Report of International Coastal Atlas Network Workshop 4:
Formalizing the Network, Engaging the Mediterranean

16 – 20 November 2009

Adriatico Guest House
UNESCO International Centre for Theoretical Physics
Trieste, Italy

More information can be found on the workshop web site:
http://ican.science.oregonstate.edu/ican4

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Acronyms Used in the Coastal Web Atlas World

(Many, but not all are cited in this report. This list is for general reference.)

ACEP	African Coelacanth Ecosystem Programme
AIS	Automatic Identification System
API	Application Programming Interface
BGODC	Bulgarian Oceanographic Data Center
BODC	British Oceanographic Data Centre
CAI	Coastal Atlas Interoperability
CF	Climate Forecast
CMRC	Coastal and Marine Resources Centre
CNR	National Research Council of Italy
COMPASS	Coastal Marine Perception Application for Science Scholarship
COST	European Cooperation in Science and Technology
COTS	Commercial-Off-the-Shelf
CPMR	Conference on Peripheral Maritime Regions
CSW	Catalogue Services for the Web
CTD	Conductivity, Temperature and Depth
CV	Controlled Vocabulary
CVI	Coastal Vulnerability Index
CWA	Coastal Web Atlas
DBMS	Database Management System
DEDUCE	Développement durable des Côtes Européennes (Sustainable Development of European Coastal Zones)
DG	Directorate-General
DG-MARE	Directorate-General for Maritime Affairs and Fisheries, EU
DISMAR	Data Integration System for MARine pollution and water quality
DOI	Digital Object Identifier
DRM	Digital Rights Management
EC	European Commission
EEA	European Environment Agency
EEZ	Exclusive Economic Zone
ECOOP	European Coastal-shelf Sea Operational Observing and Forecasting System
EDINA	Edinburgh Data and Information Access (University of Edinburgh, UK)
EDMS	European Data Management System
EIONET	European Environmental Information and Observation Network
EMIS	European Marine Information System
EMMA	European Monitoring and Assessment
EMODNET	European Marine Observation and Data Network
ENCORA	EuropeaN platform for Coastal ReseArch
ESF	European Science Foundation
ESRI	Environmental Systems Research Institute
ETC-LUSI	European Topic Centre on Land Use and Spatial Simulation
EU	European Union
EUCC	European Union for Coastal Conservation
EuroDeSS	European Decision Support System for coastal and regional seas
EurOcean	European Centre for Information on Marine Science and Technology

EUROGI	European Umbrella Organisation for Geographic Information
FAO	Food and Agriculture Organization (of the United Nations)
FGDC	Federal Geographic Data Committee
GBIF	Global Biodiversity Information Facility
GCMD	Global Change Master Directory
GEO	Group on Earth Observations (coordinator of GEOSS)
GEOSS	Global Earth Observation System of Systems
geoRSS	Geographically Encoded Objects for RSS (Really Simple Syndication) web feeds
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
GML	Geographic Markup Language
GPS	Global Positioning System
GRAME	Global Regular Assessment of Marine Environments
GSDI	Global Spatial Data Infrastructure (association)
ICT	Information and Communications Technology
ICES	International Council for the Exploration of the Sea
ICZM	Integrated Coastal Zone Management
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IFEN	Institut Français de l'ENvironnement (The French Institute of the Environment)
IFREMER	Institut Français de Recherche pour l'Exploitation de la MER (French Research Institution for Exploitation of the Sea)
IHO	International Hydrographic Organization
IMCORE	Innovative Management for Europe's Changing Coastal Resource
IMF	Internet Mapping Framework
IMO	International Maritime Organization
IMP	Integrated Maritime Policy
IMS	Internet Map Server
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
INSTM	National Institute of Marine Sciences and Technologies, Tunisia
InterRisk	*Inter*operable GMES Services for Environmental *Risk* Management in Marine and Coastal Areas of Europe (successor of DISMAR)
IO-BAS	Institute of Oceanology, Bulgarian Academy of Sciences
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data and information Exchange
IOOS	Integrated Ocean Observing System
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
ISDE	Irish Spatial Data Exchange
ISMAR	Institute of Marine Science, National Research Council (Italy)
ISO	International Organization for Standardization (derived from the Greek "isos," meaning "equal")
ISP	International Standardization Profile
ISSN	International Standard Serial Number
JCOMM	Joint Technical Commission on Oceanography and Marine Meteorology (WMO and IOC)
KML	Keyhole Markup Language (Google Earth)

LIDaR	Light Detection And Ranging
LIMES	Land and Sea Monitoring for Environment and Security
MESH	Mapping European Seabed Habitats
MIDA	Marine Irish Digital Atlas
MMI	Marine Metadata Interoperability
MOTIIVE	Marine Overlays on Topography for annex II Valuation and Exploitation
MSDI	Marine Spatial Data Infrastructure
MSFD	Marine Strategy Framework Directive
NCP	National Contact Point
NDG	NERC Data Grid
NERC	Natural Environment Research Council (U.K.)
NETMAR	Open Service **Net**work for **Mar**ine Environmental Data
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration (U.S.)
NODC	National Oceanographic Data Centre (UNESCO IOC IODE)
NRC	National Reference Centre (EIONET)
NSDI	National Spatial Data Infrastructure
NSF	National Science Foundation
OBIS	Ocean Biogeographic Information System
OCA	Oregon Coastal Atlas
ODIN	Ocean Data and Information Network (UNESCO IOC IODE)
OGC	Open Geospatial Consortium
OPeNDAP	Open-source Project for a Network Data Access Protocol
OS	Open Source
OSU	Oregon State University
OWL	Web Ontology Language
PEGASO	People for Ecosystem Based Governance in Assessing Sustainable Development of Ocean and Coast
PSI	Public Sector Information
RDF	Resource Description Framework
REDIAM	Environmental Information Network of Andalusia
ROOS	Regional Operational Oceanographic System
RSS	Really Simple Syndication (web feeds)
RTD	Research and Technology Development
SAIAB	South African Institute for Aquatic Biodiversity
SDI	Spatial Data Infrastructure
SEIS	Shared Environmental Information Systems
SIGLA	Sistema de Información Geográfica del Litoral de Andalucía (GIS for the Coastal Zone Management of Andalucia)
SKOS	Simple Knowledge Organisation System
SIL	Lagoon Information System (Italy)
SISE	Single Information Space in Europe for the Environment
SSE	Service Support Environment
SVN	Sub-version
UCC	University College Cork
UML	Unified Modeling Language
UNEP MAP	United Nations Environment Programme / Mediterranean Action Plan

UNESCO	United Nations Educational, Scientific and Cultural Organization
URI	Uniform Resource Identifier
URL	Uniform Resource Locator (often a synonym for URI)
URN	Uniform Resource Name (a URI that uses the URN scheme)
US/USA	United States or United States of America
USGS	United States Geological Survey
VLIZ	Vlaams Instituut Voor de Zee (Flanders Marine Institute)
W3C	World Wide Web Consortium
WCA	Washington Coastal Atlas
WCS	Web Coverage Service
WFD	Water Framework Directive
WFS	Web Feature Service
WMO	World Meteorological Organization
WMS	Web Map Service
WPS	Web Processing Service
XML	eXtensible Markup Language

EXECUTIVE SUMMARY

From November 16 to 20, 2009, the International Coastal Atlas Network (ICAN) held a workshop on "Formalizing the Network, Engaging the Mediterranean" at the Adriatico Guest House of the UNESCO International Centre for Theoretical Physics in Trieste, Italy. The workshop (aka "ICAN 4") engaged 32 participants from 12 countries, representing 26 organizations and multiple areas of scientific and technical expertise. This meeting was a follow-up to the successful 2008 workshop on "Federated Coastal Atlases: Building the Interoperable Approach" (aka "ICAN 3") held in Copenhagen, Denmark, as well as the 2007 workshop on "Coastal Atlas Interoperability" (aka "ICAN 2" in Corvallis, Oregon, USA) and the 2006 meeting "Potentials and Limitations of Coastal Web Atlases" (aka "ICAN 1" in Cork, Ireland). ICAN 3 continued the momentum by identifying the additional opportunities for partnering on coastal web atlas development throughout Europe, demonstrating the atlas interoperability prototype to the European Environment Agency and its many partners, and initiating the development of a long-term strategy and governance model for ICAN. ICAN 2 examined best practices for achieving interoperability between atlases, and led to the design of a demonstration interoperability prototype using the metadata catalogues of two atlases. ICAN 1 examined state-of-the-art developments in coastal web atlases (CWAs) from Europe and the U.S., shared several case studies and lessons learned, and established key issues and recommendations related to the design, data requirements, technology and institutional capacity needed for these atlases.

At the conclusion of ICAN 3 it was abundantly clear that ICAN had grown from a simple idea to the cusp of a formal virtual organization, which had captured the interest of the European Environment Agency (EEA), the European Commission, UNESCO, and several government agencies, companies, non-governmental organizations, and universities. However, much more work needed to be accomplished. Therefore, the activities of **ICAN 4** included:

- Discussions of **final implementation structures for governance** (including formal procedures for receiving new members), **technical activities**, and continued identification of **funding opportunities**, so that ICAN can formally incorporate as a virtual organization (aka "community of practice").
- Presentations on **emerging atlases in European countries** (especially the Mediterranean) and beyond that are making themselves relevant through policy, environmental and socio-economic indicator work and related themes.
- Continued progress on our **ontology and semantic interoperability** work, with an eye also toward articulating the benefits of semantic interoperability at a broader scale to non-specialists. In this we look forward to the advice and assistance of MMI and SeaDataNet, as well as to the new NETMAR (Open Service **Net**work for **Mar**ine Environmental Data) initiative, which has already developed conceptual framework documents in this area. To this end, we also:
    - Held a small "workshop within a workshop" for atlas administrators on how to become a new node in interoperability prototype.
    - Initiated strategies on making further improvements to all those nodes (according to the Shared Environmental Information Systems (SEIS) principles of sharing information for multiple purposes, using data and systems that are

accessible and interoperable).
    - Facilitated further work on partnerships, infrastructure and data exchange formats, all with the overall objective of enabling the nodes to share and communicate with each other, avoid duplication, and streamline information management.
- Presentations and discussion of **user issues**, including better knowledge of our atlas users, their needs, and on continued inventory, assessment, and evaluation of atlases. To this end, we discussed as part of a small "workshop within a workshop" how to improve the functionality of CWAs for general users, especially as the technology continues to change.
- Small group meetings on **potential funding opportunities** on both sides of the Atlantic (European Union, US National Science Foundation and government agencies) in order to continue the work of ICAN.
- Initiation of plans for a **major ICAN presence** at Littoral 2010 in London (European ICAN partners), as well as a standalone ICAN Americas meeting in Wisconsin, USA.

In addition, the ICAN workshop took place around a two-day **Workshop on Maritime and Coastal Information Systems**, organised by the **EEA's Environmental Information and Observation Network (EIONET)**, which was open to ICAN 4 attendees as well. The main objective of this meeting was to inform the many participating countries of the EIONET National Reference Centre (NRC) network and to allow for a first exchange of views on scope and roles in the new formation for this entity. Four participants of ICAN 4 were invited to give presentations at the EEA/EIONET workshop, which allowed EEA/EIONET to explore collaboration opportunities as a result of ICAN's emergence.

The US National Science Foundation (NSF) had originally awarded support for two ICAN workshops, so there will be a **5th international workshop** (aka ICAN 5), at the headquarters of the UNESCO International Oceanographic Data and Information Exchange (IODE) in Oostende, Belgium, **August 31 to September 2, 2011**. IODE will co-host CoastGIS 2011 in Oostende immediately following ICAN 5. **Objectives** of ICAN 5 will include follow-up activities that we did not have time to accomplish at ICAN 4, including:

- Continued progress on our ontology and semantic interoperability work, but with an eye also toward articulating the benefits of semantic interoperability at a broader scale, to non-specialists.
- Continued engagement and servicing of users of coastal web atlases, and on continued inventory, assessment, and evaluation of atlases.
- Revisiting the main recommendations of the ICAN 1, especially evaluating atlas impact, and developing analysis and decision-support tools in atlases.
- Forming proposal teams and submissions to the next available and appropriate NSF and other grant competitions (e.g., NSF Partnerships for International Research and Education, NSF Community-Based Data Interoperability Networks, NOAA, European Framework Program, InterReg, and ESF).
- Exchanging lessons learned in spatial data infrastructure between the US, European INSPIRE and other national and regional efforts.
- Continued implementation and improvement of new governance, strategic planning, and technical working groups.

INTRODUCTION

Significant capacity has been built in the field of coastal mapping and informatics in Europe, Canada, and the US in the last decade as a result of a steady advancement of GIS applications for coastal practitioners. 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 is still working toward providing widespread solutions to deal with common issues such as achieving full semantic interoperability of metadata and databases (where concepts, terminology, even abbreviations that are shared between two or more individuals, systems, or organizations are understood by all to mean the same thing; Gruber 1993; Egenhofer, 2002), reversing the lack of tool integration for coastal analysis and decision-making, and removing most impediments to effective use of online atlases for decision-support.

While multiple benefits are derived from 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 coastal web atlases (CWAs), to optimize decision-making at a variety of levels and across themes. And while digital data sets have continued to grow exponentially, our ability to derive meaning, knowledge and management decisions from all of these data in an analytical context remains poor (e.g., Aditya and Kraak, 2006; Deliiska, 2007; Athanasis *et al.*, 2008; Sahoo *et al.*, 2008). Hence, fundamental research questions driving the ICAN 4 workshop were:

(1) How can semantic interoperability be best achieved so as to mitigate vague data queries, vague concepts or natural language semantics when retrieving and integrating data and information?

For example, participants of the prior ICAN workshops in Ireland and Oregon (ICAN 1 and ICAN 2; O'Dea *et al.*, 2007; Wright *et al.*, 2007), confirmed that the terminology used to describe similar data in CWAs can vary widely between specialties or regions, which can complicate data searches and integration. Use of the word "*seabed*" in European English versus use of the word "*seafloor*" to describe the same feature in North America is a good example of this scenario, as is the interchangeable use of "*coastline*" versus "*shoreline*" in both regions. Agreements on content/semantic interoperability must be developed to eliminate such problems, making searches between disparate, but mutually beneficial, projects feasible. A subset of these workshop participants has been developing a demonstration prototype as a proof-of-concept to inter-relate metadata and other information between two initial CWAs (the Marine Irish Digital Atlas or MIDA, mida.ucc.ie, and the Oregon Coastal Atlas or OCA, www.coastalatlas.net). The prototype is in the form of an Open Geospatial Consortium (OGC) catalogue service for the Web (CSW), where web map services (WMS) will be registered. But much more collaborative discussion about refining and extending this prototype is needed, for which ICAN 4 provided a productive setting.

A second major question driving the ICAN 4 workshop was:
(2) *What are the best ways to share geographic data and information across multiple distributed organizational and social contexts? And under what conditions do virtual organizations (such as what ICAN seeks to become) best foster and support transformative scientific research while* ***also*** *providing an effective spatial data infrastructure?*

Again, very little work has been done in any of these realms with respect to CWAs. This includes the assessment of CWAs as used by different user communities, if user expectations are being met, and how best to ascertain and, where possible, quantify the impact of CWAs on agencies, communities, states, nations, and regions.

Outcomes from the prior ICAN workshops, as well as a recent specialist and policy meetings in Europe (e.g., European Commission, 2007; Intergovernmental Oceanographic Commission, 2008a and 2008b), all point to the considerable need for and potentials of interoperable CWAs at the international level. ICAN has represented the emergence of a strong and focused community of practitioners in the new domain of coastal atlases. Indeed, ICAN has grown from an idea to the cusp of a formal virtual organization (aka "community of practice") which has captured the interest of local and state governments, non-governmental organizations, universities, NOAA, the European Environment Agency (EEA), and UNESCO's Intergovernmental Oceanographic Commission. Oregon State University in the U.S. and the CMRC of University College, Cork, Ireland have emerged as the lead universities and hubs of this nascent international network. ICAN has thus far proven to be an organic, highly motivated, productive informal group that despite its informality and lack of incorporation, is capable of generating tangible, useful products that would attract and help users.

Deliberations at ICAN 3 (Dwyer and Wright, 2008) revealed that much more work still needs to be done to: (1) formalize the governance and strategic planning structure for this new organization; (2) further its mission of establishing scientific grounding and knowledge base among the important knowledge domains of CWA development (geography, computer science, and coastal resource management); (3) develop advances in semantic interoperability of CWAs; and (4) exchange lessons learned in spatial data infrastructure between the US, the European INSPIRE (INfrastructure for SPatial InfoRmation in Europe; e.g., Masser, 2007), and other national and regional initiatives.

The strategic aim of ICAN is to share knowledge and experience among atlas developers in order to find common solutions for coastal web atlas development whilst ensuring maximum relevance and added value for the users. These atlases can be local, regional, national and international in scale. However, this cannot be done without continued formalization. We need to move beyond the demonstration of a conceptual framework towards an operational structure in a formal organization and operational interoperability in terms of a functioning web-based catalog of linked CWAs, so that in time, users will be able to conduct sophisticated and meaningful queries across a range of atlases.

This report presents the outcomes of the workshop deliberations. The details of the prototype development are outlined and agreed future technical activities are described. The relevant policy context within which ICAN must operate is presented along with an overview of a number of related coastal and marine information management projects, which can inform

ICAN developments. Activities over the last year in regard to outreach and training are outlined along with successful efforts to engage additional members in the Network. Finally a medium to long-term strategy for ICAN and a potential governance model for the Network are presented. These will help to give a coherent focus to the activities and underpin the structure of ICAN therefore securing its future and enhancing its relevance among those interested in the future of coastal areas worldwide.

ICAN GOVERNANCE

As discussed at ICAN 3 (Dwyer and Wright, 2008), in order for ICAN to function properly a governance structure is vital. Therefore the workshop began with presentations and discussions led by John Helly of the San Diego Supercomputer Center/Scripps Institution of Oceanography and Roy Lowry of the British Oceanographic Data Center. Both have been involved over the last year in proposing and structuring possible governance models for ICAN. The discussion began with a consideration of what other organizations exist in the world that are similar to ICAN? One end member suggested by John was the Internet Engineering Task Force (IETF; http://www.ietf.org), a large, open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. The actual technical work of the IETF is done in its working groups, which are organized by topic into several areas (e.g., routing, transport, security, etc.). Much of the work is handled via mailing lists. The organization holds meetings three times a year, and membership is open to any interested individual. It is a flat, decentralized organization that is funded in different ways and at different levels.

Another end member is an organization such as the Open Geospatial Consortium (OGC; http://www.opengeospatial.org) or the Consortium for Ocean Leadership (http://www.oceanleadership.org). These organizations involve a hierarchical system of officers, board members, and staffers, both paid and voluntary. They are much more centralized and charge significant membership fees (e.g., OGC membership fees range from $55,000 for principle members to $500 for individual associate members). The pros and cons of these end-member governance examples are presented in Table 1.

