Ports

B

Photo: Port of Seattle

GRADE COMPARISON

2025: B

2021: B-

PORTS

EXECUTIVE SUMMARY

Ports are an essential component of the U.S. economy, supporting $2.89 trillion in GDP.[1] The ports sector continues to adjust to the disruptions brought about by the COVID-19 pandemic, which caused an initial decline in containerized imports followed by a surge due to an increase in consumer-driven economic activity. Ports facilitate the movement of goods and connect American manufacturers and households with international trade. U.S. ports support more than 21.8 million jobs, including maritime industry professionals and suppliers.[2] Recent federal investments nearly doubled annual funding levels for programs such as the Port Infrastructure Development Program to $450 million per fiscal year, allowing America's ports to more robustly assess, balance, and address their waterside and landside needs. Meanwhile, ports are increasingly contending with the current and future impacts of extreme weather events, which present unique challenges to their coastal facilities that are susceptible to sea level rise.

BACKGROUND

Situated along the coasts and rivers as well as the Great Lakes–St. Lawrence Seaway System, the country's more than 300 ports facilitate the movement of goods as varied as agricultural products, electronics, and chemicals throughout the country and to and from trading partners around the world. Operated by states, counties, municipalities, and private entities, ports are complex facilities that integrate water, rail, road, and utility infrastructure. Maritime commerce dates back centuries, and port infrastructure is often a mix of old and new components. While facilitating the movement of goods daily, ports are pressed to modernize their infrastructure to meet current needs and face future challenges.

CAPACITY AND CONDITION

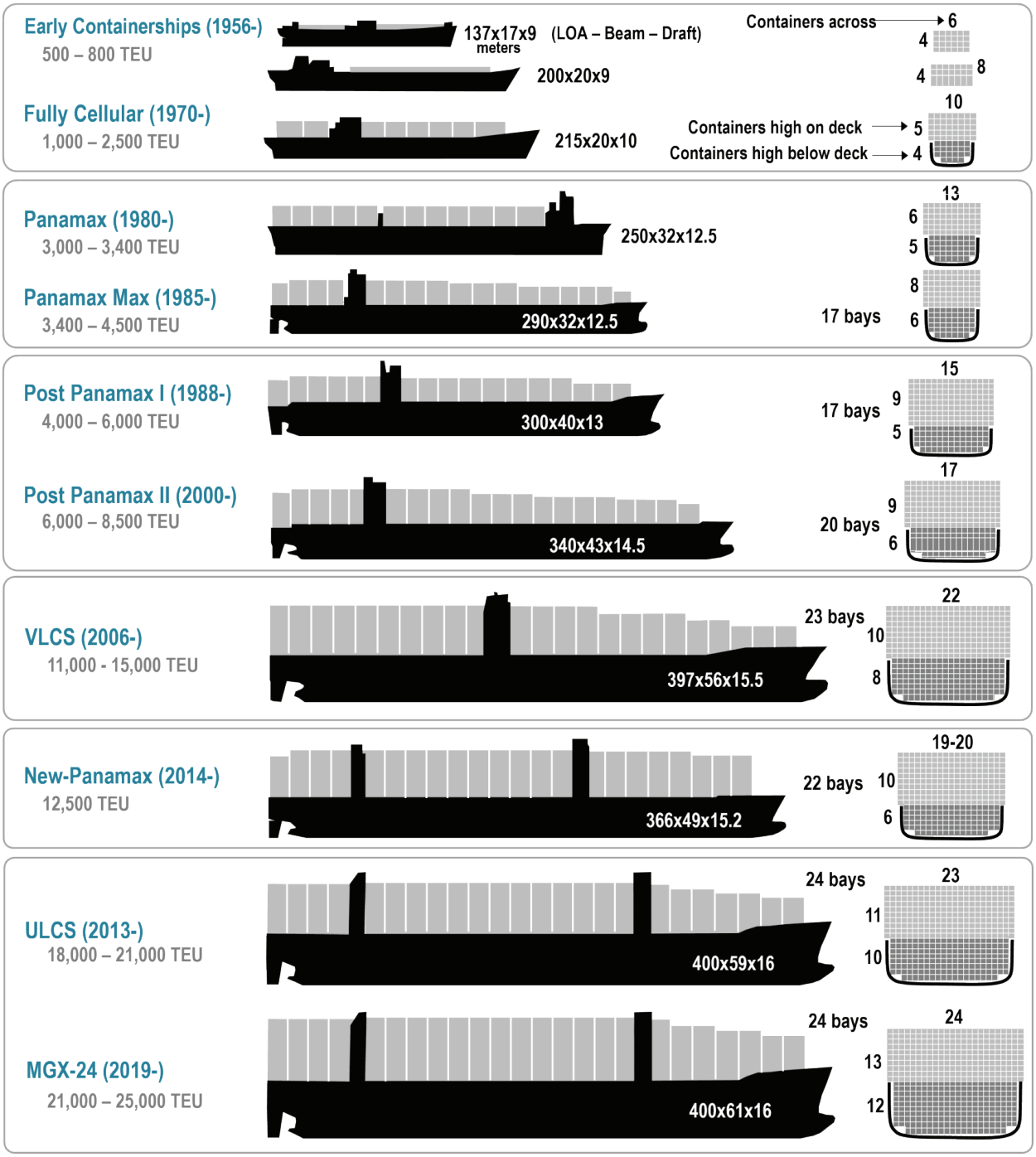
The nation's ports handled 41.5% (or $2.1 trillion) of U.S. international trade by value in 2023.[3] Furthermore, approximately 743 million tons of cargo, or 15%, of domestic freight is carried by water and must move through the nation's ports.[4]

