



Thriving Ports in a Competitive Environment



Great Expectations

The last two decades have witnessed profound change in the international maritime market. Increased global demand for goods and resources is driving the change. This comes concurrently with the globalization of manufacturing and delivery supply chains. Also at the same time, vessel sizes are growing. This brings even greater demand for port-infrastructure investment and changes in how we use facilities. Finally, ports are gaining recognition for the critical role they play in national and regional economies. This pressures them to increase their performance as corporate citizens and in their sustainability efforts.

Together, these changes have created a highly dynamic port environment. Some ports will gain importance in this environment; others will see world trade move in a different direction. Successful ports will leverage technology to facilitate three fundamental changes:

- Smarter capital investments to meet world shipping demand
- Maximized efficiency (throughput) through greater stakeholder engagement and more collaborative arrangements
- Increased proactivity in developing regional economies for even greater value to customers and stakeholders



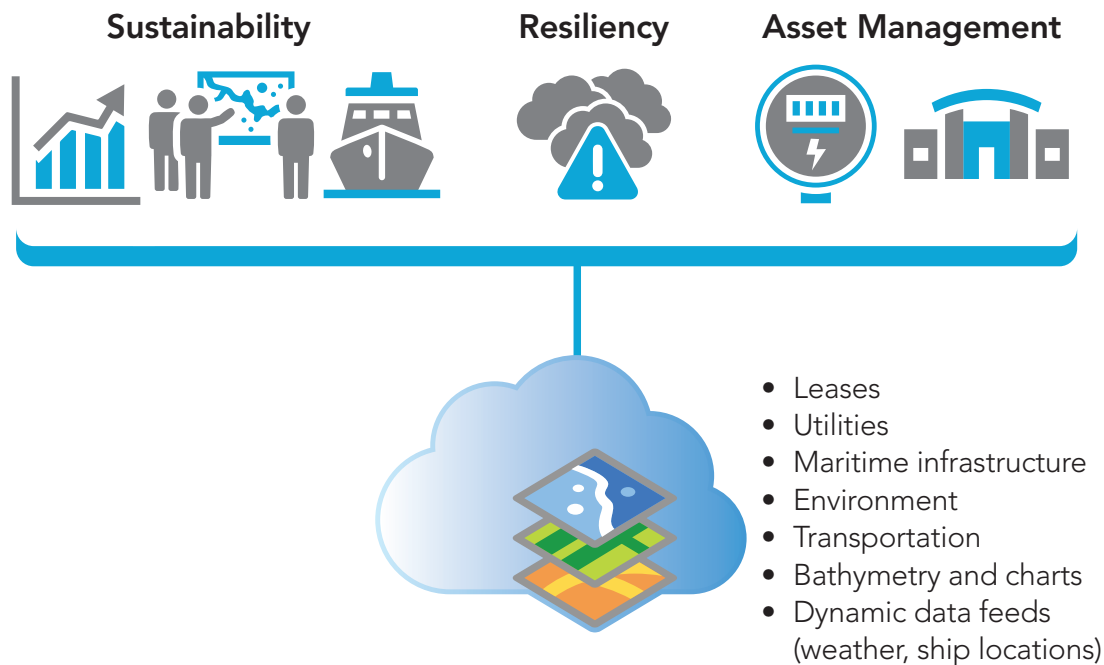
The Role of Information

Large international ports are complex organizations. They manage and maintain assets, facilities, utility networks, and utility consumption. They coordinate and optimize transportation infrastructure and minimize traffic congestion and environmental impacts. They coordinate leases and tenants and monitor performance. And they must coordinate all these activities to ensure unencumbered throughput to protect profit and sustainability.

To be effective, modern ports must realize the value in their information. However, even the best ports, characterized by their silos of information, only share data at the departmental level. Each team collects its own data—about assets, leases, facilities, weather, cargo, emissions, employees, and more. Yet each team relies on the others. They work best when they share information and collaborate freely with each other and other port stakeholders. Thus, an effective information-sharing platform is the keystone of a modern, smart port environment.

