

An Environmental Information System for Ports: Disseminating marine science to managers

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Background

Over the past decades maritime trade and port industries have experienced phenomenal growth, and as trade facilitators, ports are crucial to the global economic system. However, interest in the environmental impacts from ports is growing as natural resources across the globe are rapidly deteriorating. As a result, ports are required to undertake various environmental monitoring and assessment studies, e.g. Strategic Environmental Assessments (SEA), Environmental Impact Assessments (EIA) and Environmental Monitoring Systems (EMS). These studies generate a wealth of environmental data and information, but are seldom applied, beyond the specific studies, to contribute to improved port planning and management. Port operators often argue that environmental data and information are presented in scientific formats that are not easily accessible to them, and are thus not used in their decision-making towards more sustainable port planning and management. In addition, there is a lack of proper data storage and management as well as limited sharing of data and information across the various environmental studies, even within a single port. This is a particular challenge in ports where rapid staff turnover results in new employees not being able to easily locate historical environmental data and information when needed.

In this study, we consider a web-enabled Environmental Information Systems (EIS) as a possible tool to overcome these challenges, by applying new, innovative options to organise, communicate and disseminate environmental data and information that are accessible to port operators, taking science from dusty scientific reports to their fingertips.

Methods

The CSIR team has extensive experience in supporting national ports on environmental matters and as a result has the experiential knowledge to undertake a preliminary design of an EIS for ports. ESRI's Story Map application was selected as the software package based on its flexibility, offering multiple templates for the design of such a system, as well as a diverse range of formats to present data and information, ranging from simple text, photographs and hyperlinks to relevant reports and literature, through to interactive geographical maps (displayed through ArcGIS Pro and Arc Online). In addition, this software offered the opportunity to build a platform that did not require proprietary software to operate.

A South African commercial port was selected as a case study, using readily available marine environmental data and information to demonstrate proof of concept.

Results

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Key design criteria considering the purpose of the EIS were: (1) to provide relevant marine environmental data and information in a logical, structured format, (2) to present the data and information in a simple and visually appealing way, and (3) to allow the easy and rapid transfer of data and information among various departments in and across different ports.

The chosen EIS design allowed the presentation of data and information organised into various modules including: (1) About – explaining the purpose of the EIS and giving directions on how to use it, (2) Overview – providing an overview of the specific port itself, (3) Legislation – providing a brief overview of the legislation relevant to ports, (4) Port planning – focusing on planning in ports specifically covering EIAs and SEAs conducted for a particular port, (5) Dredging – providing an overview on the need for dredging in ports, (6) Environmental monitoring – providing an overview of environmental monitoring programmes, as well as the need and importance thereof, (7) Specific modules – focussing on marine environmental components (e.g. water, sediment and biota) and providing detailed information on the health status and compliance to related environmental requirements, and (8) Relevant literature – listing relevant literature on environmental monitoring in the specific port (with links to the relevant documentation), as well as additional scientific literature that may be important to port environmental management.

Conclusion

This study demonstrated a prototype design of an EIS to give port managers access to marine environmental data and information in a user-friendly, coordinated and systematic manner. Formal scientific outputs are disseminated in a meaningful way by translating such outputs into useful, actionable information for port management.

Although the focus of this initial design was on the marine environment, the EIS can easily be extended to include other environmental components (e.g. air quality) and related activities (e.g. waste generation, energy usage). The next phase will be to present the prototype to port authorities, obtain their inputs on future amendments and refinements and finally to investigate the most appropriate avenue of taking the EIS into operation. We propose this prototype EIS as a potentially powerful tool to manage, disseminate and communicate environmental data and information in ports, taking it from “from reports to practice”.