The pandemic disrupted shipping operations domestically and globally, but U.S. ports demonstrated nimbleness amid the uncertainty. Although maritime container imports declined during the first half of 2020, they increased in the second half of the year owing to a sharp rise in imports principally from China.[5] Spending on household supplies surged as many people found themselves working from home. Container shipping firms, which had canceled scheduled sailings and consolidated shipping routes during the first half of 2020, raced to restore capacity to pre-pandemic levels as economic activity and consumer demand increased.[6]

Annually, the number of twenty-foot equivalent units (TEUs) handled by the leading ports in the U.S. (Tacoma, Seattle, Savannah, Virginia, Oakland, New York–New Jersey, Los Angeles, Long Beach, Houston, and Charleston) grew in the years before the pandemic and has continued to increase in the years since.[7]

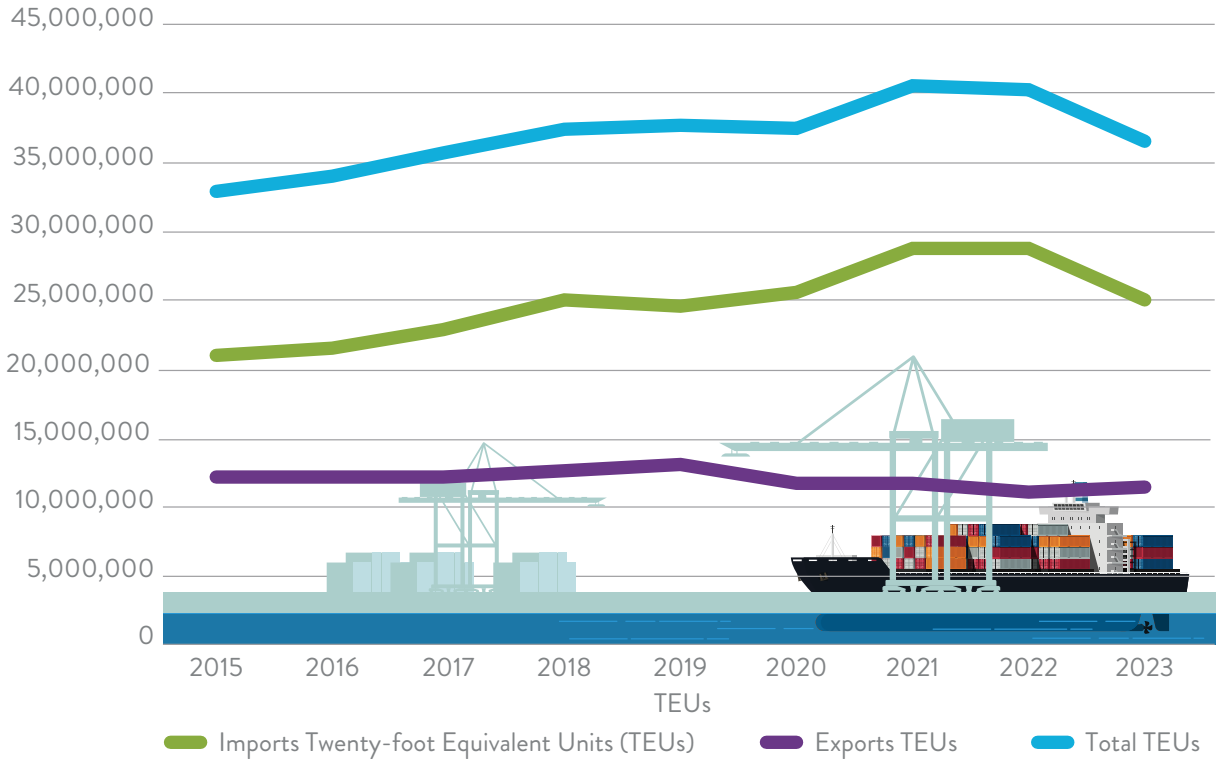
The total volume of containerized import and export cargo at U.S. ports was 32.9 million TEUs in 2015, a quantity which grew to 35.7 million TEUs in 2017 and 40.1 million TEUs in 2022.[8]

