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PORTS & HARBORS

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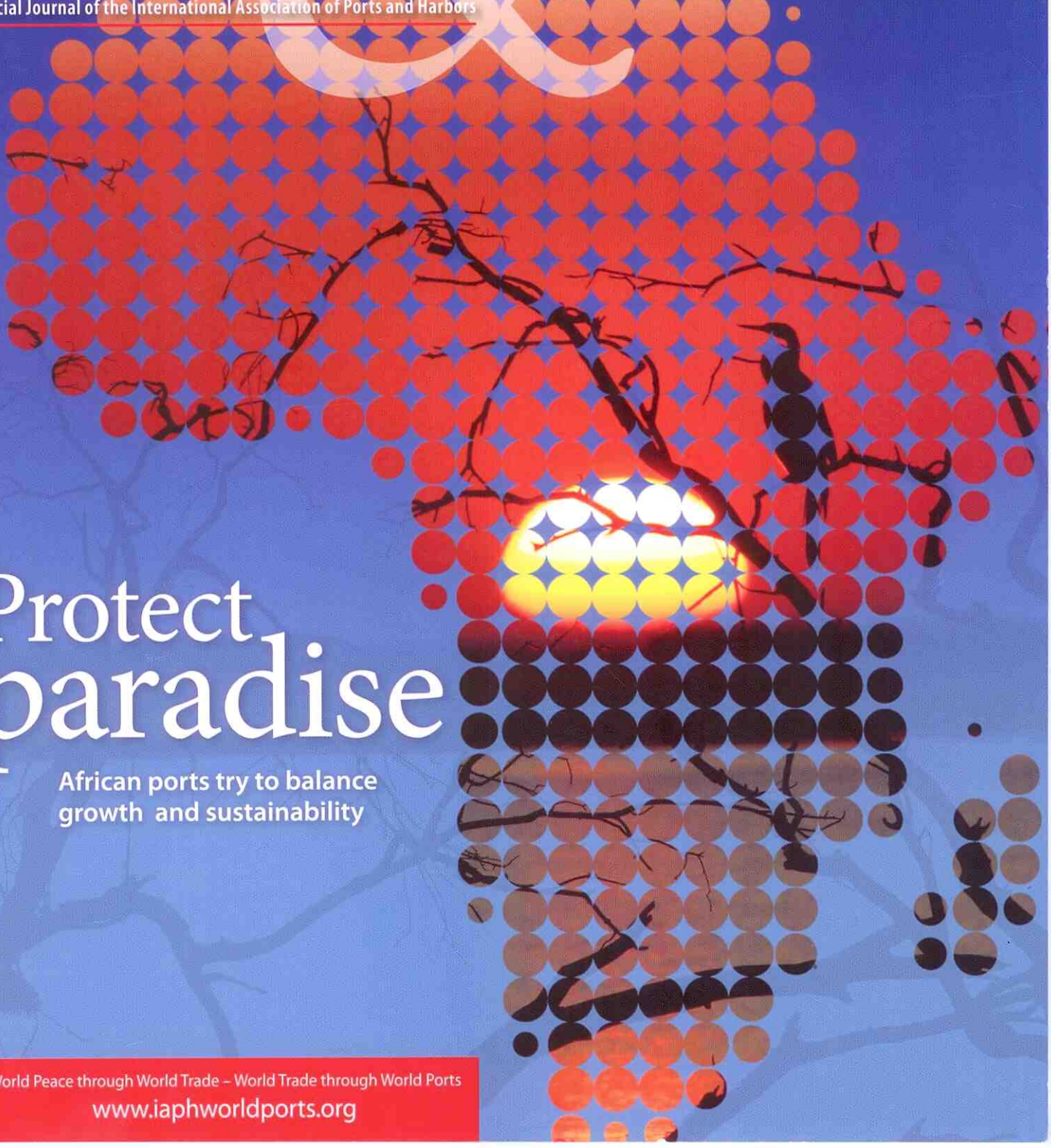

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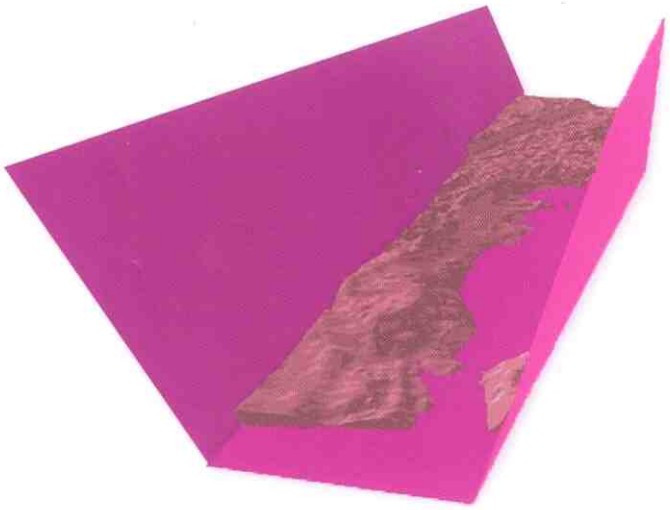
Visualising port planning

Ports have turned to digital mapping technologies to design, plan and improve operational performance and reliability. ***Terry Bills*** of geospatial software specialist ESRI talks about geographical information systems

Planned dredging: a three-dimensional model of the channel (below) shows in brown the area of dredged material to be excavated to ensure uniform depth

Port managers worldwide are discovering the operational advantages of integrating their information resources through geographical information system (GIS) technology. The initial drivers were often environmental- and security-related, but many ports have found that GIS can help them integrate disparate information sources into comprehensive operational views of their entire facilities. Such systems can support business systems including port design and planning, leasing and facilities management, maintenance and security management, port operations, vessel tracking and intermodal management. By helping to integrate information from across all business divisions (and all stages of the infrastructure lifecycle), GIS can enable port managers and planners to do their jobs better, faster and more cheaply.

