


Calcium Hydroxide (Slaked Lime)





Direct Use Chemical **P**recursor Chemical


(liquid, solid)  

 **Source of Raw Material:**
Calcium Oxide (Quicklime)

 **% of Total Domestic Consumption Attributed to Water Sector:**
Less than 7%

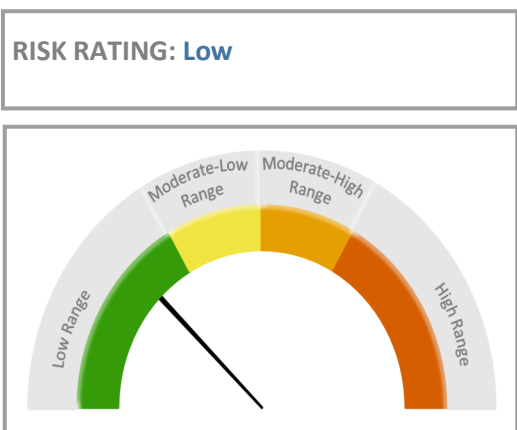
 **Product Family:**
Calcium

 **Derivative Water Treatment Chemicals:**
Calcium Hypochlorite

 [Understanding Chemical Supply Chains](#)
[Map of Suppliers & Manufacturers](#)

CAS No.: 1305-62-0
 **Shelf Life:**
6 Months

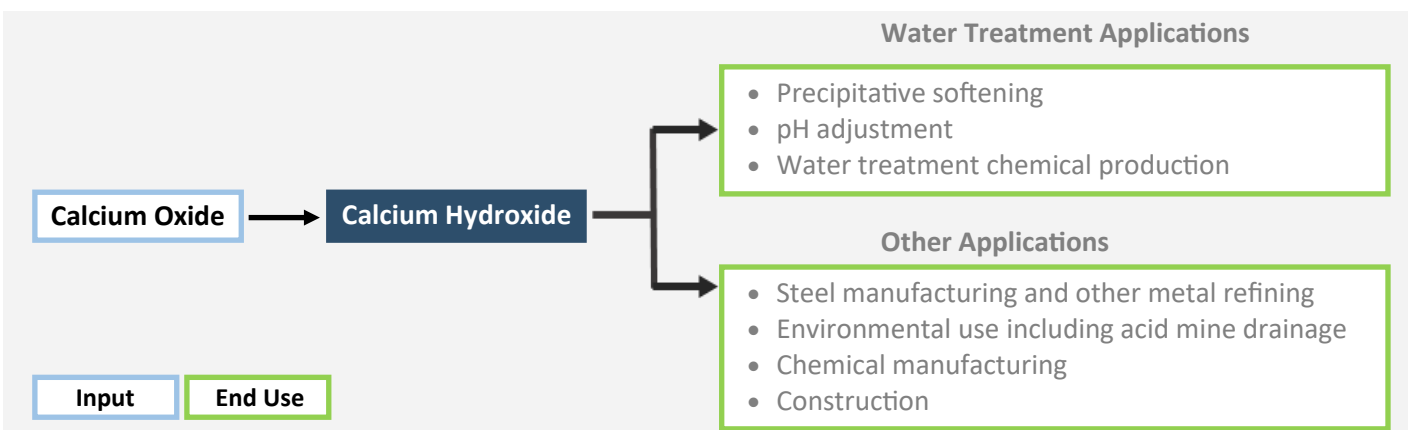
RISK OF SUPPLY DISRUPTION (Assessed in 2022)



RISK DRIVERS
Calcium hydroxide is used in a variety of industries and is widely manufactured and supplied. The key inputs (calcium oxide and calcium carbonate) are currently abundant and supplied from domestic sources.

RISK PARAMETERS
Criticality: High. Essential for softening, pH adjustment, and production of water treatment chemicals.
Likelihood: Low. The water sector has not experienced calcium oxide supply disruptions between 2000 and 2022.
Vulnerability: Low. Manufacturing and supply is widely distributed. Key raw material (calcium carbonate) is abundant and widely available.

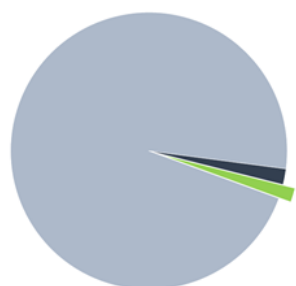
PRODUCTION PROCESS



DOMESTIC PRODUCTION AND CONSUMPTION, AND INTERNATIONAL TRADE

Domestic Production Locations (2018):
 47, distributed throughout the U.S.