Table 1. Comparison of Reference Governance Examples

Governance Type	Pros	Cons	Examples
• De-centralized • Voluntary • Loosely hierarchical	• Low cost • Flexible • Motivated • Community-based • Reputation-building	• Unreliable funding • Unreliable progress • Peer pressure accountability	• Internet Engineering Task Force (IETF)
• Centralized • Paid and voluntary	• Funded • Many levels of membership	• Costly • In-the-club of not • Tends to mature	• Open Geospatial Consortium,

• Strongly hierarchical	• Well-understood standard operating procedures • Project management principles	and become organizationally protective	Inc. (non-profit) • Consortium for Ocean Leadership (non-profit)

Somewhat in the middle of the spectrum is the Global Spatial Data Infrastructure (GSDI) Association, where most of the work is done by volunteers. There is a range of membership fees, especially to accommodate those from developing nations, and the organization brings in annual revenues (~$40-50,000) from holding conferences. So unlike the OGC, which started off as a non-profit venture, GSDI (as well as the European Umbrella Organisation for Geographic Information or EUROGI) started off as conferences and went into the realm of non-profit organizations. They now have an essentially scaled-down OGC-type structure in terms of being an "association of associations," including also members from industry. It was pointed out in the discussion that ICAN should consider keeping its membership as broad as possible, perhaps even down to the level of individual members.

In identifying the best governance model for ICAN, the group discussed the value of ICAN at this stage in its development, which can be found in its:

- Web presence, with services and resources therein.
- Implementation stack (stack of software and preferred implementation approaches, made freely available to participants and advancing the interests of coastal community).
- Interoperable layer discovery (building a local ontology, building specified technologies such as semantic mediators, and mapping into ICAN master or global ontology).
- Outreach to the community by way of lessons to be learned from experiences of others, best practices across state boundaries or national boundaries; sharing best practices, networking via workshops, social context.

There was encouragement for ICAN to continue to think about *tangible* products that will advance the interests of the ICAN community. An example cited by John, was that one of IETF's keys to success is that they don't let topics come to the table only because they sound good. They require that someone has working software in order for it to be included in the framework of Internet protocols. ICAN will seek to develop a common method developed for creating a coherent, self-consistent map of the coastal zone. We have the potential to build a high-resolution international coastline, as there is no current, existing definition for such. This might be a core vector data set that ICAN can create as a community, and claim as an ICAN product (a global coastline is being created by GSDI, at ~1:100,000, but is not suitable for local coastal management. ICAN could potentially create a much higher resolution product for local municipalities.

Updated ICAN Governance Model

At ICAN 3, the formation of three main bodies was suggested to steer the strategic and technical activities of ICAN. These were revisited at ICAN 4 and renamed the Steering Group (SG), Management Working Group (MWG), and the Technical Working Group (TWG).

Steering Group (SG)
Membership in the SG should be based on the unique contributions a member would make from a political, technical or financial aspect to the advancement of ICAN goals. The SG is responsible for providing valuable direction for the MWG and TWG based on their various expertise. The SG would be a more restrictive selective body, and would provide a check-and-balance for the MWG.

- **Composition:** Membership in the SG should be based on the unique contributions a member would make from a political, technical or financial aspect to the advancement of ICAN goals. The SG will be comprised of individuals who will have little time to devote to this enterprise but have a strong interest in the goals of ICAN. Their role is to articulate the vested interests of the organizations they represent and to interpret and negotiate with the MWG.
- **Roles and Responsibilities:** The role and responsibility of SG members is to review and comment on the published policies of ICAN, contribute to the agenda for meetings, and participate in any ICAN event (listed and defined in Table 2 below).
- **Continuing Membership:** Membership will be occasionally reviewed by the working groups and pruned on the basis of active participation and contributions to the goals of ICAN.
- **New Members:** Membership beyond the initial complement will be added by a process of open nomination from any member of the ICAN working groups and accepted or rejected by a vote of the working group membership.

Management Working Group (MWG)
The Management Working Group (MWG) has the responsibility for the functions listed in Table 2. In summary, the MWG is the public-facing aspect of the ICAN and is responsible for all funding, operations, external relations and documentation.

- **Composition:** The MWG will be comprised of individuals who provide active leadership to the activities of the ICAN, contributing time and labor to the established strategic objectives and priorities (e.g., funding efforts, event organization, etc.).
- **Roles and Responsibilities:** The role and responsibility of each MWG member is to carry out the functions listed and defined in Table 2 below.
- **Continuing Membership:** Membership will be occasionally reviewed by the working groups and pruned on the basis of active participation and contributions to the goals of ICAN.
- **New Members:** Membership beyond the initial complement may be extended to include a representative of a new coastal atlas added to ICAN.

Technical Working Group (TWG)
The TWG is the team of individuals that defines, implements and deploys the cyberinfrastructure for the ICAN technical projects, including the governance of what OGC and other kinds of standards and profiles ICAN is adopting. There may be necessary offshoots of the TWG such as an ontology content governance group.

- **Composition:** The TWG will be comprised of individuals who contribute their technical expertise through voluntary efforts organized into domain-specific or discipline-specific

working groups (WGs) with published charters. Membership in any of these WGs is open to any interested participant.

- **Founding:** The initial membership of the TWG will be founded from interested individuals from the ICAN coastal atlases and existing activities. WG chairs should be established by volunteers who agree to define their area of technical effort and its relevance to ICAN strategic goals and to draft an initial charter and technical documents appropriate to the activity.
- **Roles and Responsibilities:** The role and responsibility of each TWG member is to carry out the functions listed and defined in Table 2 below.
- **Continuing Membership:** Membership will be occasionally reviewed by the working groups and pruned on the basis of active participation and contributions to the goals of ICAN.
- **New Members:** Membership beyond the initial complement will be added to include a single representative of coastal atlases added to ICAN, as well as any new ICAN member with an active interest in the topics covered.

The group also discussed the need for an External Advisory Group of experts so that the SG and MWG in particular may be able to gain perspectives and advice on the strategic directions of ICAN. This external advisory group might be composed of those who have done similar technical work in more mature organizations (such as the Marine Metadata Interoperability initiative, the Directorate General for Maritime Affairs and Fisheries of the EU or DG-MARE, industry members, etc.) or those with a strong knowledge of our coastal user communities, giving those communities an even stronger voice and representation.

The relationship between all of the above working groups is illustrated in Figure 1. With regard to funding, as shown in Figure 1, there was discussion of the need for a set of criteria that are essential for ICAN to grasp in order to organize into a larger entity. At some point, ICAN will need to develop a business model with some sort of legal structure that will be made into an integral part of the governance structure. It very much comes down to showing value or benefit of ICAN (i.e., the value of belonging to ICAN).

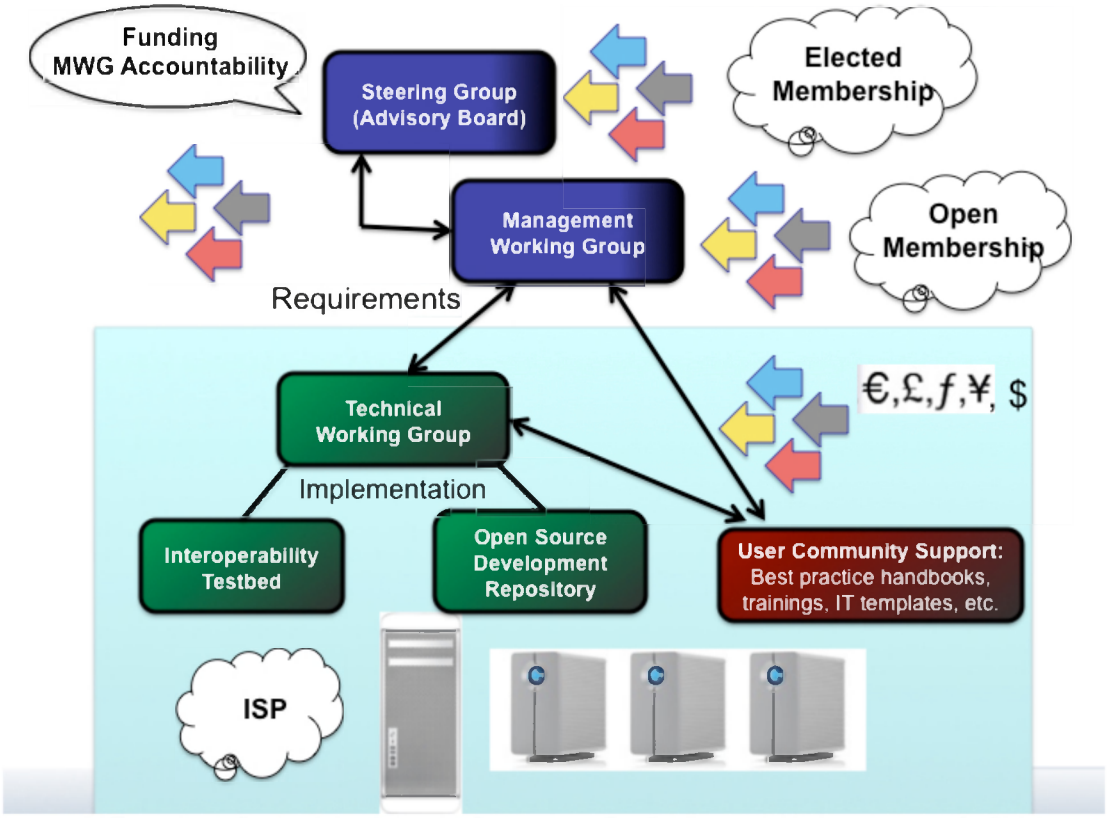

Figure 1: *Illustration adaption from an original by John Helly of the updated governance model for ICAN including the three main working groups: Steering, Management, and Technical, the requirements for which are indicated in the paragraphs above, and the implementation details for which are found in Table 2.*

The workshop participants split into breakout groups to consider and finalize primary and secondary roles for the SG, MWG, and TWG, as well as short descriptions of the responsibilities and tasks of each working group. This is detailed in Table 2. Table 3 lists the initial volunteers for each of the working groups (co-chairs in bold).

Table 2. ICAN Organizational Roles and Responsibilities. ***Key:*** *X = Lead Group; x = Contributing Group*			
Function	**Steering Group**	**Management Working Group**	**Technical Working Group**
Data or Product QA/QC – standards and practices; ensure quality of ICAN products; MWG sets general principles; TWG is advisory in this role, may even be the ones to discover a problem (e.g., metadata quality, standards conformance, ontology quality).		X	x
Policy – by-laws, incorporation, roles and responsibilities (inc IPR), standard operating procedures; Policy lays out objectives that trickle down to implementation (procedures) (e.g., By-laws of OGC, EUROGI, GSDI) – charter, terms of ref may be more appropriate for ICAN?; Who we are, how we operate, how we relate to other orgs	X		
Oversight of Mgmt Group – strategic priorities are part of this	X		
Standard Operating Procedures – the "how" in relation to policy (objectives)		X	
Priorities – e.g., what we will do in the next year; funding priorities, MWG functions; Strategic, Tactical, Operational? General priorities at SG level, further defined and managed by MWG.	x	X	x Technical project management priorities.

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Key: *X = Lead Group; x = Contributing Group*

Function	Steering Group	Management Working Group	Technical Working Group
Intellectual Property – access to content, use of content and services; who signs agreements? Agreements between data owner and who wants to access data/info; IPR is owned by data owner/service provider GSDI example: steering sets policy and Mgmt implements; ICAN SG would sign actual agreements; take into account ICAN members who are members of sister orgs. dealing w/those issues.	X Issue resolution	x Specification of licensing terms of tools and products produced by ICAN.	x Conformance to licensing terms of tools & data products used and developed by ICAN.
Stakeholder Representation – engages stakeholders, puts together programs, resources for them Stakeholder Def 1 = **user communities, data providers** (e.g., state gov); CWA is there to serve local govs; those w/ an interest in the activity; vested interest Stakeholder Def 2 = funding provider Stakeholder Def X Define levels of interest too – user perspective, or "this is useful, I want to contribute resources," license and attribution provider Steering could handle funding stakeholders; Mgmt could handle use stakeholders Could be separate user groups for different stakeholders	x	X	

Table 2. ICAN Organizational Roles and Responsibilities. ***Key:*** *X = Lead Group; x = Contributing Group*			
Function	**Steering Group**	**Management Working Group**	**Technical Working Group**
Funding – this is the responsibility of writing proposals to get the funding; engaging the funders (e.g., agency or foundation visits, etc.); Steering group IDs major sources of funding, gives guidance as to where to expend efforts Mgmt group picks an opp according to a priority and writes proposal, often in concert w/Tech as necessary Who would be a PI?? Mgmt w/Tech Funding for holding a workshop or conference might fall to Steering, but funding to advance use case or interop or develop new CWA might fall to Mgmt/Tech	x	X	x
Operations (w/Finance) – managing, reporting budging, compliance activities; Steering raises red flags if they see Mgmt going down wrong road		X	
Communications & Public Relations – internal w/in ICAN as well as external public relations		X	

Table 2. ICAN Organizational Roles and Responsibilities. ***Key:*** *X = Lead Group; x = Contributing Group*			
Function	**Steering Group**	**Management Working Group**	**Technical Working Group**
Membership – levels of membership; look at a number of working examples where issues have been worked out over the years (willing to pay model); impt voices to be heard; GSDI model (board is elected), some orgs pay $25K, some $5K, down to individual membership which ends up doing a lot of work, indiv members able to sit on board? EUROGI each member org puts people forward to serve on council (Steering) – can be unwieldy Roger & Tim's project ICAN needs to become legal body at some point to attract funding, maintain stability UCGIS model is institution member only Should ICAN consider being subsumed under an existing group such as GSDI? Might decrease heavy admin functions OGC now has thematic working groups but these are very small GSDI? Wrap CoastGIS into ICAN? Revisit incorporation issue in about 12 months time		X	
Marketing & Events		X	
Liaison with Service Providers – e.g., we put up an ICAN service for which we need to buy equipment, buy a service; anything dealing w/vendors, entering into a *commercial* contract		X	
Outreach – Papers, posters, presentations at conferences, etc. Participating in working groups, panels, etc		X	x

Table 2. ICAN Organizational Roles and Responsibilities. ***Key:*** *X = Lead Group; x = Contributing Group*			
Function	**Steering Group**	**Management Working Group**	**Technical Working Group**
Technical "Things" – Requirements, architecture, standards incorporation and implementation and guidance			X
Data & Products *Delivery* – Data providers and ICAN data products. Interfaces into data sources. Helping data providers to interface with ICAN	x		X
Interoperability Compliance – Semantic mapping and bridging between data providers. Selecting and promoting best practices and architectures.			X
Metadata – **FGDC,ISO 19115, INSPIRE OAI,** etc. Getting it populated/provided. Defining minimum required elements. Development of metadata capture methods. Legal requirements for most govt bodies Steering/Mgmt says this might also be a subset under Interop Compliance			X
Network Services & Deployment – Web services.			X
Standards – Identification, adoption, development of technical specifications that facilitate interoperability. Steering/Mgmt says this might be a subset under Interop Compliance			X
User Support – Communicating with technical users to solve their problems.			X

Table 2. ICAN Organizational Roles and Responsibilities.
Key: *X = Lead Group; x = Contributing Group*

Function	Steering Group	Management Working Group	Technical Working Group
Training & Documentation – Workshops, technical cookbooks, user support, online help, developing ICAN website content.		X	X
Atlas Inventory & Assessment – need data from technical group to complete assessment; tech team incorporated into a survey; about setting priorities but Mgmt group will implement this along with Tech Need inventory in order to do assessments: user assessment and developer/administrator assessment	x	X	x
Interface Extension – user interface to interop prototype Further work on the ICAN portal interface prototype, development of additional access methods			X

Steering Group	*Management Working Group*	*Technical Working Group*
• **Roger Longhorn** • **Kathy Taylor** • Kathy Belpaeme • Val Cummins • Tony LaVoi • Andrus Meiner • Tim Nyerges • Gonzalo Malvarez-Garcia • Ronan Uhel **Plus External Advisory Group**	• **Ned Dwyer** • **Dawn Wright** • Marcia Berman • Alejandro Iglesias-Campos • Luis Conti • John Helly • Kathrin Kopke • Mika Odido • Sean Paddy	• **Roy Lowry** • **Liz O'Dea** • Juan Arevalo-Torres • Luis Bermudez • Ramona Carr • Richard Cyganiak • Declan Dunne • Tanya Haddad • David Hart • Yassine Lassoued • Jose Ojeda-Zujar • Rita Silva • Hristo Stanchev

ICAN Membership Levels

Time did not permit discussion of the specific details of membership levels, beyond what was already established at ICAN 3 (Dwyer and Wright, 2008), and reproduced again here:

> Participants in ICAN would need to sign up to a Memorandum of Agreement (MOA) or non-contractual arrangement that has clear objectives, milestones and deliverables. Participants can comprise two levels: *full participating membership* and *associate membership*. The former gives "executive" benefits in terms of defining the strategic direction of ICAN, objective setting and input to technical and business developments. The latter gives a passive benefit in being able to keep abreast of developments.

Associate Membership

Those with an interest in CWA come from a variety of backgrounds and represent a wide range of application areas. These include the following entities.

- Central/Federal Government (e.g., Defra; NOAA).
- Regional / Local Government including coastal groups (e.g., Flanders; Wisconsin State; Irish Coastal network).
- Content Providers (e.g., SeaZone/UKHO; NOAA).
- Industry Groups (e.g., Oil & Gas UK).
- Technology Providers (e.g., Google; ESRI).
- Research Groups (e.g., university research groups such as CMRC of University College Cork, Ireland, OSU; national research groups such as NERC-UK).
- Educational Bodies (e.g., universities, curriculum development groups).
- Inter-Governmental Bodies (e.g., EU; IOC; IMO).
- Non Profit Organisations (e.g., MapAction; World Wildlife Fund; OGC).

Memorandum of Agreement

The Memorandum of Agreement (MOA) drafted during the first ICAN workshop in Cork, Ireland (http://workshop1.science.oregonstate.edu/mou) forms a sound basis for an initial agreement between full participating members. It covers organisational commitment for participation by its employees in ICAN activities. An adaptation of this preliminary MOA reads:

Pursuant to the stated aims and objectives of the International Coastal Atlas Network (ICAN) we, the undersigned, are endorsing this Memorandum of Agreement. This is an agreement between the signatory institutions to jointly pursue funding and projects in the interest of advancing the utility and interoperability of coastal web atlases. Our goals are to develop a community of common purpose to improve collectively and individually the information resource represented by the existing resources and to develop standards and practices that will improve the value of these for the future.

These efforts will encompass information technology, geographic information systems, and data and metadata content standardization to enhance compatability of information and interoperability of data systems. ICAN participants will be involved in the development and subsequent shared use of resources subject to which the developers have Intellectual Property Rights. ICAN participants agree to respect these rights by not distributing these resources without the developers' permission and by providing full acknowledgement to the developers where these resources are deployed.

What remains to be clarified is the identity of the entity signing up to the agreement. Is it an individual, a group, a department, or a 'legal entity' (e.g., NERC for BODC)? This needs to be clearly resolved.

As ICAN develops, it is inevitable that the situation will arise where circumstances force a partner to withdraw from the Network. Any conditions associated with such circumstances need to be documented in the MOA. It might also include a 'will clause' to cover the unlikely circumstance of full dissolution of ICAN.