The Esri® ArcGIS® platform provides the framework for information integration. ArcGIS creates a unified information layer. Esri provides all the tools to manage, share, analyze, and act on this information, so a port's departments can quickly make data available to the entire organization and promote cross-departmental awareness and collaboration. Teams can better understand how the port operates and make more confident decisions for greater efficiency and effectiveness.

Using maps and GIS tools the port's workforce will be able to access this information from any device and make better decisions, both in the office and in the field. ArcGIS helps executives, senior managers, knowledge workers, and field staff use and understand information that is timely, accurate, consistent, and spatial. They can do so anywhere, from any device, so they can act on the challenges your port faces today.



The ArcGIS Platform Diagrammed for Port Use

Our Modern Challenges

Capital Planning and Strategic Asset Management

Vessel sizes have increased steadily over the past three decades. Ports must provide deeper, wider docks; stronger quays; and larger cranes. Only a limited number of ports can accommodate ships that are 10,000 TEU and larger, while ships as large as 22,000 TEUs are currently being designed. For ports to keep up, they must make costly improvements to their infrastructure if they want to support these ships.

At the same time, ports have a limited amount of land and space, and many are constrained by surrounding urban development that prevents further growth. Thus, many ports need to focus on the best use of their assets and resources. These ports need total, detailed awareness of current asset conditions. They must understand a full asset life cycle and how to run effective cost analyses. Together, these behaviors help senior port managers make informed, cost-effective investments.

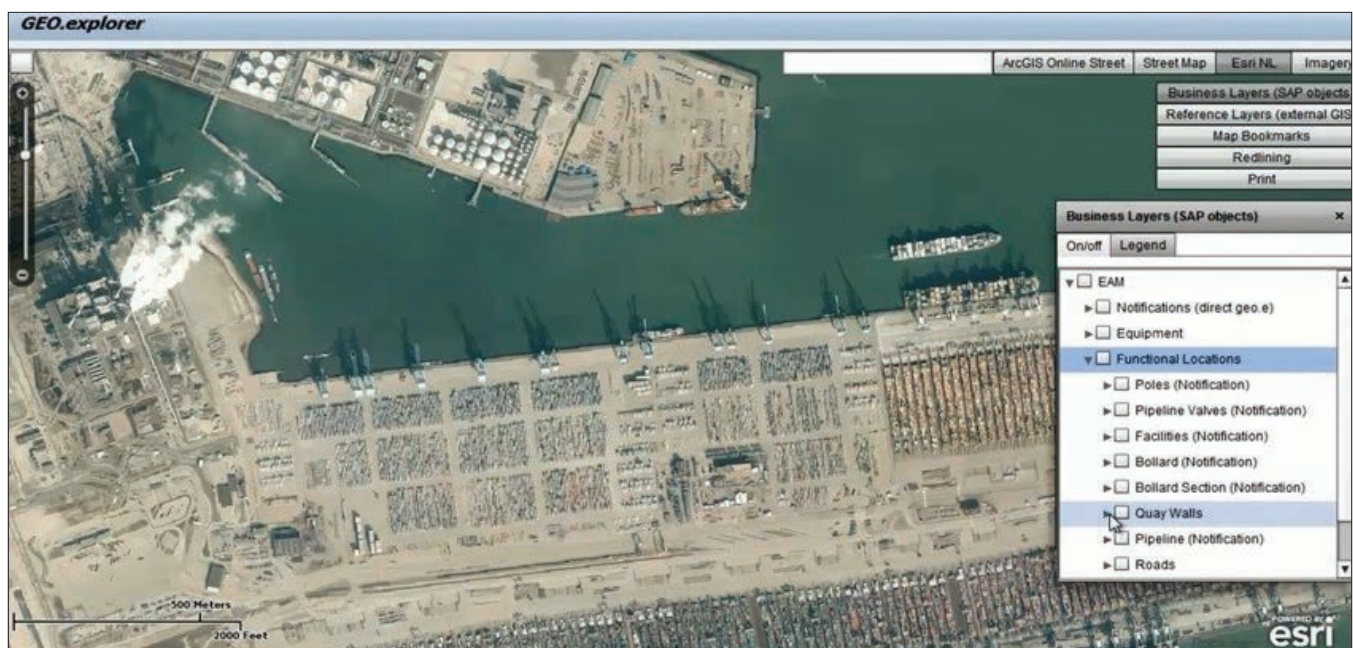
ArcGIS helps ports meet these challenges. The technology helps them make the most of their assets while planning proactive, cost-effective capital investments. ArcGIS provides tools in four key areas:

- Asset inventory
- Condition assessment
- Field inspection
- Capital investment

At Esri, we know that a port's value lies in expert systems designed to optimize port development and asset management. Instead of trying to replace these systems, Esri enhances them. We've partnered with the world's leading providers of port support systems, including Autodesk, Microsoft, IBM, and SAP. As a result, the ArcGIS platform can connect to and integrate with many existing systems, promoting communication and information exchange throughout.

Most of our port customers invest in ArcGIS to improve asset management. They use GIS to map and manage their land assets to better understand location, lease terms, capacity potential and availability, and use constraints. This streamlines many processes and reduces the time it takes to understand location issues, so managers and workers make faster and better decisions. Many ports map and manage their utility assets to support not only daily operations but also master planning and infrastructure improvements. An increasing number of ports also map maritime infrastructure to better understand risk to current revenue and opportunity for future revenue increases.

Figure 1: A Comprehensive View of Assets at the Port of Rotterdam in the Netherlands



Maximizing Port Operations

Smart ports understand that creating a collaborative environment is critical to improving productivity and increasing competitive advantage, as emphasized in a recent European Union report from the MONALISA project:

"Ports are departure and arrival hubs for different means of transportation requiring a coordinated approach, addressing the goals of the transport system as a whole, with smooth and seamless operations at sea, at port . . . as well as connections to hinterland transportation. Seamless and sustainable transports enabled by STM [Sea Traffic Management] require an efficient and collaborative port."

Lind et al.

Collaborative decision making (CDM) is an airport operations concept. Ports are embracing CDM because it envisions real-time information sharing among port departments, shipping companies, terminal operators, pilot organizations, drayage teams, and rail companies.

When everyone works together, there are greater operational efficiencies and throughput is maximized. This effort starts with a common operational picture and greater situational awareness based on shared information.

Esri's technology is used by organizations worldwide to give them this common operational view to improve performance. With the ability to integrate real-time vessel movements, weather and tidal changes, land-based transport movements, berth occupancy, and port business systems, ArcGIS provides a location-based platform designed to give port operators a port-wide view of all current activity.

Esri technology seamlessly integrates with leading document management and business intelligence systems. It integrates with most port operational systems, including Saab Technologies Klein Port System, to give port operators a comprehensive view of operations. Key port actors can drive improved performance, and port staff can view what they need, wherever and whenever. Ports that do this see immediate benefits and return on investment.