International Trade (2019)
Primary Trading Partner (Imports): Canada
Primary Trading Partner (Exports): Canada



Domestic Consumption (2018):
2,696 M kg

- Domestic Production (2,690 M kg)
- Imports for Consumption (51 M kg)
- Export of Domestic Production (46 M kg)

Product Description

Calcium hydroxide ($\text{Ca}(\text{OH})_2$), also known as hydrated lime or slaked lime, is a widely used derivative of calcium oxide (quicklime). Calcium hydroxide is used directly in water treatment for precipitative softening and pH adjustment, and also as an input in the manufacturing of calcium hypochlorite.

Use in Water Treatment

Calcium hydroxide is used directly in precipitative softening pH adjustment.

Use as a Precursor to Other Water Treatment Chemicals

Calcium hydroxide is used to manufacture calcium hypochlorite.

Other Applications

Lime, including both calcium oxide (quicklime) and calcium hydroxide (slaked lime), has a wide range of applications. The leading domestic use of lime is as a flux and slagging agent to remove impurities as part of steel manufacturing. Other metallurgical uses include beneficiation of copper and zinc ores, bauxite processing, and recovery of uranium and nickel. Other metallurgical uses include beneficiation of copper and zinc ores, bauxite processing, and recovery of uranium and nickel. Lime also has environmental remediation applications including treatment of acid mine drainage and heavy metal contamination, as well as construction applications including soil stabilization, asphalt manufacturing, as a component of mortar and plaster, and alkali chemical manufacturing (USGS, 2021).

Primary Industrial Consumers

Domestic consumption information identifies consumers of lime, including both calcium hydroxide (slaked lime) and calcium oxide (quicklime). Calcium oxide is the predominant form of lime consumed. In 2018, approximately 35% of lime consumed in the U.S. was used for ferrous and nonferrous metallurgy. Additional applications include environmental uses (29%), chemical and industrial use (21%), construction use (10%), miscellaneous uses (3%), and use for refractories (1%) (USGS, 2021). Commercial sale of lime accounted for 94% of total domestic consumption in 2018, while captive consumption, including sugar refining and precipitated calcium carbonate manufacturing, accounted for the remaining 6%. Use of lime (calcium oxide and calcium hydroxide) in wastewater and drinking water accounted for approximately 7% of 2018 domestic consumption (USGS, 2021).

Manufacturing, Transport, & Storage

Manufacturing Process

Manufacturing of calcium hydroxide primarily relies on ground calcium oxide (quicklime) from high-calcium limestone. A precise amount of water is slowly added to ground or crushed calcium oxide to produce a dry, white powder in a highly exothermic reaction. The powder may be further refined by air separation to remove coarse particles (National Lime Association, n.d.). The overall equation for this process is outlined in Figure 1.

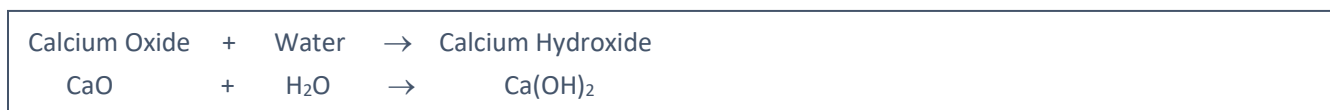


Figure 1. Chemical Equation for the Reaction to Manufacture Calcium Hydroxide

Product Transport

Calcium hydroxide is commonly transported by rail, truck, and waterway. Though widely manufactured throughout the U.S., there are areas without local access to calcium hydroxide plants, and transportation costs

may significantly increase the cost of the delivered product (USGS, 2021).

Storage and Shelf Life

Calcium hydroxide is stable and non-combustible. When stored properly, calcium hydroxide can have a shelf life of approximately 6 months (Mississippi Lime, 2015).

Domestic Production & Consumption

Domestic Production

Production data was collected from USGS, while trade data was collected from the U.S. International Trade Commission (USITC) Dataweb, as shown in Table 1. Both production and trade data are specific to calcium hydroxide.

