1. TITLES
Handbook of Coastal Informatics: Web Atlas Design and Implementation
or
Handbook of Coastal Web Atlas Design and Deployment

2. SYNOPSIS (a synopsis of your proposed publication, including a concise definition of the subject area)
In recent years significant momentum has occurred in the development of Internet resources for decision makers, scientists and the general public who are interested in the coast. A key aspect of this trend has been the development of coastal web atlases (CWA), based on web enabled geographic information systems (GIS). A CWA is defined as:
 a collection of digital maps and datasets with supplementary tables, illustrations and information that systematically illustrate the coast, oftentimes with cartographic and decision-support tools, all of which are accessible via the Internet.

CWAs deal with a variety of thematic priorities (e.g., oil spills or recreational uses) and can be tailored to address the needs of a particular user group (e.g., coastal managers or education). There are many benefits which CWAs can provide, including:
- **A portal** to coastal data and information from **diverse sources**;
- **Up to date** geospatial data which is frequently changing;
- A widely **accessible** coastal resource to a broad audience;
- A comprehensive and searchable **data catalogue**;
- Improved **efficiency** in finding data and information;
- An instrument for **spatial planning**;
- **Interactive tools and resources** which empower users to find their own answers;
- An **educational resource** which raises people's consciousness about coastal topics.

While multiple benefits are derived from these tailor-made atlases (e.g., speedy access to multiple sources of coastal data and information; economic use of time by avoiding individual contact with different data holders), the potential exists to derive added value from the integration of disparate CWAs, in order to optimize decision making at a variety of levels and across themes.

This handbook will provide a complete guide to CWA development and implementation including established principles and recommendations for atlas design, data requirements, necessary software technology and institutional capacity, as well as best practices for achieving interoperability between CWAs (where concepts, terminology, and even abbreviations that are shared between two or more atlases are understood by all to mean the same thing).

3. INTRODUCTION (an introduction to the subject area.)
This handbook will be based on the results of two international workshops (http://workshop1.science.oregonstate.edu) funded by the National Science Foundation (U.S.) and the National Development Program of Ireland which brought together key experts from Europe, the United States, Canada and Africa to examine

state-of-the-art developments in coastal informatics (e.g., data portals, data/ metadata vocabularies and ontologies, metadata creation/ extraction/ cross-walking tools, geographic and information management systems, grid computing) and coastal mapping (particularly via Internet map servers and web-based geographical information and analysis).

Digital data sets for these efforts are growing exponentially worldwide, and our societies have therefore changed from being data-poor to data-rich. At the same time, our ability to *derive knowledge and management decisions* from all of these data in an analytical context remains poor. This is especially problematic in the dynamic zones of the coasts and oceans where it can be difficult to capture features accurately in both space and time or to adequately monitor or manage resources by way of maritime boundaries. Any problems that remain in finding data are now compounded by the additional challenge of effectively filtering through large volumes of them in order to find meaningful knowledge. From an organizational perspective, although geospatial data sets are legion, there has been a general inability and often unwillingness to exchange data across boundaries, exacerbated by low levels of coordination.

In the United States and Europe, several national and regional initiatives relate to the building of nationwide partnerships and data infrastructures (e.g. e-Government, National Spatial Data Infrastructure, The National Map, I-CoNet, the European Atlas of the Seas). These initiatives call for the development of data portals, often with the inclusion of an Internet map service component, that connect the variety of spatial data producers with their users, including government at all levels, private sector, and academic institutions. Government agencies, businesses, academic institutions, and even non-profit organizations all have a tremendous stake in the development and management of geospatial data resources, especially in the coastal zone where, worldwide, 20% of humanity lives less than 25 km away from the coast, and 39%, or 2.2 billion people, live within 100 km of the coast (World Resources Institute, 2001). However, as reported recently by Sakar (2003), despite the expense and energy devoted to information sharing initiatives, government at all three levels (local, state, and federal) is left to wonder if it really knows how to implement them successfully. The pieces are out there, but they haven't been applied well to large-scale efforts (e.g., nationwide scale). Communication about the availability or the need for data is also lacking (caused usually by the lack of proper *metadata* in order to properly assess geographic coverage, quality, accuracy, point of contact for access, etc.), and thus the duplication of data sets is still a huge problem.