Evolution of Containerships



Source: Rodrigue, J-P (2024) The Geography of Transport Systems, Sixth Edition, New York: Routledge

Containerized Cargo at U.S. Ports (in TEUs)



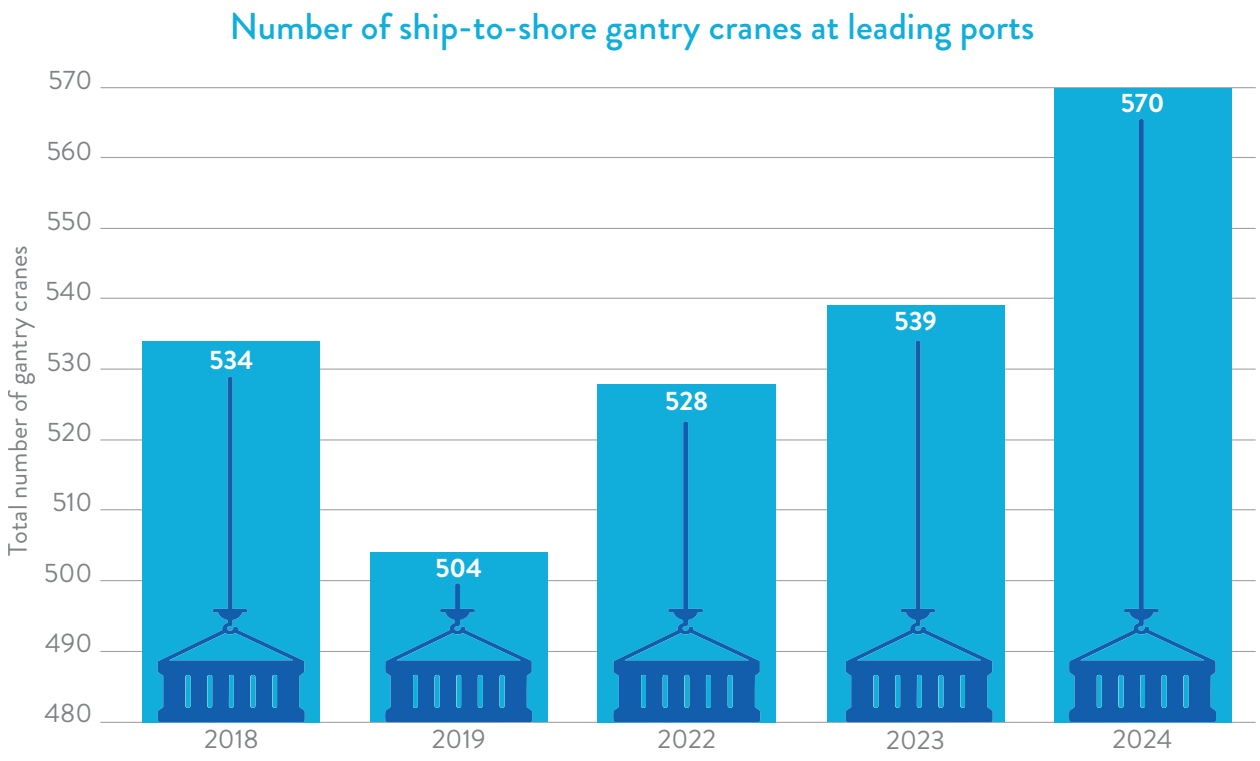
Source: Maritime Administration analysis of data from S&P Global PIERS

