

REGIONAL FREIGHT COMMODITY PROFILE

Energy

COMMODITY BUNDLE OVERVIEW

The energy commodity bundle consists of four specific commodity groups of unrefined and refined fuel and energy commodities. These include: coal and coal products; crude (unrefined) petroleum; gasoline; and fuel oils.

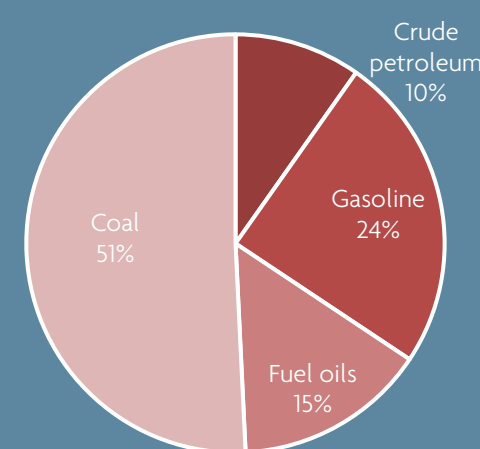
The primary data source for commodity flows reported in this profile is NJTPA's Freight Forecasting Tool, which generates commodity freight data and forecasts for a 2020 base year and 2050 forecast year. This profile describes freight flows between domestic origins and destinations. Public policies that promote transition to renewable energy sources could substantially change the forecasted volumes of the energy products described in this profile.

- 120 million tons in 2020, increasing 23 percent to 147 million tons in 2050, in a "business as usual" future scenario.
- Represents 32 percent of the goods moved in the region by weight and 11 percent by value.
- Nearly 3 million square feet of warehousing/distribution center space dedicated to this commodity bundle.
- 47 percent moves by pipeline, 44 percent moves by truck, 12 percent by rail, 4 percent by rail, and 5 percent by other modes.

Highlights

Composition

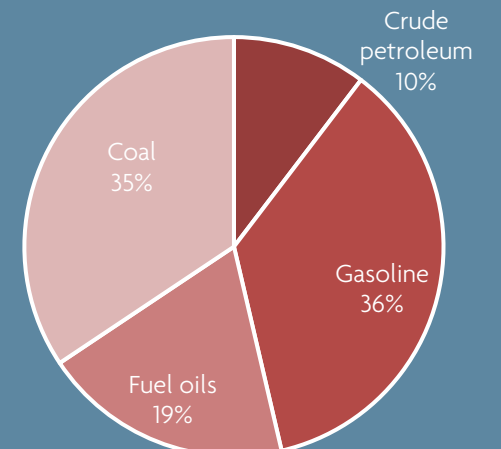
Domestic Tons in 2020



Total Tons: 120 million

Source: NJTPA Freight Forecasting Tool, 2020

Domestic Value in 2020



Total Value: \$75 billion

Source: NJTPA Freight Forecasting Tool, 2020

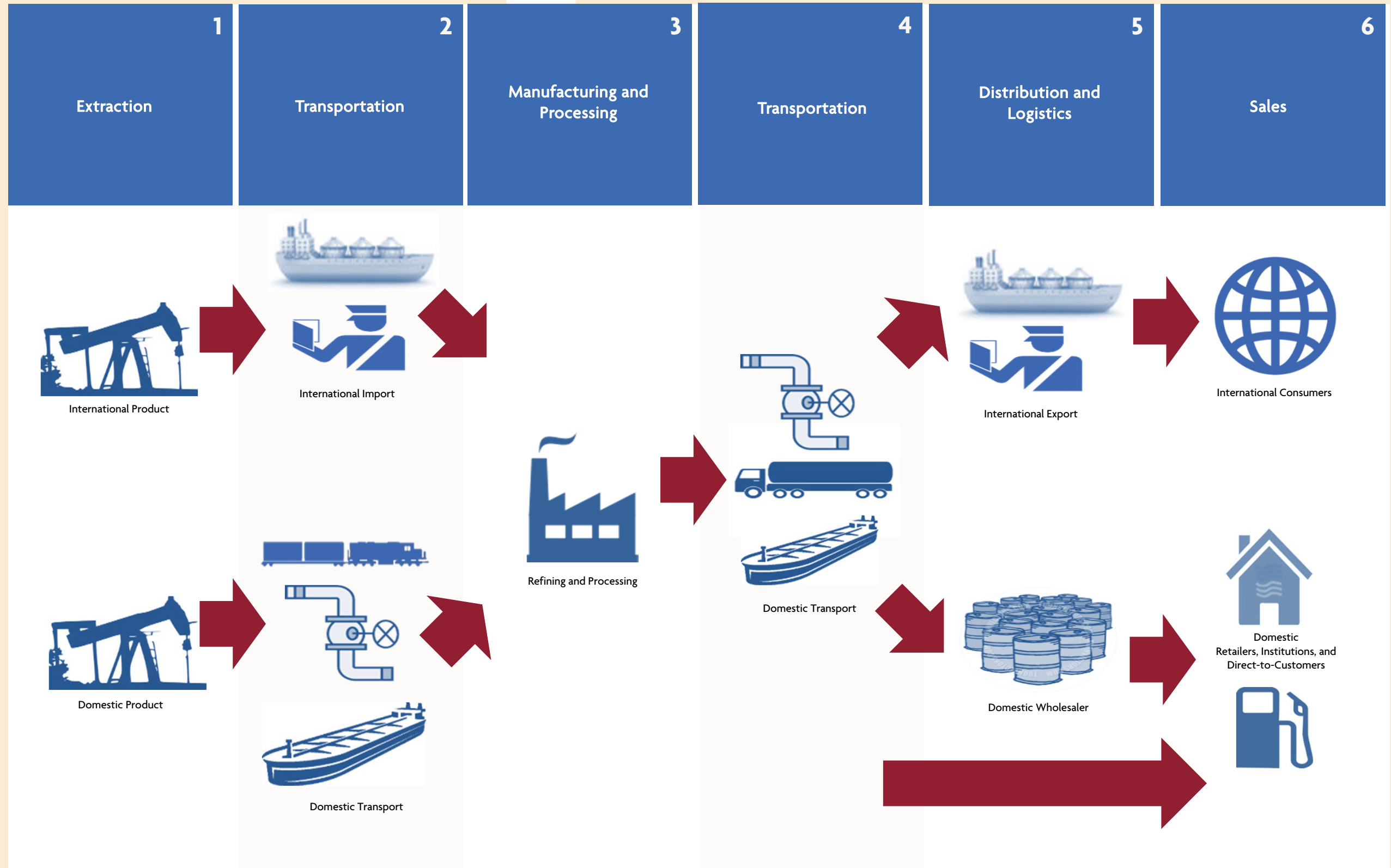
Coal represents 51 percent of goods in the energy bundle by weight and 35 percent by value. About half of the remaining tonnage consists of gasoline (24 percent of the total). Fuel oils and crude petroleum are the smallest components of this bundle by weight and value.

