Thriving Ports in a Competitive Environment

Rapidly Changing Environment: The last two decades have witnessed profound changes in the international maritime market, driven by increased global demand for goods and resources, and the concurrent globalization of manufacturing and delivery supply chains. Simultaneously vessel sizes have been rapidly increasing, and this in turn has brought greater demands for new investment in port infrastructure, and changes to facility utilization. Finally, ports are being increasingly recognized for the critical role they play in their national and regional economies, but this has also led to greater pressures to be good "corporate citizens," and greater demands for sustainability in the port environment.

Taken together, these changes have created a highly dynamic environment for ports, an environment in which some will gain in importance, while others will see world trade move in different directions. Ports that will succeed in this highly competitive environment will be those that can leverage technology to bring about three fundamental changes:

- Better plan their capital investments to meet world shipping demand
- Engage their stakeholders to develop collaborative arrangements to maximize efficiencies and port throughput
- Play a more proactive role in the development of their regional economies, and thus provide greater value to their customers and their stakeholders.

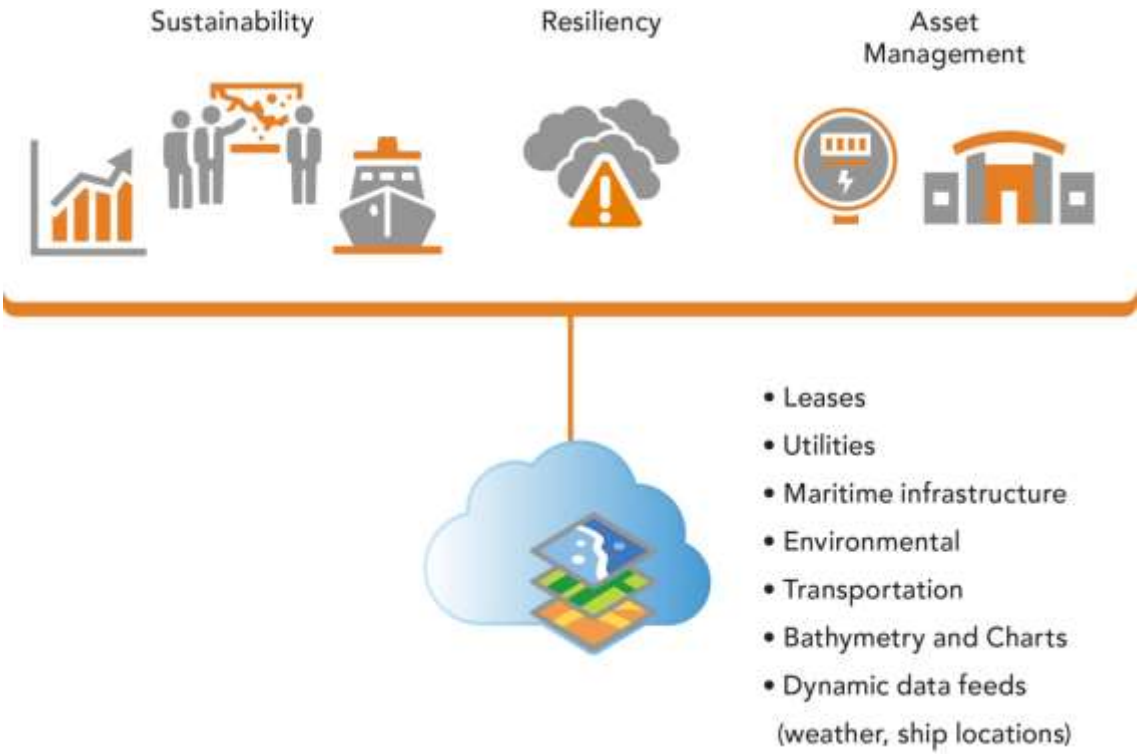
The Role of Information: Large international ports are complex organizations. They need to manage and maintain assets and facilities, understand and effectively manage their utility networks and consumption, coordinate and optimize transportation infrastructure, minimize traffic congestion, mitigate environmental impacts, manage leases and tenants, monitor performance, and more. All these activities must be effectively coordinated to ensure an unencumbered flow of goods through the port, and to keep the port profitable and sustainable.