Although TEU throughput often fluctuates across the various seasons, ports sometimes need to accommodate unexpected shipments in the event of disruptions. For example, the collapse of the Francis Scott Key Bridge that temporarily closed the Port of Baltimore in March 2024 caused vessels bound for Baltimore to reroute to other East Coast ports.

Port investment decisions are driven by the need to accommodate ever-larger vessels, upgrade aging facilities, and decarbonize their infrastructure. Some ports, such as PhilaPort in Philadelphia and Honolulu Harbor in Hawaii, have piers dating back to the early 20th century. These aging assets and limited water frontage can affect the ability of ports to construct suitable modern facilities. In addition, channel depth determines the size of vessels that can call at a port. Ports throughout the country have been engaged with federal and non-federal projects to deepen channels and widen harbors to safely accommodate large ships and compete with one another.

Ship-to-shore (STS) gantry cranes serve a vital role in moving containers. The number and size of STS cranes at a port affect the number and size of vessels that a terminal can service. The top 25 container ports operated 570 STS cranes in 2024, up from 539 STS cranes in 2023.[9] Of these STS cranes, 248 are classified as super post-Panamax, which are the most capable because they are large enough to load and unload super post-Panamax ships, the latest and largest container ships. Several port facilities plan to purchase cranes at new and existing container terminals.

Photo: Port of Seattle



Source: Bureau of Transportation Statistics

The ease with which a port can facilitate the movement of goods depends largely on its ability to connect with other modes of transportation. Nearly all major ports have National Highway System connectors and on-dock or nearby intermodal container transfer facility (ICTF) rail connections.[10] Of the top 25 container ports, 18 have on-dock rail, and all have nearby rail transfer facilities.[11] On-dock rail eliminates the need for drayage trucks to ferry shipping containers to and from the marine terminal and ICTFs, reducing port congestion and emissions and improving efficiency.[12]

FUNDING AND FUTURE NEED

Federal, state, local, and private sector funding support port infrastructure. Waterside infrastructure needs, such as maintenance dredging, are paid for through the federal Harbor Maintenance Trust Fund (HMTF). The HMTF collects revenue through a 0.125% user fee on the value of the cargo shipped. Although intended specifically for maintenance dredging, the fund has also been used for other port infrastructure purposes. The Water Resources Development Act (WRDA) of 2020 included full utilization of the $10 billion balance of the HMTF by allowing $500 million to be appropriated in Fiscal Year 2021, with an increase of $100 million annually until 2030.[13]

Recent federal legislation has included provisions to improve ports and their equipment. In 2021, the Infrastructure Investment and Jobs Act (IIJA) invested $17 billion in ports and inland waterways, supporting programs such as the Maritime Administration's (MARAD) Port Infrastructure Development Program (PIDP) and the Federal Highway Administration's (FHWA) Reduction of Truck Emissions at Port Facilities Program. The IIJA provided $450 million annually over five years for the PIDP. Prior to 2021, the program averaged $245 million annually.[14] In addition to the PIDP, MARAD administers programs for marine highways and small shipyards. **Since the IIJA's enactment, the Department of Transportation (DOT), the U.S. Army Corps of Engineers (USACE), and the Environmental Protection Agency (EPA) have announced more**

than 1,060 port and waterways projects.[15] The EPA's Clean Ports Program, which funds zero-emission port equipment and technology, was provided $3 billion through the Inflation Reduction Act in 2022.[16] In the fall of 2024, the EPA awarded $3 billion through the Clean Ports Program, while MARAD awarded $580 million through the PIDP.