EMERGING ATLASES IN THE MEDITTERANEAN AND OTHER REGIONS

Atlas Development and Related Coastal Data Management Initiatives

With an increased of awareness of ICAN, new members have joined the Network. Some of these presented their atlas development and plans at ICAN 4. Within the Mediterranean area the Atlas of the Lagoon of Venice, which has existed for a number of years, has embarked on a new phase of its development. Similarly, further work on the Coastal Information System of Andalusia, Spain will see it integrated into the existing Environmental Information Network of the region. We also heard for the first time about the emerging Bulgarian Black Sea Coastal Atlas and plans to develop a Tunisian Coastal Atlas. ICAN membership has extended into South America with the developers of the São Paulo State Coastal Atlas who will be taking the experience of the ICAN community into account as they embark on their initiative. The EU funded NETMAR (Open Service **Net**work for **Mar**ine Environmental Data) project will see strong synergies with ICAN, especially with regard to the ICAN prototype and specifically ontology development and data integration and processing. Finally a presentation on the European Marine Observation and Data Network showed how practical action is being taken to implement the European Integrated Maritime Policy.

The Atlas of the Lagoon of Venice: From a Book to a Dynamic Web GIS

Alessandro Mulazzani of Venice City Council and Stefano Guerzoni of the National Research Council- Institute of Marine Sciences (CNR-ISMAR) presented ongoing work on the Atlas of the Lagoon of Venice. Born as a book and first published in 2005, the atlas was produced by the Natural Observatory of the Lagoon of Venice (http://bit.ly/9e5z5c), and set up within the city council in 2002. The key objective of the Atlas was to bring together and organise the information held by separate research bodies, so that citizens, professionals, and various institutions could refer to a single, shared information base.

The production of the Atlas involved several researchers and technicians and was governed by means of agreements between institutions operating in the Venice area (National Research Council- Institute of Marine Sciences (CNR-ISMAR); IUAV and Ca' Foscari Universities; Venice provincial authorities; Veneto Regional Environmental Protection Agency; Veneto Institute of Sciences, Letters and Arts; the Venice Water Management Authority; the Venice Museum of Natural History) and beyond (Technische Universität, Berlin; Worcester Polytechnic Institute, Boston). The ecosystem approach (rather than administrative) has been applied to define the geographical coverage of the Atlas and includes the Lagoon of Venice, its catchment area and its coastal waters.

The book is composed of 103 plates grouped in five main thematic sections: Geosphere, Biosphere, Human Environment, Protected Environments and Integrated Analyses (combinations of themes and relations between them). In 2006 the entire book's content was made available on the Internet, using a web GIS and in 2009 an English language version was released (http://atlante.silvenezia.it/en/index_ns.html). This provides the ability to zoom and pan the maps, perform queries in some maps, measure lengths, print and download maps (in geoTiff format), in addition to being able to browse text and images.

In 2007 the Natural Observatory of the Lagoon of Venice started the development of a dynamic atlas, which was already planned since preparations on the book started (http://atlante.silvenezia.it/en/html/tra_terra_e_mare_cap6.html). The prototype is called the Lagoon Information System (LIS or SIL in Italian; Figure 2). The SIL is based on an entirely open source platform, and is an evolution of the first web version of the Atlas. It allows overlay of several data layers, supports transparency adjustment and may allow download of the original data. The SIL intends to provide services in compliance with the main INSPIRE and international standards related to geospatial information. It makes use of the Web Map Service (WMS) standard OGC protocol. Therefore its content will be updated by the data producers, thus requiring agreements and continuous collaboration of project partners (data providers and data producers). At present, a metadata catalogue is not available, but its development using GeoNetwork is planned; in the meantime "pseudo-metadata" are used for each data layer.

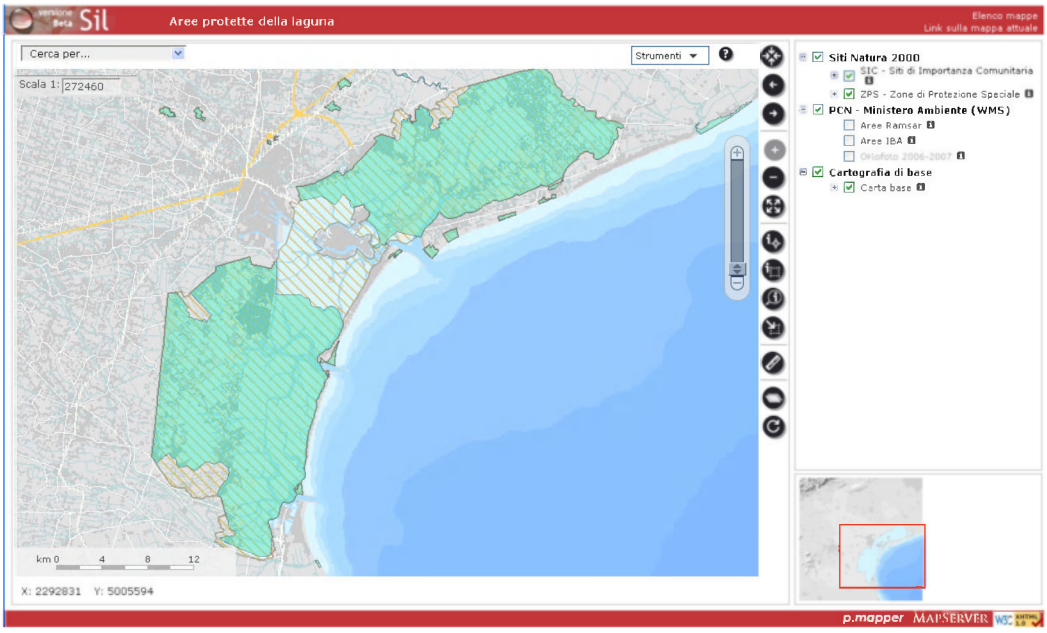

Figure 2: The Lagoon Information System showing protected areas.

The SIL is presently based on an institutional collaboration between the City of Venice and the –CNR-ISMAR. In October 2009 the City of Venice joined the Cartographic Cooperating System (SCC) of the National Cartographic Portal (http://bit.ly/ctOo5U), to exchange data via WMS. The

SIL makes use of WMS, to display data produced by the project partners, i.e. CNR-ISMAR (e.g. physical data on the lagoon) and the National Cartographic Portal (base maps, imagery, protected areas, etc.). Additional bodies that produce data on the lagoon are expected to join the project in the near future.

The Atlas of the Lagoon and its evolution (the SIL) represent an interesting example of a local Atlas, based on the description of a natural ecosystem rather than an administrative unit. It shows how a local Atlas can use data provided by different data producers, i.e. a research institute which produces physical data on the lagoon or a national authority which collects imagery of the lagoon area.

The development of the SIL will have to face many challenges, such as: (i) rivalries among different levels of administration; (ii) difficult communication between data producer bodies; (iii) data quality and reliability; (iv)absence of external and internal coordination for spatial data management and (v) uncertain financing and consequent slow development.

In spite of that, we are confident that the SIL can rely on a strong partnership between a Public administration and a Research Institute, on the agreement with the National Cartographic Portal and by the indirect support of EU policies (i.e. Directive on public access to environmental information (2003/4/CE), INSPIRE Directive (2007/2/EC), ICZM Policy) and should develop well in the future.

Useful Links

The Atlas of the Lagoon online: http://atlante.silvenezia.it/en/index.html

The Prototype of the Lagoon Information System: http://www.silvenezia.it/

The web site of CNR-ISMAR: http://www.ismar.cnr.it/

Coastal Information System of Andalusia (Spain)

As a result of the implementation of the Andalusian Strategy for Integrated Coastal Zone Management and the need to establish information and management tools for the governance of these areas, the Andalusian Ministry of the Environment is developing a Coastal Information System which is to be integrated in the existing Environmental Information Network (REDIAM). Alejandro Iglesias-Campos, Junta de Andalucía, Regional Ministry of the Environment presented the latest developments with regard to the Coastal Information System.

The main goal of this initiative is to provide standardized and uniform core information about the coastline and marine environment, accessible to a range of stakeholders. This will be achieved by collecting, structuring and organising the information according to a consistent data model with its own network of environmental information.

The subsystem will be integrated in REDIAM at the same level as the other subsystems already in operation, such as the Biodiversity and the Climate subsystems.

Given the diversity of information on coastal and marine resources as well as the range of data sources and the numerous application areas it is difficult to completely harmonise the

information. However, the Andalusian Government has significant power in regard to coastal management, which is consistent with the principles of ICZM promoted by and for all administrative levels (European, state, regional and local).

Using the data infrastructure already created by the REDIAM, the subsystem will incorporate the data of interest relating to the seas and coasts of Andalusia, especially those with a strong spatial component. Examples of such include socio-economic data related to fisheries, tourism, regional planning and urban pressures, in addition to purely environmental issues (biodiversity, climate, physiography, environmental planning and quality), as well as other topics, that have a clear environmental component.

During the last year, the technical group supporting the Coastal Information System of Andalusia has defined a new coastline adapting the existing one by using a more detailed methodology. Physiographic units and urban uses have also been updated for the coastal zone as have the erosion rates for the province of Cádiz.

Since 2007 the Regional Ministry of the Environment has been studying the impact of sea level rise on the Andalusian coast, in order to follow up on the Andalusian climate change strategy which was published in 2002. The aim of this study is to document, for coastal strips, sensitivity to a potential sea level rise, as well as their adaptation capacity. A set of biological, physical, geological/ geomorphologic and social variables are used for this purpose.

In accordance with Intergovernmental Panel on Climate Change (IPCC) guidelines, two ways have been considered for the calculation of this vulnerability. Both the susceptibility and resilience of natural systems (ecological vulnerability), and the impact on socioeconomic activities and goods (socioeconomic vulnerability) are considered. The Coastal Vulnerability Index (CVI), developed by the US Geological Survey, has been used for the assessment of the former. The Regional Government of the Environment has shown interest in the CVI, and has improved on the original calculation methodology by using modelling studies and trend analyses existing in Spain and Andalusia for the different variables applied. Finally, this indicator tries to illustrate cartographically the ecological and socioeconomic vulnerability of the Andalusian coast in view of expected sea level rise.

Bulgarian Black Sea Coastal Atlas

Hristo Stanchev from the Bulgarian Institute of Oceanology within the Bulgarian Academy of Sciences (IO-BAS) presented work related to development and publishing of an online Bulgarian Black Sea Coastal Atlas (BCA). The main goals of the BCA are to foster sharing and use of geographically-linked spatial information on marine and coastal features and resources along the Bulgarian part of the Black Sea coastal zone. Thus, the key purpose of the Atlas is to improve public access to coastal information to help and support different authorities, institutions and stakeholders in coastal zone management and in particular to have a better appreciation of various natural and anthropogenic risks.

The idea for the development of the BCA emerged as part of a Bulgarian Oceanographic Data Center (BGODC) initiative and it has been developed with financial support of the SIBEMA Project (Scientific and Institutional Capacity Building for Implementing European Marine Policy in the Black Sea Region). Under this project ESRI ArcInfo 9.1 (Desktop); ESRI ArcSDE 9.1 and

ESRI GIS Server software have been provided to the Institute. In addition, topographic and nautical maps at different scales have been obtained.

Some of the main data for inclusion in the Atlas are: sea level rise (Figure 3); conductivity, temperature, and depth (CTD) data for temperature and salinity from field surveys (ship cruises); geomorphic typology/classification of the Bulgarian Black Sea coast (erosion sections/sandy beaches/coastal-protection structures); population census data for the 14 Bulgarian Black Sea coastal municipalities for the period 1934-2001; and coastline and port/coastal-protection structures. Images along the Bulgarian coast are also available for viewing and download from the Atlas site. It is expected that different target groups will benefit from the implementation of the BCA: the coastal scientific/research community in Bulgaria and outside; environmental agencies; governmental and municipal authorities; local communities/owners; civil protection authorities; coastal-protection agencies; and decision-makers.

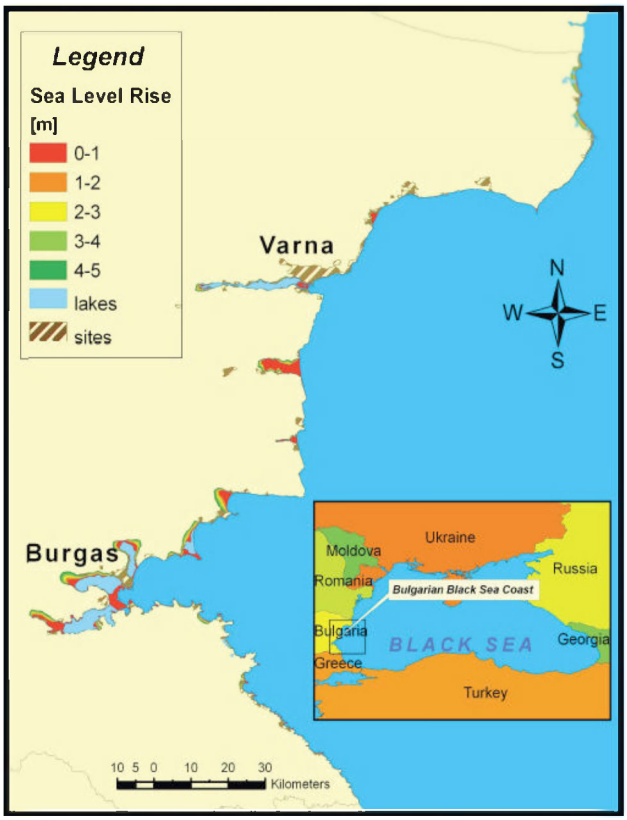

Figure 3: Predicted sea level rise along the Bulgarian Black Sea coast.

The geographical area covered by the BCA includes the Bulgarian Black Sea catchment area, coastline, internal waters, territorial waters, contiguous zone and exclusive economic zone (EEZ). The main topics are physical environment, hydrology, biology, fisheries, aquaculture, coastal habitats, coastal geomorphology and geology, imagery, human impact, tourism and recreation, cultural and heritage infrastructure, socio-economics and natural resources.

At the moment the major data issues are mostly associated with costs (intellectual property rights, data use restrictions, price restrictions), accessibility (limited GIS-ready layers, inaccessible data) and quality (inappropriate data scales, non-existent metadata, and variable data quality). Other issues to be addressed include lack of funding sources for web atlas generation and maintenance; lack of common spatial data standards and harmonized data management between different institutions responsible for the Bulgarian Black Sea coastal zone; lack of common agreements for sharing spatial data between institutions involved in data gathering and lack of suitably qualified staff at the IO-BAS

The main challenge facing the BGODC (IO-BAS) is related to getting the Atlas development underway. As of now only a limited number of datasets have been published in the GIS Server under the BGODC database. However, there are many other GIS-layers in the IO-BAS geodatabase, which cover a range of coastal and marine topics that have to be published online over the next year in order to truly initiate the BCA Atlas. The forthcoming ICAN handbook on coastal web atlases (Wright *et al.*, in press, 2010) will help in addressing implementation issues.

Plans for a Tunisian Marine Atlas

Yassine Lassoued reported on plans to develop a Tunisian Marine Atlas. Taking advantage of links with his home country he visited the National Institute of Marine Sciences and Technologies (INSTM), Carthage, Tunisia in early 2009. Possible collaborations between the INSTM and the CMRC were discussed. One of the first practical outcomes of these discussions is the use of the "MIDA Engine" within the Tunisian Atlas. During 2010, documentation on how to install, adapt and implement the MIDA software will be provided. The institute will then begin populating the Atlas with data and information already available nationally.

A Proposal for a São Paulo State Coastal Atlas (Brazil)

Luis Américo Conti of the University of São Paulo, Brazil presented on efforts to initiate a project for the development of a Coastal Atlas for the São Paulo State coast (southeastern Brazil). He focused on the results of discussions concerning issues related to atlas design, data, technology and institutional capacity. The Brazilian coast, specifically São Paulo State is under intense and conflicting pressures (Figure 4): on the one hand environmental and conservation policies and on the other the necessity of development due to population growth and economic activities (i.e. the recent discovery of large reserves of oil at deep sea locations in Brazilian Territorial Waters).

Figure 4: False-color composite satellite image showing the large built up coastal areas (in purple) around Santos city in the central part of São Paulo State (Source: University of São Paulo).

The proposal for a "São Paulo State Coastal Web Atlas (SPCA)" started during a workshop on protected marine areas held in Ilhabela City, Brazil in March 2009. More than 100 researchers met to discuss the development of a program that would group environmental research projects to help create a management plan and structure with clearly defined roles and responsibilities for conservation policy. A first step is the establishment of a central database to organize the information which could then be shared via the Atlas while also providing a clear and direct platform to receive, integrate, analyze and deliver marine and coastal data.

The project structure is based on a partnership among research teams from various universities, and can involve different knowledge areas allied to an academic base, considering that research requires interfaces with professionals, researchers and students. The project is still at the conceptual stage and there have been discussions by a multidisciplinary group at a technical level.

The project activities will take place at three levels :

- **Technical:** This will involve the development and implementation of specifications and technological support of the Atlas, such as the operating system, Web servers, databases, metadata standards, ontologies, etc.

- **Scientific:** This will focus on the process of scientific knowledge production and how it is related to data modeling and environmental issues. It can involve development of new mapping methodologies and new environmental indices and models.

- **Management:** This will look at Atlas use issues, for example how decision making can be enhanced by improving the understanding of the inter-relationships between natural and socio-economic variables. Such inter-relationships include boundary recognition for protected areas, tracking processes and activities with potential environmental risks, and levels of sensitivity in marine and coastal areas.

A key question to be addressed is how to co-ordinate these various activities and ensure that there is coherency between the three levels. This will require an overarching management plan to ensure that an integrated view is retained during development of the Atlas.

NETMAR and its Relationship to ICAN

Roy Lowry presented NETMAR which is a European Commission funded Framework Program 7 project that aims to develop a pilot European Marine Information System (EMIS) for searching, downloading and integrating satellite, in-situ and model data from ocean and coastal areas. It will be a user-configurable system offering flexible service discovery, access and chaining facilities using OGC, OPeNDAP and W3C standards. It will use a semantic framework coupled with ontologies for identifying and accessing distributed data, such as near-real time, forecast and historical data. EMIS will also enable further processing of such data to generate composite products and statistics suitable for decision-making in diverse marine application domains.

The implementation of EMIS will be done through a set of use cases from different marine application domains, ranging from near-real time monitoring and forecasting of marine pollution to exploration of decadal time series for assessment of climate changes. The developed subsystems will be based on open source software, and will be offered as contributions to SISE (Single Information Space in Europe for the Environment) and SEIS (Shared Environmental Information System).

ICAN is one of the use cases to be explored during the project which starts in early 2010 and runs for three years. The specific issues of relevance to ICAN that will be addressed are:

1. How can *in-situ*, remote sensing, and modeling data be discovered and included in a CWA?
2. How can real-time information be connected to a CWA in an automatic and cost-effective way?
3. How can relevant historical data products be discovered and new ad-hoc products generated on the fly? How can these dynamic products be integrated into a CWA?
4. A CWA contains a diverse range of environmental datasets. How can such multi-domain and multilingual datasets be connected from a local CWA to a web-based EIS (Environmental Information System)?

A key objective in relation to this use case will be to augment or even replace the ICAN prototype with an EMIS workflow. As part of the Ontology Development, the strategy is to locate and utilise existing semantic resources. Bridges, including mappings, will be developed to interface resources to NETMAR. Multilingual functionality will be facilitated through the harnessing of existing technology and only as a last resort will there be the development of new semantic content. A fundamental technology to be used to carry out online "further processing" will be workflow based on chained Web Processing Services (WPSs). WPS is a new OGC Standard that specifies a framework for geo-processing of spatial data over the web (Schut, 2007). NETMAR will use a semantic framework based on ontologies to "glue" the definition, semantics, workflows, etc. of the WPS processes.