LOGISTICS SUMMARY

The graphic to the right represents the supply chain for the energy commodity bundle from initial extraction of raw product through the refining and processing phase to the delivery of finished goods to consumers and wholesalers.

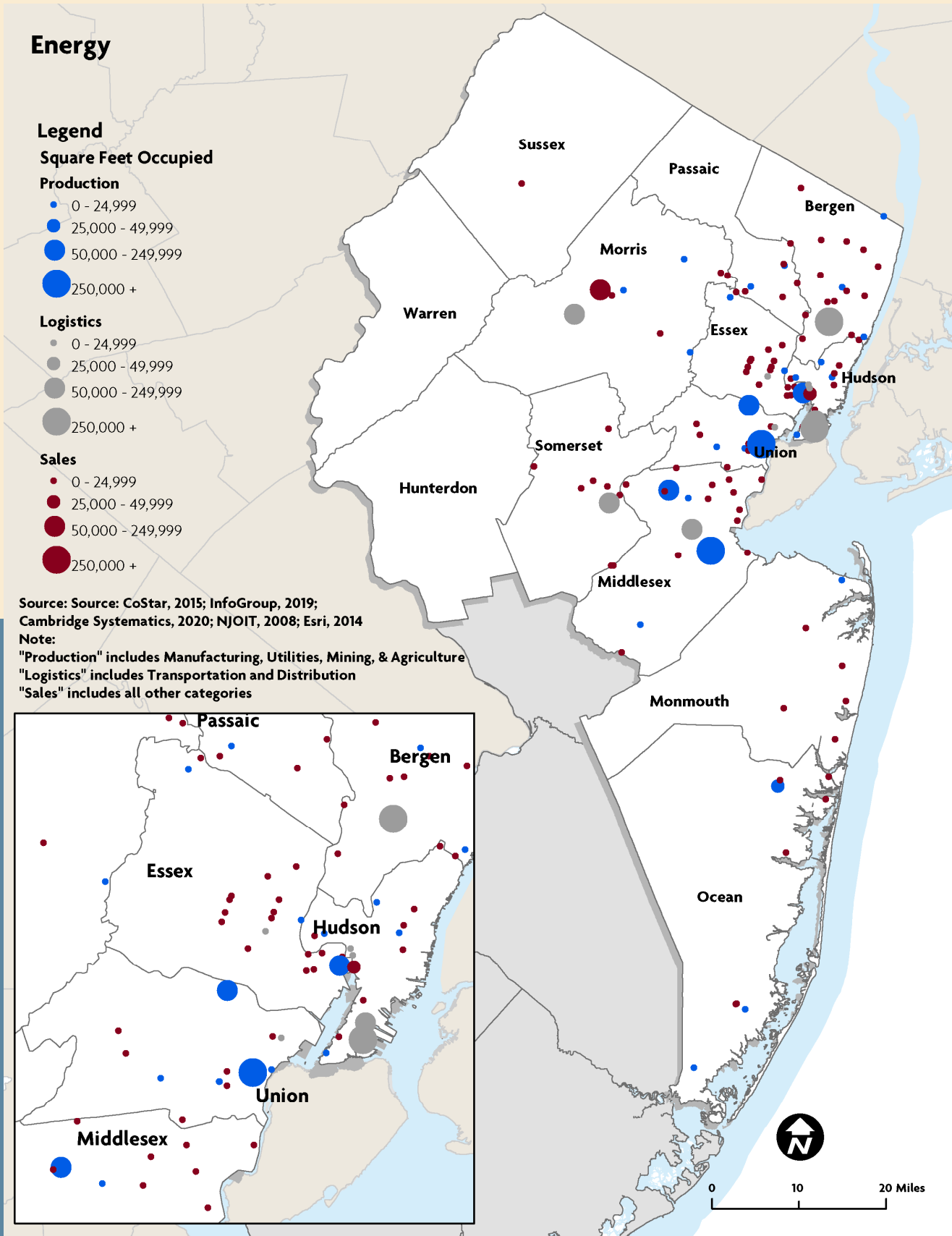
This supply chain consists of six steps:

1. Raw material is extracted from international and domestic sources.
2. International goods are transported by ocean oil tankers to U.S. Ports-of-Entry where they are inspected by U.S. Customs and transloaded to pipelines, rail tank cars, or barges. Domestically produced goods are transported by pipeline, rail tank car, and barge.
3. Raw material is refined into finished product in manufacturing and processing facilities.
4. Finished products are shipped by truck oil tanker, water, or pipeline.
5. Shipments are then distributed via one of the following three routes:
 - A. Through a marine terminal for international export.
 - B. To a domestic wholesaler.
 - C. By truck directly from the refining facility to domestic retailers, institutions, or direct-to-consumer.
6. Shipments are delivered to international and domestic customers, according to the customers' specifications.



Business Locations by Industry Type

Business Square Footage by Industry Type



BUSINESS LOCATIONS SUMMARY

The map on the previous page illustrates the locations of facilities that ship, handle, or receive commodities in this bundle, including:

- Production facilities such as manufacturing businesses where goods are produced, and correspond to steps 1 and 3 in the logistics summary chart on pages 2 and 3.
- Logistics facilities, including warehousing and transportation facilities through which goods are distributed, and correspond to steps 2, 4 and 5 on the logistics summary chart.
- Sales, represented in Step 6 on the logistics summary chart, including retail, services, and institutional establishments where goods are sold. Gasoline stations throughout the region are not shown.

The largest production and logistics facilities are located in eastern Union and northeastern Middlesex counties, along the shores of Arthur Kill.

KEY INDUSTRY TRENDS

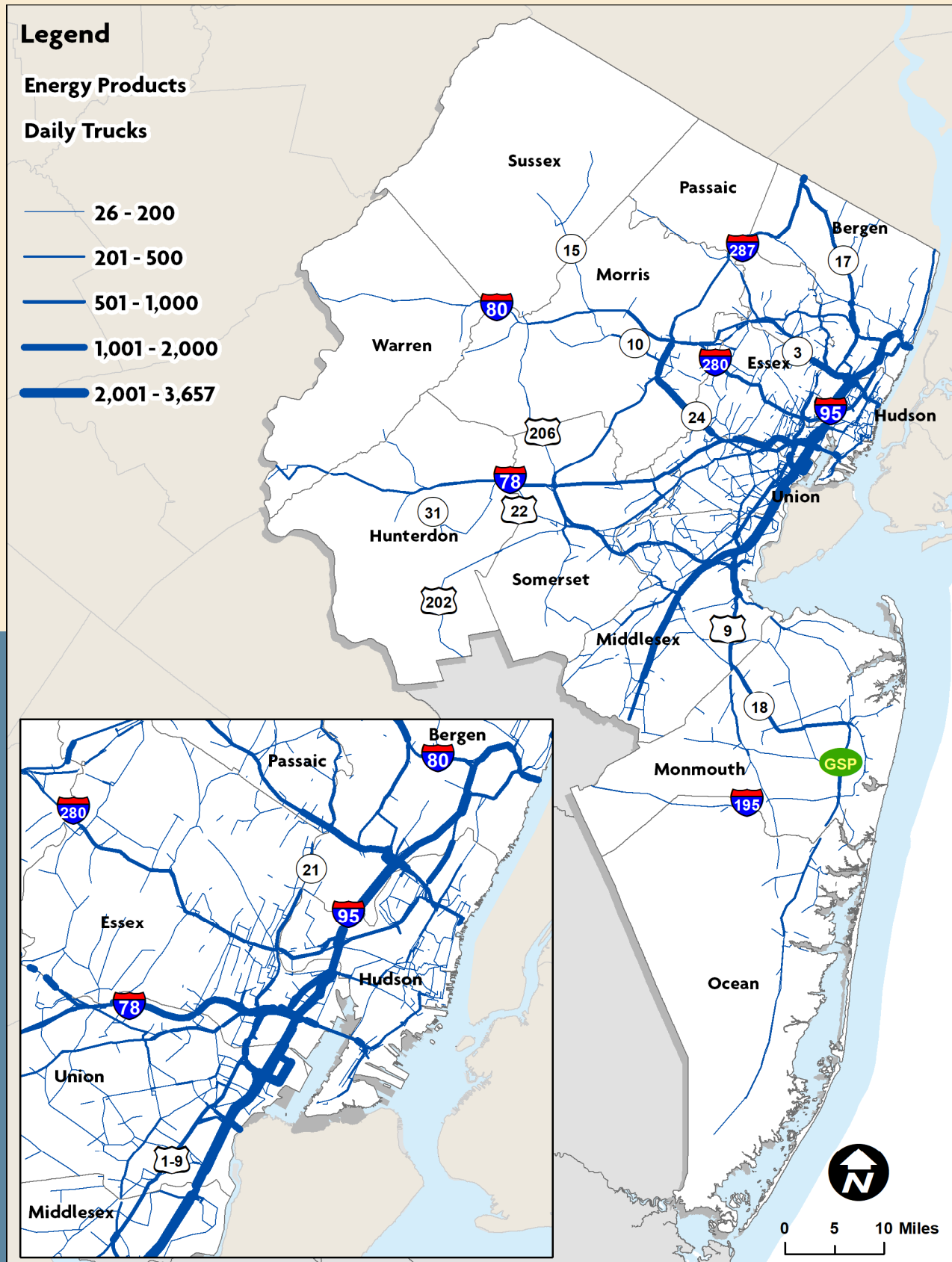
The following trends are shaping demand for energy commodities today, and projected demand in the future:

- Public policy, such as New Jersey's Energy Master Plan, could facilitate the transition from fossil fuels to renewable energy sources, reducing future demand for petroleum and coal products to levels below the "business as usual" forecast scenario described in this profile.
- US petroleum production and exports hit a high in January 2020. Oil refining also set a record high in December 2019. Coal exports had been increasing due to strong international demand. Domestic production may be reduced due to falling energy prices in 2020
- The COVID-19 crisis reduced demand for petroleum as travel and commutation was drastically reduced.
- Alternative fuels, and the infrastructure required to develop and transmit them, may result in growth of commodities in other bundles, including construction materials, agriculture, and machinery, electronics, and transportation equipment.

An Oil Refining Facility in Middlesex County



Highway Network Utilization, 2020



Source: NJTPA Freight Forecasting Tool, 2020; NJRTM-E, 2019; NJOIT, 2008; Esri, 2014.

HIGHWAY NETWORK FLOWS OF ENERGY COMMODITIES

The map on the previous page shows the volume of truckloads of goods in this bundle traveling on highway segments in the NJTPA region every day.

The New Jersey Turnpike/Interstate 95 between Exit 12 in Middlesex County and Exit 17 in Bergen County carries the greatest volume of energy products in the region. More than 2,000 truckloads of energy products move on this highway daily.

Portions of the New Jersey Turnpike north of Exit 16W and south of Exit 12, Interstate 78 in Essex and Union counties, Route 3 in Bergen and Passaic counties, Route 24 in Union and Morris counties, and Route 9 in Middlesex County carry between 1,000 and 2,000 truckloads per day in each direction. Short segments of the New Jersey Turnpike, Interstate 78, Interstate 287, Route 17 in Bergen County, Route 9 in Middlesex and Monmouth counties, and Route 18 in Monmouth County carry 500 to 1,000 daily truckloads of energy products in each direction.

COMMODITY FLOW SUMMARY

Collectively, about 120 million tons of goods in this bundle, worth \$75 billion, moved in the NJTPA region in 2020. By 2050, more than 147 million tons worth nearly \$90 billion are expected to move in the region in a “business as usual” future scenario. These projections represent 23 percent growth by tons and 19 percent growth by value. Public policy could result in lower volumes of these products, and increased freight associated with renewable energy and renewable energy infrastructure.

This bundle represented 32 percent of the goods moved in the region by weight and 11 percent by value in 2010. By 2050, this bundle’s share of weight of goods in the region is expected to change slightly, as the bundle will represent 34 percent of all goods by weight and 11 percent by value.

As the table below shows, coal products not classified elsewhere makes up the largest proportion of this bundle by weight in 2020 and is expected to remain the top commodity in 2050. Gasoline is the top commodity by value in 2020, but coal products not elsewhere classified is expected to become the top commodity by value by 2050.

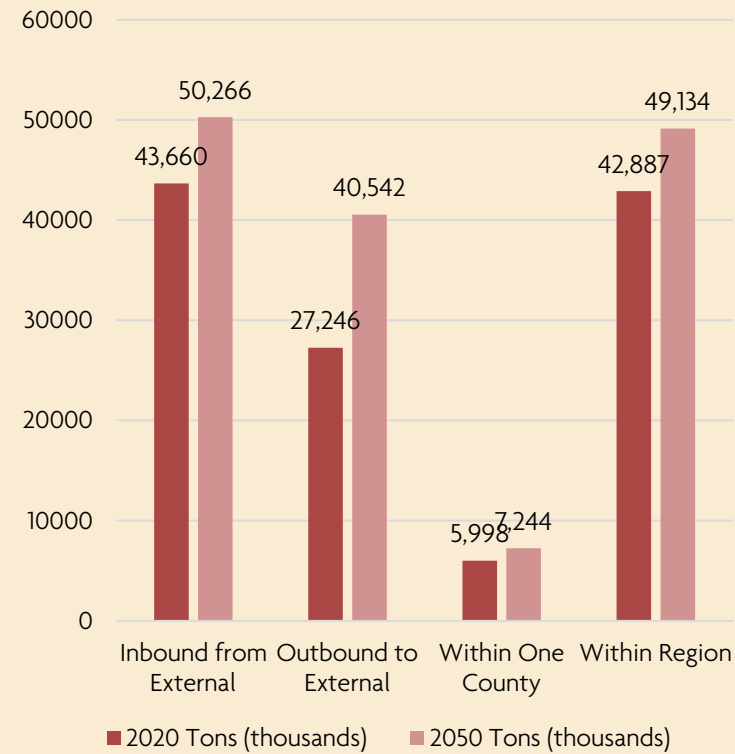
Forecasted Change in Commodity Flows in the Energy Bundle by Weight and Value, 2020 and 2050