To be effective, modern ports have come to realize the significant value of information to achieve these objectives. However ports are often characterized by information "siloes" whereby information is often locked at the departmental level. Each department maintains data relevant to its functions—data about assets, leases, facilities, weather, cargo, emissions, employees, and more. But these departments can only work together effectively when they can share information and collaborate freely with other stakeholders at the port. That is where creating an effective information sharing platform is critical to the transition to a modern smart port environment.

Esri's ArcGIS platform provides the framework to integrate information from across the port into a unifying information layer. Esri provides tools that let you manage, share, analyze, and act on your authoritative port data. Your departments can use these tools to quickly make their data available to the entire organization, promoting both collaboration and cross-departmental awareness of the port's activities. You can then use this data to better understand how your port is operating and make changes for better efficiency and effectiveness.

Using maps and GIS tools, your 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 consistent, accurate, and timely spatial information so they can act on the challenges facing ports today.

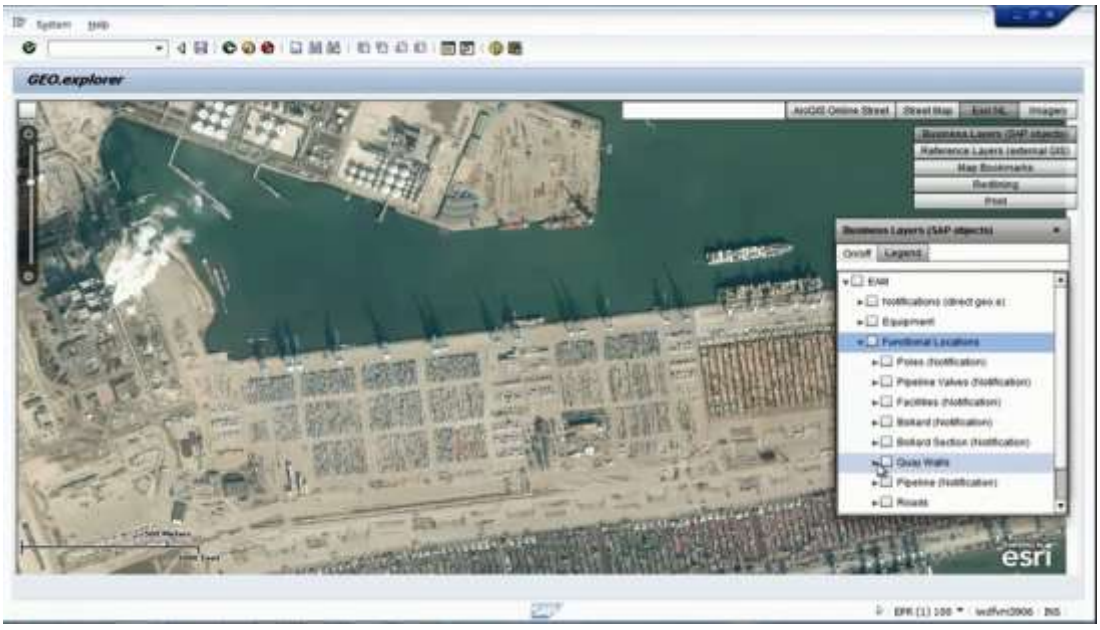
The ArcGIS Platform



Port Challenges

Capital Planning and Strategic Asset Management: Over the last few decades, the size of vessels has been increasing rapidly, requiring ports to provide more depth, wider docks, stronger quays, and larger cranes. Only a limited number of ports can accommodate container ships larger than 10,000 TEUs, and ships as large as 22,000 TEUs are currently in the design stage. Ports 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. As a result, ports must achieve the highest and best use of their assets and resources. Ports need a complete and detailed awareness of their current asset conditions, an understanding of the full asset life cycle, and the ability to run effective life cycle cost analysis. Together, these capabilities help senior port managers make informed and cost-effective investment decisions.



