REPORT IN BRIEF

A Geospatial Framework for the Coastal Zone

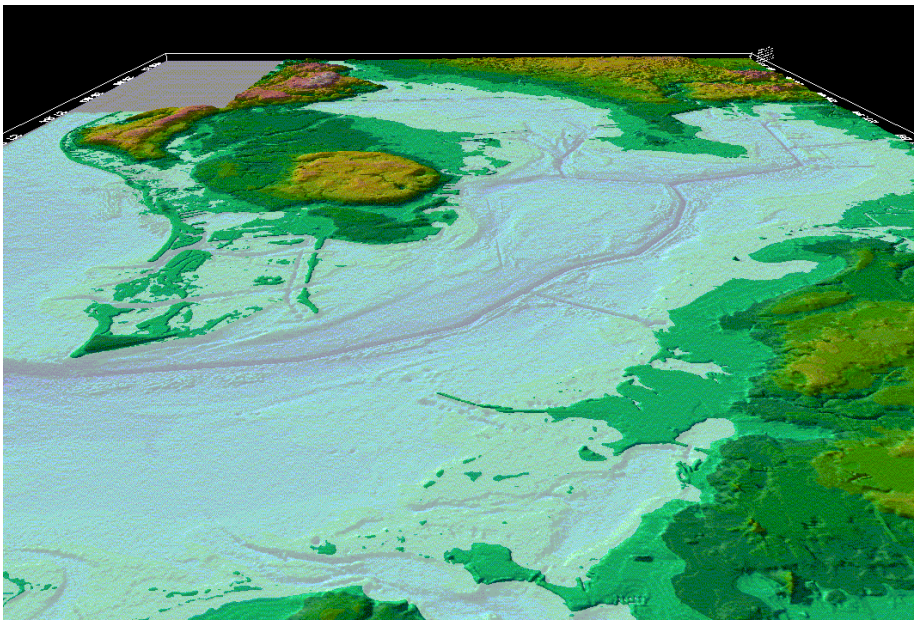
National Needs for Coastal Mapping and Charting

The coastal zone is one of the nation's greatest environmental, social, and economic assets. It is a nexus for tourism and industry activities that include shipping and boating, fishing, oil and other resource exploration, and the recreational use of beaches. Fourteen of the twenty largest urban corridors are located along the nation's coast. While more than 80% of the U.S. population lives within 50 miles of the coast, the coastal zone also encompasses forests, rivers and streams, wetlands, beaches, barrier islands, and ocean habitats.

People who manage and maintain this complex area—ensuring public safety, managing resources, building roads, maintaining beaches or parks, ensuring safe navigation—need a solid framework for understanding how natural and manmade forces are interacting and affecting processes in the system. The foundation of this framework is accurate geospatial information presented on maps or charts. Accurate maps can support better decisions in navigation, homeland security, coastal hazards, resource management and other areas—decisions that could save lives, preserve livelihoods, and save the nation hundreds of millions of dollars.

What's the Problem? Although there are currently detailed onshore maps (topography) and offshore charts (bathymetry), there are no standardized uniform geospatial products—either maps or charts—that integrate the two. Differences in scale, resolution, mapping conventions, and reference datums (horizontal and vertical frames of reference for mapping) prohibit the seamless combination of existing onshore and offshore data.

This lack of accurate coastal zone maps is a serious impediment for coastal managers as



Proof of Concept: The Tampa Bay Bathy/Topo Shoreline Demonstration Project, a joint effort of NOAA and the USGS, has developed a suite of vertical datum tools and demonstrated the feasibility of generating a seamless onshore/offshore dataset for the Tampa Bay area.

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they do their jobs. Further, the lack of standardization and coordination of coastal zone data has led government agencies, the research community, and the private sector to generate new data and maps for almost all new studies and initiatives, in some cases duplicating efforts.