Commodity	2020 Tons (thousands)	2050 Tons (thousands)	2020 Value (millions \$)	2050 Value (millions \$)	Change in Tons, 2020-2050	Change in Value, 2020-2050
Coal	1,721	2,625	51	80	53%	56%
Crude petroleum	11,730	14,353	7,775	9,513	22%	22%
Gasoline	29,408	32,555	27,012	29,931	11%	11%
Fuel oils	17,836	19,983	14,470	16,170	12%	12%
Coal products not classified elsewhere	59,096	77,671	25,796	33,897	31%	31%
Grand Total	119,791	147,187	75,104	89,590	23%	19%

Source: NJTPA Freight Forecasting Tool, 2020

Note: Public policies that promote transition to renewable energy sources could substantially change the forecasted volumes of these commodities.

Domestic Tons by Direction, 2020 and 2050



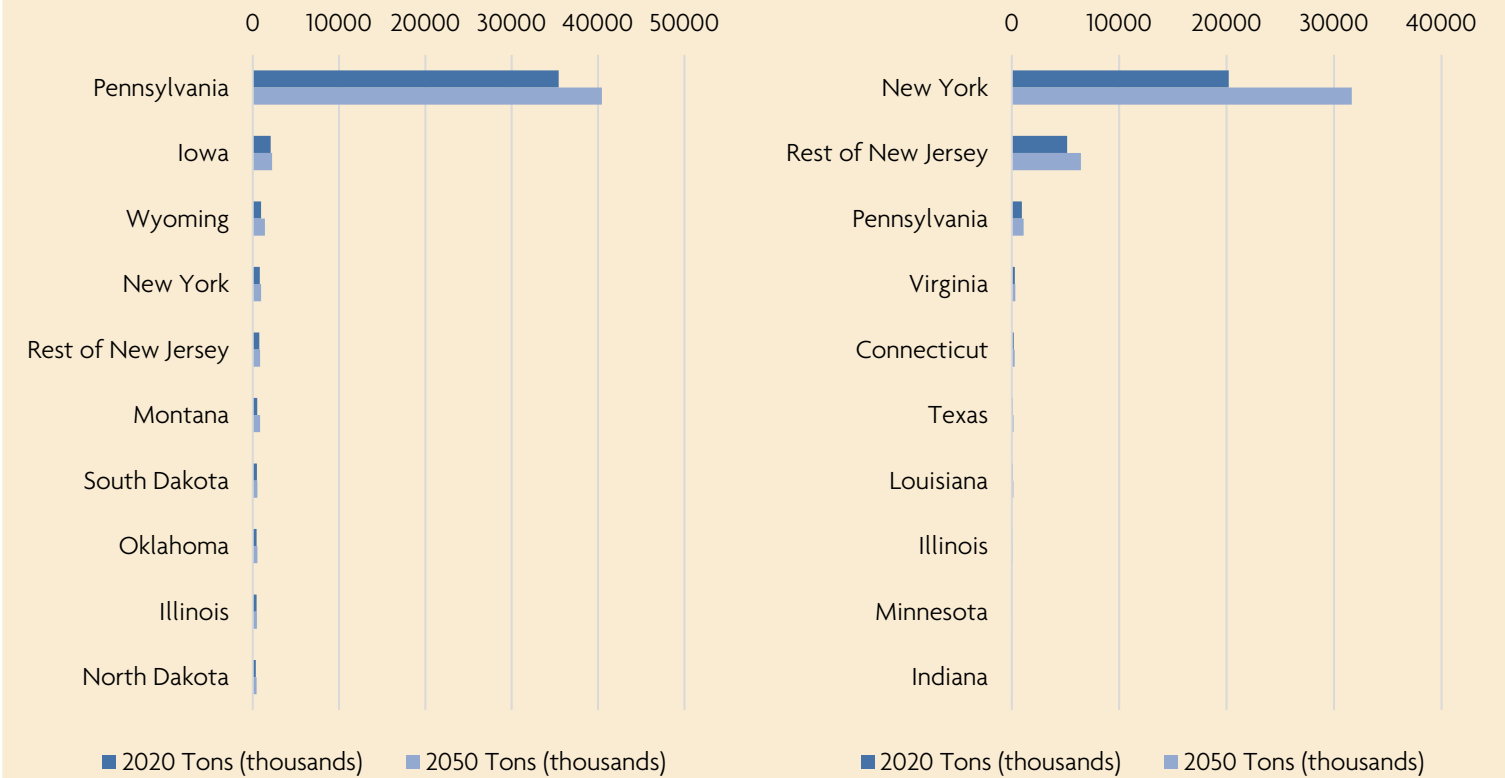
Inbound and intraregional moves of energy products each represent about 36 percent of energy product flows. About 23 percent of energy products move outbound, and 5 percent have an origin and destination within one county in the region.