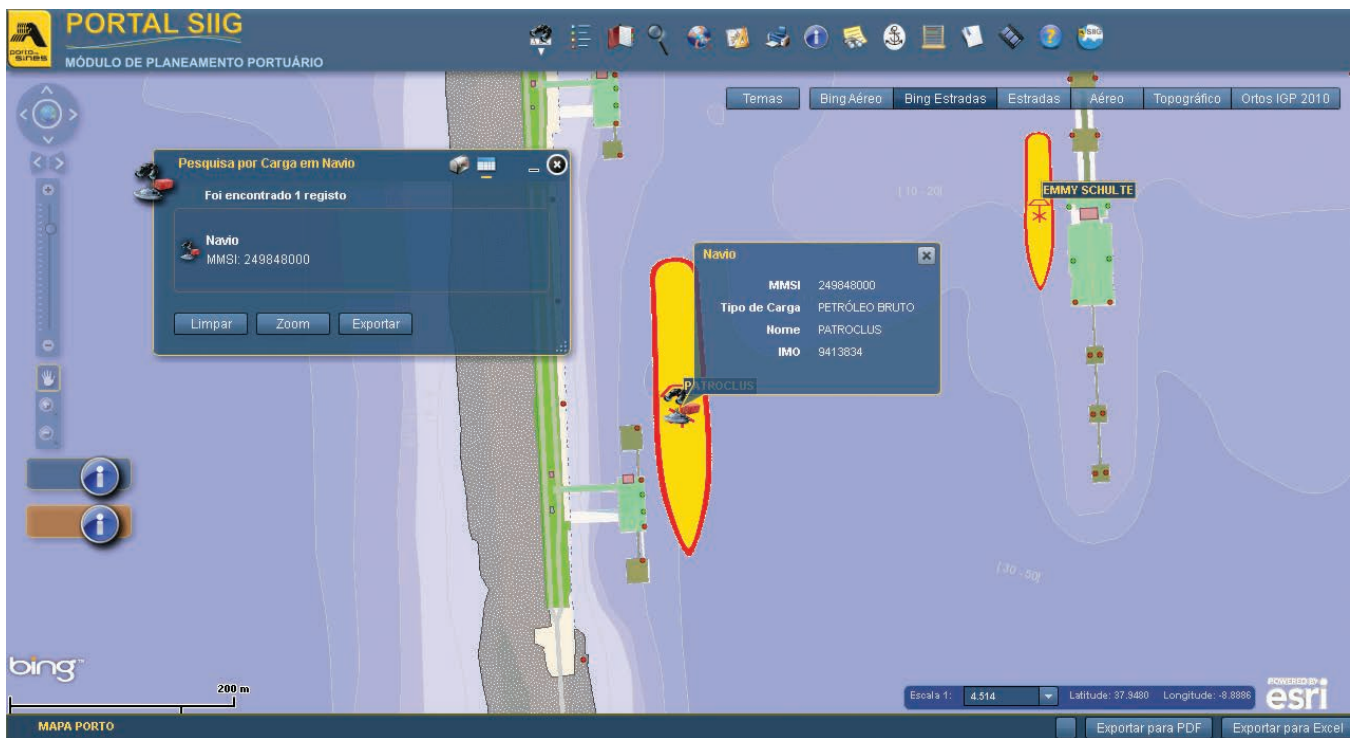


Figure 2: Berth Occupancy and Planning at the Port of Sines in Portugal

Port Security and Resiliency

Ports must be prepared to respond to and recover from sudden disruptions (e.g., extreme weather conditions). Resilient ports require a strong security network and effective business continuity and emergency management plans. Port-wide visibility and control give ports complete awareness, letting executives and senior managers envision the port's current and future states.

ArcGIS delivers a common operational picture that can be shared port-wide. This includes tools for the following:

- Vessel tracking
- Sensor inputs
- Field visibility
- Environmental monitoring

Ports are already becoming resilient with Esri technology. They make information available to staff wherever and whenever it's needed, on any device. For example, when a port documents and publishes asset data with ArcGIS, operators can mitigate utility interruptions and restore services more quickly. ArcGIS lets ports access intelligent maps showing utility infrastructure, perform tracing to isolate leaks, and discover where abnormal utility operations have damaged assets. With detailed basemaps, ArcGIS gets responders to the right location faster and allows them to better understand each event's potential impact on surrounding assets and activities. This leads to fewer utility interruptions and faster restoration of services.