Table 1. Calcium Hydroxide Production and Trade Data Sources

Production and Trade Data			
Category	Data Source	Identifier	Description
Domestic Production	U.S. Geological Survey	CAS No.: 1305-62-0	Calcium Hydroxide
Imports and Exports	U.S. International Trade Commission	HS Code: 2522.20	Calcium Hydroxide (slaked lime)

Total U.S. domestic production of calcium hydroxide for commercial sale was approximately 2,690 million kilograms (M kg) in 2018 (USGS, 2021). Because calcium hydroxide requires only the addition of water to calcium oxide, many calcium oxide production locations also manufacture calcium hydroxide. Of the 74 calcium oxide manufacturing locations operating in 2018, domestic commercial production of calcium hydroxide took place at 29 of these locations in addition to 18 stand-alone calcium hydroxide manufacturing plants. Calcium hydroxide represents a fraction of overall lime production, with the majority (84%) of lime produced for use as calcium oxide. The number of domestic manufacturing locations shown in Figure 2 represents operating facilities as of 2018 (USGS, 2021). Supply of NSF/ANSI Standard 60 certified calcium oxide for use in drinking water treatment is distributed throughout the U.S. (NSF International, 2021). For a more current listing of manufacturing locations and supplier locations, visit the U.S. Environmental Protection Agency's (EPA's) [Chemical Locator Tool](#) (EPA, 2022a).