ASCE's *Bridging the Gap* report indicates water transportation needs from 2024 to 2033 are about $45 billion, of which nearly $38 billion is specific to ports.[17] According to a survey conducted by the American Association of Port Authorities, public port authorities and their private tenants have about $163 billion in capital investments planned through 2025.[18] Ports have planned a variety of landside and waterside infrastructure improvements, and port property tenants have planned their own investments in terminal facilities, warehousing, and security. However, infrastructure owners need better data to inform long-term investment decisions for inland and river ports.[19]

Another anticipated need at ports is radiation portal monitors, which scan incoming containers for radioactive materials. The SAFE Port Act of 2006 required all containerized cargo entering the U.S. to be screened for radiation, and the monitors have been fixtures at container ports since. However, nationwide, those scanners are reaching the end of their useful lives, and ports must install upgraded equipment.

OPERATION AND MAINTENANCE

U.S. port governance is unique because there is no national port authority.[20] Rather, authority is dispersed through federal, state, and local levels of government. Some ports are privately owned and operated, whereas government authorities manage others. Port authorities are government entities that either own or administer the land, facilities, and adjacent bodies of water where cargo is transferred between modes. Port authorities manage the infrastructure within ports, including docks, terminals, and storage facilities. At the federal level, the USACE is responsible for deepening and maintaining federal shipping channels to keep them safe and navigable.

In addition to traditional maritime infrastructure, such as piers and channels, ports must maintain the network of systems connected to their facilities. For example, in addition to focusing on projects such as harbor deepening and wharf repairs, the Port of Long Beach maintains a diverse investment portfolio that includes sewer and stormwater maintenance as well as rail infrastructure.

Photo: Georgia Ports Authority

Asset management is fundamental to effectively operate and maintain all infrastructure, including ports. Some ports have assessed vulnerabilities and risks to their infrastructure. For example, Port Tampa Bay is conducting a vulnerability analysis, which evaluates the port's critical assets, the vulnerability of those assets, and preliminary adaptation strategies to enhance the port's resilience. Initial findings of the analysis have led the port to pursue adaptation projects aimed at reducing flooding and constructing a redundant underground electrical feeder. Although Port Tampa Bay lost power for two days after Hurricane Milton made landfall on October 9, 2024, the facility did not experience widespread flooding and the docks were not significantly damaged. The port reopened channels and resumed vessel operations October 12.[21]

Challenges in finding qualified workers—and the need to train workers on operating and maintaining modernized cargo handling equipment—are an element of ports' operational needs. The Ports of Los Angeles and Long Beach have partnered to construct the Goods Movement Training Campus, which will provide a centralized facility to attract and retain dockworkers, truck drivers, warehouse employees, and other logistics workers. The Steamship Trade Association of Baltimore purchased a crane simulator to expedite training programs for workers without slowing cargo movement.

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PUBLIC SAFETY AND RESILIENCE

Prompted by environmental concerns and regulatory pressures, ports have demonstrated efforts to address the effects of climate change. Sea level rise along the U.S. coastline is projected to increase between 10 and 12 inches in the next 30 years.[22] Rising sea levels can damage port infrastructure and disrupt commerce, leading ports to consider solutions such as raising structures and electrical equipment and building protective barriers. The Hawaii Department of Transportation manages the state's harbors and conducts light detection and ranging (LiDAR) scans to see which piers would be susceptible to overtopping.

While coastal ports grapple with rising sea levels, inland ports have faced challenges with low water levels, hampering freight movement along the Mississippi and Ohio Rivers. In 2022, the Mississippi River carried 57% of the 164.1 million tons that moved between the states on the Upper Mississippi System and Louisiana.[23] Because of low water levels, the movement of river-borne freight was affected, because barges had to carry less cargo to reduce their drafts and barge tows needed to be reduced in number and length. At points in 2022 and 2023, parts of the waterway system were unnavigable by barges, delaying the movement of goods.[24]

Air draft, the vertical clearance between the water's surface and a restriction such as a bridge, can bar vessels from entering a port. In recent years, ports have constructed new bridges (such as the Long Beach International Gateway Bridge in California, completed in 2020) or elevated existing bridges (such as the Bayonne Bridge near the Port of New York and New Jersey, completed in 2019) to alleviate this restriction.[25] At the federal level, the National Oceanic and Atmospheric Administration (NOAA) maintains the Physical Oceanographic Real-Time System (PORTS), which provides data to vessel agents and ship pilots to help ensure vessels can safely transit under bridges. This system has been installed in 38 ports, and four more have been approved over the next two years.[26]

Ports are critical in the aftermath of disasters because they facilitate the delivery of supplies. Integrating ports into a holistic disaster recovery plan—developed with all stakeholders and based on shared data—is vital to helping a community recover quickly. Moreover, in the event of major disruptions, such as the Francis Scott Key Bridge collapse, adaptation plans should be implemented so logistics and commerce can continue.