The European Marine Observation and Data Network Pilot Projects

The action plan which accompanies the European Integrated Maritime Policy vision documents includes a task to develop a European Marine Observation and Data Network (EMODNET), which is meant to facilitate better governance, expansion of value-added services and sustainable maritime development. Alessandra Giorgetti from the National Oceanographic Data Center (NODC) at the National Institute for Oceanography and Experimental Geophysics, Trieste presented on one of the four EMODNET pilot projects (http://nodc.ogs.trieste.it/nodc/projects/emodnet) which are funded by DG-MARE in order to initiate development of the EMODNET. These pilots focus on four different thematic areas (hydrography, marine geology, chemistry, biology) started in June 2009 and will run for three years. The data collated over the lifetime of the projects will feed into the European Atlas of the Seas. The overall goal of these pilots is to assemble fragmented and inaccessible marine data into interoperable, contiguous and publicly available data streams for complete maritime basins.

The specific objectives are to:

- collate existing data into interoperable formats
- develop, test, operate and maintain a portal for data access
- monitor and report on the effectiveness of the system in meeting the users' needs
- analyse what further steps are needed to improve the system
- analyse the necessary requirements to keep the system as a sustainable infrastructure

In order to ensure connection of the EMODNET portals to the SeaDataNet distributed infrastructure the pilots will follow the following strategy:

- Develop a high-end dedicated portal, outfitted with a powerful spatial database, that is complemented with WMS, WFS and WCS services (OGC) to serve users and to provide layers for the other EMODNET portals, the prototype European Atlas of the Seas, and the broad-scale European Marine Habitats map;
- Involve research institutes and monitoring authorities in providing data sets for producing interpolated maps with specific resolution for each geographical region, that are loaded and integrated afterwards into the portals' spatial databases;
- Include in the portal a metadata discovery service, by adopting the SeaDataNet CDI metadata standard, that *inter alia* gives clear information about the background data, the access restrictions and distributors.

The chemistry pilot is being developed at the NODC and focuses on the groups of chemicals required for monitoring under the Marine Strategy Framework Directive and includes synthetic compounds, heavy metals, radionuclides, fertilizers and other nitrogen- and phosphorus-rich substances, organic matter (e.g. from sewers or mariculture) and hydrocarbons including oil pollution.

The geographical regions to be included in the study are:

- the Greater North Sea, including the Kattegat, and the English Channel. It includes stretches of water (Fair Isle, Cromarty, Forth, Forties, Dover, Wight, Portland) identified in a recent study as being those European waters most affected by human activity;

- the Black Sea;
- five areas in the Mediterranean: Balearic Sea, Gulf of Lion, North Adriatic Sea, Gulf of Athens and northeast Levantine basin.

TECHNICAL DIRECTIONS/DEVELOPMENTS

Update on the Interoperability Prototype of the ICAN Coastal Atlas Portal

One of the major activities since the July 2007 workshop has been the development of a prototype to demonstrate semantic interoperability within CWAs, for the purpose of eventually serving as an ICAN Coastal Atlas Portal where people can search for and view geographic data from multiple atlases. The prototype development thus far has focused on metadata and catalog services, and next will extend to inclusion of WMS (Wright *et al.*, 2007; Dwyer and Wright, 2008). The aim of the prototype is to exploreThe Oregon Coastal Atlas (OCA) and the Marine Irish Digital Atlas (MIDA) were the first two "nodes" in the prototype due to their advanced state of development, their use of a similar technology platform (Minnesota Map Server) and the strong working relationship between Oregon State University/the Oregon Coastal Management Program and the Irish CMRC (Dwyer and Wright, 2008). The Flanders Marine Institute Administrative Boundaries Geodatabase and the Washington Coastal Atlas have emerged as additional nodes, with the Wisconsin Coastal Atlas steadily working toward participation as well.

At ICAN 4 discussions continued about the additional work needed on partnerships, infrastructure and data exchange formats, all to address the overall objectives of enabling the nodes to share and communicate with each other, avoid duplication, and streamline information management. Yassine Lassoued of the CMRC, Liz O'Dea of the Washington Department of Ecology, and Tanya Haddad of the Oregon Coastal Management Program presented a general introduction to the prototype, which is now essentially at Version 2.0. They also presented the progress to date on its further development, including:

- Bugs fixes which have been addressed.
- New functionalities that have been added (e.g., bounding boxes, ability to check on status of nodes, etc.).
- New graphical user interface using Adobe Flex (Figure 5).
- Separation between server side and client side code so that one can send queries to the mediator without using the interface. One can now also implement one's own interface and connect it to the mediator if not wanting to use ICAN's.
- Users can have direct interaction with nodes, select nodes, and view the behind-the-scenes code in action using the event monitor.
- Progress to date with the Washington Coastal Atlas' connection to the prototype, including lessons learned in using ESRI's GeoPortal Extension for its Catalog Service for the Web (CSW), as opposed to the open source GeoNetwork

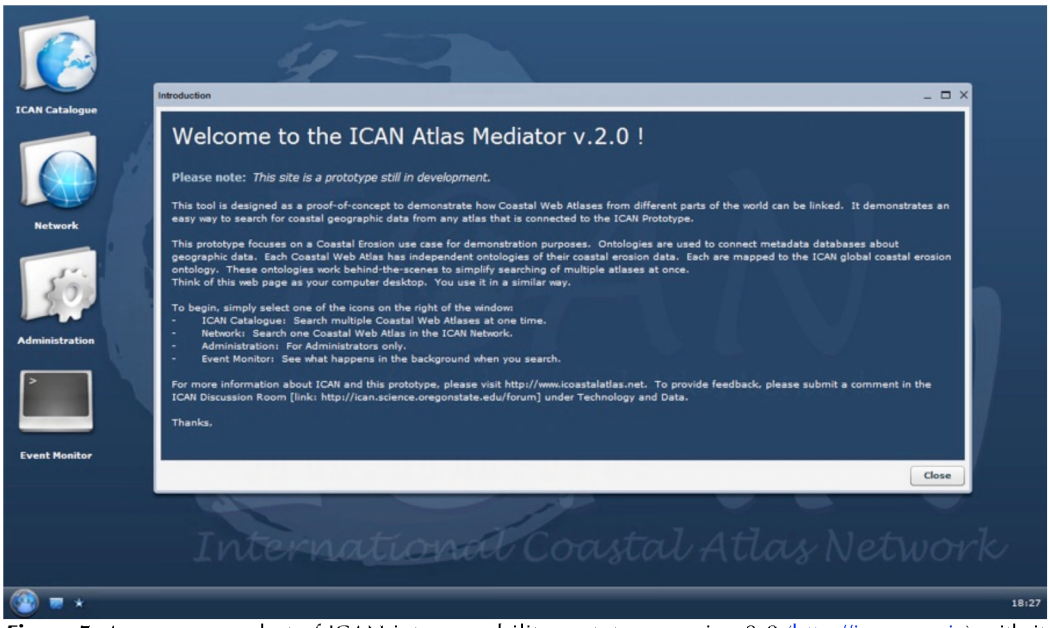

Figure 5: A screen snapshot of ICAN interoperability prototype version 2.0 (http://ican.ucc.ie) with its new user interface employing Adobe Flex.

Future work on the prototype will include the following objectives:

- OGC services will be extended to include WMS for data visualisation and then Web Feature Service (WFS) & Web Coverage Service (WCS) for actual data delivery. A demonstration implementation of WFS and WCS for actual data delivery will be implemented for OCA and MIDA in a later prototype.

- Share resources (thematic information about layer), and structure thematic information using ontologies (instruments, platforms, parameters, themes, disciplines, etc.)

- Advanced semantic framework will now be driven by NETMAR as described in an earlier section

- Continue to add more coastal atlas nodes (e.g., the Atlas of the Lagoon in Venice would like to work toward being a node).

- Create documentation on technology development, ontology development and a cookbook for new ICAN prototype members.

Ontology Content Governance and Use Cases

Luis Bermudez of the Southeastern Universities Research Association and the Marine Metadata Interoperability (MMI) initiative shared progress to date and lessons learned from MMI's semantic mediation prototype in development for the Ocean Observatories Initiative (OOI). His presentation helped the group to see the overall picture of what MMI has been advocating in terms of semantic registration and ontology registries. Once one has an ontology, the idea is to

map it with other ontologies, with the mapping being the key to discovering and building relationships to the other ontologies. As an additional example in support of OOI, some communities are working very hard to create an ocean sensor ontology that will be sanctioned by the World Wide Web Consortium.

There will be many communities creating their own technologies and mapping them using the technologies that Luis described (see full presentation by way of Appendix C), but *content governance* is also an important issue. Each community will pick their own upper, central ontologies, but tools will also be needed for automatic metadata creation (e.g., sensors), and for reviewing and accepting the content by a vetting body (e.g., approval of ICAN ontologies for the MMI ontology registry). If the process is there, the technology will provide helpful content governance, even if personnel change. Roy Lowry added that a key objective of NETMAR is to deal with domain ontologies. Hence, NETMAR should be able to find and build ontologies, and to play a role in ICAN ontology content governance. The participation of ICAN as a use case within NETMAR will be very important in this regard.

One caution that was discussed is the situation where a programmer/developer also has the burden of doing the ontology mapping. This assumes that the programmer has all knowledge of all domains. What is needed is an ontology content governance group made up partly of domain experts (e.g., local resource managers or scientists), to help make content governance decisions. We will need expertise at both the global and local ontology levels, and for the global and local ontology experts to communicate together.

One aside was shared by Roy regarding the processing of ontologies when using the ESRI GeoPortal Extension as a CSW. The British Oceanographic Data Center had originally installed the ESRI extension and found that ESRI does not implement standards correctly. Resulting XML documents were incorrectly imbedded with ESRI namespaces. They decided to abandon the ESRI extension and move on to GeoServer. They will likely end up using GeoNetwork. Liz shared that the Washington Coastal Atlas team will persist with ESRI technology for now, as it is standard throughout their agency and they must seek special permission to use other products.

As discussed at ICAN 3, use cases can be developed around related topics to facilitate ontology development and ultimately interoperability across coastal atlases (Dwyer and Wright, 2008). Coastal erosion was chosen as a use case theme of global relevance, with pertinent data layers already existing in atlases participating as nodes in the prototype. Discussion at ICAN 4 centered on the true viability of coastal erosion as a use case, and how the emphasis might be improved or broadened. On one hand, coastal erosion is a major issue with ongoing research that continues to be funded in several connecting regions (such as Oregon and Washington). And the true usefulness of the ICAN prototype comes into play when there are neighboring regions working together on a common issue such as coastal erosion. On the other hand, we have not yet been able to get to the place where we can truly test whether the use case is effective. This needs to be demonstrated clearly, especially in terms of seeking funding. We need to fully play out the coastal erosion use case to make it useful for coastal erosion managers in order to show full utility, with a prototype to prove the concept, and with more interaction with a use case and management group. The parameters and results of the use case also need to be fully documented (potentially in the cookbook). Perhaps the need now is to

propose to work with coastal managers or a regional user group who might be interested in participating with us in a use case or a demonstration.

While coastal erosion *is* a very important, fundable issue, it was mentioned that INTERREG (a European Union funded program) funds projects which apply existing technology to regional development, and there may be something along those lines that ICAN could develop to help managers in the North Sea. Hence a coastal erosion use case could be imbedded into a larger project that has funding. There is also the possibility that the atlases already connected in the prototype can continue working on an erosion use case in depth while new atlases connect under any theme that they want that is of use to their own user communities (pollution, tourism, environmental, social, or sustainability indicators on coast, marine spatial planning, etc.). Indeed climate impact indicators are being developed throughout the US, both for built infrastructure and green infrastructure. Marine spatial planning is among the ocean priorities of President Obama's new ocean task force, and part of the effort will be identifying necessary tools to aid in marine spatial planning. And in the US, while climate is being sold by some as a job *loser*, marine spatial planning and offshore energy are seen as important job *generators* in a difficult economic climate. ICAN needs to find issues that governments and funders are interested in. If we can connect ICAN to these issues, we stand a good chance for funding success. We may just need to show technical prowess.

An Interoperability Prototype Cookbook

An important discussion ensued on how best to structure and create a cookbook that will help new atlas administrators to connect their atlases to the ICAN prototype Coastal Atlas Portal. Four main questions guided the discussion: (1) How should we structure the cookbook? (2) What should be included/excluded? (3) What existing resources can be used? And (4) How should we proceed? Main discussion points under each question are included below:

(1) How should we structure the cookbook?

- May be best to minimize the mention of "ontology," "standards," or specifications or even spatial data as many audiences still do not understand or resonate with these technicalities (however some technical talk may be needed when describing how new atlases will connect to the prototype).
- Use simple terms and good examples. David Hart suggested that documents from the Center for Language Education and Research (CLEAR; http://clear.msu.edu/) at Michigan State University document may provide a good model, especially with their clear and effective discussion of mashups.
- Also needed is a small review committee of non-technical people to help TWG people develop the cookbook.
- Use Wiki style like GSDI cookbook, which can also take comments from people.
- Warning: Cookbook may not be able to keep up with new technology, but we can at least structure it at the outset, starting with generic items, such as CSW, but not going into ontologies (which will change too quickly).

(2) What needs to be included?

- A glossary would be helpful.
- Dictionary with existing definitions that other atlases have used (a repository).
- Definitions for ontology super terms, which are currently in the works.
- List of tools, such as Protégé and implementations of CSW (see notes from Technical Breakout at ICAN 3; http://ican.science.oregonstate.edu/ican3_prog).
- Template ontology? Users can add or delete? Coastal erosion use case? Start with global ontology as a template and refer people to the local ontologies that CWAs have alreadydeveloped.
- Quick start for those up-to-date technically.
- Videocast of how to register keywords, or how to install network and put on YouTube - CommonCraft, 3-5 minute videos, can use Adobe Capture software.
- Review examples of existing cookbooks / layouts for other ideas that we can use:
    - MapServer cookbook
    - OOS Tethys
    - EEA resources (Andrus Meiner)
    - CLEAR
    - NOAA CSC flipbook about metadata
    - MMI cookbooks on how to register ontologies; MMI Guides Team

(3) What existing resources can be used?

- Tanya Haddad's email dialogue with David can form the basis of an FAQ
- The new ICAN handbook to be published by IGI-Global (Wright *et al.*, in press)
- Belgian coastal atlas version 2 documentation?
- Flow diagrams.
- SDI cookbook for GSDI as an example?

4) How should we proceed?

- Agree on chapter structure beforehand and editor for each chapter - volunteers for editors of chapters of book.
- Have users write the cookbook as they learn, and then editors clean it up.
- Have people adopt a chapter or portion, being willing to comment on or even to lead.

MINI WORKSHOP FOR CWA USERS

The mini workshop for Coastal Web Atlas users investigated feedback mechanisms and ways to measure the impacts of atlases. In particular the session addressed the questions:

- What methods are currently used to gather user feedback and are these appropriate when trying to improve elements of CWAs to meet users' needs?
- How can these methods be improved and what additional means of gathering feedback should be considered?

The collection and analysis of CWA user feedback is extremely important in order to gauge CWA impact. A range of tools and mechanisms are used to acquire feedback, which can have

different levels of detail and quality. Different tools were discussed during the workshop as well as the advantages and disadvantages of user surveys. How users could be facilitated in providing content to atlases was also discussed. Experiences from developers of the Marine Irish Digital Atlas, the Washington Coastal Atlas, Chesapeake Bay coastal Atlases, the Wisconsin Coastal Atlas and the Belgian Coastal Atlas were presented.

Web-GIS Usage, User Feedback and User Interfaces

Kathrin Kopke from the Coastal and Marine Resources Centre, UCC, Cork spoke about user feedback from the MIDA and user-interface design issues in relation to the maritime security elements of the EU FP6 funded LIMES project.

The Marine Irish Digital Atlas (MIDA) has been shown to have numerous uses from providing data and information to different groups of end-users to being a valuable training resource for skills in web mapping, data and metadata management. The use of the 'MIDA Engine' or core software elements of the MIDA in other national and international initiatives requiring web GIS portals illustrates the added value of the project as it has demonstrated the technical skill set available within the CMRC which has in turn led to additional project work. At regular intervals throughout the design and development phase of the MIDA project developers consulted a representative cross-section of end-users. This proved to be vital, as the end-user input ensured that the Atlas met their needs. Face-to-face meetings have proven to be somewhat more effective than anonymous web-based surveys as a means of gathering feedback. Recurrent analysis of the Atlas usage statistics has highlighted the most popular aspects of the MIDA, which is informing the ongoing development work.

The challenge to update the MIDA interface was seen by workshop participants as extremely important. As the interface ages it generates an impression with certain atlas users that data or information provided is also dated even though data is kept up to date and new data is added on a regular basis. The Idea of allowing users to input content to the Atlas was raised as it is a means that can help create a sense of ownership for the user community and therefore help raise awareness of MIDA itself. However, issues of site access and quality control of user input would need to be addressed. Examples such as Oregon's North Coast Explorer (http://northcoastexplorer.info), which includes a special data type known as a "story" (essentially a user's case study about an important issue such as habitat restoration and how he/she used the atlas to address the issue), or the use of geoRSS feeds (http://georss.org, where users can receive updates about new atlas content via short pieces of text or via location as expressed in Google Maps) were discussed. These mechanisms could be further explored for applicability in MIDA.

The LIMES project is a large project funded by the European Commission. LIMES is exploring how new and emerging data sources from recent civil satellites, Sat-AIS and GPS may be combined and used to address issues of maritime security. The end user community for the LIMES Web GIS demonstrator is specialized and includes Navies, Customs and Coastguards. These are operational users that require information at a certain time and with a quantifiable reliability. Specific applications include how to identify suspect vessels to combat for example drug trafficking or illegal immigrant transportation. The demonstration LIMES user-interface for maritime security is a prototype and was introduced to the ICAN community to gather feedback

given their experience with user interface design for diverse end-users. The key messages from the group discussion included:

- Use cases for each end-user organization should be devised and provided in order to capture the user response, which can then help the developers of the interface.
- Standard workflow that includes the end user input should be developed and followed to ensure that the application is answering to the user requirements.
- Interface development should follow an iterative approach where the interface presented could be considered a prototype, which, based on feedback, could then be upgraded to provide necessary functionality and enhanced ease of use for the target audience.
- The most important users should be addressed in a focus group for detailed feedback in the development phase of the interface.
- An interpretation tool tailored to improve the decision making process of the end users could be incorporated.

West Coast Coastal Atlas Workshop: A Model for Other Regions

Kathy Taylor from the Washington State Department of Ecology, Washington Coastal Atlas team spoke about the West Coast Coastal Atlas Workshop, which took place in April 2009 (Purce *et al.*, 2009). This was the first time a meeting like this had been held on the west coast of North America. The Workshop was put together through a multi-partnered collaborative effort which included energetic staff and supportive management at Washington Department of Ecology, staff time and conference facility contributions from NOAA, and web site and informational support from ICAN.

Many existing Coastal Atlas applications, using different technologies have been developed by different government organizations to meet user needs in the specific geographic area of the governing body. However many needs are regional, as is shown by the West Coast Governors' Agreement on Ocean Health and the Pacific Coast Collaborative Agreement.

The goals of the West Coast Coastal Atlas Workshop were to:

1. increase contact among existing and emerging coastal web atlas efforts on the west coast,
2. inform one another of future plans and data gaps, and
3. explore opportunities for collaboration.

