



PORT PLANNING IN THE 2020S

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As we begin a new decade, this article will attempt to identify likely future trends and current industry best practice in port and marine terminal planning. A useful place to start is to look back at the trends of the past 10 years. What were the most successful ports and terminals from the 2010s? Like all-star teams in sports, this topic is endlessly debatable, but I have selected four North American examples to help explain trends in the wider industry.

PRINCE RUPERT, CANADA

From a perspective of percentage growth, the Fairview Container Terminal in Prince Rupert is by far the leader in North America, although starting at zero has given them perhaps an unfair advantage with this metric. The strengths of Prince Rupert include very deep water and no air draft restrictions, a motivated pro-growth community and labor force, and a simple, focused operation with a proactive partner in the CN railway. The CN's vast network and the low Canadian dollar have also given Prince Rupert a structural advantage against their main US competitors in Seattle/Tacoma.

LONG BEACH CONTAINER TERMINAL (LBCT)

This terminal was developed in a port with the most expensive land and labor in North America and a great deal of community opposition to development. As a result, the operators chose a system with high storage density (1-over-6 ASCs), a very high level of automation, and a nearly 100% electrified operation that generates the lowest air emissions per TEU of any terminal in the world. The terminal included development of a large on-terminal railyard, which is indicative of another global trend to shift cargo from trucks to either rail or barges to the greatest extent possible. The fact that LBCT, a three berth terminal, was recently sold for \$1.8 billion speaks to both the value of first rate terminals in premium locations, and the level of capital investment required for a terminal of this style.

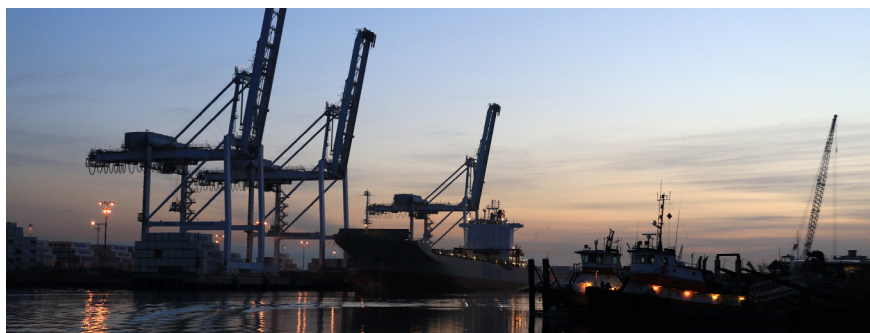
PORT OF SAVANNAH, GA

Another star performer in terms of growth is the Port of Savannah, GA. All the container operations at this port take place in a single enormous terminal: Garden City. Savannah benefits from relatively low labor and land

cost by North American standards. The operator, Georgia Ports Authority (GPA), is an arm of the state government so they may have a different perspective on the optimum mix of labor vs capital compared with a private operator. Robots can do many things on a terminal, but they have not yet acquired the right to vote. Consequentially, it is perhaps not surprising that GPA has opted to stay with conventional operations. One of GPA's most important strategic moves has been to leverage the large amount of cheap land near the port to incentivize beneficial cargo owners (BCOs) to build transload warehouses near the Port. This is similar to ancillary development of free trade zones that have been so successful at driving cargo growth in places like Dubai and Panama. London Gateway is another example of a new terminal that is actively promoting adjacent warehouse space as a feature of their operation.

PORT AUTHORITY OF NY AND NJ

The most notable projects in the 2010s in New York were the raising of the Bayonne Bridge and the building of a new near-



terminal railyard to support GCT. These are both consistent with wider trends of investment to allow for ever larger ships, and to facilitate shifts of cargo away from truck. In North America, all major east and west coast ports are to some extent competing for the same rail cargo to destinations in the center of the continent, so having high quality rail facilities is a priority for every major port on the coasts.