A Comprehensive View of Assets at the Port of Rotterdam

ArcGIS helps ports make the best use of their assets, manage maintenance activities, and plan proactive and cost-effective capital investments. ArcGIS provides tools for:

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

Esri understands the value of expert systems designed to optimize port development and asset management. Instead of trying to replace these systems, Esri has built partnerships with many of the world's leading providers of port support systems, including Autodesk, Microsoft, IBM and SAP. As a result, ArcGIS can connect to and integrate with many common systems, promoting better communication and information exchange throughout the port.

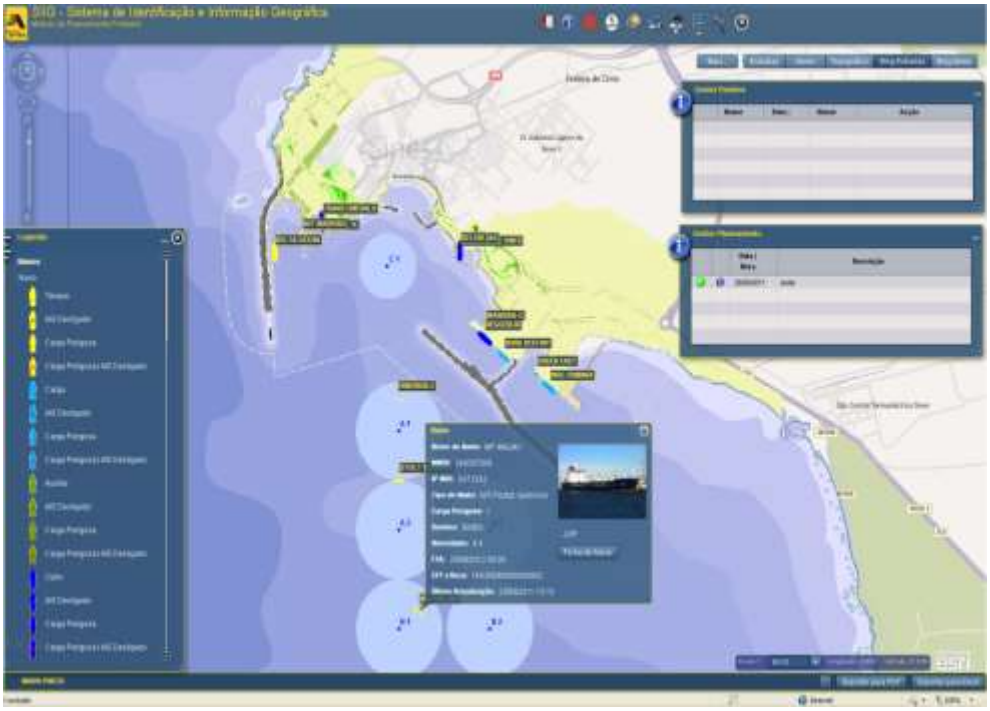
Most Esri port customers begin their investment in ArcGIS to improve their asset management activities. They use GIS capabilities to map and manage their land assets and to better understand locations, lease terms, available or potential capacity, or use constraints. Using GIS in this way streamlines many port processes, reducing the time it takes to understand the issues related to a location and helping managers and workers make better decisions.

Many ports map and manage their utility assets to support not only day-to-day operations and management, but also master planning and infrastructure improvements. An increasing number of ports also map their maritime infrastructure to better understand their risk to current revenue and their potential for revenue increases in the future.