Data portals are proliferating in response, but that too may become as problematic as the duplication of individual data sets (i.e., the duplication of portals adding to the confusion – which portal to use and why; portals developed *outside* of comprehensive partnerships such as the one proposed here). Toward this end in the marine and coastal realm there has been a steady advancement in the application of GIS for the development of decision support systems for coastal practitioners over the last decade. These products have been built and maintained as a result of significant financial and human resource investment. Many technological challenges have been met along the way to provide web-based mapping solutions that meet with end user requirements.

As a result, significant capacity has been built in U.S., Canada, and Europe in the field of coastal mapping. However, little has been done to take stock of the implications of

these developments or to identify best practice in terms of creating an approach that takes lessons learned into consideration. Furthermore, the research community has not provided widespread solutions to deal with common issues in the emerging field of informatics, such as the semantic interoperability of metadata and databases, the lack of tool integration for coastal analysis and decision-making, and impediments to effective use of online atlases for decision-support (including the lack of imbedded tools).

4. KEY WORDS (5-10 searchable key words for you proposed subject area.)
coastal informatics, coastal atlas, web GIS, data access, geospatial data and information management, metadata, coastal zone management, marine resource management, online mapping, software solutions, system design, coastal planning, decision-making, semantic interoperability, cyberinfrastructure

5. OBJECTIVES (overall objectives and mission)
The purpose of the proposed textbook is to review present the latest developments in the new field of coastal web atlases, share best practices and lessons learned, which will in turn help readers to determine future needs in mapping and informatics for the coastal practitioner community and improve spatial thinking in the coastal context.

6. CONTRIBUTION AND SCHOLARLY VALUE
The scholarly contribution and value of the proposed handbook includes:
- *Wide data dissemination to enhance scientific and technological understanding.* The handbook should be greatly welcomed by the coastal/marine research community and be of benefit to libraries, high schools, and outreach sites. Linkages will be made to parallel research in geographic information science, digital library development, and computer science. The presentation of lessons learned in the handbook will guide and help in the building of build new national and regional atlases and improve decision support systems.
- *Advancing discovery and understanding; promoting teaching, training and learning through integration of research and education.* The handbook will allow for the incorporation of new content and natural resource data sets into faculty resource materials. We anticipate a number of student research topics and projects at both the Master of Science and doctoral levels, that will be aided by this handbook.
- *Benefiting society.* With the release of the Pew and U.S. Ocean Commission reports as well as the European Union Integrated Maritime Policy there is growing public awareness of the critical state of our coastal zones and fisheries. The handbook will propose informatics solutions that will improve management practices and decision-making. Mapping plays a critical role in issues of national sovereignty, resource management, maritime safety, and hazard assessment.
- *Economic impact.* By raising awareness with this handbook, there could be thousands to millions of U.S. dollars and Euro potentially saved in the prevention or mitigation of failed coastal development projects.

7. PURPOSE AND POTENTIAL IMPACT (why your theme is viable and how it will expand the field of research)
Driving factors for CWA development include the need for:

- Better planning to cater for increased **population pressures** in the coastal zone (e.g. the UN estimate that by 2020 75% of the world's population will be living within 60 km of the coastal zone; UN 1992; Shi and Singh, 2003).
- Decision support systems in relation to **climate change** scenarios in vulnerable coastal regions.
- Information to facilitate assessments of **risk from natural hazards** (including tsunamis and floods).
- Access to data and maps to support **marine spatial planning** (MSP) as a tool for better coastal and marine area management.
- Maps of jurisdictional boundaries for maritime territories in support of claims related to the **United Nations Convention on the Law of the Sea** (UNCLOS), which has a deadline for submissions of 2013.
- More efficient and effective coastal and marine area **governance** including access to relevant data and information.
- Information on **resource availability and exploitation** including habitat and species information, as well as ecological and community resilience.