Recognizing this situation, the National Oceanic and Atmospheric Administration (NOAA), the U.S. Geological Survey (USGS), and the U.S. Environmental Protection Agency (EPA) requested that the National Academies undertake a study of national needs for coastal mapping and charting. ***A Geospatial Framework for the Coastal Zone*** identifies needs and makes recommendations in three areas: 1) producing onshore/offshore maps; 2) improving coordination among those doing coastal mapping; and, 3) increased data collection.

Finding the Shoreline: Seamless Maps and Tidal Models

For most coastal zone management activities, the single biggest need is a continuous map of the Earth's surface that extends from the land through the shoreline and beneath the water. One substantial barrier to creating such a map is the need for common reference datums from which to describe various geographic features and locations.

While horizontal datum issues can be resolved by using existing transformation tools, vertical datum transformation models must be developed. These would require establishing a series of real-time tidal measuring stations, developing hydro-dynamic models for coastal areas around the nation, and developing protocols and tools for merging offshore and onshore datasets. The report recommends the creation of a national project to develop and apply these models, protocols, and tools.

Producing accurate coastal zone maps would help overcome another major barrier to informed decision-making in the coastal zone—the lack of a consistently defined national shoreline. Many different definitions of the shoreline remain embedded in local, state, and federal laws, making it impractical to call for a single "National Shoreline." However, the key to achieving a consistent shoreline is the use of seamless onshore to offshore maps together with tidal models and known horizontal and vertical reference frames. The report recommends that within the context of established vertical datum transformation tools, all parties define their shorelines in terms of a tidal datum, allowing vertical shifts to be calculated between and among the various legal shoreline definitions.

Improving Coordination and Collaboration

At least 15 federal agencies are involved in the collection or use of coastal geospatial data, often with responsibilities shared among multiple divisions within the same agency. In addition, a plethora of state and local agencies, academic institutions, and other organizations also gather and use coastal zone information. This has resulted in a chaotic collection of potentially overlapping, and often uncoordinated, coastal mapping and charting activities and products that can frustrate the efforts of users to take advantage of existing datasets and build on past studies.

The report recommends that all federally-funded coastal zone mapping and charting activities be entered in a registry at a common, publicly available website. Each registry entry should include a description of the mapping activity, its location and purpose, the agency collecting the data, the tools to be used, the scales at which data will be collected, and other relevant details. Once implemented, this registry would serve as the focal point for national coordination of geospatial data and analysis efforts, helping to avoid duplicated efforts and identifying areas where agencies could combine their data collection efforts to reduce costs.

The report recommends that this effort should be coordinated among all primary agencies involved in coastal zone mapping and mediated by one body with authority and the means to monitor and ensure compliance.

