



10 Greenest Ports in America

FROM ATLANTIC TO PACIFIC,
THESE PORTS KNOW HOW TO
GET THEIR GREEN ON.

By Chris Lewis

As environmental sustainability continues to be a hot topic for today's shippers and transportation service providers, U.S. ports have implemented a wide variety of green initiatives. While they have completed some of these initiatives in a matter of months, others have taken years, and even decades to achieve. Whether ports are reducing ship waiting times, decreasing fuel consumption, or modernizing fleets, their primary goal is clear: To significantly diminish emissions that are potentially detrimental to the health of the environment, employees, and residents who live nearby.

On the next few pages, *Inbound Logistics* identifies the 10 greenest ports in the United States, based on their wide-ranging (and, at times, novel) approaches to reducing emissions such as greenhouse gases, carbon monoxide, and fine particulate matter. The ports differ in location and size, yet they share a commonality—they have undertaken various initiatives to ensure the ultimate impact of sustainability outweighs its costs.

Inbound Logistics selected each of these ports according to the variety—and long-term effect—of their green initiatives, as measured by emissions reduction, air and water quality improvements, and other green ingenuities.





Upgraded cranes and equipment at the GPA reduce fuel consumption and air-polluting emissions.

GEORGIA PORTS AUTHORITY

In recent years, the Georgia Ports Authority (GPA), which currently oversees the Ports of Brunswick and Savannah, has announced a variety of initiatives that share one central purpose — emissions reduction. Among those initiatives, the GPA has begun to transition its rubber-tired gantry cranes (RTGs) from diesel to electric power. Because the electric RTGs only use diesel power when they move between container rows, they operate on electric power more than 90 percent of the time.

The GPA has also installed 104 electrified refrigerated container racks. Because they do not require the use of diesel generators, the racks currently save 5.6 million gallons of fuel annually. In addition, the GPA uses electrified ship-to-shore cranes, which capture energy — enough to power themselves for 18 minutes of each operating hour — as they lower container boxes.

Other green initiatives:

- Installed new computer-controlled, photosensitive lights at the 1,200-acre Garden City Terminal, reducing 3,569 metric tons of CO₂ emissions annually.
- Launched a truck rebate and finance program that assists owners and operators as they replace their diesel trucks with container hauling trucks equipped with 2010 (or newer) engines.
- Preserved 312 acres of wetlands.

Reducing emissions: By retrofitting 20 RTGs with electric power, the GPA reduced emissions by roughly 1,800 tons. The GPA also retrofitted 11 locomotives with automatic engine stop-start devices, ultimately leading to an annual emissions decline of 18 tons.

At what cost: To date, the RTG retrofitting project alone has cost \$20.6 million.

What's ahead: The GPA predicts that the Garden City Terminal's new photosensitive lights, which phase on and off according to the number of daylight hours in a given season, will reduce energy costs by \$4.9 million over the next 10 years.

PORT OF BALTIMORE

Continuing its commitment to environmental stewardship, the Port of Baltimore currently offers a Dray Truck Replacement Program that allows truck owners and operators to trade in their old model trucks for newer models that reduce air emissions. Since the port enacted the program in 2012, nearly 135 trucks have been replaced. As a result, emissions have steadily declined, as truck turn times were reduced by 6.6 percent in 2014 alone.

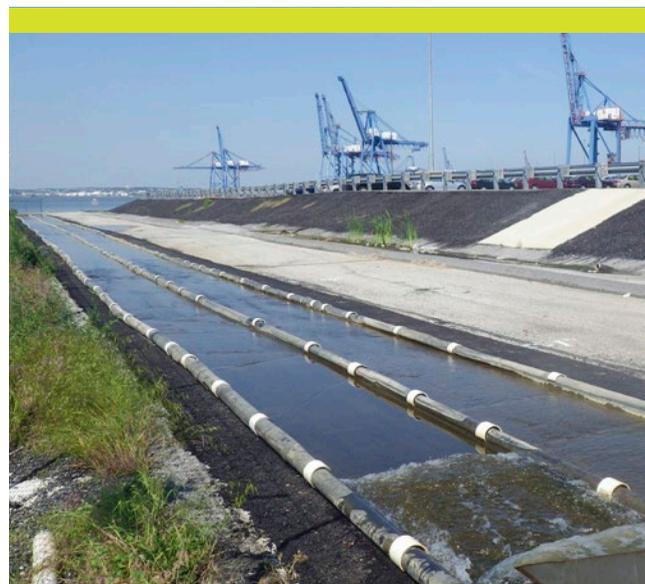
In addition, the port strives to improve the water quality and energy conservation of its facilities. For example, it installed a variety of vaults that treat stormwater, and upgraded its lighting and mounted solar panels on a cruise terminal and transit shed. These projects not only increased environmental sustainability, but also improved the productivity of port operations.