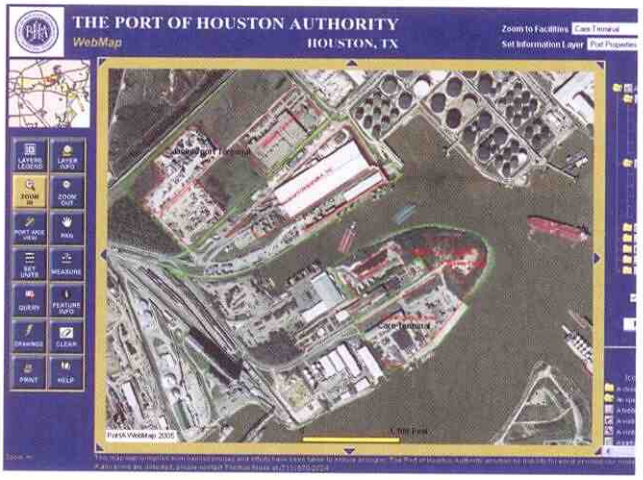


For a port, the infrastructure lifecycle generally begins in planning, whether for a new port masterplan, expansion of existing terminals or planning for new facilities at existing sites. The planning and design process relies on large amounts of data and information from various sources. A key strength of GIS is the ability to organise a wide array of data for modelling and analytical purposes.

A comprehensive GIS database can include trend data of channel depths, coastal erosion and visualisation of above- and below-water terrain, boring and geophysical data, all of which are required for pre-design studies. Seabed classification, tidal current and wave pattern analysis can also be modelled for port design and configuration purposes. A GIS can be used to create a three-dimensional model of the subsurface for dredging, for channel design and for keel clearance analysis, all of which are critical to port site planning.

GIS is used widely to determine channel and berth project depths, for calculating dredging and excavation quantities and for determining locations for disposal and deposit of dredged materials.

The design of structures, berths and other port facilities is typically conducted in computer-aided design (CAD) packages. Design® engineers have now started bringing GIS data into the process, as the interoperability of CAD and GIS allows them to incorporate GIS data such as the location of existing



Images: ESRI

Left: Port of Sines portal with the locations of terminals and ships at berth

Right: Port of Houston portal indicating terminals and property boundaries

utilities, aerial photographs and other base map and topographical information into their designs.

The Port of San Diego uses GIS integrated with its design tools to support a wide range of design tasks. Ari Isaak, a GIS analyst for the San Diego District Port, explained: "AutoCAD users are drawn to this tool [ArcGIS for AutoCAD] because it gives them a window into GIS information while still allowing them to work in their familiar AutoCAD environment."

Draft designs can be brought back into the GIS environment to model the technical feasibility of alternative project designs and for compliance with environmental and social safeguards.

But GIS is used for many other planning and operational purposes. Port environment departments were early proponents of GIS, to ensure that they met water quality and coastal environmental regulations, but also to ensure the port could operate as a good corporate citizen in the community.

A prime example was the co-ordinated set of initiatives that were employed in helping to restore the coastal habitat and water quality of the Port of Tampa. Under the multi-agency planning initiative, various environmental actions were begun, all with the goal of improving the health and overall water quality of the Tampa Bay area. GIS was used to manage and display a wide range of data and information collected for the project – water quality data, surrounding land use, vegetation samples – that were required to run the hydrodynamic, watershed and water quality models.

Other common uses for GIS include storm drain mapping and stormwater control, spill containment and spill effect modelling and inventories of hazardous materials found in the port.

For many ports, tracking and managing properties and leases are essential to protect a major source of revenue, so is critical from both the business and the planning perspectives. It is not uncommon for there to be major differences between the land leased to a shipper and legal property boundaries, making the property manager's job all the more complex. GIS is often used to integrate information from different systems and databases, eg legal and jurisdictional boundaries and the location of each facility along with building footprints and digital images, plus a lease management system.

This approach was taken by the Port of San Diego for the various properties and facilities spread over its 2,430ha site. GIS was used to integrate all of its engineering and CAD drawings, its document management and SAP financial information systems, making this information available to all port personnel through their browsers. The port's GIS manager, Malcom Meikle, said: "Using GIS, the time it takes to access critical information went from seven or eight hours to mere minutes because the data is now in one location and is up to date. This change is driving faster and more informed decision-making."

For both shippers and port managers, it is throughput and efficiency that count. GIS is being used in a number of ways to help in planning and managing port traffic and vessel loading and unloading. The Port of Sines in Portugal uses GIS for vessel traffic management and tracking, together with dynamic berth assignment, as does Port of Vancouver, in Canada. Berth and support scheduling are integrated with real-time vessel tracking, which can help to optimise berth allocation and generate timely billing, as is the case in Vancouver.

Sines uses GIS technology to help integrate information from seven legacy information systems, including its SAP financial system and a pre-existing data warehouse, to build a comprehensive spatial information framework that facilitates access to information and improves existing business processes.

The same advantages of GIS are seen in planning maintenance and security needs. The latter have expanded exponentially over the past 10 years, and ports have discovered how GIS can help them integrate disparate technologies into a single framework.

In San Diego, Malcom Meikle explained: "By using geographic data and systems, the port is able to use geography as the common factor to bring together data that otherwise is difficult to integrate." And that, more than any other function, is what establishes GIS as a core integrative technology to help ports manage their facilities and operations better. PH

More info: www.esri.com