Maximizing Port Operations: Smart ports understand that creating a collaborative information environment among all the actors at a port is critical to improving productivity at the port, and increasing competitive advantage. As a recent paper from the European Union's MONALISA Project stated:

> *"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)*

Berth occupancy and Berth Planning at the Port of Sines



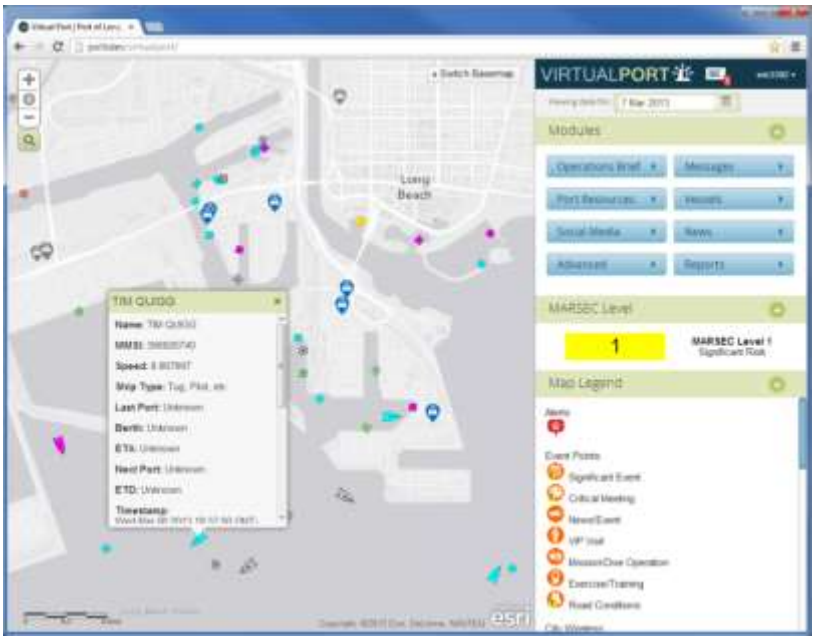
Drawing from a concept used among airport operators, port collaborative decision making (CDM) envisions the sharing and coordination of real time information between the port, shipping companies,

terminal operators, pilot organizations, drayage and rail transport firms, all with the goal of maximizing port throughput and creating greater operational efficiencies. But central to achieving this goal, is the need to share this information in a common operational picture to create situational awareness, and to make better real time decisions.

Esri's technology is used by organizations worldwide to give them real time visibility of their operations, and to improve operational performance. With the ability to integrate real time vessel movements, weather and tidal movements, land based transport movements, berth occupancy together with port business systems, ArcGIS provides a location platform designed to give port operators a port wide view of all current activity, and thus achieve better coordination and information sharing among key actors in the port. From the movement of vessels, cranes, trucks and other assets through the port, Esri's technology can help drive improved operational performance.

Esri technology seamlessly integrates with leading document management and business intelligence systems, to help you organize your valuable information sources, and gain tangible business insights to improve your operational efficiencies.Esri integrates with many port operational systems including Saab Technologies' Klein Port system to give port operators a comprehensive real time view of their operations.

Port Security and Resiliency: Ports must always be prepared to respond to and recover from sudden disruptions. Resiliency requires the port to prepare for extreme weather, establish strong security networks, maintain effective business continuity plans, and emphasize emergency management and response. Complete preparedness is enabled by port-wide visibility and control, which give executives and senior managers a view into the port's current and future states.



A Common Operational Picture of the Port of Long Beach

ArcGIS provides a real-time operational view of the port and can deliver a single, port-wide common operational picture. ArcGIS provides tools for:

- Sensor inputs
- Vessel tracking
- Common operational pictures
- Field visibility

Many Esri port customers achieve better resiliency by making their information available to staff wherever and whenever it's needed. For these ports, the ability to view local and regional weather data and access accurate asset information in one place has resulted in immediate benefits and return on investment.

For example, when ports accurately document and publish their asset data with ArcGIS, they can mitigate utility interruptions and restore services more quickly. ArcGIS lets these ports access intelligent maps showing their utility infrastructure, perform utility tracing to isolate leaks, and discover nearby assets that can be damaged by abnormal utility operations. In addition, ports use detailed basemaps provided by ArcGIS to guide responders to the right locations and to better understand the impact an issue might have on nearby assets and activities.