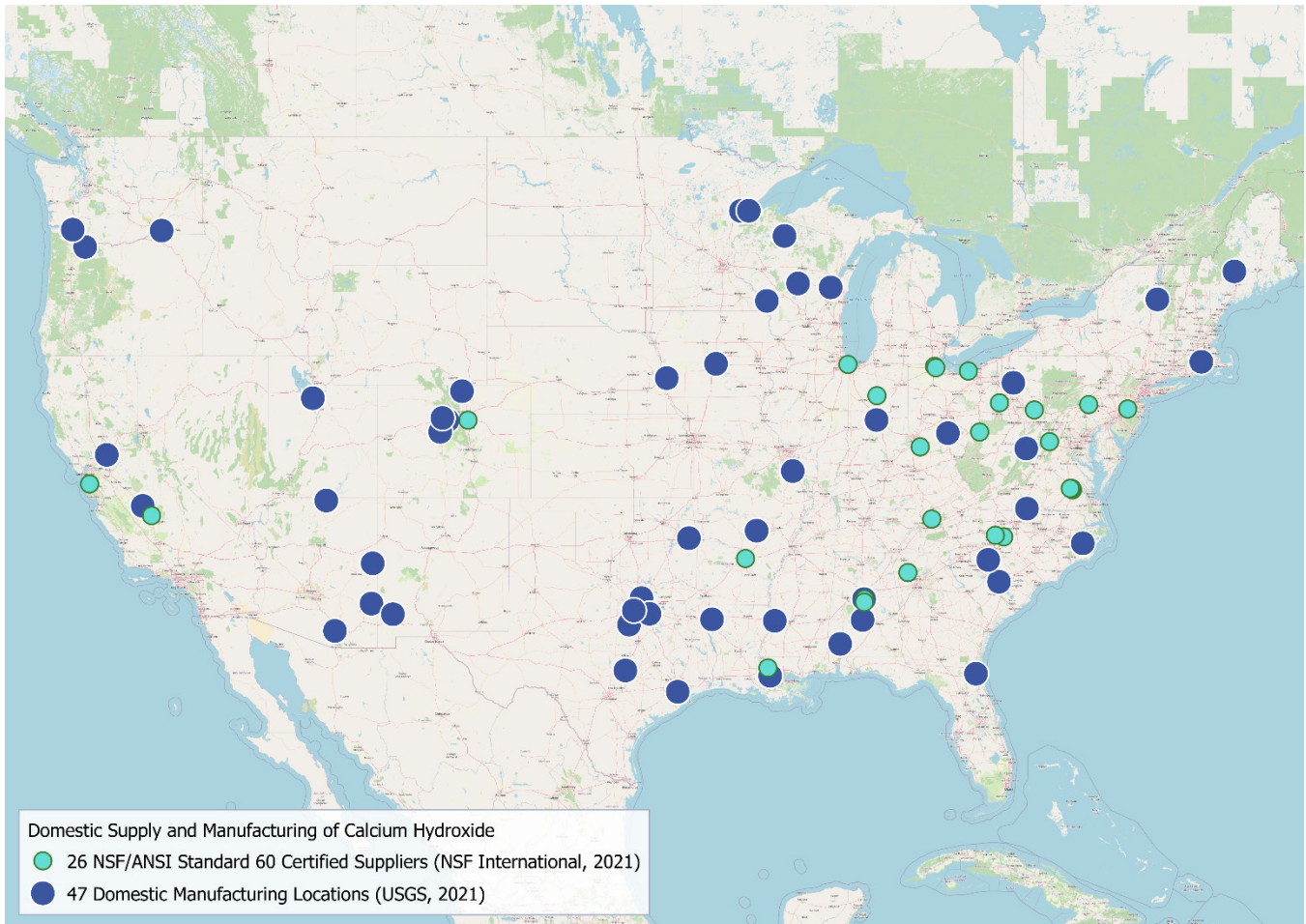


Figure 2. Domestic Supply and Manufacturing of Calcium Hydroxide

Domestic Consumption

U.S. consumption of calcium hydroxide in 2018 is estimated at 2,696 M kg. This estimate includes production of 2,690 M kg, import of 51 M kg, minus export of 46 M kg (USGS, 2021; USITC, 2021), as shown in Figure 3.

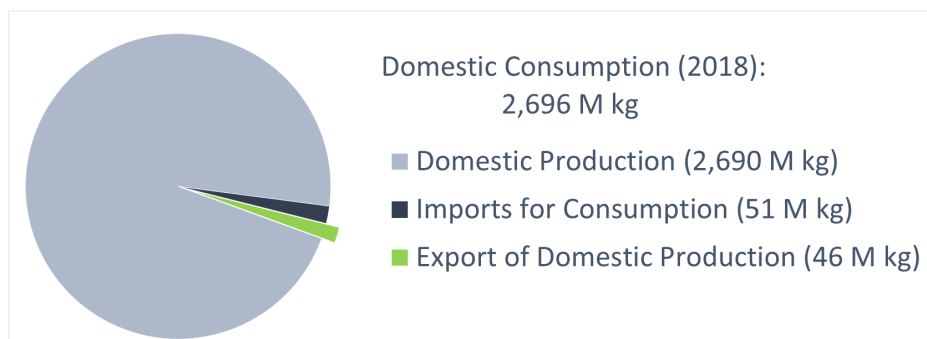


Figure 3. Domestic Production and Consumption of Calcium Hydroxide in 2018

Trade & Tariffs

Worldwide Trade

Worldwide import and export data for calcium hydroxide (slaked lime) is reported through the World Bank’s

World Integrated Trade Solutions (WITS) software, as a category specific to calcium hydroxide. In 2021, the U.S. ranked 21st worldwide in total exports and seventh in total imports of calcium hydroxide. In 2021, Germany ranked first worldwide in total exports and Zimbabwe ranked first worldwide in total imports (WITS, 2022) as shown in Table 2.

Table 2. WITS Worldwide Export and Import of Calcium Hydroxide in 2021

2021 Worldwide Trade Calcium Hydroxide (Slaked Lime) (HS Code 2522.20)			
Top 5 Worldwide Exporters		Top 5 Worldwide Importers	
Germany	103 M kg	Zimbabwe	785 M kg
United Kingdom	83 M kg	Philippines	87 M kg
Malaysia	82 M kg	Germany	70 M kg
Zambia	67 M kg	Singapore	66 M kg
Oman	63 M kg	Netherlands	62 M kg

Domestic Imports and Exports

Domestic import and export data are reported by USITC in categories specific to calcium hydroxide. Figure 4 summarizes imports for consumption¹ and domestic exports² of calcium hydroxide between 2015 and 2020. During this period, the overall quantity of imports remained relatively steady, while exports rose and fell, with the largest volume exported in 2018. Over this five-year period, Canada was the primary recipient of domestic exports and the primary source of imports (USITC, 2021).

