Calcium Carbonate (Limestone)

$CaCO_3$ (solid)

R Raw Material **D** Direct Use Chemical **P** Precursor Chemical

Source of Raw Material:
Naturally occurring rock

% of Total Domestic Consumption Attributed to Water Sector:
Less than 1%

Product Family:
Calcium

CAS No.: 1317-65-3

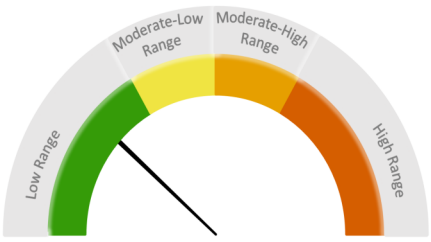
Derivative Water Treatment Chemicals:
Calcium Oxide

Understanding Chemical Supply Chains
Map of Suppliers & Manufacturers

Shelf Life:
60+ Months

RISK OF SUPPLY DISRUPTION (Assessed in 2022)

RISK RATING: Low



RISK DRIVERS

Use of calcium carbonate (limestone) in construction aggregate is the leading domestic use. Increases or decreases in demand for construction aggregate may periodically impact the availability and price, however calcium carbonate resources are abundant.

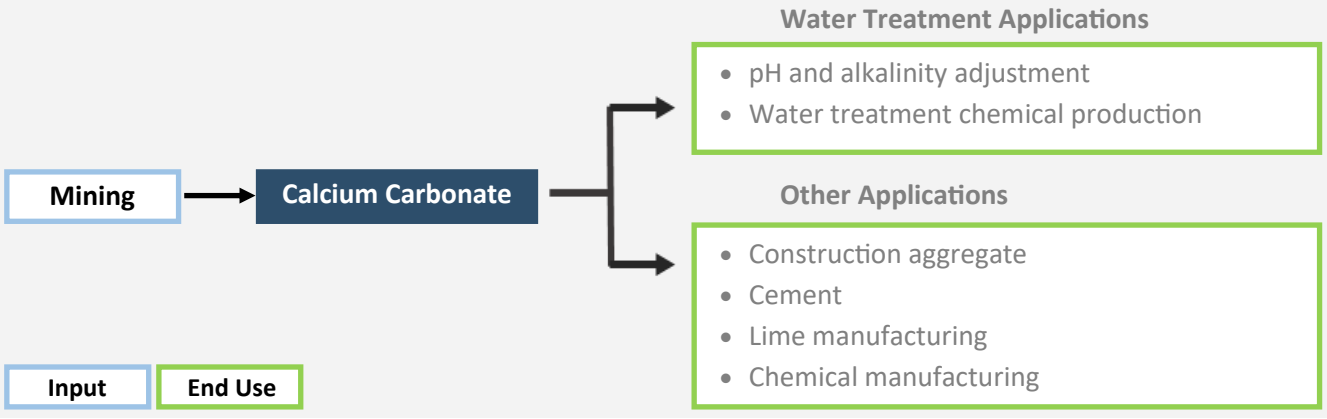
RISK PARAMETERS

Criticality: High. Essential for pH and alkalinity adjustment, and production of water treatment chemicals.

Likelihood: Low. The water sector has not experienced calcium carbonate supply disruptions between 2000 and 2022.

Vulnerability: Low. The U.S. is a leading producer of calcium carbonate. It is abundant and production is widely distributed.

PRODUCTION PROCESS



DOMESTIC PRODUCTION AND CONSUMPTION, AND INTERNATIONAL TRADE

Domestic Production Locations (2015):
1,960, widely distributed across 45 states.

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

Product Description

Calcium carbonate ($CaCO_3$), found in natural deposits as the chief component of limestone, is an abundant, naturally occurring mineral. Calcium carbonate is used directly in water treatment for pH and alkalinity adjustment, and also as an input in the manufacturing of calcium oxide (quicklime). The most common domestic use is in construction aggregate.

Use in Water Treatment

Calcium carbonate is used directly in water treatment for adjustment of pH and alkalinity.

Use as a Precursor to Other Water Treatment Chemicals

Calcium carbonate is used to manufacture calcium oxide.

Other Applications

Calcium carbonate, more commonly referred to by the rock bearing large amounts of calcium carbonate, limestone, has a wide range of applications. The leading domestic uses are in construction aggregate (roads, roofing, etc.) and Portland cement production. It is also widely used in pharmaceutical manufacturing, calcium oxide (quicklime) manufacturing, toothpaste, paint, glass, soil amendment, and foods (USGS, 2012; USGS 2022).

Primary Industrial Consumers

In 2018, approximately 72% of domestically consumed limestone was used as construction aggregate, 16% for cement manufacturing, 8% for calcium oxide and calcium hydroxide manufacturing, 3% for miscellaneous uses, and 2% for agricultural uses (USGS, 2021).