The workshop brought together over 30 participants from Alaska, British Columbia, Washington, Oregon and California representing state coastal zone management programs, state universities, and four branches of NOAA, private consulting firms, and non-governmental organizations (Figure 6). Prior to the 2-day workshop, each coastal atlas submitted a one-page summary describing their application. The first day of the Workshop consisted of presentations and discussion of coastal web atlases and web mapping applications. The second day consisted of structured discussions focused on collaborative groups, relevant legislation, regional

information needs, data coordination, and group priorities. In addition to increased communication, the Workshop outcomes included prioritized coastal atlas data needs for the west coast and an agreed list of next steps for west coast coastal atlas coordination. Lessons to share with other coordination efforts include the importance of making contact with the managers/project leaders of other coastal atlas efforts prior to workshop planning, setting reasonable workshop goals, focusing on areas of agreement or convergence during the workshop, documenting the results of the workshop, and actively communicating the results to existing regional efforts. More detailed information regarding the workshop can be found in Purce *et al.* (2009).

Figure 6: Attendees at the West Coast Coastal Atlas Workshop, in Seattle, Washington, USA (from Purce *et al.*, 2009).

Kathy explained how this workshop proved to be very useful in terms of gathering specific feedback for the Washington Coastal Atlas (WCA). In particular, positive user response in regard to the utility of the oblique aerial photographs in the Atlas was forthcoming. WCA developers also explored availability of west coast LIDAR data, but contacts with the LIDAR consortium confirmed that the desired data were not available; however John Helly, in attendance at the ICAN workshop, offered support for additional enquiries concerning LIDAR data for the WCA.

Peer review of coastal data quality and data standards was identified as an activity of importance to the participants in the regional atlas workshop. However, the group has not yet undertaken this large task, which would involve issues concerning different data standards and data quality, as well as institutional concerns because of the cross-state nature of the work. Issues of age and relevance of data included in the WCA to date were explored to see whether the WCA ontology could relate to the coastal erosion ontology of ICAN.

WCA plans to undertake a future user survey with a focus group via survey monkey or similar online tools. Previous WCA surveys, which gave valuable information in terms of data needs and requirements, were undertaken with people known to use the atlas. A further exploration of

user community input was investigated with the example of the Pacific Coastal Resources Atlas for British Columbia, Canada, which enables users to contribute their own data. The Venice Lagoon Atlas was also highlighted in that it provides certain mechanisms for user input. Other discussion points were raised such as involving users through more formalized mechanisms (e.g. user networks or school projects), however these networks may have a more general target audience than WCA which specifically aims to target decision makers, coastal managers and planners. Additional challenges may be encountered by government institutions when encouraging the general public to add their own data to atlases compared to research institutes, schools or network projects.

Coastal Atlases Within the Chesapeake Bay Region

Marcia Berman of the Virginia Institute of Marine Science spoke of how the importance of regional atlas development is well demonstrated in an estuary as large and ecologically significant as the Chesapeake Bay. The states of Virginia and Maryland comprise a large portion of the watershed surface area, and both face similar challenges and responsibilities to improve water quality, enhance habitat restoration, and adapt for climate change impacts. A CWA has been developed in each state to support state and local government planning. A review and comparison of these tools reveals some notable findings. First, both are funded by their states' NOAA funded Coastal Zone Management Programs and support a broad user audience. Both use ESRI's ArcIMS platform to develop and serve their atlas. Internal program limitations force both CWAs to be developed and maintained off site, and Virginia and Maryland program managers agree this creates a number of challenges. Major differences between the CWAs pertain to content. The Virginia Coastal Geographic and Education Mapping System (Coastal GEMS) is almost exclusively an interactive map interface. Maryland's Shorelines Online combines an interactive map interface with a broad array of outreach material, web based tools, and links to real time data streams.

The Research Agenda of the Wisconsin Coastal Atlas

The Wisconsin Coastal GIS Applications Project has been ongoing, in various phases since 1994. David Hart, University of Wisconsin Sea Grant Institute, presented four specific integration projects of relevance to coastal web atlases that have been developed over this period and explained how they have influenced the development of a Wisconsin Coastal Atlas scheduled to start in February 2010.

As part of the Lake Michigan Potential Damages Study (1998-2000) data on parcels, base maps, orthophotos, land use/land cover, and soils were acquired and integrated for coastal counties and cities in Wisconsin. This integrated database proved useful and allowed local government data to be used in a number of regional analyses. However, it was noted that some coastal data maintained by local governments quickly goes out of date and that spatial data needs dedicated data managers.

The Lake Superior Coastal Mapping Portal project (2003-2005) had the objective of supporting integrated coastal management along the Lake Superior coast of Wisconsin. The portal developed was successful at showing the potential of integrating web-mapping services in

Wisconsin, however it suffered from slow performance and maintenance issues and the interface proved to be poorly suited to maintain a functional catalog of interoperable web mapping services.

The Wisconsin Coastal Guide is an interactive web-mapping site that supports coastal heritage tourism and features parks, beaches, shipwrecks, and lighthouses. Maps can be viewed via Google Maps, Google Earth and OpenLayers. Links to information on relevant external sites are also provided. The Google Earth compatible KML is now an OGC standard that promotes interoperability. Providing a stable URL to the KML files promotes their use in other web mapping applications. The mapping mashups researched in this project have been beneficial in promoting tourism, but also illustrate how little guidance exists on deciding among the various approaches to developing web mapping interfaces.

The Wisconsin Coastal Data Catalog has been developed using GeoNetwork. The experience gained would indicate that this provides the best open source option for implementing a coastal spatial data catalog. However, difficulties were encountered in customizing the interface, metadata import, displaying WMS and KML and harvesting CSW.

The major goals of the Wisconsin Coastal Atlas are that it will serve as the portal to geospatial data for the Great Lakes coasts of Wisconsin and that it will promote the development of a spatial data infrastructure for the Great Lakes coasts of Wisconsin through methods for cataloging, archiving, and semantic integration. The initial focus will be on implementing the maps and search components for coastal hazards. Development will be synchronized with the employment of a NOAA Coastal Management Fellow for two years who will help build a Great Lakes spatial decision-support toolbox. Five key research objectives will be addressed in development of the Wisconsin Coastal Atlas:

- Design and evaluate the Atlas using a formalized development process such as the LOGIC model;
- Develop the web portal interface using the Oregon Coastal Atlas as a key example;
- Design, develop, and evaluate web mapping interfaces and ensure strong cartographic design;
- Develop and implement a CWA geospatial data catalog with concurrent archiving capabilities;
- Develop ontologies for coastal hazards in Wisconsin to promote semantic integration and add the Atlas as a node in the ICAN interoperability prototype.

User Analysis of the Belgian Coastal Atlas and Future User Needs

Kathy Belpaeme of the Coordination Center for ICZM, Belgium presented recent developments of the Belgian Coastal Atlas. The online version of the Atlas was launched in October 2005 (Figure 7), following the publication of the book in 2004. Developing an online atlas originally was not the intention. The aim was to publish a tabletop atlas as part of the reporting system to the European Commission. The challenge at the time of the online development was mainly to achieve the best possible link with the book. The online version of the atlas is available in four languages: Dutch, French, English and German.

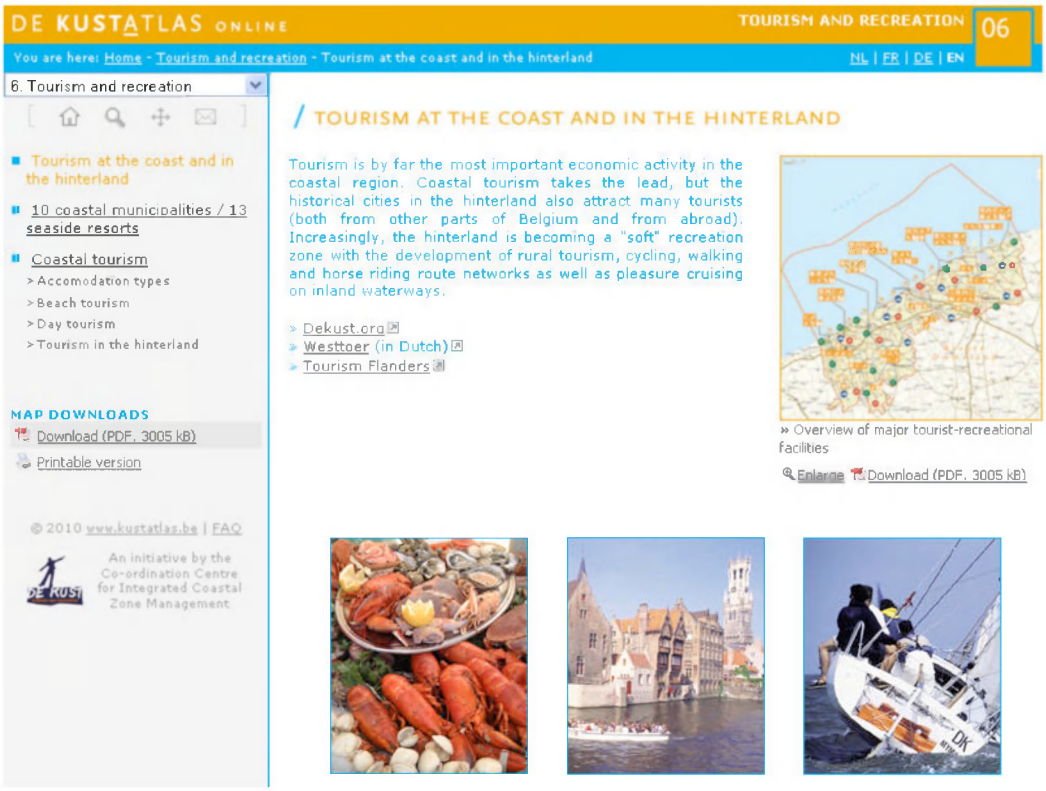

Figure 7: A screen shot of one of the thematic pages with De Kustartlas.

Visitor analysis using web statistics shows that the atlas has on average 2000 unique visitors per month since the launch. In the period 2005-2008 about 17% of the visitors visit the website more than once a day and most visits are work related. Forty percent of the visitors access the website through the direct web address; about 53% use a search engine. More than 50% add the site to their favorites. The top three visiting countries in 2008 were Belgium, the Netherlands and France.

The feedback on the Atlas is unanimously positive. Visitors appreciate the layout and the easy way to navigate through the website. Also the simplicity and the fact that visitors are not overwhelmed by information to choose from is highly valued. An end-user workshop was held in April 2009 to help determine the future development and revision of the atlas. The end-users see an important role of the coastal atlas as a communication tool and a portal for coastal information. Providing unique and integrated maps is seen as an important added value. By integrating tools and instruments such as sustainability indicators, policy documents and a coastal Wiki in the Belgian atlas, it should develop towards a policy support tool, aiding the ICZM process for a wide range of coastal actors, planners and managers. In the revised version of the Belgian CWA, new ways of receiving user feedback will be integrated in the site.

Discussion on Users

The analysis of user feedback is as important as the identification of existing, new and emerging technologies to provide good quality and reliable user feedback. Baseline information such as the IP address, data downloads, visitor numbers, type of browser or country code is collated by many CWA developers. These are felt to be very useful especially with regard to Atlas interim updates and to gauge trends, however many CWA developers require more detailed information such as an indication of how data downloads have been used or more qualitative evaluation of CWA elements to enable Atlas improvement based on user experience. Trying to collect detailed information from CWA users through pop-up windows which might, for example, request a user to identify themselves could annoy end users, lead to inaccurate information being collected and in the worst case discourage atlas use. Other mechanisms that have been shown to be popular and successful should be considered such as those used in Web 2.0 applications such as "like/dislike" buttons. These tools might not provide a detailed user evaluation of the CWA but can indicate trends and offer instant impressions of user opinion on information, format or layers in a CWA.

User surveys are often perceived as tedious and need an effective design so that users will not be discouraged by the large amount of information requested. During 2009 a survey was designed by an ICAN working group. However, it was believed that a revised version should be designed and this could be published on individual atlas pages. However Atlases would need to show that the survey has a goal such as atlas improvements in order to motivate the end user to provide information. Focus groups could be targeted for more detailed semi-structured surveys to answer specific questions.

Encouragement of a sense of ownership in the CWA user community, such as that achieved by web applications that allow more direct user input and even provision of data, should be further explored by individual CWAs, as this could deepen the understanding of user needs and improve the relationship of the atlas developer with the user community. However, issues of data and information quality control as well as access rights to the atlases and security concerns would have to be addressed, and these differ depending on the type of CWA host organization.

Useful Links

Coastal Atlases

The Belgian Coastal Atlas: http://kustatlas.be
The Marine Irish Digital Atlas: http://mida.ucc.ie
Maryland Shorelines Online: http://shorelines.dnr.state.md.us/
Oregon Coastal Atlas: http://www.coastalatlas.net
Pacific Coastal Resources Atlas for British Columbia: http://cmnbc.ca/atlas_gallery/pacific-coastal-resources-atlas-british-columbia
Virginia Coastal GEMS: http://www.deq.virginia.gov/coastal/coastalgems.html
The Washington Coastal Atlas: http://www.ecy.wa.gov/programs/sea/sma/atlas_home.html
Wisconsin's Lake Superior Coastal Mapping Portal: http://maps.aqua.wisc.edu/lscmp/wlscmp_resources.htm

Other Links

Lake Superior Coastal Mapping Portal: http://maps.aqua.wisc.edu/lscmp/
The LIMES project: http://www.fp6-limes.eu/
The Oregon Explorer: http://www.oregonexplorer.info
Pacific Coast Collaborative Agreement: http://www.pacificcoastcollaborative.org/
West Coast Governors' Agreement on Ocean Health: http://westcoastoceans.gov/
Wisconsin Coastal Data Catalog: http://speedy.ersc.wisc.edu:8080/geonetwork/
Wisconsin Coastal GIS Applications Project: http://coastal.lic.wisc.edu/
Wisconsin Coastal Guide: http://www.wisconsincoastalguide.org/

FUNDING STRATEGIES

United States Funding Opportunities

A side meeting, facilitated by Dawn Wright, looked at potential funding opportunities within the US National Science Foundation, NOAA, and the EPA that might support ICAN activities. The group discussed a basic science angle (NSF type research questions, technical development, as well as the more applied, marine spatial planning (MSP) angle, where policy and outreach are also paramount. The applied angle may be more appropriate for ICAN in the long run, especially given that MSP cannot be done effectively without the proper data. Given that our atlases have a state and regional emphasis, we are in a bit of a quandary given the poor funding available from states in the current economic downturn.

John Helly shared some of his projects in progress in California:

- US Navy Sea Level Rise
- collaborations with Lisa Levin at Scripps on work requested by NOAA on ocean hypoxia, ocean acidification, formation of a possible hypoxia data network that might be centered around the emerging California Coastal Atlas. This would actually be more of a basic science implementation for ICAN, rather than resource management focus.
- State of California getting broadband wireless money from the Obama administration, but need LIDAR data collected at San Diego and NASA Ames. Would this be the backbone of a statewide geospatial architecture? With best current imagery, use atlases to plug into and extract data, link in to communities of interest.

The group discussed how ICAN might *develop a requirements process*, that would point out how CWAs are in a position to say what coastal resource managers, state agencies, and science communities need in terms of sources of data. This could then feed down to the individual project level. One requirement is for data but another requirement is to greatly improve the ability to explore options for the data that are available (a data mining issue). Another issue is lack of staff capacity.

ICAN could also seek to provide to the coastal management and science communities a high-resolution shoreline, a true "digital coast" for the whole nation. This could be built at the local level (e.g., states have already developed such shorelines which could be pieced together for the nation). The Environmental Protection Agency (EPA) is building a national hydrographic dataset at 1:24,000 but there is no national activity that is gathering a comprehensive, standard shoreline in terms of surf zone bathymetry. Items of note included:

- Compilation of research and management value of ICAN; pull together existing resources, perhaps gap analysis (a start is already online at http://ican.science.oregonstate.edu/ican_benefits).
- White paper requirements documents for high-resolution shoreline, vetted at the ICAN level, market it to different organizations (NOAA, EPA, USGS, NSF GEO directorate, the US Navy, state Coastal Zone Management programs via the NOAA Coastal Services Center, and the Federal Geographic Data Committee's Marine and Coastal Spatial Data Subcommittee). We need to find the proper program and interagency effort: EPA National Estuary Program (Kathy?), and perhaps the Water and Semantic Clusters of the Open Geospatial Consortium?
- Five uses cases as an appendix to the white paper.
- Market white paper around and seek requests for proposals.
- ACTION: John will start draft of white paper (see Appendix F).

Current funding possibilities for 2010 include:

- John in California – develop ICAN-vetted data requirements document; consensus statement; link that in to restoration, offshore energy
- Tim Nyerges is still waiting to hear on his NSF Sustainable Digital Data Preservation and Access Network Partner (DataNet) proposal that includes ICAN.
- Kathy's pilot with NOAA CSC and Digital Coast and beyond (Tony's backing, Digital Coast and partners backing?)
- Tie state efforts in coastal zone management to science at USGS, EPA, NOAA - data archiving, lots of money for estuary, wetlands and island restoration, and then MSP focus; conflicts over alternative energy uses with other ocean uses
- Possible NSF Partnerships for International Research and Education (PIRE) proposal involving all - Dawn has old draft of prior PIRE proposal; Tim also wants to make links with Francoise Breton via the EU-FP7-funded People for Ecosystem Based Governance in Assessing Sustainable Development of Ocean and Coast (PEGASO) initiative
- Less likely, but also a possibility is the ICAN Tech Team working on an NSF Community-based Data Interoperability Networks (INTEROP) or Cyber-Enabled Discovery and Innovation proposal as opportunities arise

European Union Funding Opportunities

A second side meeting, led by Roger Longhorn, looked at potential funding opportunities within the European Union, which could support ICAN activities.

There are a range of different funding instruments and programmes available and these fund different types of activities. In order to target the appropriate funding mechanism it is important to address two questions:

1. What is ICAN – i.e. what are we requesting funding for?
   - An information service?
   - The ICAN Mediator portal and its supported tools?
   - A thematic network?
   - A best practice network?
   - Something else?

2. Having defined clearly for what funds are being requested, it is important to define how the funding is to be used.
   - further development of the ICAN software for the Mediator?
   - tools to help other CWAs to link to the Mediator portal?
   - expansion of the ICAN network?
   - something else?

When addressing these two questions, it is important to be aware of existing EU funded initiatives, in order not to propose to carry out activities already funded.
For example, a list compiled by Enterprise Ireland indicates that there are a number of projects with a marine theme already funded under Framework Programme (FP) 7.

The INSPIRE initiative can be viewed as both an opportunity and a threat. INSPIRE is addressing areas of data interoperability as is ICAN, therefore we need to be careful not to duplicate already funded activities. Existing projects such as HUMBOLDT http://www.esdi-humboldt.eu/home.html and BLAST should be explored in order to see if there are complementarities to ICAN. As ICAN involves institutions and collaborators from outside Europe it offers an opportunity to raise awareness of INSPIRE and promote wider adoption of its principles.

Another consideration is to maximise participation in already funded programmes. An ICAN use-case will be developed under the FP-7 NETMAR project to start in early 2010. This will allow some of the priorities in regards to ontologies to be advanced. The PEGASO project (http://www.pegasoproject.eu/), which will also start in early 2010, is looking to improve coastal management in the Mediterranean and Black Sea basins and offers potential to advance some ICAN goals.