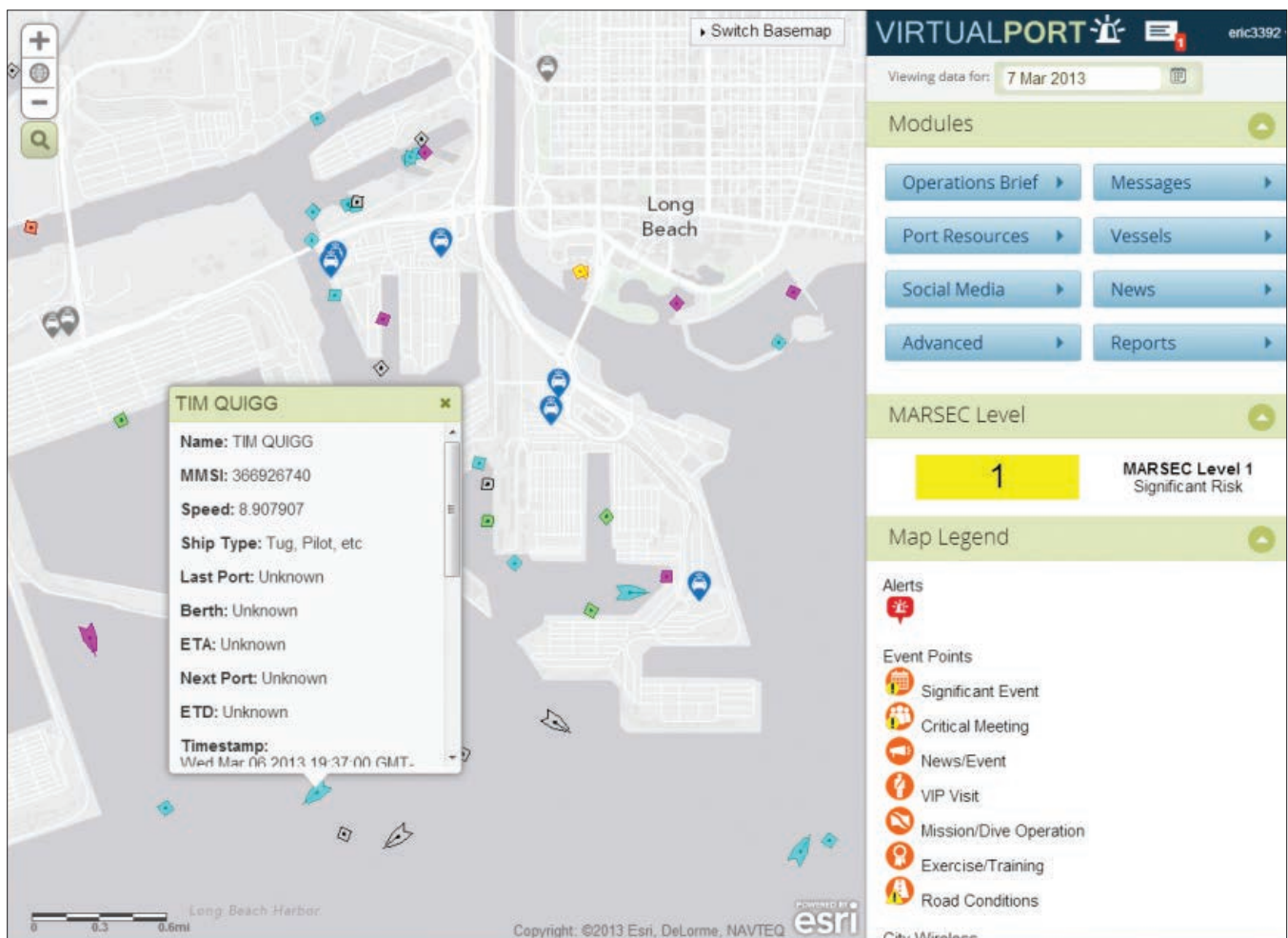


Figure 3: A Common Operational Picture of the Port of Long Beach in California

Port Sustainability/Green Ports

Ports are under increasing pressure to find the most efficient use of their limited geography. They must mitigate environmental impact while growing profitability and performance and sustaining positive community relationships. Ports have become beholden to triple bottom-line accounting—the need to thrive in economic, social, and environmental conditions—to maximize their value to their community and pursue sustainable growth. They must become transparent “port cities” or “green ports.”