About 97 percent of the goods in this bundle imported to the NJTPA region originate in one of the locations shown in the graph on the next page. More than 80 percent originate in Pennsylvania alone. Among the top origins, flows from Montana are expected to grow fastest (64 percent) through 2050.

The graph on the next page also shows the destinations of 99 percent of the goods in this commodity bundle that leave the NJTPA region. The New York alone is the destination of 74 percent of outbound flows. Among the top destinations shown, flows to Texas, Louisiana, Illinois, Minnesota, and Indiana are expected to grow by 60 percent between 2020 and 2050. Flows to Virginia are expected to grow slowest (13 percent).

Source: NJTPA Freight Forecasting Tool, 2020

Top Origins of Inbound Commodities (Left) and Top Destinations of Outbound Commodities (Right), 2020 and 2050



Source: NJTPA Freight Forecasting Tool, 2020

Source: NJTPA Freight Forecasting Tool, 2020

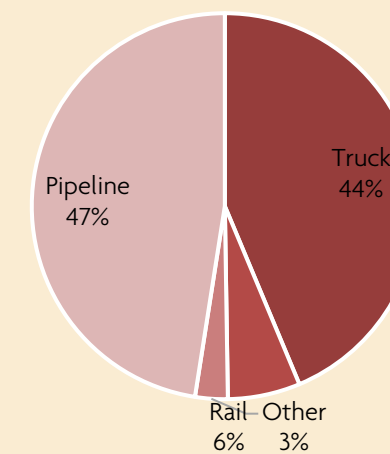
Nearly Half of the Energy Commodities Move by Pipeline (Left). Most of the Rest Moves by Truck (Right)



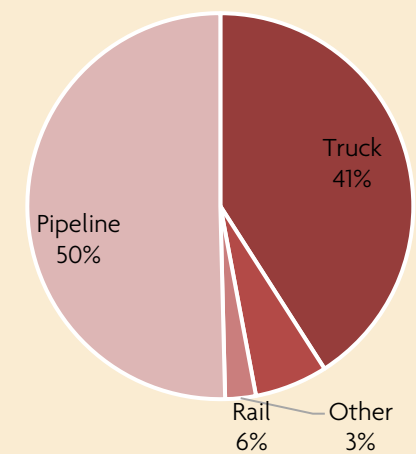
Mode Splits, 2020 and 2050

In 2020, about 47 percent of the energy commodities moving in the NJTPA region traveled by pipeline. About 44 percent traveled by truck, 12 percent traveled by rail, and 5 percent other modes. By 2050, the proportion of energy products moved by pipeline is expected to increase to 50 percent, while 41 percent are expected to move by truck.