Other green initiatives:

- Retrofitted, replaced, and repowered more than 100 pieces of equipment that service terminals.
- Planted 35 acres of trees.
- Installed the Inner Harbor Water Wheel, a solar- and water-powered device that removes trash from Baltimore's waterfront.

Reducing emissions: Thus far, the Dray Truck Replacement Program has diminished 2,076 tons of nitrogen oxides, 81 tons of fine particulate matter, and 520 tons of carbon monoxide. Equipment operators saved thousands of dollars thanks to the truck replacement program, which has also decreased fuel by 502,065 gallons of diesel over the lifetime of the truck that has been replaced.

What's ahead: Due to the Dray Truck Replacement Program's success, the Port of Baltimore is currently promoting a similar program to replace older cargo handling equipment with newer models.



Located at the Port of Baltimore's Dundalk Marine Terminal, this algal turf scrubber takes up nutrients from the water, thus minimizing the major cause of water pollution in the Chesapeake Bay region.

PORT OF LONG BEACH

In 2005, to decrease the Port of Long Beach's ecological footprint long term, the Long Beach Board of Harbor Commissioners ratified an investment in cleaner air, soil, and harbor water, known officially as the Green Port Policy. Adhering to this policy, the port seeks to improve its air quality through various initiatives of the San Pedro Bay Ports Clean Air Action Plan. Enacted in 2006, the plan is being updated for a second time, as the port seeks new strategies to reduce emissions.

In 2015, the Port of Long Beach constructed four new buildings on a recently redeveloped marine terminal located at the 170-acre Middle Harbor. The buildings, which conserve energy and water, have received a gold level certification from the Leadership in Energy and Environmental Design (LEED). Of equal importance, the terminal itself is also environmentally friendly. Its cranes and cargo moves run on electricity, resulting in nearly zero emissions compared to traditional terminals.

Other green initiatives:

- Introduced the Clean Trucks Program—since 2008, all trucks entering the port's terminals must be equipped with engines that were manufactured in 2007 or later.
- Began a transition to renewable power sources and self-generation systems.

PORT OF LOS ANGELES

In 2004, the Port of Los Angeles pioneered a process that captures emissions as ships plug into shore power—while they're at berth. Shortly after implementation, the process, known as the Alternative Maritime Power program, resulted in the decline of 14 tons of diesel particulate matter, as well as 123 tons of nitrogen oxide emissions. Buoyed by this early success, on Jan. 1, 2014, the State of California established a new regulation that requires



In 2004, the Port of Los Angeles became the first port to use shore-side power to capture emissions from containerships. Today, ports throughout the world employ this practice.



Ship-to-shore gantry cranes arrive at Long Beach's Middle Harbor. The new Pier E terminal, scheduled to open to full operations in 2016, will dramatically reduce air pollution emissions.

Reducing emissions: From 2005 to 2014, diesel particulate emissions, nitrogen oxides, sulfur oxides, and greenhouse gases declined—by 85, 50, 97, and 21 percent, respectively. The port will release 2015 emissions data in late 2016.

At what cost: Since 2005, the port has spent approximately \$500 million to implement the Green Port Policy; it spent about 40 percent of this total on shore power.

What's ahead: The port anticipates one of its primary initiatives—10 LEED-certified buildings—will reduce water and energy costs a minimum of 20 and 10 percent, respectively.

container and refrigerated ship fleets to plug into shore-side power.

Since 2006, the Port of Los Angeles has invested more than \$180 million in shore power infrastructure, which includes shore-power capable berths at the port's eight marine container terminals, as well as its cruise passenger and ferry terminals. As a result, the port currently has more shore-power capable berths than any other port in the world.

Other green initiatives:

■ Established a new system that uses a bonnet to capture emissions as they emerge from a ship's stacks. The system was developed at a Port of Los Angeles terminal and approved by the State of California as an alternative to compliance with the shore power rule. This bonnet system is the first of its kind anywhere.