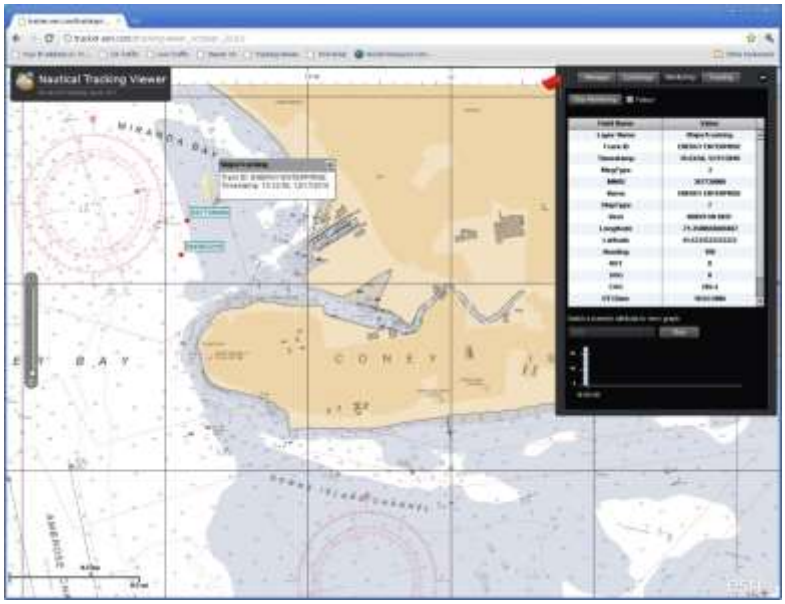
Port Sustainability/ Green Ports: Ports are under increasing pressure to make the most efficient and effective use of their limited geography. Ports must mitigate growing environmental impacts, improve profitability and performance, and maintain positive relationships with surrounding communities. Often referred to as "triple bottom line accounting," ports are under increasing pressure to act as good corporate citizens, maximizing their value to the larger community. Port Cities and Green Ports are both concepts which capture this need to proactively engage in the larger community in a responsible and transparent way.

On the environmental side, ports must minimize port congestion, pollution, emissions, the impacts of sea level rise and increased disruptive storms, and engage in harbor and coastal restoration activities. By taking a proactive approach to community involvement and public transparency, ports can increase sustainability and improve goodwill in the community.

With Esri's spatial location technology, ports can streamline their workflows for new development, dredging, permitting, and litigation management by visualizing and analyzing information related to port locations. Further, many ports map trade data alongside local community resources (like industrial properties or businesses of specific types). Together these activities help port officials improve business development processes and make better decisions to attract and retain customers, and provide greater value to the larger regional economy.

A Single Platform to Integrate Your Business: Esri's location platform provides the technology to help ports integrate their disparate information systems into a comprehensive view of their operations, and drive operational improvements. ArcGIS helps you visualize and convert your existing business systems to actionable intelligence, whether lease, facility and property management, asset or security management, or real time tracking systems, Esri's platform gives you the information you need, on any device, at any time. As a result, leading ports worldwide have turned to Esri technology to help them improve their global competitiveness, and improve their bottom line.

Next Steps: By contacting an Esri representative, you can arrange a preliminary assessment of how Esri's spatial location technology can help your port achieve its global objectives. Esri's port and maritime experts can help you conduct a business value assessment, to understand how spatial location technology can help you bring together the information sources within your port to help you meet your current challenges. Services "jumpstart" engagements can help you quickly realize the value of Esri technology, and start you on the path to greater productivity. From port operations, to strategic asset management, and creating a more secure and resilient port, to meeting your larger social



responsibilities, Esri provides a location platform to help you stay competitive in a rapidly changing global environment.