These driving factors have already resulted in the proliferation of ad hoc CWA projects that have been designed to address thematic (e.g., fisheries management, recreational use) or spatial areas of interest (e.g., country to local level). While multiple benefits are derived from these tailor-made atlases (e.g. speedy access to multiple sources of coastal data and information; economic use of time by avoiding individual contact with different data holders), the potential exists to derive added value from the integration of disparate CWAs, to optimize decision making at a variety of levels and across themes. For example, the European Union's Maritime Policy for Europe suggests the development of an Atlas of the Seas for the EU (European Commission, 2007). Opportunities exist to facilitate such a development by providing for data interoperability among existing CWAs, and within the context of international programs such as GEOSS (Global Earth Observation System of Systems, www.epa.gov/geoss).

The immediate **benefits** of integration and interoperability are improved data search, discovery, documentation, and accessibility. All of these issues are to be covered in this handbook, making it extremely valuable and a must for the coastal atlas developer and resource management professional alike.

European Commission, 2007. *An Integrated Maritime Policy for the European Union.*, COM-2007 (575 final), Commission of the European Communities, Brussels, Belgium, 16 pp., http://ec.europa.eu/maritimeaffairs/subpage_en.html

Shi, H. and Singh, A., 2003. Status and interconnections of selected environmental issues in the global coastal zones, *Ambio*, 32 (2): 145-152.

United Nations, 1992. *Agenda 21: The United Nations Programme of Action from Rio*. United Nations, New York, USA, 147 pp.

8. UNIQUE CHARACTERISTICS (how it is distinguished from existing titles within the subject area)
Currently, we know of no other book in any form that addresses coastal informatics in general, and certainly none that addresses coastal web atlases in particular. The

proposed handbook will offer extensive and organized printed material on CWA developments during the last 5 years and provide accompanied electronic material for actual development of specific online applications. These two educational means (organized in one package) will allow professionals and student to apply the offered knowledge for their specific problem-solving tasks.

The proposed handbook will also be accompanied by a dedicated website, which will include links to mature CWAs, templates for CWA design, snippets of scripts and programming routines to achieve interoperability with partner atlases, and several other web links mainly for online GIS developments and online data providers.

9. AUDIENCE

The prime audience for the handbook will be coastal resource managers and consultants, coastal scientists, coastal technologists (e.g., information technologists, GIS specialists, software developers), government researchers, and graduate students. The handbook should be especially valuable to coastal resource managers who need to tackle such topic-based issues (explaining environmental concepts to the public and reaching them with current information has always been a difficult task).

The proposed handbook may also be suitable for intermediate, advanced courses in coastal/marine GIS or coastal zone management (i.e., courses toward a related BSc., MSc. or PhD degree, in the classroom but also potentially for distance education as well). The material in the book and the dedicated website will allow students to familiarize themselves with what CWA (web GIS) technology is, what are the basics of related disciplines, and how to use physical environmental and biological data available in the atlases in order to develop specific GIS applications and models. Course instructors may use the contents of the dedicated website either to present ready-to-use applications or to use the variety of included data for building new GIS applications.

10. POTENTIAL BENEFITS (potential benefits the reader will gain from your proposed publication and benefits to enhance available literature)

Readers will find this handbook of practical use in web atlas design, development and implementation as it presents the state-of –the-art in the field. It will also give guidance on geospatial data management and documentation through standards based metadata and provide guidance on how to make underlying geospatial databases interoperable.