■ Focused on the Pasha Terminal, which may become the world's first terminal to generate power onsite via a renewable energy source that, with a 2.6-MW battery storage system, could potentially allow it to operate off the local energy grid while using zero emissions yard equipment and drayage trucks.

Reducing emissions: From 2005 to 2014, ocean-going vessels' diesel particulate matter, fine particles, nitrogen oxides, and sulfur oxides declined by 87, 85, 31, and 97 percent, respectively.

At what cost: In the past 10 years, the port has spent more than \$350 million on environmental initiatives.

What's ahead: As a result of its initiatives, the port expects local environmental and health risk to decrease by 85 percent by 2020.

PORT OF OAKLAND

With nearly 19 miles of waterfront on the San Francisco Bay, the Port of Oakland is committed to protecting its surrounding wildlife from the transmission of harmful pollutants. To help diminish air pollution from mobile and stationary on-, near-, and off-shore areas, the port has created a Maritime Air Quality Improvement Plan (MAQIP). Among other goals, the plan's key objective is to reduce diesel particulate matter emissions by 85 percent by 2020, when compared to 2005 levels.

In response, the port's maritime area offers shore power to ships so they can plug into electric grids while they are docked. Through an electric grid connection, the docked vessels help the port achieve another sustainability goal: the State of California Air Resources Board's requirement to reduce the aggregate of air pollutants emitted from ships by 80 percent by 2020.

Other green initiatives:

- Sought funding for zero-emission container handling and truck technology.
- Introduced two smartphone applications so truckers can calculate their turn times, optimize their arrival, and decrease their idling time — and, in turn, fuel and emissions.

Reducing emissions: From 2005 to 2012, the port reduced diesel particulate matter, carbon monoxide, nitrogen oxides, and sulfur oxides by 70, 33, 15, and 80 percent, respectively; it will measure emissions inventory again in 2016.

At what cost: Among other expenses, the port has spent about \$60 million on its shore power project.

What's ahead: Considering the steady success of its previous initiatives, which resulted in a 70-percent reduction of diesel particulate matter as early as 2012, the port is expected to either meet or exceed its MAQIP diesel emissions goals three to four years before its original 2020 target date.

The Port of Oakland reduced its seaport diesel particulate emissions by 70 percent between 2005 and 2012.



The Port of Portland has set a multi-year target to reduce port-wide energy consumption by 20 percent from the 2011 baseline by 2020.

PORT OF PORTLAND

With a goal to reduce greenhouse gases by 15 percent by 2020 in comparison to 1990 levels, and diesel particulate matter by 75 percent by 2020 when compared to 2000 levels, the Port of Portland has implemented an array of sustainability initiatives. In 2012, the port began to replace the Oregon's (a dredge that it owns and operates) 1960s-era engine with a modern, more efficient engine; it completed the project in 2013. Since then, the vessel's diesel particulate emissions have declined by 88 percent.

The Port of Portland has also purchased certified Renewable Energy Credits for 100 percent of its electricity consumption, and invested in new energy-efficient LED lighting for its maintenance facilities, marine terminals, and roadways, along with the Portland International Airport's parking lots. It will complete the two-year project in 2017.

In addition, the Port of Portland installed 35 acres of porous pavement at one of its terminals. Aside from increasing vehicle storage space, the pavement also infiltrates 100 percent of stormwater into the site's subsurface to naturally break down pollutants.

Other green initiatives:

- Installed shore power at Terminal 6 for all tugs that are moored, so that they can plug into an electric grid.
- Installed meters to track energy cost savings.
- Monitored aquatic invasive species, such as zebra mussels, in the Columbia River, through a partnership with state agencies and the Oregon Invasive Species Council.

Reducing emissions: Since 2009, the port has decreased greenhouse gas and diesel particulate matter by 67 and 73 percent, respectively.

At what cost: The port has invested \$3.5 million toward energy efficiency improvements port-wide; it has also spent \$5.1 million on the Oregon's engine replacement.

What's ahead: The port intends to develop a monitoring plan for the Pacific lamprey species that live near its terminals and may be affected by dredging projects. It will also evaluate the potential contribution of zinc (from galvanized metals) to stormwater and review probable source control measures.