In general terms, ports and terminals develop in response to the desires of their customers: shipping lines and BCOs. What these folks want in a port is unlikely to change much from the current list of:

- **No restrictions on ship size; deep channels and no air draft restrictions.** Ships of 18,000 TEU+ will be used on many routes worldwide so the ability to serve these ships without restrictions is a big advantage for any port.
- **Big terminals with on-terminal rail.** This allows for convenient working of large ships with large call sizes. It's much easier to manage a 10,000 container call on a terminal with 400 acres than it is with 100 acres. Rail is more efficient than truck, and allows ports to compete for discretionary inland cargo.
- **Full service operations.** Starting from the waterside, this could include bunker supply of clean fuels including LNG or any variety of biofuels that may become popular in the medium term future. It may also include cheap and low-CO2 electric power, a convenient supply of chassis, convenient warehousing, and rail networks that can manage domestic containers.
- **Last but not least, low price.** Price refers both to the terminal operation and to the end-to-end logistics chain. This is driven by a combination of cheap land, cheap labor, clever automation, and good warehouse and rail connections.

From a terminal development perspective, the global trends are very clear and are expected to accelerate into the 2020s.

ALMOST EVERYTHING WILL BE ELECTRIC

All of the equipment you see on container terminals today that runs on diesel should have proven electric options by 2030. These will either plug in like RTGs or run off batteries in the case of tractors, strads,

and top-picks. Some ports have mandates for electrification today, but electric motor technology so superior to internal combustion engines (ICE) that once options are reasonably price competitive, there will be a massive shift away from ICE equipment.

Consider that STS cranes have been running on electricity for many years now, not because of any particular mandates but because compared with a diesel STS, an electric STS performs better, costs less to operate, and of course emits zero pollution. All these same characterizes will be true for an electric tractor or reachstacker. The only uncertainty is the pace of progress on reducing equipment prices, which depend primarily on economies of scale and battery price.

Between shore power for ships (possibly even some integrated ship batteries) and tugboats, and a significant fraction of over-the-road trucks, a great deal of electric power will be required on terminals in the future. There will also be increasing opportunities for clever technology to manage this power including vehicle-to-grid connections which would allow terminal equipment to feed back into local grid during times of low demand on the terminal. Ports with uncertainty about the reliability of grid power, a big issue lately in parts of California, may invest in microgrids that can isolate the port from wider grid on either a temporary or permanent basis.

ALMOST EVERYTHING CAN BE AUTOMATED

After 25 years of refinement in robotic terminal operations, it may be easier to describe the elements of a container terminal that cannot be automated in 2020. These elements typically revolve around mechanically complicated items such as IBC handling and lashing, although robotic IBC machines exist in prototype mode, and will be a very appealing option if they can be perfected. The maintenance of equipment is another area that will require direct human contact indefinitely.

Just because a task can be automated does not necessarily mean it should be automated. The ILA labor union, which works ports in the US East and Gulf coasts has specifically prohibited "full" automation in their contract. This effectively means that

manual tractors or straddle carriers will be used for STS service indefinitely in these areas. Ports in areas with cheap labor, or with government mandates to positively impact the regional economies may prefer to avoid highly automated operations. Similarly terminals with low volume may opt to stay with the lower up front cost of manual operations.

Since the dawning of the container era over 60 years ago, container terminals have been big success stories in their ability to adapt and grow while dramatically reducing both emissions and workplace injuries. These positive trends can and should continue indefinitely with proper planning and focused effort from decision makers.

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ABOUT THE AUTHOR

Mark Sisson leads AECOM's marine analysis group. He is responsible for business development, project execution, and oversight of research and development of AECOM's simulation models. Mark has over 20 years' experience managing and executing a wide range of marine and rail terminal planning, simulation, and analysis projects. Typical projects involve supervision of field data collection, model development, and presentation of analysis results. Sisson received his BS in Civil Engineering at California State Polytechnic University and his MS in Civil Engineering from Northwestern University and is a registered professional engineer in the state of California, US.

ABOUT THE ORGANIZATION

AECOM is made up of a global network of experts working with clients, communities and colleagues to develop and implement innovative solutions to the world's most complex challenges. Those challenges include delivering clean water and energy, building iconic skyscrapers, planning new cities, restoring damaged environments, and connecting people and economies with roads, bridges, tunnels and transit systems. We connect expertise across services, markets, and geographies to deliver transformative outcomes. Worldwide, we design, build, finance, operate and manage projects and programs that unlock opportunities, protect our environment and improve people's lives.

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