Tons by Mode, 2020

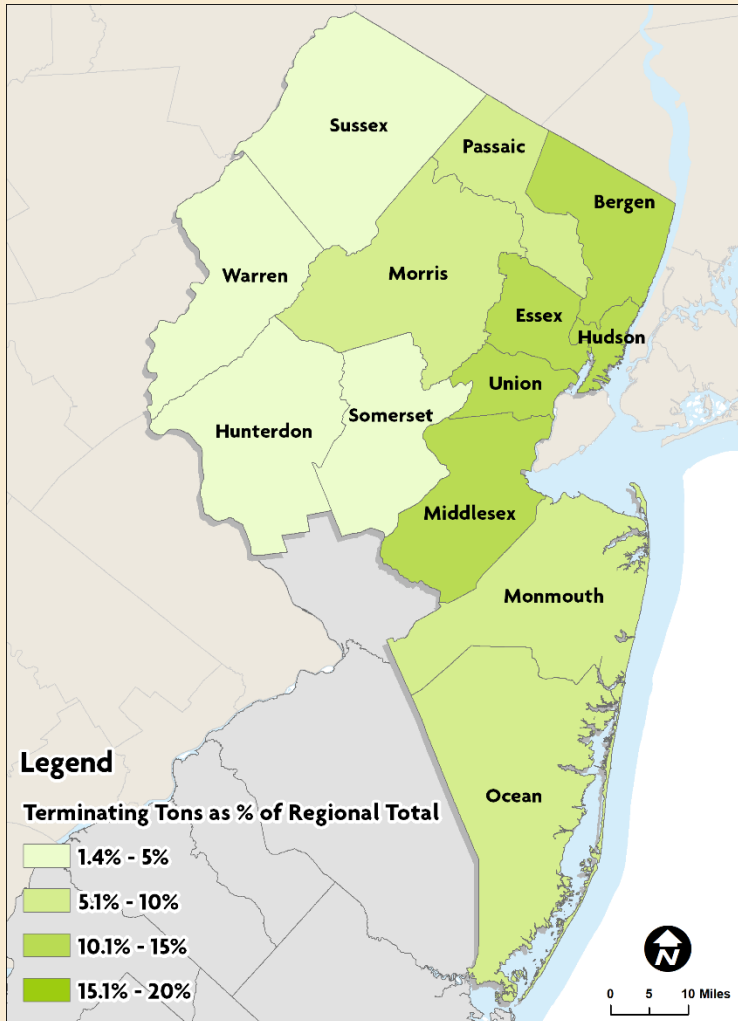


Tons by Mode, 2050



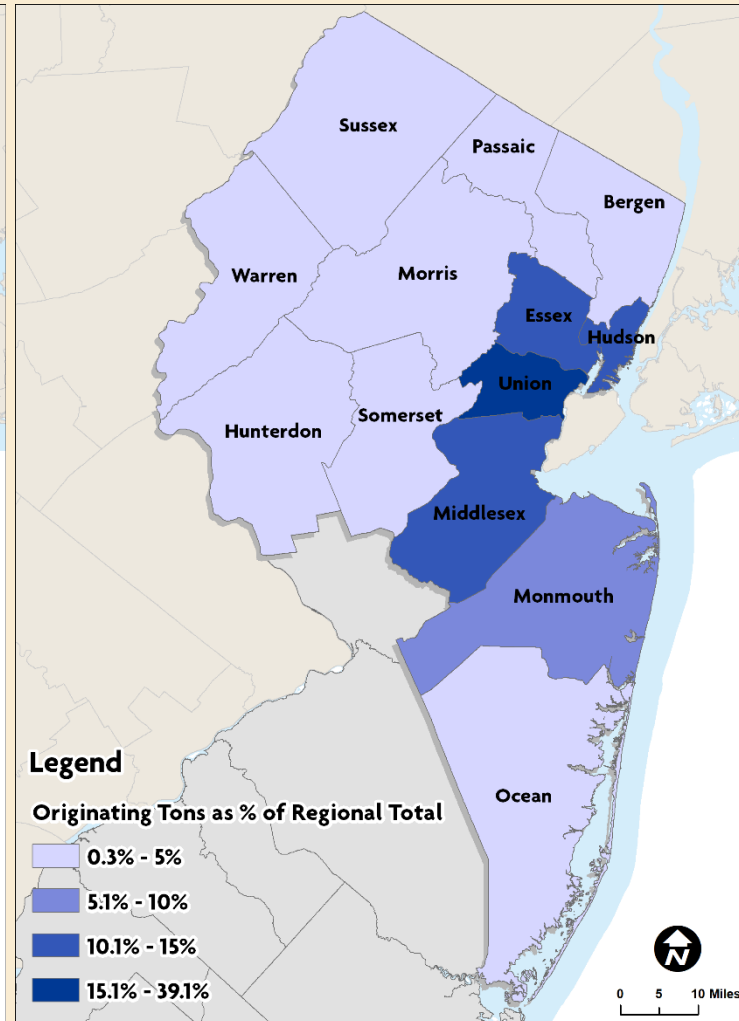
Source: NJTPA Freight Forecasting Tool, 2020

Inbound Domestic Tons by County, 2020



Source: NJTPA Freight Forecasting Tool, 2020; NJRTM-E, 2019; NJOIT, 2008; Esri, 2014.

Outbound Domestic Tons by County, 2050



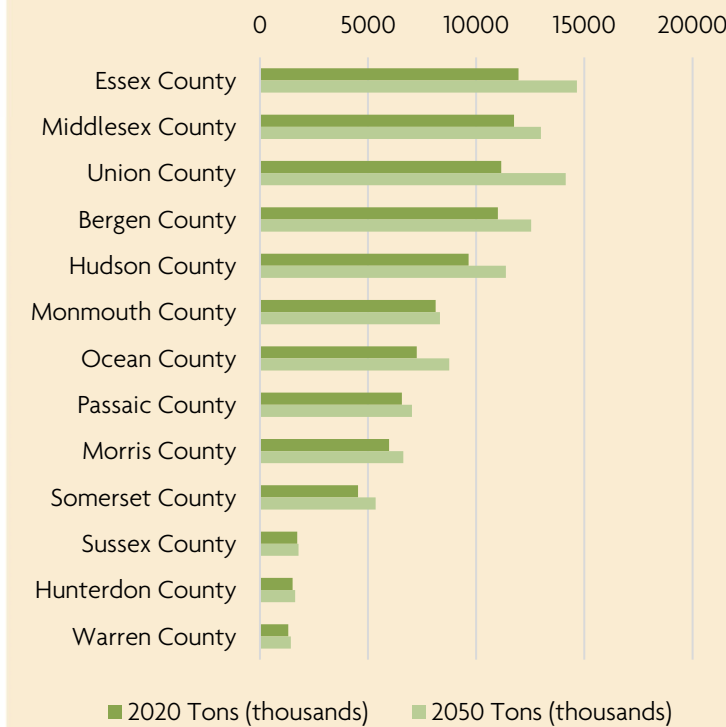
Source: NJTPA Freight Forecasting Tool, 2020; NJRTM-E, 2019; NJOIT, 2008; Esri, 2014.