PORT OF SAN DIEGO

In 2013, the Port of San Diego's Board of Port Commissions created a seven-year and 22-year Climate Action Guide. With a focus on long-term environmental sustainability, the port established two main objectives—to reduce greenhouse gases by 10 percent by 2020 and 25 percent by 2035, using 2006 statistics as a reference point. To achieve these goals, the board also outlined six emission reduction strategies, including water and energy conservation.

Although the port has reduced water usage by 47 percent since 2008, it will continue to implement new tactics for further conservation, including discontinuing repetitive power washing and decreasing irrigation. The port has also installed 10 public electric vehicle-charging stations around port tidelands, so that vessels can receive shore power and plug into electric grids while they are docked.

Other green initiatives:

- Replaced 296 street, parking, and walkway lights with LEDs, leading to an annual decline of 270,000 kilowatt hours—enough energy to power 17 homes for one year.
- Removed 29 tons of trash and invasive vegetation during recent port-sponsored cleanup events.

Reduction of emissions: Since 2008, the port has reduced greenhouse gas emissions by approximately 24 percent.

At what cost: Within the past 10 years, the port's environmental fund committed \$8.5 million to support 75 projects.

What's ahead: In fewer than 10 years, the port has saved \$3.4 million in utility costs, primarily as a result of energy and water conservation; these savings are expected to steadily rise throughout the next decade.

The Port of San Diego's equipment and infrastructure support its energy conservation initiatives.



To reduce emissions, the Port of Charleston invested in fully electrified ship-to-shore and rubber-tired gantry cranes.

SOUTH CAROLINA PORT AUTHORITY

Committed to the safety of its employees, nearby residents, and environment, the South Carolina Port Authority (SCPA), which operates terminals in Charleston, Georgetown, and Greer, has introduced various sustainability initiatives in recent years. For example, to reduce emissions, the SCPA has replaced traditional diesel conveyors with electrified ones, and upgraded its terminal equipment, including fully electrified ship-to-shore and rubber-tired gantry cranes.

In March 2016, the SCPA publicized plans to install solar panels on the warehouse rooftops of two of its terminals, resulting in the generation of 3.7 megawatts of electricity. Furthermore, the SCPA has dedicated \$5 million to the conservation of the Cooper River Corridor's Francis Marion National Forest, in Huger, S.C.

Other green initiatives:

■ Introduced the Clean Truck Program. Since January 2014, all trucks serving the SCPA's container terminals must have engines that were manufactured in 1994 or later; to date, more than 80 trucks have been replaced.

Reducing emissions: Since 2005, truck emissions have declined by more than 50 percent, as a result of local, state, and federal regulatory programs supported by the SCPA. Ocean-going vessel emissions of particulate matter have decreased by 80 percent since 2011.

At what cost: The SCPA, along with its local, state, and federal partners, has spent more than \$20 million on environmental protection and emission reduction efforts.

What's ahead: The SCPA intends to expand its solar energy program, while also undertaking a comprehensive environmental restoration of the uninhabited Drum Island, located near Charleston.



The goal of the Northwest Ports Clean Air Strategy is to reduce diesel and greenhouse gas emissions in advance of, and complementary to, applicable regulations.

THE NORTHWEST SEAPORT ALLIANCE

To unify the management of their marine cargo terminals and achieve their goals of emission reduction more efficiently, the ports of Seattle and Tacoma formed a partnership known as The Northwest Seaport Alliance. The alliance is committed to ensuring sustainable growth that will not only protect the environment, but also the public health of each port's surrounding communities.

Prior to this alliance, the two ports had already joined forces in 2008, collaborating with Port Metro Vancouver, British Columbia,

to develop a variety of short- and long-term emission reduction goals, via a policy known as the Northwest Ports Clean Air Strategy. Among other key goals, the strategy, which was updated in 2013, is particularly focused on reducing two emissions by 2020: Diesel particulate matter emissions per ton of cargo by 80 percent and greenhouse gas emissions per ton of cargo by 15 percent.

Other green initiatives:

- Installed bio-filtration stormwater treatment systems at Seattle's and Tacoma's log and container terminals, as well as Tacoma's rail yards.

- Introduced a Clean Truck Program that requires drayage trucks to have model-year 2007 or newer engines by Jan. 1, 2018.

Reducing emissions: Maritime-related air pollution in the Puget Sound region has decreased by upwards of 40 percent since 2005.