Potential Funding Mechanisms

In terms of funding mechanisms there are four programmes which offer potential for ICAN activities:

COST (European Cooperation in Science and Technology) http://www.cost.esf.org/

- This funds activities in nine thematic domains. The most relevant to ICAN are those in ICT and Earth System Science and Environmental Management (ESSEM). Inter-disciplinary proposals not fitting readily into a single domain are also welcome

- Proposals should include researchers from a minimum of five COST countries and financial support in the range of €100,000 p.a. for normally four years can be expected.

- Project proposals are solicited on an 'open call' basis – i.e. you can submit at any time, but the proposals are only 'collected' and evaluated periodically (about every 6 months). Proposals are assessed in two stages by external experts. The next round of preliminary proposals (1500 words maximum) will be collected 26 March 2010

CIP ICT PSP - Competitiveness and Innovation Programme, ICT Policy Support Programme (ICT PSP) http://ec.europa.eu/cip/index_en.htm
CIP is an extension of the previously known eContent programme. Its focus is on information market oriented developments and there is a geographic information component under ICT PSP (Public Sector Policy). Activities funded include

- Thematic Networks
- Best Practice Networks
- Pilot Projects – type A - building on initiatives in Member States or associated countries and focusing on developing EU-wide interoperability of ICT-based solutions;
- Pilot Projects – type B - stimulating the uptake of innovative ICT based services and products.

The next call for proposals is expected to be in early 2010.

Framework Research Technology and Development. http://cordis.europa.eu/fp7/
This is the largest RTD funding mechanism of the EU. The current programme is called FP 7 and has 5 'specific programmes' – Cooperation, Ideas, People, Capacities and Nuclear Research. The most relevant to ICAN is *cooperation* and includes the main ICT-related projects, fisheries, environment (including climate change), transport, etc. The funding mechanisms include:

- Collaborative Projects – with 'clearly defined scientific and technology objectives and specific expected results', such as developing new knowledge or technology to improve European competitiveness. Funding is typically from 50% to 75%.

- Networks of Excellence – for research institutions to combine and 'functionally integrate a substantial part of their activities and capacities in a given field....' This one would not appear to be of relevance to ICAN.

- Coordination and Support Actions – funding not for research, as such, but for coordination and networking of projects, programmes, and policies. This could be useful – several of the early INSPIRE pre-implementation projects in FP6 were 100% funded Support Actions – but competition is fierce.

Work programmes of the FP7 are agreed in discussions with EU Member States. National Contact Points (NCPs) can be encouraged to promote certain activities which may result in them being included in work programmes. If many NCPs are pushing the same activity, then the chances are higher. Therefore once clear ICAN objectives are described it would be valuable for ICAN representatives in EU states to coordinate efforts in regard to promoting these via NCPs.

INTERREG IV (2007-2013) http://ec.europa.eu/regional_policy/index_en.htm
This is a programme of structural funding for strengthening social and economic cohesion throughout Europe, supporting projects and actions in three axes: A - Cross-border; B - Trans-national; and C - Interregional. Non-EU participants are allowed, but typically receive no funding (other than travel). These tend to be very large (multi-million euro) projects that will have a direct impact on regional development goals. Funding is to a maximum of 75%. Calls are made at various intervals in support of specific objectives.

A proposal led by Venice City council to develop local atlases was made in 2006, however it was unsuccessful. Many of the ideas contained in this proposal are still valid.

Recommendations and Conclusions

European ICAN members must monitor all the calls for proposal from all the programmes and sub-programmes in order to be ready to alert a proposal development team to begin work on a proposal as the time between the published Call and the submission date is very short.

A draft proposal suitable for many different applications could be prepared in readiness to respond to a call. This saves time and it is usually easier and faster to modify a pre-existing piece of work than to start from scratch. Partners will already have been found, background information collected, estimated budgets worked out in regard to the work that is considered needed, draft work plans prepared, etc.

ICAN funding opportunities do exist within Europe. However a certain amount of preparatory work needs to be carried out by the emerging steering and management working groups in order to maximum the potential of success. These activities are described in the action plan.

CONCLUSION AND FUTURE DIRECTIONS

At the conclusion of ICAN 3 it was abundantly clear that ICAN had grown from a simple idea to the cusp of a formal virtual organization which had captured the interest of the European Environment Agency (EEA), the European Commission, UNESCO, and several government agencies, companies, non-governmental organizations, and universities. However, much more work needed to be accomplished, and ICAN 4 represented an important step forward with:

- Discussions of final implementation structures for governance (including formal procedures for receiving new members), technical activities, and continued identification of funding opportunities, so that ICAN can formally incorporate as a virtual organization (aka "community of practice").
- Presentations on emerging atlases in European countries (especially the Mediterranean) that are making themselves relevant through policy, environmental and socio-economic indicator work and related themes.
- Continued progress on our ontology and semantic interoperability work, but with an eye also toward articulating the benefits of semantic interoperability at a broader scale, to non-specialists. In this we look forward to the advice and assistance of MMI and SeaDataNet, as well as to the new NETMAR (Open Service **Net**work for **Mar**ine

Environmental Data) initiative, who have already developed conceptual framework documents in this area. To this end, we also:

- Held a small "workshop within a workshop" for atlas administrators on how to become a new node in interoperability prototype.
- Initiated strategies on developing further improvements of all those nodes (according to the SEIS principles of sharing information for multiple purposes, using data and systems that are accessible and interoperable).
- Facilitated further work on partnerships, infrastructure and data exchange formats, all with the overall objective of enabling the nodes to share and communicate with each other, avoid duplication, and streamline information management.
- Presentations and discussion of user issues, including better knowledge of our atlas users, their needs, and on continued inventory, assessment, and evaluation of atlases. To this end, we held a small "workshop within a workshop" for general atlas users, and discussed how to function effectively in CWAs, especially as the technology continues to change.

❖ Small group meetings on potential funding opportunities on both sides of the Atlantic (European Union and US National Science Foundation and government agencies) in order to continue the work of ICAN.

❖ Initiation of plans for a major ICAN presence at Littoral 2010 in London (European ICAN partners), and an ICAN Americas meeting in Wisconsin, USA, also in 2010

Appendix F details the action items resulting from ICAN 4 that the group intends to implement in 2010 and beyond. These action items are in the categories of governance, funding, atlas assessment, advertising and outreach, training, publications, and technical projects. Appendix F also details the specific goals of the ICAN Technical Team. Appendix G details the plans as of January 2010 for the ICAN Americas meeting of September 2010.

The US National Science Foundation (NSF) had originally awarded support for two ICAN workshops, so there will be a **5th international workshop** (aka ICAN 5), at the headquarters of the UNESCO International Oceanographic Data and Information Exchange (IODE) in Oostende, Belgium, **August 31 to September 2, 2011**. IODE will then be co-hosting CoastGIS 2011 in Oostende immediately following. Objectives of ICAN 5 will include follow-up activities that we did not have time to accomplish at ICAN 4, including:

❖ Continued progress on our ontology and semantic interoperability work, but with an eye also toward articulating the benefits of semantic interoperability at a broader scale, to non-specialists;
  - applications emphasis on coastal zone vulnerability, climate change impacts

❖ Possible ICAN involvement in OceanTeacher Academy project, "Training Academy for IODE Ocean Data and Information Networks"

❖ A continued focus on users: better knowledge of our users, their needs, and on continued inventory, assessment, and evaluation of atlases, evaluating atlas impact, and developing analysis and decision-support tools in atlases.
  - Another small "workshop within a workshop" for general atlas users is planned.

❖ Updated guidelines to the coastal/marine research community and decision makers on the development of coastal atlas projects

- Recommendations on the development of a joint program of work to the NSF, European Science Foundation, and the UNESCO IODE which will also provide international research experiences for the enhancement of doctoral dissertation research
- Revisiting the main recommendations of the ICAN 1, especially evaluating atlas impact, and developing analysis and decision-support tools in atlases;
- Forming proposal teams and submissions to the next available and appropriate NSF, European, and other grant competitions (e.g., NSF Partnerships for International Research and Education, NSF Community-Based Data Interoperability Networks, NOAA, the European Framework Program, InterReg, and ESF);
- Exchanging lessons learned in spatial data infrastructure between the US and European INSPIRE and other national and regional efforts; and
- Continued implementation and improvement of our new steering, management and technical working groups. This will require us to evaluate progress of the working groups and rotate in new personnel to lead and participate.

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Appendices

Appendix A: Participating Institutions in ICAN

ICAN is still an informal partnership and at the time of this writing has not yet been officially incorporated, or defined by memoranda of understanding. Additional members will be welcome as we formalize!

Coastal and Marine Resources Centre, University College Cork, **Ireland**
Department of Geosciences, Oregon State University, **USA**

African Marine Atlas (South African Institute for Aquatic Biodiversity and University of Ghana)
British Oceanographic Data Centre, **England, UK**
California Coastal Commission, **USA**
Caribbean Marine Atlas (**9 Caribbean nations including Barbados and Trinidad & Tobago**)
Centre for Marine and Coastal Zone Management, University of Aberdeen, **Scotland, UK**
Co-ordination Centre for ICZM, **Belgium**
Department of Geography, University of Washington, **USA**
Department of Geosciences, Oregon State University, **USA**
Department of Agriculture, Fisheries and Food, **Ireland**
Center for Atmospheric Sciences, Universidad Nacional Autónoma de México, **Mexico**
Environment & Heritage Service, **Northern Ireland, UK**
EurOcean European Centre for Information on Marine Science and Technology, **Portugal**
European Environment Agency, **Denmark**
Flanders Marine Institute, European Network for Coastal Research, **Belgium**
Geological Survey of **Ireland**
Institute of Marine Sciences, National Research Council, **Italy**
Marine Institute, **Ireland**
Marine Metadata Interoperability (MMI)
Maritime & Coastguard Agency, **UK**
Memorial University Newfoundland, **Canada**
NOAA Coastal Services Center, **USA**
NOAA's Digital Coast Initiative, **USA**
Oregon Coastal Management Program, **USA**
San Diego Supercomputer Center, **USA**
Scripps Institution of Oceanography, **USA**
SIGLA (GIS for the Coastal Zone Management of Andalucia), **Spain**
Strangford Lough Management Committee, **Northern Ireland, UK**
Southeast Universities Research Association (SURA), **USA**
Ulster Museum, **Northern Ireland, UK**
UNESCO IOC's IODE (International Oceanographic Data and Information Exchange)
University of Ulster, **Northern Ireland, UK**
Université Paul Cézanne, **France**
Virginia Institute of Marine Science, **USA**
Washington (state) Department of Ecology, **USA**
Wisconsin Sea Grant's Digital Great Lakes and Coastal Communities, **USA**

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ICAN 4 Workshop Program and Documents, Trieste, Italy, 16-20 November 2009

Submitted by dawn on 24 January 2010 - 4:22pm.

MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY

ICAN Workshop 4:
Formalizing the Network, Engaging the Mediterranean
16-20 November 2009
Denardo and Lundqvist Lecture Halls
Adriatico Guest House, UNESCO International Centre for Theoretical Physics
(ICTP Mtg H206)
Centro Internazionale di Fisica Teorica
Strada Costiera 11
I-34014 Trieste (Italy)
Last update to this page: 24 November 2009

How to Reach the ICAN 4 Workshop
Information on Electrical Power and Computer Connections

Workshop Chairs: Dawn Wright of OSU, Ned Dwyer of CMRC

Pre-Workshop Downloads
Draft ICAN Governance Plan (pdf)
Benefits of CWA Interoperability (doc)
Mini "Workshop w/in a Workshop" on Coastal Web Atlas Users (pdf, for Tues)
US NSF Requests for Proposals (zip, for Tues/Wed) | NSF VOSS (pdf)
For those new to ICAN, see these prior workshop reports:
ICAN 1, Cork | ICAN 2, Corvallis | ICAN 3, Copenhagen

Time	Day 1 - Monday, 16 November 2009 *Focus on ICAN Governance Policies & Procedures* Denardo Room
7:30-9:00a	**Breakfast available in Adriatico Cafeteria** (pay on your own)
8:30-9:00a	**Registration** Outside of Denardo Rm.
9:00-9:15a	**Welcome** Welcome participants, Adriatico Guest House logistics (Dawn Wright, OSU)
9:15-9:45a	**Introduction to Workshop Objectives & Agenda** Review outcomes of ICAN 3 (Ned Dwyer, CMRC) Agenda and objectives of ICAN 4 (Dawn Wright, OSU)
9:45-10:45a	Governance Discussion chaired by John Helly, SDSC and Roy Lowry, BODC Discuss and finalize implementation structures on governance (including formal procedures for receiving new members) Goal is to put governance model into play beyond the whiteboard graphic from Copenhagen!
	Coffee Break Sponsored by ISMAR

10:45-11:00a	
11:00-12:00	**Governance Discussion continued** Assign chairs and members to a central coordination team, an advisory steering group, and within the existing technical task force, an ontology content governance group to manage storage, security, change management and serving of the ICAN interoperability ontologies
12:00-1:30p	**Lunch available in the Adriatico Cafeteria** (pay on your own)
1:30-2:30p	**CONCURRENT SESSIONS** **Governance Discussion continued/Strategic Planning (Denardo)** Discuss and finalize any remaining issues wrt governance or strategic planning **Technical Task Force Discussion (Lundqvist)** Various issues in preparation for Day 2 Needs/action items re: cookbook/documentation **Steering/Management Breakout Results** | **Tech Breakout Results** (.doc)
2:30-3:00p	**EMERGING ATLASES IN MEDITERRANEAN & OTHER REGIONS (Denardo**, chaired by Ned Dwyer) **The Atlas of the Lagoon of Venice: From a Book to a Dynamic Web GIS** **Atlas of the Lagoon** | **Lagoon Information System (prototype)** Alessandro Mulazzani, Venice Municipality and Marine Science Institute of the National Research Council (ISMAR-CNR)
3:00-3:30p	**ICAN in NETMAR** **Roy Lowry, BODC**
3:30-4:00p	**Coffee Break Sponsored by OSU** 
4:00-4:30p	Coastal Atlas of Sao Paulo, Brazil Luis Conti, Universidade de Sao Paulo, Brazil
4:30-5:00p	Bulgarian Black Sea Coastal Atlas Hristo Stanchev, Nansen Institute of Oceanology, Bulgarian Academy of Sciences
5:00-5:05p	**Update on Plans for Tunisian Marine Atlas** Yassine Lassoued, CMRC
5:05-5:35p	**EMODNET, Trieste** | **Presentation File** Alessandra Giorgetti, National Oceanographic Data Center/IOC, Italy
5:35-6:00p	**Concluding Discussions**
6:00p	**Ice Breaker Reception Sponsored by the Marine Institute** 
6:30-8:00p	**Dinner available in the Leonardo Building Cafeteria** (pay on your own)

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Time	Day 2 - Tuesday, 17 November 2009 *Focus on ICAN Prototype and on CWA Users* Denardo Room
7:30-9:00a	**Breakfast available in Adriatico Cafeteria** (pay on your own)
8:30-9:00a	**Registration** Outside of Denardo Rm
9:00-10:30a	**Progress to Date on ICAN Prototype** (chaired by Liz O'Dea) Discuss further work needed on partnerships, infrastructure and data exchange formats, all with the overall objective of enabling the nodes to share and communicate with each other, avoid duplication, and streamline information management. Prototype 1.1 and additional use cases beyond coastal erosion? **The ICAN Prototype** (7 Mb) - Yassine Lassoued, CMRC; Tanya Haddad, OCMP; Liz O'Dea, WA Dept of Ecology **The Ocean Observatories Initiative (OOI). Semantic Prototype as Implemented by MMI** | **Architecture Graphic** - Luis Bermudez, SURA **The Washington Coastal Atlas: Connecting with the ICAN Interoperability Prototype** - Liz O'Dea, WA Dept of Ecology; Tanya Haddad, OCMP et al. Additional resource based on discussion: **Marine Spatial Planning and the US Ocean Policy Task Force**
10:30-10:45a	**Coffee Break Sponsored by CMRC**
10:45a-12:15p	**Mini Workshop on Improving Existing Nodes, Adding New Ones** Discussion moderated by Ned Dwyer A small "workshop within a workshop" for atlas administrators on how to become a new node in interoperability prototype and about how cookbooks should be structured
12:15-1:15p	**Lunch available in the Adriatico Cafeteria** (pay on your own)
1:15-3:45p	**Mini Workshop for CWA Users** (chaired by Marcia Berman and Kathy Belpaeme) **Focus:** 1) The user's perspective on the impacts and outcomes of Coastal Web Atlases will be discussed from presenters who are closely linked to the CWA user community. 2) Feedback and review are essential to insure CWA developers are meeting the needs of the user audience. Surveys provide one mechanism for collecting and disseminating feedback to a broad audience. A workgroup of the ICAN User Committee has developed a survey. The second half of this mini-workshop is devoted to the survey. **US Coastal Atlas Statistics** (.xls) **Contributions:** - Kathrin Kopke (CMRC, Cork, Ireland, Marine Irish Digital Atlas): **Web-GIS usage, user feedback and user interface**

	- Kathy Taylor (Washington State Department of Ecology, Washington Coastal Atlas): **West Coast Coastal Atlas Workshop as a model for other regions** (26.6 Mb) - Marcia Berman (Virginia Institute of Marine Science, Coastal GEMS, Shorelines Online): **Coastal atlases within the Chesapeake Bay Region** - Kathy Belpaeme (Coor Ctr for ICZM, Belgium, Belgian Coastal Atlas): **User analysis of the Belgian Coastal Atlas and future user needs** - David Hart (University of Wisconsin Sea Grant Institute, Wisconsin Coastal Atlas: **The Research Agenda of the Wisconsin Coastal Atlas**
3:15-3:30p	**Coffee Break**
3:45-4:30p	**Mini Workshop for CWA Users continued** Discussion: 1. Testing and evaluating the User survey 2. Survey Discussion Points: • Is the survey too long? • How can we improve on this? • Very minimal survey response. Is this typical among other regions that have tried to poll users? How to encourage users to take the survey? • Is there a need for this type of survey? 3. General Discussion Points: What are the CWA components that work well? Do we have enough feedback to know what elements of a CWA meet the users' needs.
4:30-5:00p	**Coastal Information System of Andalusia** **(WARNING: 92 Mb!)** Alejandro Iglesias-Campos, ETC-LUSI / Junta de la Andalusia
5:00-5:30p	**Concluding Remarks/Brief Overview of EEA/EIONET Meeting for Next 2 Days/** Andrus on EEA/EIONET meeting overview
6:30-8:00p	**Dinner available in the Leonardo Building Cafeteria** (pay on your own)

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Time	Day 3 - Wednesday, 18 November 2009 Giambiagi Lecture Hall
7:30-9:00a	**Breakfast available in Adriatico Cafeteria** (pay on your own)
9:00-10:00a	**European partners meeting on funding (Giambiagi)** include action item "push, via national contact points, to get a line related to ICAN activity put in the action plans for calls within FP7"
10:00-11:30a	**US partners meeting on funding (common area outside of Lundqvist)** US NSF opportunities include NSF PIRE (currently NSF 09-505), INTEROP (currently NSF 07-565), Developing Global Scientists and Engineers (currently NSF 04-036). Funding from other agencies to be disussed. NSF competitions require focused, hypothesis-driven research questions and junior research mentoring arrangements to propose. Other agencies would be interested in more applied topics, showing/developing the utility of CWAs in both management/policy/planning realm and science.
9:00-11:30a	**Tech Team Continuing Discussions (Denardo)**

1:00-6:00p	**EEA/EIONET Workshop on Maritime and Coastal Information Systems** (Giambiagi) EEA Meeting Agenda - Anne France Woestyn, DG.MARE, European Commission: Integrated Maritime Policy and the EU Atlas of the Seas - Andrus Meiner, EEA: EEA Activities Related to the Coastal Atlases: Assessments, Support to ICZM and Future Plans
4:40-5:00p	- Tony LaVoi, NOAA Coastal Services Center: Coastal and Marine Geospatial Information Sharing (including U.S. Ocean Policy and Digital Coast Initiative)
5:00-5:30p	- Ned Dwyer, CMRC and Dawn Wright, OSU: The International Coastal Atlas Network (ICAN): Overview and Recent Activities | ICAN 4 Overview
5:30-5:45p	- Liz O'Dea, Washington Department of Ecology : The ICAN Prototype

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Time	Day 4 - Thursday, 19 November 2009 Giambiagi Lecture Hall
7:30-9:00a	**Breakfast available in Adriatico Cafeteria** (pay on your own)
9:00-4:00p	**EEA/EIONET Workshop on Maritime and Coastal Information Systems** (Giambiagi) EEA Meeting Agenda - Andrus Meiner, EEA: Maritime Spatial Planning: The EU Roadmap and Approaches for Implementation - Oregon Coastal Atlas and MarineMap featured in new NOAA Marine Spatial Planning portal
9:00-1:00p	Individual, small-group strategy/planning meetings for ICAN.