Manufacturing, Transport, & Storage

Manufacturing Process

In its natural form calcium carbonate occurs as limestone, a rock containing at least 50 % calcium carbonate. In 2018, approximately 75% of domestic crushed stone produced was limestone (USGS, 2022).

Limestone deposits are found throughout the world, and are recovered by quarrying or mining. Generally, limestone is crushed to break the rock into the desired size, then screened, washed, and classified. Grain size, shape, color, structure, and content differ based on deposit location dictate how limestone is processed and the applications after mining. Limestone may be used as dimenions stone in large pieces, crushed stone in a variety of applications depending on the grain size, and calcined for use in cement, bricks, steel making, and calcium oxide manufacturing (DOE, 2013; USGS, 2012; USGS, 2022).

Product Transport

Limestone is commonly transported by rail, truck, and waterway. Though extensive deposits are found throughout the U.S., there are areas without local access to quarries, and transportation costs may significantly increase the cost of the delivered product (USGS, 2012; USGS, 2022).

Storage and Shelf Life

Ground limestone is stable and non-reactive over a wide range of temperatures. When stored properly, limestone can have a shelf life in excess of 60 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 limestone.

Table 1. Calcium Carbonate Production and Trade Data Sources

Production and Trade Data			
Category	**Data Source**	**Identifier**	**Description**
Domestic Production	U.S. Geological Survey	CAS No.: 1317-65-3	Limestone
Imports and Exports	International Trade Statistics U.S. International Trade Commission	HS Code: 2517.10 HTS Code: 2517.10.0020	Crushed Stone Limestone

Total U.S. domestic production of limestone was approximately 917,000 million kilograms (M kg) in 2018 (USGS, 2022). Domestic commercial production took place at 1,960 quarries across 45 states. Top producing states in 2018 were Texas, Florida, Ohio, Missouri, and Pennsylvania, which collectively accounted for 46% of all domestic production (USGS, 2022).

Domestic Consumption

U.S. consumption of limestone in 2018 is estimated at 930,030 M kg. This estimate includes production of 917,000 M kg, import of 13,181 M kg, minus export of 500 M kg (USGS, 2022; USITC, 2021), as shown in Figure 1. National consumption dominates use of domestically produced limestone. As of 2012, the U.S. consumed between 5 and 10% of global limestone production (USGS, 2012)

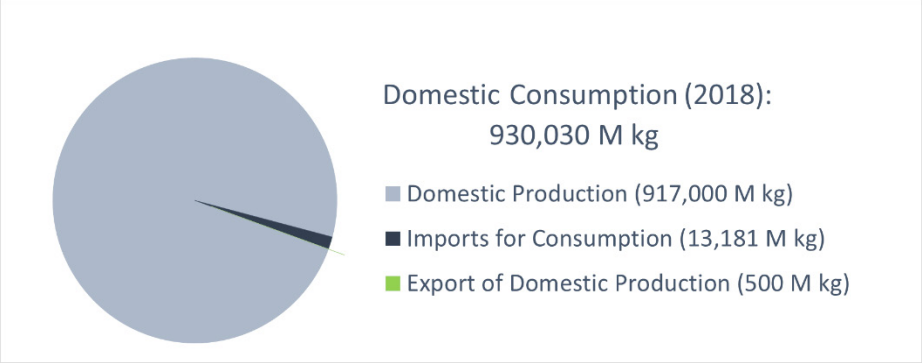


Figure 1. Domestic Production and Consumption of Limestone in 2018

Trade &Tariffs

Worldwide Trade

Worldwide import and export data for limestone are reported through the World Bank's World Integrated Trade Solutions (WITS) software, as a category encompassing all crushed stone, including limestone. In 2021, the U.S. ranked 43rd worldwide in total exports and first in total imports of crushed stone. In 2021, United Arab Emirates ranked first worldwide in total exports (WITS, 2022), as shown in Table 2.

Table 2. WITS Worldwide Export and Import of Crushed Stone in 2021

2021 Worldwide Trade Crushed Stone (HS Code 2517.10)			
Top 5 Worldwide Exporters		Top 5 Worldwide Importers	
United Arab Emirates	33,660 M kg	**United States**	**17,332 M kg**
Norway	25,829 M kg	Qatar	15,629 M kg
Oman	22,745 M kg	Hong Kong	11,826 M kg
China	11,620 M kg	Netherlands	11,270 M kg
Indonesia	9,709 M kg	Russian Federation	6,931 M kg

Domestic Imports and Exports

Domestic import and export data are reported by USITC in categories specific to limestone. Figure 2 summarizes imports for consumption[1] and domestic exports[2] of limestone between 2015 and 2020. During this period, the overall quantity of exports and imports remained relatively steady, with the volume of imports considerably larger than the volume of exports. Over this five-year period, Canada was the primary recipient of domestic exports while Mexico was the primary source of imports (USITC, 2021).