At what cost: Although expenditures have not yet been measured, the alliance's budget allocates \$1.7 million for its air quality and sustainable practices program in 2016.

What's ahead: To further reduce pollutants, The Northwest Seaport Alliance will revise its Clean Air Strategy's air emissions inventory, evaluate new technologies that may improve truck efficiencies, and incorporate advanced, state-of-the-art stormwater systems into its modernization plans for transportation systems such as Tacoma's North Lead rail tracks.

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

The Port Authority of New York and New Jersey has undertaken a variety of initiatives to improve air, land, and water quality. For example, since 2001, the Port Authority acquired nearly 400 acres of property within the Hudson-Raritan Estuary to preserve open space for conservation and ecological development.

Additionally, it restored several Jamaica Bay marsh islands, using the clean dredge material it acquired by deepening its harbor by 50 feet, an accommodation for larger, deeper-draft vessels.

The Port Authority has also introduced a Clean Air Strategy, a set of voluntary actions that will reduce emissions through initiatives such as installing shore power capability at the Brooklyn Cruise Terminal, modernizing cargo handling equipment, and replacing old trucks. In doing so, the Port Authority is committed to annually decreasing criteria air pollutants and greenhouse gases by 3 and 5 percent, respectively, resulting in an eventual 80-percent decline in greenhouse gases by 2050.

Other green initiatives:

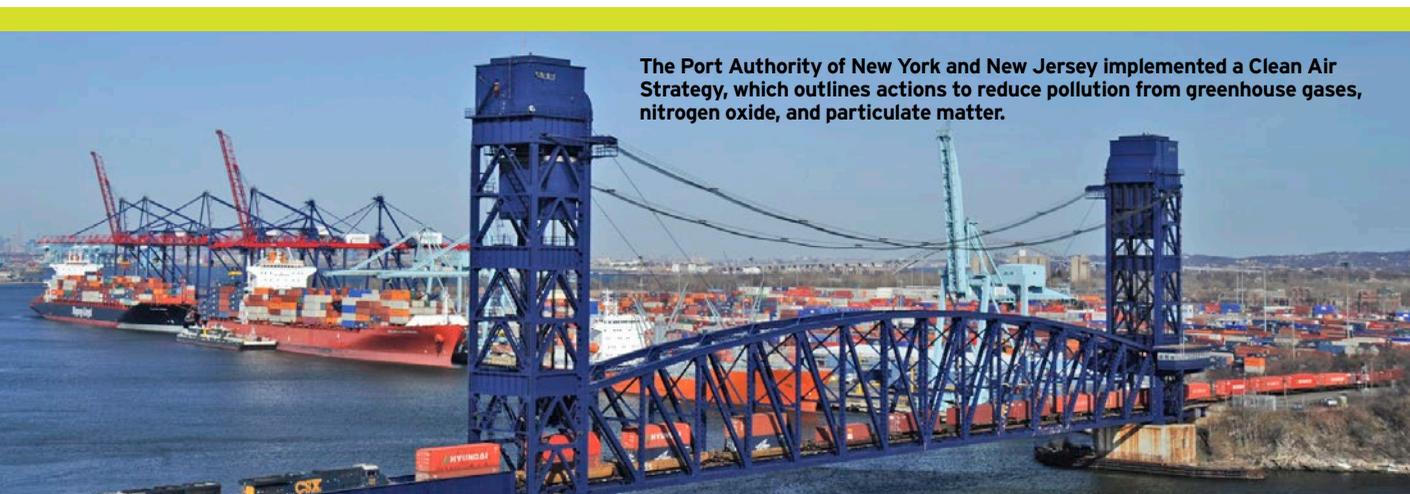
- Implemented a cargo handling fleet modernization program, which reduces emissions by replacing old equipment with new units.

- Introduced a Truck Replacement Program that awards truck owners a financial incentive if they replace older trucks with newer vehicles.

Reducing emissions: From 2006 to 2014, the Port Authority's Criteria Air Pollutant emissions decreased by 41.5 percent.

At what cost: Since 2006, the Port Authority spent approximately \$42 million on air emission reduction initiatives.

What's ahead: The Port Authority of New York and New Jersey intends to spend another \$18 million on air quality initiatives over the next several years. ■



The Port Authority of New York and New Jersey implemented a Clean Air Strategy, which outlines actions to reduce pollution from greenhouse gases, nitrogen oxide, and particulate matter.

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