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Time	Day 5 - Friday, 20 November 2009 *Action Plans / Conclusion* Lundqvist Room
7:30-9:30a	**Breakfast available in Adriatico Cafeteria** (pay on your own)
9:30-10:30a	**ICAN Action Plan Session** (Dawn Wright and Ned Dwyer) - New action items to do resulting from ICAN 4, or any other outstanding action items
10:30-11:00a	**Coffee Break (Adriatico Cafeteria)**
11:00a-12:30p	**Concluding Discussions** (Dawn Wright and Ned Dwyer) - Continued discussion of action items resulting from workshop, and related recommendations, collaborations - Prepare for ICAN partner meetings in 2010 and ICAN 5 in Oostende, Belgium (2011) hosted by IODE
12:15-1:00p	**Lunch available in the Adriatico Cafeteria** (pay on your own)
1:00-2:30p	**Concluding Discussions / End of Workshop** FINAL ACTION ITEM SPREADSHEET TECH TEAM GOALS SPREADSHEET

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Appendix C: Access to Presentation Files, Notes, Photos, Links

This workshop report has an accompanying web site at

<http://ican.science.oregonstate.edu/ican4>

from which the reader may download all PowerPoint files presented at the workshop, as well as working papers and prior reports, breakout group notes, photographs, and links to related web sites.

Appendix D: Session Chair Profiles

(See full list of speakers and download their presentations at <http://ican.science.oregonstate.edu/ican4_prog>

Ned Dwyer

Remote Sensing Specialist
Coastal & Marine Resources Centre
University College Cork
Cork, IRELAND
n.dwyer@ucc.ie

Ned has a MSc and a PhD in Remote Sensing. He has worked for many years with both optical and radar satellite data for a range of applications including fire detection, rice mapping and natural disaster monitoring. Since joining the CMRC in 2002 he has been working on development of the Marine Irish Digital Atlas (MIDA). Activities have included project management, atlas design, dataset sourcing and preparation and development of educational and informational elements. He also contributes to teaching in University College Cork's Department of Geography, at both undergraduate and postgraduate level, on remote sensing and GIS. Since December 2005, Ned is in receipt of a fellowship from the Environmental Protection Agency to work on aspects of climate change research related to the Global Climate Observing System (GCOS).

Kathy Belpaeme

Head of the Co-ordination Centre for Integrated Coastal Zone Management
Flanders Marine Institute
Ghent, BELGIUM
Kathy.belpaeme@vliz.be

Kathy Belpaeme studied biology at the Free University of Brussels, Belgium. She worked as a Ph.D. researcher for 3 years, focussing on mutagenetic effect of marine pollution. In 1999 she began working in the field of Integrated Coastal Zone Management. In 2001 she was instrumental in setting up the Coordination Center on Coastal Zone Management for Belgium, where she currently works. The Coordination Center's main objective is to stimulate and promote integrated management of the coastal zone in Belgium. The Center is collaboration between different authorities at local, regional and national level.

Marcia Berman

Director, Comprehensive Coastal Inventory Program
Virginia Institute of Marine Science
Gloucester, Virginia, USA
marcia@vims.edu

Marcia Berman came to the Virginia Institute of Marine Science in 1989 to direct the newly legislated Comprehensive Coastal Inventory Program, a GIS and remote sensing program. The Coastal Inventory is charged with mapping conditions along the 16,100 km (10,000 miles) of tidal shoreline in Virginia. This effort has expanded to include the state of Maryland and parts of North Carolina. Through additional grant and contract activities, Marcia has broadened the program to include the development of GIS based decision support tools to enhance coastal management at the local and regional planning levels within the Chesapeake Bay Watershed. In addition to her research interests in applied coastal science she has active research initiatives in the areas of shallow water use conflict, ecosystem risk assessment, and remotely sensed assessment techniques for wetland habitat valuation. Marcia is a coastal geologist by training with a graduate degree in Oceanography from the School of Oceanography at Old Dominion University in Norfolk, Virginia. In her spare time she enjoys marathon running, travel, and sailing.

John Helly

Director, Laboratory for Environmental and Earth Science
San Diego Supercomputer Center
(also with Scripps Institution of Oceanography)
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Dr. John Helly is a scientist at the San Diego Supercomputer Center at the University of California, San Diego where he leads the Earth System Science program there, and has research interests in enivironmental and ecological modeling, remote sensing, and visualization. He is also jointly appointed with the Scripps Institution of Oceanography. John is now working with partners to build a California Coastal Atlas. He has a PhD in Computer Science from UCLA, an MS in Biostatistics also from UCLA and an MA and BA from Occidental College in Biology.

Roy Lowry

Technical Director
British Oceanographic Data Centre
Natural Environment Research Council
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Roy Lowry is the Technical Director of the BODC. He took on that role in 2000 after working in the organisation for 6 years as a programmer followed by 13 years developing the concept of "project data management" and running the data management for UK projects such as the NERC North Sea Project, Biogeochemical Ocean Flux Study (BOFS) and Land Ocean Interaction Study (LOIS), and EU projects such as Ocean Margin Exchange (OMEX) and Inlet Dynamics Initiative Algarve (INDIA). During this period he chaired the international Joint Global Ocean Flux Study (JGOFS) Data Management Task Team for nearly nine years. During

this time considerable practical experience was gained in the collection and handling of physical, chemical, biological and geological oceanographic data, including participation in more than 10 oceanographic research cruises on the vessels of three nations.

In addition to IT management responsibilities within BODC Roy researches and develops technologies that have potential to enhance BODC's operational capabilities. This work has focused on the issues of interoperability between distributed metadata and data repositories through the adoption, and if necessary, development of standards. This has included active participation in two projects, NERC DataGrid and SeaDataNet, both building distributed data systems. Within these projects Roy's work has focused on facilitating semantic interoperability through development of a well-managed controlled vocabulary infrastructure, including ontologies to support semantic cross-walking. To this end , Roy also serves on the Technical Advisory Panel and the Ontology Team of MMI. He holds a Ph.D. in experimental geochemistry from the Imperial and Chelsea Colleges, London.

Liz O'Dea

GIS Analyst/Programmer
Washington State Department of Ecology
Olympia, Washington USA
lode461@ecy.wa.gov

Liz has been working in GIS since 1996. She has a BA in environmental science from Willamette University, and a MSc in Geography from Oregon State University (working in Dawn Wright's lab). She has mapped mountain tops, seabed and the space between. Four years working at Mt. Hood National Forest in Oregon gave her a strong knowledge base in GIS, which she then used to explore the world of web GIS at Oregon State University during her Master's research. There she developed a sea floor web GIS for the Virtual Research Vessel, as well as the Tahoma Virtual Atlas - a tool for a Seattle-area high school to incorporate community mapping into their science education. Liz worked at the CMRC from 2002-2007, as the co-coordinator of the creation of the Marine Irish Digital Atlas (MIDA). During that time she has overseen web design, atlas design and web GIS implementation, as well as being involved in other related issues (e.g., data and metadata acquisition and processing, database development, Open Source). She is now the manager of the MIDA project. In 2007, she returned to the U.S. and joined the Washington State Department of Ecology and is now involved in the building of the Washington Coastal Atlas.

Dawn Wright

Professor of Geography and Oceanography
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Dawn Wright's research interests include geographic information science, benthic terrain and habitat characterization, tectonics of mid-ocean ridges, and the processing and interpretation of

high-resolution bathymetry and underwater videography/photography. She has completed oceanographic fieldwork in some of the most geologically-active regions of the planet, including the East Pacific Rise, the Mid-Atlantic Ridge, the Juan de Fuca Ridge, the Tonga Trench, and volcanoes under the Japan Sea and the Indian Ocean. She serves on the editorial boards of the "International Journal of Geographical Information Science," "Transactions in GIS," "The Journal of Coastal Conservation: Planning and Management," and "The Professional Geographer," as well as on the National Academy of Sciences' Ocean Studies Board, Committee on Strategic Directions for the Geographical Sciences in the Next Decade, the Standing Committee on Geophysical and Environmental Data, and the Technical Advisory Team of the Marine Metadata Interoperability project. Dawn's most recent books include "Arc Marine: GIS for a Blue Planet" (with Michael Blongewicz, Pat Halpin, and Joe Breman, ESRI Press, 2007), "Place Matters: Geospatial Tools for Marine Science, Conservation, and Management in the Pacific Northwest" (with Astrid Scholz, Oregon State University Press, 2005), "Undersea with GIS" (published by ESRI Press, 2002), and "Marine and Coastal Geographical Information Systems" (with Darius Bartlett, Taylor & Francis, 2000).

Appendix E: Participant List

NAME	ORGANIZATION	COUNTRY	E-MAIL
Kathy Belpaeme	Coordination Centre for Integrated Coastal Zone Management of Belgium	Belgium	Kathy.Belpaeme@vliz.be
Marcia Berman	Virginia Institute of Marine Science	USA	marcia@sweethall.wetlan.vims.edu
Mihai Burca	National Institute of Oceanography and Experimental Geophysics	Italy	mburca@ictp.it
Ramona Carr	Marine Institute	Ireland	ramona.carr@marine.ie
Luis Conti	São Paulo University	Brazil	lconti@usp.br
Richard Cyganiak	Digital Enterprise Research Institute (DERI)	Ireland	Richard.Cyganiak@deri.org
Ned Dwyer	Coastal & Marine Resources Centre, University College Cork	Ireland	n.dwyer@ucc.ie
Alessandra Giorgetti	National Oceanographic Data Center/IOC	Italy	agiorgetti@ogs.trieste.it
Stefano Guerzoni	CNR-Institute of Marine Sciences (ISMAR)	Italy	stefano.guerzoni@ismar.cnr.it
Tanya Haddad	Oregon Ocean-Coastal Management Program	USA	Tanya.Haddad@state.or.us
David Hart	University of Wisconsin/Wisconsin Sea Grant	USA	dahart@wisc.edu
John Helly	San Diego Supercomputer Center and Scripps Institution of Oceanography	USA	hellyj@ucsd.edu
Alejandro Iglesias-Campos	ETC LUSI	Spain	alejandro.iglesias@uab.es
Dylan Keon (student)	Oregon State University	USA	keondy@geo.oregonstate.edu
Kathrin Kopke	Coastal & Marine Resources Centre, University College Cork	Ireland	k.kopke@ucc.ie
Yassine Lassoued	Coastal & Marine Resources Centre, University College Cork	Ireland	y.lassoued@ucc.ie
Tony LaVoi	NOAA Coastal Services Center	USA	tony.lavoi@noaa.gov

NAME	ORGANIZATION	COUNTRY	E-MAIL
Roger Longhorn	Info Dynamics Research Assoc Ltd & IODE	UK	ral@alum.mit.edu
Roy Lowry	British Oceanographic Data Centre	England	rkl@bodc.ac.uk
Andrus Meiner	EEA	Denmark	Andrus.Meiner@eea.europa.eu
Matteo Morgantin	Consortium for Coordination of Research Activities Concerning the Venice Lagoon System (CORILA)	Italy	morgantin@corila.it
Alessandro Mulazzani	Venice Municipality and Marine Science Institute of the National Research Council (ISMAR-CNR)	Italy	alessandro.mulazzani@gmail.com
Tim Nyerges	Department of Geography, University of Washington	USA	nyerges@u.washington.edu
Liz O'Dea	Washington Department of Ecology	USA	lode461@ecy.wa.gov
Mika Odido	UNESCO IOC IODE, African Marine Atlas Team	Belgium	m.odido@unesco.org
Sean Paddy	Institute of Marine Affairs, Caribbean Marine Atlas Team	Trinidad & Tobago	sean.paddy@gmail.com
Andrea Rosina	Consortium for Coordination of Research Activities Concerning the Venice Lagoon System (CORILA)	Italy	rosina@corila.it
Rita Silva	EurOcean, European Centre for Information on Marine Science and Technology	Portugal	Rita.Silva@fct.mctes.pt
Hristo Stanchev	Bulgarian Academy of Science	Bulgaria	stanchev@io-bas.bg
Kathy Taylor	Washington Department of Ecology	USA	ktay461@ecy.wa.gov
Dawn Wright	Oregon State University	USA	dawn@dusk.geo.orst.edu

The Adriatico Guest House.

Monday evening reception sponsored by the Marine Institute.

Workshop co-chair Ned Dwyer addresses the group.

Miramare Castle in nearby Miramare Park.

Photos by Dylan Keon, Oregon State University. **See additional photos at http://ican.science.oregonstate.edu/blog4/**

Type	Activity/Task	Time (completion)	Funding source	Lead	Deliverable	Deadline	Notes
Governance	Steering, Mgmt, Technical Work Groups form	Winter 2010	N/A			today	
	Add Ontology Mgmt (Content Governance) group to Tech WG	start February 2010 and complete w/in 1 month	N/A	**Roy to recruit Luis B. and others**			
	Election of leads in 3 work groups; also representation across 3 groups; 2 liaisons from Mgmt	Winter 2010	N/A	see below	see below	today	N/A
	Steering Group (SG) **Roger Longhorn, Kathy Taylor** Kathy Belpaeme Val Cummins Tony LaVoi Andrus Meiner Tim Nyerges Gonzalo Malvarez-Garcia Ronan Uhel ***Members EXTERNAL to ICAN to be named as well*** someone like John Graybeal, MMI? Eamonn O'Tuama, GBIF?	**Management Working Group (MWG)** **Ned Dwyer, Dawn Wright** Marcia Berman Alejandro Iglesias-Campos Luis Conti John Helly Kathrin Kopke Mika Odido Sean Paddy	**Technical Working Group (TWG)** **Roy Lowry, Liz O'Dea** Juan Arevalo-Torres Luis Bermudez Ramona Carr Richard Cyganiak Declan Dunne Tanya Haddad David Hart Jose Ojeda-Zujar Rita Silva Hristo Stanchev Yassine Lassoued				**Group leads on mailing lists of all other groups to keep in better communicaton** **A small subgroup has to know the whole story; checks and balances** report from 3 groups on regular basis SG, MWG, TG, ICAN Update listservs
	Define terms of reference and scope of duties; Operational procedures are need to come up w/by-laws and start with clear TORs; MOUs to secure level of commitment (John's example)	End of March 2010	N/A	**Group leads**			SG and MWG work together w/John H.?
	Finalize governance document; need THIRD box in Figure 1 diagram, under "Implementation," for community/best practices/lessons learned/workshops, etc.	End of March 2010	N/A	**John Helly**			
	Review GSDI, EUROGI structures, others; Tease out Membership levels	End of March 2010	N/A	**Roger, Tim**			
	Pros and cons of ICAN being attached to an existing organization such as GSDI; 1 pager	End of March 2010	N/A	**Roger, Tim, Tony**			
	Develop sustainable business model (use existing examples from IETF, GSDI, GBIF, ISDE, DataNet)	End of March 2010	N/A	**Tim, Roger, Luis**	Outline of business model	Initial outline to discuss	
	Explicitly state the requirements of ICAN, i.e., what is ICAN for? Value proposition statement, MWG with SG. Who we are, what we want	End of March 2010	N/A	**MWG w/SG**			
	Timeline to registration as a "legal" entity; full incorporation by start of ICAN 5?	**Start of ICAN 5?**	N/A				

Funding	US Funding Group: White paper requirements process on what ICAN can bring to both resource mgmt and science; shop white paper to NOAA, USGS, EPA; high rez shore zone for the nation and PROCESS for defining that zone (intertidal, swash zone, including Great Lakes, estuarine coasts; nearshore gap - no man's land)	end of February 2010	N/A	**John Helly will start initial draft; Tony will help**	the white paper + summary 1-pager (what is ICAN, accomplishments, benefits, next steps)		Tony will share results of recent coastal/ocean integration act workshop; plus MCSDS of FGDC; David to review; Andrus, Hristo, Luis to participate in review of white paper to show that we are looking at this from a global pt of view; implications for coastal classification schemes
	Identify good EPA contact (counterpart to EEA), more NSF contacts	early 2010	N/A	**Tim for EPA high level, Kathy T. for EPA Nat. Estuary Program; Tony know EPA spatial data administrator well; Luis B. for NSF**			everyone coordinate with Tony
	Scope foundation contacts via Jena Carter of TNC; Lighthouse Foundation (Mihai Burca: mburca@ictp.it)	early 2010	N/A	**Kathy T., Dawn**			
	Scope NSF PIRE intl partners	early 2010	N/A	**Tim w/Pegaso for Med (Francoise, UNEP MAP, Dawn w/EEA; build in NETMAR**			
	Scope new NSF US/UK program	tomorrow	N/A	**Dawn w/Aberdeen or JNCC**			
	European funding actions similar; coordinate on white paper; 4 funding program in Europe: Competititveness & Innovation (March), Cost Action (later next year); FP 7 (needs a bit more scoping); InterReg (needs more scoping; Alessandro led a similar proposal but shows different levels of participation possible) - TAP INTO UNESCO UNEP as well (Caribbean and other regions, regional coordinating units, regional activity centers)?	early 2010	N/A	**Ned, Roger, Sean (UNESCO, UNEP)**	white paper + 3 different versions of possible proposals		will be brief chapter in workshop report
Assessment	Expand the benefits of semantic interoperability document (which focuses on regional ocean governance) to add more value propositions, such as the social networking, prioritization, bang for buck/Euro	2010	N/A	**Tim, Andrus**	Document		Add to portal
	User survey - Research other ways to gain feedback - social networking tools that might work in a CWA context? Plug-in tool that CWA developers can grab off of ICAN portal (tracking, feedback); will need technical advice; initially review options and interface w/technical people	March 2010	Perhaps part of Gabe's time at NOAA CSC could be borrowed for this?	**Marcia, Kathrin**	Summary document listing possible approaches; summary off of ICAN portal, Digital Coast; short white paper on status of CWAs in US (comparable effort on EU side?)		Gabe Sataloff to update US CWA compilation spreadsheet, so that we can examine it more closely and get a sense of possible disconnect (are all listings actually CWAs?, duplication?)