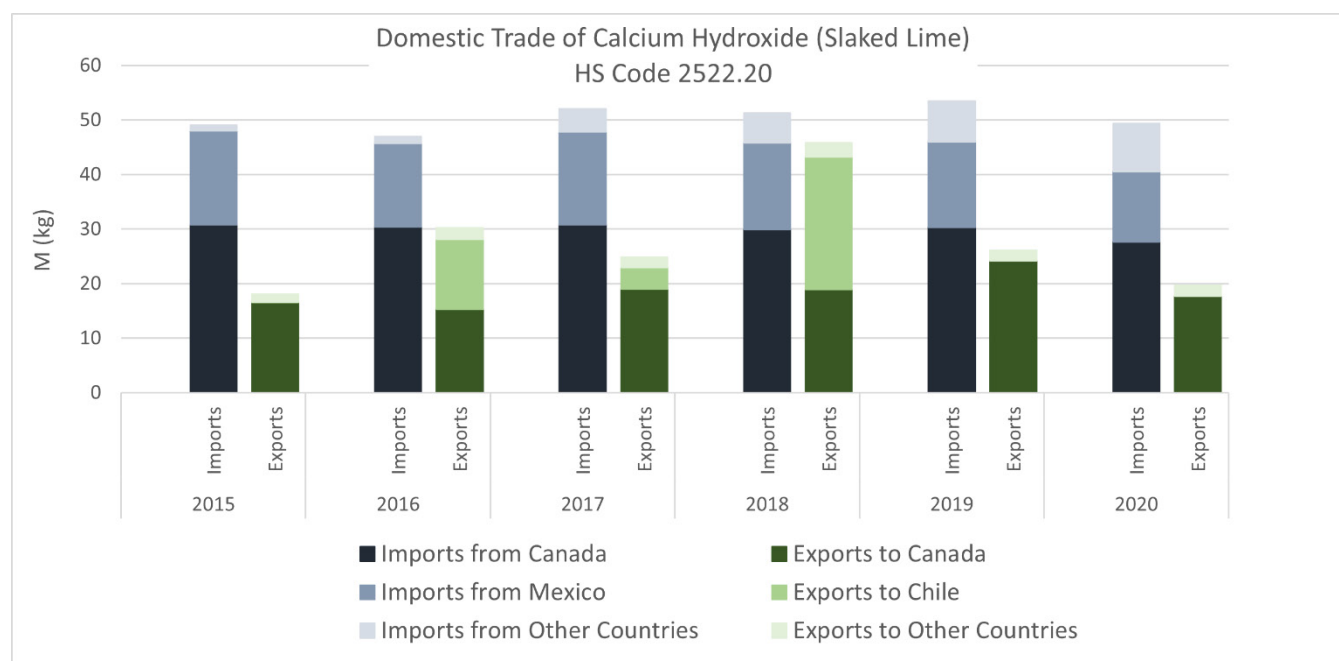


Figure 4. USITC Domestic Import and Export of Calcium Hydroxide between 2015 and 2020

¹ Imports for consumption are a subset of general imports, representing the total amount cleared through customs and entering consumption channels, not anticipated to be reshipped to foreign points, but may include some reexports.

² Domestic exports are a subset of total exports, representing export of domestic merchandise which are produced or manufactured in the U.S. and commodities of foreign origin which have been changed in the U.S.

Tariffs

Imports of calcium hydroxide are primarily supplied from Canada. There is no general duty for import of calcium hydroxide, however there is an additional 25% duty on imports from China (USITC , 2022), as summarized in Table 3.

Table 3. 2020 Domestic Tariff Schedule for Calcium Hydroxide

HS Code	General Duty	Additional Duty – China (Section 301 Tariff List)	Special Duty
2522.20	None	25%	None

Market History & Risk Assessment

History of Shortages

Calcium hydroxide is widely manufactured and used in a variety of industries. There were no identified calcium hydroxide supply chain disruptions between 2000 and 2022.

Risk Evaluation

The complete risk assessment methodology is described in *Understanding Water Treatment Chemical Supply Chains and the Risk of Disruptions* (EPA, 2022b). The risk rating is calculated as the product of the following three risk parameters:

Risk = Criticality x Likelihood x Vulnerability	
Criticality	Measure of the importance of a chemical to the water sector
Likelihood	Measure of the probability that the chemical will experience a supply disruption in the future, which is estimated based on past occurrence of supply disruptions
Vulnerability	Measure of the market dynamics that make a chemical market more or less resilient to supply disruptions

The individual parameter rating is based on evaluation of one or more attributes of the chemical or its supply chain. The ratings and drivers for these three risk parameters are shown below in Table 4.

Table 4. Supply Chain Risk Evaluation for Calcium Hydroxide

Risk Parameter Ratings and Drivers		
Criticality	High	Calcium hydroxide is widely used in water treatment for softening and pH adjustment. It is a precursor in the production of calcium hypochlorite.
Likelihood	Low	The water sector has not experienced calcium hydroxide supply disruptions between 2000 and 2022.
Vulnerability	Low	The U.S. is a leading producer of the key raw material of calcium hydroxide, calcium carbonate. Manufacturing and supply are widely distributed.
Risk Rating: Low		

References

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World Integrated Trade Solutions (WITS), 2022. Trade Statistics by Product (HS 6-digit), retrieved from <https://wits.worldbank.org/trade/country-byhs6product.aspx?lang=en#void>