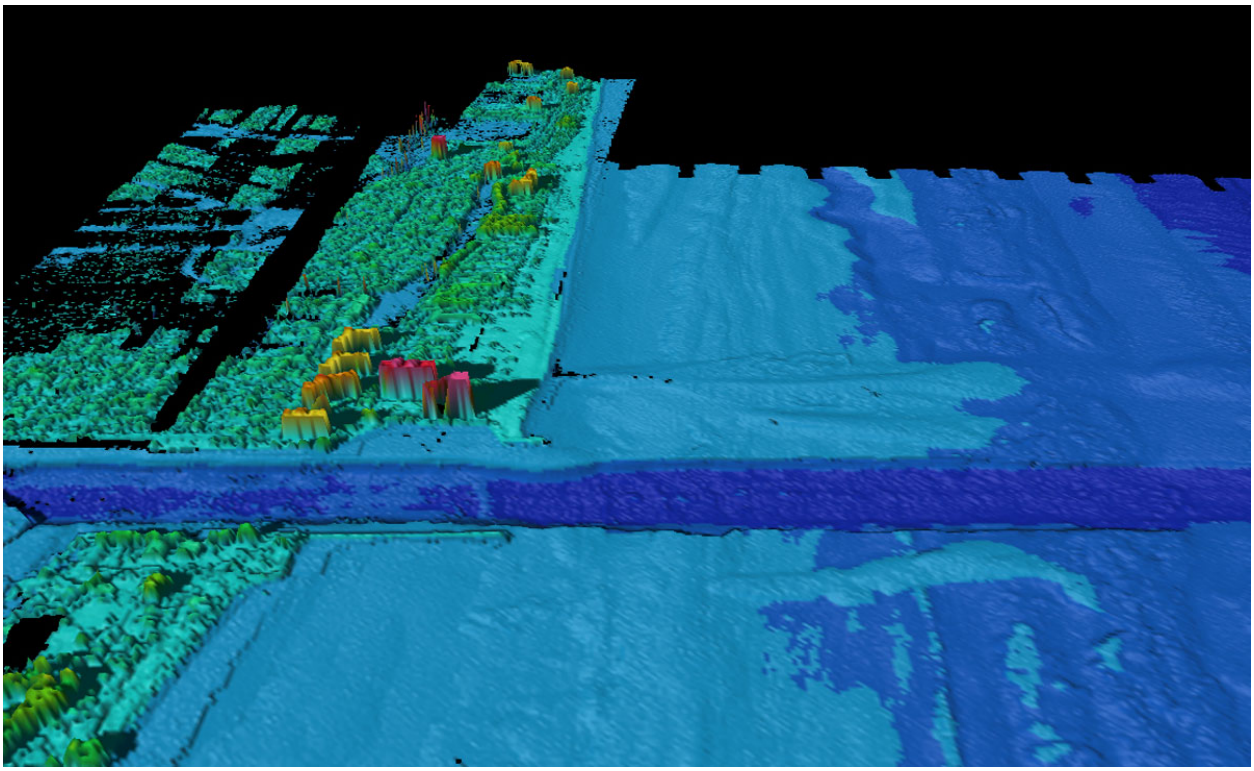
The Federal Geographic Data Committee (FGDC) could fill the mediation role.

More and Better Data

There is a widespread need for more and better data to be collected in the coastal zone. The single most cited need among the agencies and the user community is the requirement for high-resolution bathymetric data, particularly in very shallow coastal waters. The seamless merging of these offshore bathymetric data with onshore elevation data will provide the basic geospatial framework—the reference frame—for a wide range of derived mapping products (e.g., maps showing habitat distribution, infrastructure, resources, etc.). The report recommends that this fundamental reference frame data be collected, processed, and made available to users for the entire coastal zone. The report also recommends that new remote sensing and in-situ technologies and techniques be developed to help fill critical data gaps at the land/water interface.

Easy access to timely data is an essential component of effective coastal zone management. Many agencies have created websites that offer access to data in a variety of forms, but these sites still represent only a small percentage of existing coastal zone data. A single web portal should be established to facilitate access to all coastal mapping and charting data and derived products. This site should be well advertised within federal and state agencies, state and local governments, academic institutions, non-governmental organizations, conservation groups, and to other potential users.

Although easy access to data through a single web portal is a critical need, users must also be able to combine and integrate data collected by different agencies using a range



New Technology Provides Opportunities: Image of the coastal zone in the Fort Lauderdale area, collected using a modern SHOALS LIDAR (aircraft-mounted laser) system that can record ground surface elevation both onshore and through shallow water in the offshore.

of sensors and different datums or projections. Both the private sector and government agencies should continue to develop tool kits for coastal data transformation and integration and make them accessible through the web-portal.

In order for data to be universally acceptable and transferable through a central web portal, they must adhere to predetermined standards and be accompanied by the correct metadata—information about how, when, and under what circumstances data were collected. While the FGDC is in the process of establishing a series of standards for the National Spatial Data Infrastructure (NSDI) that will be applicable to all coastal zone data, the report recommends increased involvement by the private sector because of its history of establishing well-accepted and easily used data protocols that often become *de facto* standards.

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This report brief was prepared by the National Research Council based on the committee's report. For more information, contact the Ocean Studies Board at (202) 334-2714. *A Geospatial Framework for the Coastal Zone: National Needs for Mapping and Charting* is available from the National Academies Press, 500 Fifth Street, NW, Washington, DC 20001; 800-624-6242 or 202-334-3313 (in the Washington area); www.nap.edu.