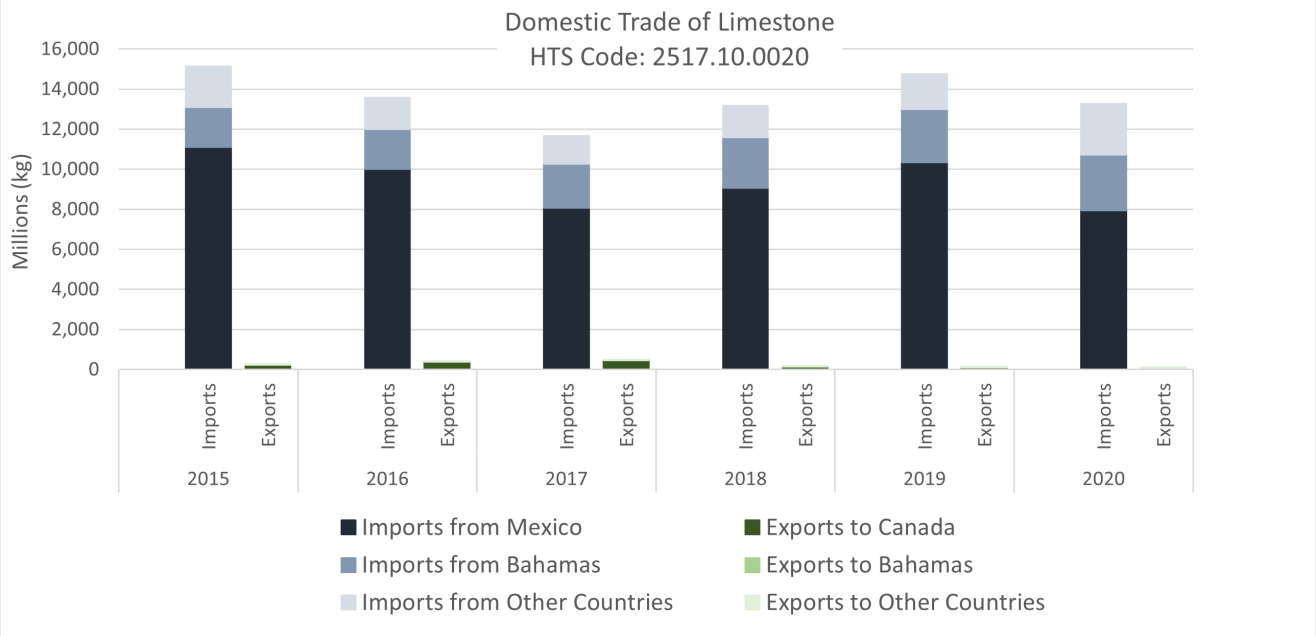


Figure 2. USITC Domestic Import and Export of Limestone between 2015 and 2020

[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 limestone are primarily supplied from Mexico. There is no general duty for import of limestone, 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 Limestone

HTS Code	General Duty	Additional Duty – China (Section 301 Tariff List)	Special Duty
2517.10.0020	None	25%	None

Market History & Risk Evaluation

History of Shortages

The most significant current domestic use of limestone is for construction aggregate. This application accounts for the consumption of the majority of domestically produced limestone. Increases or decreases in demand from the construction industry may periodically impacted the availability and price of limestone, however limestone resources are abundant and there were no identified limestone supply chain disruptions between 2000 and 2022.

Risk Evaluation

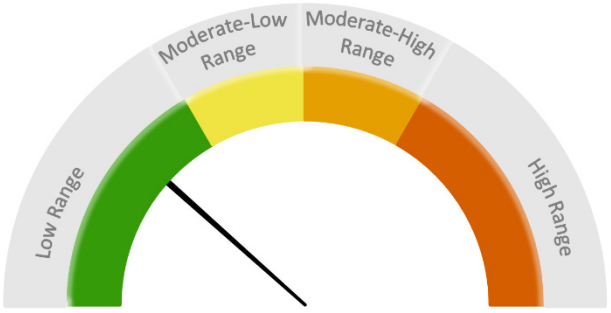
The complete risk assessment methodology is described in *Understanding Water Treatment Chemical Supply Chains and the Risk of Disruptions* (EPA, 2022). The risk rating is calculated as the product of the following three risk parameters:

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 Carbonate

Risk Parameter Ratings and Drivers		
Criticality: High	**Likelihood: Low**	**Vulnerability: Low**
Calcium carbonate is essential and has widespread application in pH and alkalinity adjustment. It is a precursor in the production of other water treatment chemicals.	The water sector has not experienced calcium carbonate supply disruptions between 2000 and 2022.	The U.S. is a leading worldwide producer of calcium carbonate. Calcium carbonate is abundant and production is widely distributed.
Risk Rating: Low		



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