INNOVATION

Many recent examples of port innovation stem from efforts to cut emissions. The maritime sector requires vast amounts of energy for vessel propulsion, ground transport, cargo handling equipment, and electricity generation. Some ports have embraced innovation, such as the electrification of equipment, to comply with air quality mandates and reduce emissions. The Ports of Los Angeles and Long Beach use shore power, which allows vessels to connect to the electrical grid while berthed instead of relying on their engines for power. Shutting down their engines reduces air pollution, improving air quality in the port area and surrounding communities.

Photo: Electric cranes at the Port of San Diego; Port of San Diego.

Wind is another potential power source. In May 2023, the Port of Long Beach released plans for Pier Wind, a facility that would support the assembly of floating offshore wind turbines.[27] Once assembled, the turbines would be towed by sea to wind farms off the coasts of Central and Northern California, where they would generate power for the grid. Ports on the East Coast are building facilities to support the offshore wind business in the Northeast and mid-Atlantic regions.

As the maritime industry considers options other than traditional fossil fuels, alternative fuels for oceangoing vessels are under development. Ports provide the infrastructure for fueling and bunkering operations, meaning they can play a crucial role in adopting cleaner fuels. Hydrogen, green methanol, ammonia, renewable natural gas (RNG), and liquefied natural gas (LNG) have the potential to decarbonize the maritime sector.

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Photo: Ship bunkering at Jacksonville, Fla.; Jacksonville Port Authority

Brought on by pandemic-induced consumer demand, the number of container ships waiting to enter U.S. ports has surged.[28] To address this backlog, the Ports of Los Angeles and Long Beach participated in an innovative vessel queuing system to improve the efficiency of cargo movement, reduce congestion, and minimize negative air quality impacts.

The beneficial reuse of dredged material has been another area of innovation. Dredged material can be used to create or restore habitats, and ports often realize cost savings associated with not hauling sediment long distances. Various projects ranging from Green Bay, WI, and Oakland Harbor to wildlife refuges in Louisiana have made use of dredged material.

Automation is an emerging factor in the ports sector as well. Although it is expensive and has drawn concern from labor representatives, automation can increase efficiency and physically transport freight.[29]

RECOMMENDATIONS TO RAISE THE GRADE

- Sustain federal and state funding for ports to address outdated infrastructure and the maintenance backlog and invest in alternative energy options.
- Encourage innovation and adopt new technologies to reduce wait times, improve efficiency, increase resilience and security, and reduce negative environmental impacts.
- Improve freight and landside connections, such as through on-dock rail and rail transfer facilities, to boost the efficiency of freight movement and reduce congestion.
- Include ports in comprehensive disaster planning and establish redundancies so commercial operations can proceed in the wake of a disaster or failure.
- Encourage port owners and operators to use asset management to best allocate available funding and identify critical repairs. In addition, by establishing data collection systems, ports can better assess asset conditions and infrastructure needs.
- Ensure ports of varying sizes can compete in both existing and new competitive grant programs.
- Spend down the balance of the Harbor Maintenance Trust Fund on maintenance dredging needs while supporting approved port investments.

DEFINITIONS:

Twenty-foot equivalent units: The most prevalent container transported in the maritime sector is 40 feet long. However, the capacity of container ships is measured in twenty-foot equivalent units (TEUs), which are equal to 8 feet wide, 8.5 or 9.5 feet high, and 20 feet long.

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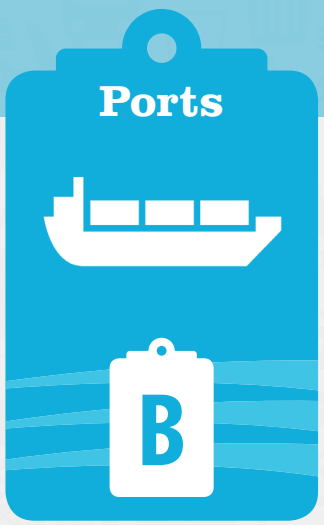

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