Ports become green by minimizing congestion, pollution, emissions, rising sea level impacts, storm disruptions, and more. Green ports restore the harbor and coastal activities. Through proactive community involvement and transparency, these ports improve goodwill and increase sustainability.

Esri technology makes this easy. Spatial technology helps streamline workflows through visualization and analysis of port information. It becomes easier to manage new development, dredging, permitting, and litigation. Furthermore, many ports map trade data combined with community data (i.e., information about industrial properties or surrounding businesses) to help port officials improve business development and make decisions that will attract and retain customers while providing greater value to the larger regional economy.



Across America, Communities Restoring Estuaries

Restore America's Estuaries (RAE) is a national 501(c)(3) nonprofit organization established in 1995 as an alliance of eleven community-based conservation organizations working to protect and restore the vital habitats of our nation's estuaries. Click on the tiles and arrows below or explore the dynamic map to find out more about the RAE member organizations.

Map Legend

- RAE Member Organization Office
- Organization Project Sites
- Service Areas

Tampa Bay Watch

Established in 1993, Tampa Bay Watch trains and organizes citizen volunteers, students, at-risk youth, and civic organizations to participate in environmental projects. By expanding community involvement in hands-on restoration and protection projects around the bay, TBW strives to counteract the huge loss of Bay wetland habitat over the past 100 years. For more info click [here](#).

1 **clf** Conservation Law Foundation
 2 **SAVE THE BAY.** Narragansett Bay
 3 **Save the Sound!** Save the Sound, a program of CT Fund for the Environment
 4 **AMERICAN LITTORAL SOCIETY** Coastal Conservation
 5 **CHESAPEAKE BAY FOUNDATION** Saving to National Recreation Chesapeake Bay Foundation
 6 **RESTORE AMERICA'S ESTUARIES** RAE's National Office
 7 **North Carolina Coastal Federation** North Carolina Coastal Federation
 8 **TAMPA BAY WATCH** Tampa Bay Watch
 9 **COAIF**

Figure 4: A Story Map from Restore America's Estuaries, showcasing current Initiatives.



A Single Platform to Integrate Port Business

Ports are leaving behind disparate information systems in favor of using a comprehensive operational picture. ArcGIS is the industry leader in a spatial platform that supplies this common operational view.

ArcGIS visualizes existing business systems, converting them into actionable intelligence. That means port administrators will be making informed decisions on data collected on leases; facilities; property, asset, and security management; and real-time tracking systems. Esri's platform gives them the information they need, on any device, at any time. As a result, leading ports worldwide have turned to Esri to help them improve their global competitiveness and their bottom line.



Your Next Steps

You can arrange a preliminary assessment of how Esri's spatial platform, ArcGIS, can help your port achieve its business objectives. When you contact an Esri representative, our port and maritime experts will help you conduct an official business value assessment to understand where the opportunities for a location-based strategy exist. You will see how bringing spatial information together from your existing port systems can help you meet current challenges. Esri's Jump Start engagements can help you quickly implement intelligent solutions, so you start right away on the path to greater productivity. Meet today's rapidly changing global environment with Esri.



Figure 5: Integration of Electronic Navigational Chart with Live Vessel Tracking, off of Coney Island in New York City

Visit esri.com/smartports.





Understanding our world.

Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them.

Governments, industry leaders, academics, and nongovernmental organizations trust us to connect them with the analytic knowledge they need to make the critical decisions that shape the planet. For more than 40 years, Esri has cultivated collaborative relationships with partners who share our commitment to solving earth's most pressing challenges with geographic expertise and rational resolve. Today, we believe that geography is at the heart of a more resilient and sustainable future. Creating responsible products and solutions drives our passion for improving quality of life everywhere.



Contact Esri

380 New York Street
Redlands, California 92373-8100 USA

1 800 447 9778
T 909 793 2853
F 909 793 5953
info@esri.com
esri.com

Offices worldwide
esri.com/locations

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