Summaries 2020](#)
- [70] [U.S. Geological Survey, Minerals Yearbook 2019: Salt \(Advance Release\).](#)
- [71] [U.S. Geological Survey, Salt Data Sheet – Mineral Commodity Summaries 2020](#)
- [72] [Bolen, Wallace P., US Geological Survey Minerals Yearbook - Salt, 2019 \(Advance Release February 2025\), Bolen, Wallace P., US Geological Survey Mineral Commodity Summaries - Salt, January 2024](#)

- [73] [Bolen, Wallace P., US Geological Survey Minerals Yearbook - Salt, 2019 \(Advance Release February 2025\), Bolen, Wallace P., US Geological Survey Mineral Commodity Summaries - Salt, January 2024](#)
- [74] [Bolen, Wallace P., US Geological Survey Mineral Commodity Summaries - Salt, January 2024](#)
- [75] [Bolen, Wallace P., US Geological Survey Minerals Yearbook - Salt, 2019 \(Advance Release February 2025\)](#)
- [76] [Manual of Practice for an Effective Anti-Icing Program \(FHWA-RD-95-202\), Appendix B](#)
- [77] [The Deleterious Chemical Effects of Concentrated De-icing Solutions on Portland Cement Concrete](#)
- [78] [Bolen, Wallace P., US Geological Survey Minerals Yearbook - Salt, 2019 \(Advance Release February 2025\)](#)
- [79] [Bolen, Wallace P., US Geological Survey Minerals Yearbook - Salt, 2019 \(Advance Release February 2025\)](#)
- [80] [City and County of Denver, Executive Order No. 123 \(Sustainability Policy\), Memorandum 123-D "Environmentally Preferable Purchasing," 2013.](#)
- [81] [National Recommended Water Quality Criteria: Aquatic Life Criteria Table 2024](#)
- [82] [New Hampshire Department of Environmental Services, WMB-4: Road Salt and Water Quality](#)
- [83] [New Hampshire Department of Environmental Services, WMB-4: Road Salt and Water Quality](#)
- [84] [U.S. Environmental Protection Agency, Winter Is Coming: Road Salt and the Environment](#)
- [85] [U.S. Geological Survey Mineral Commodity Summaries 2024: Salt](#)
- [86] [U.S. Geological Survey Mineral Commodity Summaries 2024: Salt](#)
- [87] [U.S. Geological Survey Mineral Commodity Summaries 2024: Salt](#)
- [88] [U.S. Geological Survey Mineral Commodity Summaries 2024: Salt](#)
- [89] [U.S. Geological Survey Mineral Commodity Summaries 2020: Salt](#)
- [90] [U.S. Geological Survey Mineral Commodity Summaries 2024: Salt](#)
- [91] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, Pooled Fund #TPF-5\(218\). University of Iowa and Vaisala Inc., p. 6.](#)
- [92] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, p. 18.](#)
- [93] [Iowa Department of Transportation. \(2008\). Winter Maintenance Program. Iowa Legislative Services Agency presentation, Slide 8.](#)
- [94] [Washington State Department of Enterprise Services. \(2025\). Contract 11021: Snow and Ice Control Products, Contract Summary.](#)
- [95] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, pp. 18-19.](#)
- [96] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, p. 18 \(citing Hanneman 2009a,b\).](#)
- [97] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, p. 19.](#)
- [98] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, p. 6.](#)
- [99] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, Appendix A.](#)
- [100] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, p. 18.](#)
- [101] [Iowa Department of Transportation. \(2008\). Winter Maintenance Program. Iowa Legislative Services Agency presentation, Slide 8.](#)
- [102] [Iowa Department of Transportation. \(2008\). Winter Maintenance Program. Iowa Legislative Services Agency presentation, Slide 9.](#)
- [103] [Iowa Department of Transportation. \(2008\). Winter Maintenance Program. Iowa Legislative Services Agency presentation, Slide 8.](#)
- [104] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, p. 19.](#)
- [105] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, Pooled Fund #TPF-5\(218\). University of Iowa and Vaisala Inc., p. 17.](#)
- [106] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, Appendix A \(Interview Questions\).](#)
- [107] [Nixon, W. A., & DeVries, R. M. \(2015\). Development of a Handbook of Best Management Practices for Road Salt in Winter Maintenance Operations. Clear Roads Final Report CR14-10, p. 18.](#)
- [108] [U.S. Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150.](#)
- [109] [U.S. Federal Highway Administration. \(1996\). Manual of Practice for an Effective Anti-Icing Program: A Guide for Highway Winter Maintenance Personnel. FHWA-RD-95-202.](#)

- [110] [U.S. Geological Survey. \(2022\). Mineral Commodity Summaries 2022 - Salt. USGS, p. 150.](#)
- [111] [U.S. Geological Survey. \(2024\). Mineral Commodity Summaries 2024 - Salt. USGS, p. 150-151.](#)
- [112] [U.S. Geological Survey. \(2022\). Mineral Commodity Summaries 2022 - Salt. USGS, p. 150.](#)
- [113] [U.S. Geological Survey \(USGS\), Minerals Yearbook 2018: Salt \(Advance Release\), published 2023.](#)
- [114] [U.S. Geological Survey \(USGS\), Mineral Commodity Summaries 2024: Salt, 2024.](#)
- [115] [U.S. Geological Survey \(USGS\), Minerals Yearbook 2019: Salt \(Advance Release\), published 2024.](#)
- [116] [IPCC, Climate Change 2021: The Physical Science Basis \(AR6 WG1\) – Technical Summary, 2021](#)
- [117] [IPCC, Climate Change 2021: The Physical Science Basis \(AR6 WG1\) – Chapter 12, 2021](#)
- [118] [IPCC, Climate Change 2023: Synthesis Report \(AR6 SYR\) – Summary for Policymakers, 2023 \(PDF\)](#)
- [119] [Federal Highway Administration \(FHWA\), The Impacts of Weather within the Context of Climate Change \(RWMP\), 2003 \(PDF\)](#)
- [120] [U.S. Geological Survey \(USGS\), Mineral Commodity Summaries 2024: Salt, 2024.](#)
- [121] [U.S. Geological Survey \(USGS\), Minerals Yearbook 2018: Salt \(Advance Release\), published 2023.](#)
- [122] [U.S. Geological Survey \(USGS\), Minerals Yearbook 2019: Salt \(Advance Release\), published 2024.](#)
- [123] [U.S. Geological Survey \(USGS\), Historical Statistics for Mineral and Material Commodities in the United States: Salt, updated 2023–2024.](#)
- [124] [U.S. Geological Survey \(USGS\), Minerals Yearbook 2018: Salt \(Advance Release\), published 2023.](#)
- [125] [Federal Highway Administration \(FHWA\), Manual of Practice for an Effective Anti-icing Program, Publication No. FHWA-RD-95-202, 1996](#)



cruxinvestor.com



[YOUTUBE.COM/CRUXINVESTOR](https://www.youtube.com/cruxinvestor)



[LINKEDIN.COM/COMPANY/CRUX-INVESTOR](https://www.linkedin.com/company/crux-investor)



[X.COM/CRUXINVESTOR](https://x.com/cruxinvestor)