The presentation of a wide number of currently available atlases and related Internet resources will be of value to all those with an interest in coastal and marine matters worldwide as it will provide access to a wide range of pertinent data and information. The immediate **benefits** of integration and interoperability are improved data search, discovery, documentation, and accessibility. All of these issues are to be covered in this handbook, making it extremely viable and a must for the coastal resource management professional.

Ongoing international efforts at developing harmonized regional atlases (e.g. African Marine Atlas, Carribean Marine Atlas, the EU Atlas of the Seas) will find this book of great value in providing practical guidance and the latest technological developments on how to implement web atlases. It will also be quite valuable to INSPIRE

(Infrastructure for Spatial Information in Europe; www.inspire-geoportal.eu), the GSDI (Global Spatial Data Infrastructure) Association (www.gsdi.org), and the U.S. Coastal NSDI (National Spatial Data Infrastructure; www.csc.noaa.gov/shoreline/cnsdi.html).

11. PUBLICATIONS (similar to (8); existing publications (competitors) and their advantages and disadvantages)
Currently, we know of no other book in any form that addresses coastal informatics in general, and certainly none that addresses coastal web atlases in particular. There are books that that have been published on coastal and marine GIS, but these contain at most a single chapter on coastal web atlases as an example application, not the in-depth discussion of design and implementation that we propose here.

Undersea with GIS (Dawn J. Wright, Editor. ESRI Press, 2002, ISBN: 1589480163) – deals mainly with the use of GIS technology for mapping deep oceans, coasts, and estuaries, as well as nautical charting and scientific visualization, with little to no coverage CWAs.

Geographic Information Systems in Oceanography and Fisheries (Vasilis D. Valavanis, Author. Taylor & Francis, 2002, ISBN: 0415284635) – deals mainly with GIS applications for physical oceanographic processes and species-environment relations, with no treatment of CWAs.

Marine Geography: GIS for the Oceans and Seas (Joe Breman, Editor. ESRI Press, 2003, ISBN: 1589480457) – a collection of case studies documenting some of the many applications of marine GIS in the field, but none that are web-based.

Geographic Information Systems in Fisheries (W.L. Fisher and F.J. Rahel, Editors. American Fisheries Society, February 2004, ISBN 1-888569-57-3) – a collection of essays on the use of GIS in marine and inland fisheries and aquaculture, with no treatment of CWAs.

Place Matters: Geospatial Tools for Marine Science, Conservation, and Management in the Pacific Northwest (Dawn Wright and Astrid Scholz, Editors. Oregon State University Press, 2005, ISBN 0-87071-057-5) – a research monograph exploring how marine GIS is contributing to the understanding, management, and conservation of the shores and ocean of the Pacific Northwest, which is becoming a hotbed of marine GIS development and applications. Includes one chapter on the tools of the Oregon Coastal Atlas.

12. TENTATIVE TABLE OF CONTENTS
(authors of chapters and sections to include participants from both international workshops - http://workshop1.science.oregonstate.edu/people, http://workshop1.science.oregonstate.edu/people2)

Part I – Principles
1 – Introduction: Coastal Web Atlas Defined

2 – Coastal Web Atlas Features
2.1. Map Area
2.2. Data Display
2.3. Legend/Layer List
2.4. Atlas Tools
2.5. Attribute Tables
2.6. Metadata

2.7. Information/Extras

3 – Coastal Web Atlas Implementation
3.1. Getting Started
3.2. Implementation
    3.2.1. Atlas Interface
    3.2.2. Map Area
    3.2.3. Data Content and Display
    3.2.4. Legend/Layer List
    3.2.3. Atlas Tools
    3.2.6. Attribute Tables
    3.2.7. Metadata
        Data management
    3.2.8. Information/Extras
        Decision-support tools
    3.2.9. Software and Hardware Technology
    3.2.10. Image Formats
    3.2.11. Map Legends
    3.2.12. Interfacing to Google Earth
    3.2.13. User Feedback
    3.2.14. Curriculum Development from Atlases
    3.2.14. Support and Future Development