Outreach/Training	ICAN feedback on EU Atlas of the Seas during public consultation [April 2010]	ongoing	N/A	**Ned**			
	Find out more about BLAST and Humboldt on the EU side	ongoing	N/A	**Roger, Roy**			
	Explore opportunities w/PEGASO (FP 7 project); tease out specific ICAN involvement in PEGASO	ongoing	N/A	**Ned, Alejandro, Tim**			overlaps between a CWA and an information system?
	EBM Tools Network Webinar based on ICAN 4 presentations already given	March 2010, use as part of recruitment for The Americas Wisconsin meeting	N/A	**Dawn, Tanya or Liz**	Dawn will scope timing out with Sara		Moore and Packard foundations pay attention to EBM Network; talk in webinar about critical groundwork needed for MSP that CWAs can provide
	Planning for EuroICAN 2010, directly before or directly after Littoral 2010, London, 21-23 September 2010; **half day workshop at Littoral and half day EuroICAN meeting**; tie in African Marine Atlas?	ongoing	IODE?	**Ned, Roger, Andrus**			
	Planning for The Americas-ICAN 2010, Wisconsin, with agenda/program. 4 elements: (1) regional, Great Lakes outreach; (2) national outreach to isolated/unknown CWAs (share white paper); (3) training element so participants take away tangible product/knowledge; (4) short internal ICAN partner meeting. Use resources from Kathy's West Coast Atlases Meeting; **consider Webinars/web-casting of sessions to reach isolated CWAs who cannot attend and for EU partners**. Include Canada, Brazil (Luis C.), CMA (Sean), and SPINCAM (W. Coast of S. America)	end of calendar year 2009 for prospectus	NOAA CSC to provide travel grants as this meeting wll be "grassroots Digital Coast" and will engage state CZ managers as part of CSC's mission? Tony will take to Miki and others leading Digital Coast effort on ICAN and Digital Coast. FGDC CAP grants (existing call)? Tim would like to scope EPA money, especially in Great Lake region; info to Digital Coast Partnership team	**David, Tim, Kathy, Dawn, Tony to develop initial program (motivation, goals, agenda); timeline for contacting potential partners**	The meeting itself, new members for ICAN, progress on US ICAN outreach in many other ways, proceedings with requirements articulation		Large meeting (50-70 participants), 5 days long? Technical people and people in CZM Programs would have a reason to get together in and of itself, but regional initiatives such as West Coast, Gulf Coast, East Coast Gov Agreements, etc. are certainly important, as well as federal efforts. Again, this is very grassroots! Incredible commitment and interest from the states is already there. **Share a webinar at GSDI 12 an possibly URISA.**
	Both meetings might be scheduled in similar time frames to facilitate communication between the two; perhaps a webinar to connect Wisconsin to European partners	**September 2010**	N/A				
	End-users of atlases workshop-w/in-workshop - Develop short half day training on effective use of CWAs, other user issues. Useful for Coastal GeoTools, Littoral 2010, US Federated meeting, etc. Benefits, variety of content, tools that have been implemented, etc., importance of maritime boundary issues/jurisdictions	September 2010	ad hoc	**Marcia, Kathy B. et al**	pilot mini workshop to launch in Wisconsin in US, and Littoral 2010 on EU side		Collaboration w/FOSS4 Geotech resources

	Atlas developers/providers workshop-w/in workshop - Develop short half day training on becoming a new node? Realize that prototype is NOT an end user product at this stage!	April-September 2010?	ad hoc	**Tanya to lead. Roy, Luis want to be involved**	pilot mini workshop to launch in Wisconsin in US, and Littoral 2010 on EU side		Collaboration w/FOSS4G resources; use their workshop materials after 1st week of September; Guides group from MMI can provide resources
	Participate in on-site training and develop short distance learning courses on CWA (e.g. IODE course for Caribbean Marine Atlas), development of a workbook	March 2010 and check with Mika	Soros Foundation IODE	**Sean and Tim on scoping; Kathrin**	Scoping and Options Document (what are the kinds of training, rather than actually producing the materials at this point)	Perhaps something that could ported from a 2010 workshop at a conference	OceanTeacher portal for IODE; materials can be tested and used by IODE
	Finalize plans for ICAN 5; email to Peter Pissierssens	**December 2009**	IODE, NSF	**Dawn, initial email; Workshop subcommittee of Dawn, Ned, Kathy B., Roger**		Email confirmation recvd by Peter in Jan 2010	
Publications	Continue IGI handbook publication process; Secure Jackie McGlade for Foreword	2010	own funding ad hoc support	**Dawn**	the book!	set by publisher **Note: Foreword completed Jan 2010**	Title has been changed by publisher to *Coastal Informatics: Web Atlas Design and Implementation*
	Consider publishing in Journal of Coastal Conservation (Planning, Conservation & Management)	Ongoing		**Dawn, Kathy B.**		set by editor **Note: papers by Kathy B. and O'Dea et al. submitted Dec/Jan**	Different emphasis here where we have case studies of CWA efforts. Would not overlap with material in handbook. David Hart on the editorial board of Coastal Mgmt. Kathy B. paper on her BENCORE conf. presentation or EEA Copenhagen presentation. More emphasis on indicators, decision-support for conservation/mgmt
Awareness Raising	Participating in and contributing to relevant workshops and conferences (e.g. CoastGIS, Littoral, Coastal Zone, Coastal GeoTools, etc.). Complie list of 2010/2011 conferences	ongpoing	own funding ad hoc support	**Dawn, Ned, Roger to compile list**	Paper or panel session, mini-workshop, poster	depends on conference	

Technical

Management:							
	Google Code as a Task / Issue manager: http://code.google.com/p/ican-prot/ - Will populate with specific tasks from Workshop 4 discussions and Skype calls	ongoing		All			Link to this from Tech page! Also be aware of service level agreement w/Google. All details of discussions also become property of Google. IPR issues. Don't be evil Google!!!
	Monthly Skype calls (chair: Liz) - thematic topics, what we can work on independently of NETMAR; January call	ongoing		All			
	Regular contact with ICAN "users"/atlas owners/developers (different from tech team)	TH to create contact list					Might wait to create it until September as a continuing discussion forum
Ontologies:							
	Changing method for developing ontologies. MMI has good tools for new method. Will examine new workflows, do test run and document the process.	To be done by MMI		Luis/MMI			Will drop Protégé among other changes
	Review ontology thematic content with a view to reflecting expanding ICAN priorities	will be done in NETMAR		Roy			
Technology:							
	Technology will be heavily influenced by NETMAR project. Future work to be determined.	will be done in NETMAR, which starts in Feb 2010, runs for 3 years		Yassine, Declan, Roy			DataNet proposal is $20 million and ICAN is part of $4 million piece of that; start date is Sept 1, 2010
	Determine how to ensure that non-NETMAR members have active voices in development.	Luis will check w/Roy in February 2010					
	Examine how the prototype can best illustrate the use cases. Maximize benefits of prototype for regional CWAs (e.g., cross-border use case of OR and WA)			**Sean w/CMA**			
	MWG to review Declan's development of ICAN use case for NETMAR	ongoing		**Ned**			
	USE CASES: complete coastal erosion use case - 3-4 page document; how the technologies of the prototype fulfill the vision of a coastal erosion use case. Of "roles" defined in Corvallis white paper, one is the most effective in this regard. Nuance to make use case more useful	September 2010		**Tim, Kathy T., David, Tanya, Luis, Hristo, Sean, Juan?**			Template as a basis for doing use cases; Tim and Luis have templates, proposal for a new one

	Also explore other use case themes? Are CWAs providing relevant info for marine/maritime spatial planning (including marine boundaries, jurisdictions & VLIZ has this in prototype), hazards (including tsunamis)	proceed in parallel with erosion group		**Kathrin, Tim, Tanya, Marcia, David, Kathy T., Hristo, Simon, Alejandro?**			Informed by CWA assessment. Expansion to ecosystem services, marine spatial planning, bathing water quality, public access. Super categories of climate change, sustainability development (although indicators not necessarily tied to spatial and temporal scales).
Documentation:							
	Cookbook for new ICAN member atlases: documentation, potential Wiki development, with structure at outset, including Tanya's email dialogue w/David	late February/early March 2010 will kick this off	ad hoc, IODE?	**Tanya to lead. Roy, Luis, Richard, Alessandro & Mihai Burcka to be testers/evaluators, David, Sean**	wiki, pdf	September 2010 mtg	Employ MMI Guides. Link to Ocean Teacher?
	Image map/KML of ICAN partners globally, of US partners and other CWAs known from Gabe's compilation; contact people and have them email in footprints where appropriate	in time for US meeting, Sept 2010	ad hoc support	**Dawn and Dylan**	KML, but also image map		combine efforts w/ Simon Claus? Sebastien Colas?
	Address longstanding issues from ICAN 1, esp. cartographic issues for CWAs. Preparatory action for fuller discussion at ICAN 5	time (completion)?		**Liz, David, Tanya, Kathy B.?, Declan (InterRisk), Eamonn? Alejandro?**	1-2 page, scoping document, esp. problems inherent in WMS		wish list of issues for us to address to benefit the community (e.g., geographic scale); portal will provide support for this
	Update portal; SG, MWG, TG, ICAN_Update listservs	**November 24, 2009**		**Dawn**		Listservs formed Jan 2010	

ICAN Tech Team Goals for 2009-2011

Last updated 23 January 2010 by Liz

Type	Component	Goal	Who	End Date	Status
Organization / Management:					
Task	Management	Define **ICAN Tech terms of reference**	LOD/RL		
Task	Management	**Skype calls** (chair: Liz) - Topics of first calls decided: what we can work on before NETMAR is established		ongoing	
Task	Management	Skype call: Initial cookbook discussion	All	Feb 2010	
Task	Management / Ontologies	Skype/video call: new simple MMI ontology methods	All (**LB** to lead)	Mar 2010	
Task	Management	Skype call: Ontology development for use case perspectives to connect use cases and data	All	April 2010	
Task	Management	Contact Roy about the **global expanding theme / governance/ QA/QC**, Create a conference call.	LB	March 2010	
Task	Management	**Task / Issue manager:** choose and populate with tasks and issues. Google Code is first draft (http://code.google.com/p/ican-prot/); look for Open Source option.	All	ongoing	
Task	Management	**Explore student project opportunities**	YL/DD / others?		CMRC researching
Task	Management	**Create ican-atlases mailing list.** Have regular communication with ICAN "users"/atlas owners/developers who are not involved in ICAN Tech Working Group.	TH		TH to create contact list
Task	Management	**Update ICAN-tech list:** Confirm list is complete (some may prefer to be moved to Atlas-Providers list)	LOD	Feb 2010	
Task	Management	**Supply monthly summary of ICAN Tech activity to Steering Group**	LOD/RL	ongoing	
Task	Management	**Discuss prototype directions with Steering Group:** Need to decide what we want the prototype to deliver, and how it can demonstrate practical results for use case.	LOD/RL/others	ongoing	
Task	Outreach	**Present ICAN Prototype to Ecosystem Based Management Tools webinar**	TH/LOD	Mar 2010	

Ontologies:					
Task	Ontologies	**Changing method for developing ontologies.** MMI has good tools for new method. Will examine new workflows, do test run and document the process. Need to separate mapping from local ontologies (so there will be 3 ontologies: global, local and mapping).	Luis/MMI		To be done by MMI
Task	Ontologies	**Create CSV template for ICAN providers.** Explaining the column of the headers and provide a template.	LB		
Task	Ontologies	**Review ontology thematic content and ICAN priorities** -- how far do we want to take it? What's required to incorporate new use cases, if we decide to expand?	Roy		will be done in NETMAR

Task	Ontologies	Create and agree on **definitions** of superterms/upper ontology.	TH		Active
Task	Ontologies	**Export keywords** to Comma Separated Values (CSV) - Oregon Atlas & Washington Atlas	TH/LOD		
Task	Ontologies	If we create our own list of vocabulary, could we submit it to SeaDataNet or MMI?	Luis/MMI		

Prototype / Technology:					
Enhancement	UI	Discussion: What do we see **prototype 3** looking like? Design interface based on the use case. Ex.: 1. Go to my home 2. Need to know - parcel inventory, etc. 3. People need to know what to do 4. Results of erosion - to make decision of where to dump the sediments	All		
Task	Research	**Evaluate other existing architectures** of other projects for potential incorporation/synergy, including InterRisk, ISDE, NetMAR, OOISP, MMI	LB/RL/YL/DD		will be done in NETMAR
Enhancement	UI	**Smart search:** including ability to search local terms as well as global terms, free text search, possibility of doing secondary search (on abstract); Specify / select local atlases from prototype page. SEARCH: * For indexing purposes: lucene in JENA * Search by * Keyword a graph containing the facets and the instances (and defintions) * Abstract - via CSW	YL/LB		will be done in NETMAR
Enhancement	UI	**Implement WMS** (thumbnail with each metadata record; add to map option; one large map to show integration within regions). Oregon and MIDA already have capability.	YL/DD/TH		will be done in NETMAR
Enhancement	UI	**Update UI to accept SKOS type vocabularies.** Update UI to traverse not class subclasses but narrower than instances	LB		
Task	UI	Scope and test **WFS** implementation	RL/YL/DD		will be done in NETMAR
Task	Configuration	**Upgrade** to GeoNetwork 2.4.2.	GeoNetwork users		
Task	UI	Ensure prototype supports **CSW 2.0.2**	LB/YL		
Defect	UI	**Link to ICAN tech** page from Prototype	YL		
Task		**Connect new atlases:** Washington, Africa, Wisconsin, Carribean, etc.			
Task		Discuss how **Web 2.0 can** be integrated into coastal atlases: GeoRSS? Search Global Atlas" widget? "Like" button for different pages/features to get user feedback? Others?			
Task		Discuss validation service implementation in ICAN mediator	RL/YL/DD		will be done in NETMAR

Documentation:					
Task	Documentation	**Update ICAN Website**	All	review regularly	Continue to populate and update.
Task	Documentation	**Document bulk metadata entry from different sources.** Metadata entry should be done programatically. The sources are ARC, FGDC catalogs.	TH		
Task	Documentation	**Ontology work documentation:** Includes choosing ontology and setting up global ontology; steps taken by local atlases to prepare local ontologies; mapping local ontologies to global; etc...	**TH**/LOD/YL/LB	Feb 2010	To be added to web portal; determine connection with handbook
Task	Documentation	**ICAN Atlas Cookbook for new members:** Explanation of use case, prototype project purpose and future aims; Outline guidelines regarding necessary metadata; standards that are supported; keywords (list used, use in metadata, definitions, CSV, etc.); Guidelines and best practices for implementing services (CSW/WMS/WFS) - What is minimum metadata required? - What standards are supported - Make list of keywords used - Metadata with keywords - Make keywords into vocabulary list, with definitions - List of CSV keywords - ... (continue outline in Feb call)	**TH**/LOD/YL/DD/KK	Sep 2010	TH to send initial outline and content; then open for input. Continue to fill in outline during Feb conference call.
Task	Documentation	**Technology development documentation:** How the prototype got to this stage; GeoNetwork / ESRI steps taken with portal and local atlases; issues like metadata database duplication; etc... --> To be merged with cookbook	YL/TH/DD	Sep 2010	
Task	Documentation	**Recommendations for next phase:** how can we streamline? Can we eliminate duplication of metadata databases? How do we accommodate new members? Considerations on scaleability [themes and atlases]? Ontology development?	TH/LOD/YL/DD/KK	Mar 2010	
Task	Documentation	**Training Documentation for America/Europe workshops:** Possibility includes installing OGC compliant software (GeoNetwork for Coastal Atlases)		Sep 2010	

International Coastal Atlas Network (ICAN)

ICAN-Americas 2010 Workshop

September 13-15, 2010
Pyle Center
University of Wisconsin – Madison
Madison, Wisconsin USA

Background: A coastal web atlas (CWA) has been defined by members of the International Coastal Atlas Network (ICAN) 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. CWA's are online information resources that can help build collaborative relationships within and across state, regional, national, and international areas to foster more effective management of coastal and ocean resources and activities.

Workshop Purpose: The ICAN-Americas 2010 meeting will bring together key personnel from North and South America who are developing, maintaining, and/or evaluating a CWA for their specific political area or region. This workshop will begin the process of sharing information and coordinating current activities in the field of CWA in the Americas, as it is being done in Europe. Of special interest to US participants is the meeting's grassroots theme of building NOAA's "Digital Coast" by way of our CWAs. Four additional and important emphases of the meeting are: (1) regional, Great Lakes outreach; (2) national outreach to isolated/unknown CWAs; (3) training elements so that participants take away tangible products/knowledge; and (4) continuation of internal ICAN organizational business.

Meeting Objectives:

- Participants share knowledge of existing programs, projects, and capabilities for CWA
- Participants learn about technical and management best practices for CWA
- Participants learn about ICAN and how it may benefit their CWA activities
- Participants learn about other national and regional activities that can support or benefit from CWA
- Participants develop ideas on how to integrate CWA within the US and internationally via ICAN

Meeting Inputs:

- ICAN working documents

Meeting Outputs: Attendees gain knowledge about:

- developing and evaluating CWAs
- current members of ICAN
- benefits and use of CWAs
- opportunities for how CWAs can join ICAN

Participants: 50 – 100

Workshop Co-Chairs: Dawn Wright, Oregon State University and Tony LaVoi, NOAA Coastal Services Center

Program Co-Chairs: David Hart, University of Wisconsin and Tim Nyerges, University of Washington

Local Arrangements: David Hart, University of Wisconsin

Program Committee:

Luis Bemudez, SE Universities Research Association
Luis Conti, Sao Paulo University
David Hart, University of Wisconsin
Tony LaVoi, NOAA, Coastal Services Center
Tim Nyerges, University of Washington
Sean Paddy, Institute of Marine Affairs, Trinidad
Kathy Taylor, Washington Department of Ecology
Dawn Wright, Oregon State University

International Coastal Atlas Network (ICAN)
ICAN-Americas 2010 Program

Day One: CWAs, ICAN, and Use Cases

Morning
- Welcome to Madison, meeting overview.
- Define a coastal web atlas and provide an overview of ICAN for those not familiar.
- Showcase the most robust CWAs in the Americas (Oregon, Washington, Virginia, Ohio, others).
- Describe the ICAN coastal erosion use case.
- Showcase the latest developments on selected ICAN initiatives, especially the ICAN prototype.

Afternoon
- Brainstorm the range of possible use cases for individual/linked CWAs.
- CWA support for Regional Ocean and Coastal Governance including Marine Spatial Planning.
- Include a breakout by topic, by region

Day Two : Promoting Regional Networks of CWAs

Morning
- Describe the Digital Coast initiative.
- Survey of coastal atlases in the US.
- Describe international CWA activity.
- How can one become an ICAN node?
- How can the Digital Coast help promote individual/linked CWAs?

Afternoon
- Present lessons learned from the West Coast Atlas Workshop.
- Present the Great Lakes Information Network Map Viewer. Propose rethinking the Great Lakes Environmental Atlas.
- Breakouts by region

Day Three: Technical and Business

Morning
- Hands-on Training: Creating robust web services and catalogs for coastal web atlases. (limit: 40)
- Possible Parallel track - Obtaining CWA user feedback

Afternoon
- ICAN Business Meeting