The maps above and the graphs on the next page show the top counties of origin and top counties of destination for goods in this commodity bundle traveling to or from the NJTPA region.

About 50 percent of terminating tons in the energy commodity bundle are destined for Essex, Middlesex, Union, or Bergen counties, each of which received more than 10 million tons in 2020. Projected growth rates in inbound energy commodities tonnage between 2020 and 2050 range from 2 percent (Monmouth County) to 27 percent (Union County).

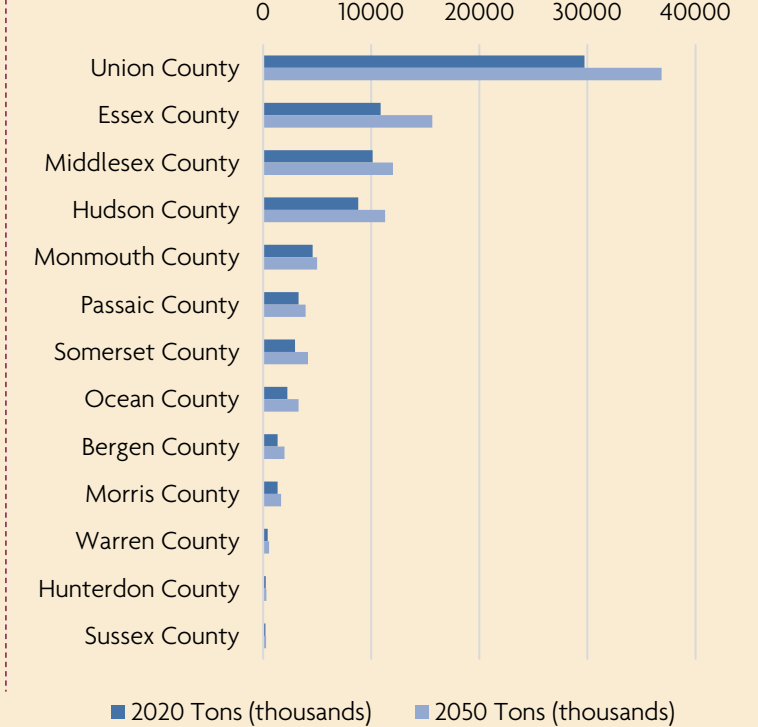
About 66 percent of originating tons in the energy commodity bundle originate in Union, Essex, or Middlesex counties. Union County alone is the source of 40 percent of originating energy commodity tonnage in the region. Projected growth rates in outbound tonnage between 2020 and 2050 range from 9 percent (Monmouth County) to 47 percent (Bergen County).

Inbound Domestic Tons by County, 2020 and 2050



Source: NJTPA Freight Forecasting Tool, 2020

Outbound Domestic Tons by County, 2020 and 2050



Source: NJTPA Freight Forecasting Tool, 2020

References

For more information on energy commodity flows and logistics in the North Jersey region and elsewhere, consult the following sources:

- United States Energy Association, www.usea.org
- United States Energy Information Administration, www.eia.gov
- American Petroleum Institute, www.api.org
- Bureau of Labor Statistics, U.S. Department of Labor, www.bls.gov

ABOUT THE NJTPA

The North Jersey Transportation Planning Authority (NJTPA) is the federally authorized Metropolitan Planning Organization for 6.7 million people in the 13-county northern New Jersey region. Each year, the NJTPA oversees the investment of more than \$1 billion in federal funding for transportation projects and provides a forum for interagency cooperation and public input into funding decisions. It also sponsors and conducts studies, assists county planning agencies and monitors compliance with national air quality goals.

The NJTPA Board of Trustees includes 15 local elected officials, including one representative from each of the 13 northern New Jersey counties – Bergen, Essex, Hudson, Hunterdon, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, and Warren – as well as from the cities of Newark and Jersey City. The Board also includes the Commissioner of the New Jersey Department of Transportation (NJDOT), the Executive Director of NJ TRANSIT, the Chairman of the Port Authority of New York and New Jersey, a Governor's Representative and a Citizens' Representative appointed by the Governor.

ABOUT THE STUDY

Conditions in the goods movement industry have changed over the last several years. The 2050 Freight Industry Level Forecasts Study developed updated information on current and projected freight demand through 2050 for the NJTPA to use in its freight planning activities. This effort built on two previous NJTPA freight planning studies: the 2040 Freight Industry Level Forecasts Study (completed in 2012) and the Regional Freight Commodity Profiles Study (completed in 2015).

This study helps identify locations with concentrations of goods movement activity and where they will occur in the future; the types of commodities that are and will be moving through the region; and where strategic investments should be considered to support economic growth and enhance regional resiliency. The results of this work will serve as background for the NJTPA's next Long Range Transportation Plan as well as freight planning and subregional planning studies.

For further information, please contact Jakub Rowinski, NJTPA Project Manager, at jrowinski@njtpa.org.

This Freight Profile is one of a series of profiles, representing 12 freight commodity bundles in the 13-county NJTPA region.

This document was prepared by the NJTPA with funding from the Federal Transit Administration and the Federal Highway Administration. The NJTPA is solely responsible for its contents.