4 – Coastal Atlas Interoperability
    4.1 Introduction to controlled vocabularies and ontologies
    4.2 Ontology components and practices
    4.3 Advanced ontology concepts
    4.4 Interoperability – Why it Matters
    4.5 Tools for Interoperability
    4.6 Open Geospatial Consortium Services (WMS, WFS, WCS, CSW)
    4.7 Linking Your CWA to Regional Partners
    4.8 Guidance from the Marine Metadata Interoperability (MMI) and the
        International Coastal Atlas Network (ICAN)

Part II – Coastal Web Atlas Case Studies Around the World
5 – Oregon, USA
6 – Ireland
7 – Virginia, USA
8 – California, USA
9 – Federated Coastal Atlas of the USA
10 – Belgium
11 – UK
12 – Africa
13 – Caribbean
14 – Australia
15 – The International Coastal Atlas Network

Part III – Institutional Capacity
16 – Data & metadata ownership issues
17 – Partnerships / Institutional support

Part IV – Cross-Cutting Issues

Appendix (accompanying web site)
Links to CWAs around the world, particularly those in the International Coastal Atlas Network (ICAN); e.g., see http://workshop1.science.oregonstate.edu/join, http://marinecoastalgis.net/
Links to snippets of Mapserver code, ArcIMS AXLs, PHP code, etc.

13. PROJECT PAGE/WORD COUNT
We anticipate a word count along the lines of what IGI Global Handbooks usually contain (e.g., a minimum of 50 sections or articles of ~3500 words each, 175,000 words total).

14. POTENTIAL CHANNELS OF CALL DISTRIBUTION (used for the procurement of submissions and contacts (List-Servs, Universities, etc.)
The audience for the book may belong to societies such as the International Geographical Union, the Association of American Geographers (particularly the Coastal/Marine Geography and GIS specialty groups), the Association for Geographic Information, the Canadian Association of Geographers, the American Geophysical Union, the Oceanography Society, the American Geophysical Union, GISDATA, and the American Society of Photogrammetry and Remote Sensing. Copies should appear for sale at various conferences, particularly the CoastGIS, Coastal Zone, Coastal GeoTools, and The Coastal Society series of conferences, as well as the ESRI User Conference annually in San Diego (14,000 attendees). Journals read by these individuals probably include: *Annals of the Association of American Geographers; Canadian Geographer; Cartographica; Cartography & Geographic Information Science; Coastal Management; Computers & Geosciences; GIS Europe; GIS World; Journal of Geographical Information Science; Geographical Review; Ocean & Coastal Management; Photogrammetic Engineering & Remote Sensing; The Professional Geographer.*

15. TIMETABLE
We are not familiar with the normal timeline for writing and production expected by IGI Global, but here is an estimate:
July 2008 – Finalize and contact chapter authors
August 2008 – Authors begin developing chapters
December 2008 – Authors submit draft chapters to editors for review

December, 2008 to March 2009 – Review and edit process
April – May, 2009 – Authors revise chapters
June 30, 2009 – Absolute deadline for final reviewed manuscripts to reach editors
    Sample chapter sent in hard copy, camera-ready format to IGI, Global, who will
    check this and make suggestions. The sample chapter will show what things we
    need to look out for. **Time frame: 2 weeks**
August, 2009 – Camera-ready copy of handbook delivered to IGI, Global
September to November 2009 – Copyediting and production by IGI, Global?
December 2009 - Editors review copy-edit, galleys, help with indexing

16. CONTACT INFORMATION OF EDITORS
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17. VITAE
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available online at http://dusk.geo.orst.edu/vita.html .

Ned Dwyer – A short vitae is available online at:
http://cmrc.ucc.ie/pages/K_staff_page.php?id=0

Val Cummins – A short vitae is available online at:
http://cmrc.ucc.ie/pages/K_staff_page.php?id=7