



**Report of International Coastal Atlas Network Workshop 5:
Coastal Atlases as Engines for Coastal and Marine Spatial
Planning**

31st August – 2nd September 2011

**UNESCO IOC IODE Headquarters
Oostende, Belgium**



More information can be found on the workshop web site:
<http://ican.science.oregonstate.edu/ican5>

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Acronyms

AMIS	African Marine Information System
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
ASCLME	Agulhas and Somali Current Large Marine Ecosystems
BODC	British Oceanographic Data Centre
CAI	Coastal Atlas Interoperability
CIGNo	Collaborative Interoperable Geographic Node
CIS	Coastal Information System
C-SCOPE	Combining Sea and Coastal Planning in Europe
CMA	Caribbean Marine Atlas
CMRC	Coastal and Marine Research Centre
CMSP	Coastal and Marine Spatial Planning
CNR	National Research Council of Italy
CORILA	Consortium for the Management of the Coordination Centre for Research Activities concerning the Venice Lagoon
COTS	Commercial-Off-the-Shelf
CSW	Catalogue Services for the Web
CV	Controlled Vocabulary
CWA	Coastal Web Atlas
DBMS	Database Management System
DG	Directorate-General
DG-MARE	Directorate General for Maritime Affairs and Fisheries, EU
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
EDMS	European Data Management System
EIONET	European Environmental Information and Observation Network
EMIS	European Marine Information System
EMODNET	European Marine Observation and Data Network
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
FP7	Framework Programme 7 (EU)
GEO	Group on Earth Observations (coordinator of GEOSS)
GEOSS	Global Earth Observation System of Systems
GIIDA	Integrated and Interoperable Management of Environmental Data (Italy)
GIR	Geographic Information Retrieval
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
GML	Geographic Markup Language
GPS	Global Positioning System
GPL	GNU General Public Licence
GRAME	Global Regular Assessment of Marine Environments
GSDI	Global Spatial Data Infrastructure (association)
HDF	Hierarchical Data Format
HTML	HyperText Markup Language
ICAM	Integrated Coastal Area Management
ICAN	International coastal Atlas Network
ICT	Information and Communications Technology

ICES	International Council for the Exploration of the Sea
ICWA3	ICAN prototype 3
ICZM	Integrated Coastal Zone Management
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IFREMER	Institut Français de Recherche pour l'Exploitation de la MER (French Research Institution for Exploitation of the Sea)
IHO	International Hydrographic Organization
IMF	Internet Mapping Framework
IMO	International Maritime Organization
IMP	Integrated Maritime Policy
IMS	Internet Map Server
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
IO-BAS	Institute of Oceanology, Bulgarian Academy of Sciences
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data and information Exchange
IPR	Intellectual Property Rights
ISMAR	Institute of Marine Science, National Research Council (Italy)
ISO	International Organization for Standardization (derived from the Greek "isos," meaning "equal")
ISSN	International Standard Serial Number
JCOMM	Joint Technical Commission on Oceanography and Marine Meteorology (WMO and IOC)
JNCC	Joint Nature Conservation Committee
KML	Keyhole Markup Language (Google Earth)
LIDaR	Light Detection And Ranging
MarAtlas	European Atlas of the Seas
MARCO	Mid-Atlantic Regional Council on the Oceans
MASTS	Marine Alliance for Science and Technology Scotland
MIDA	Marine Irish Digital Atlas
MMI	Marine Metadata Interoperability
MSDI	Marine Spatial Data Infrastructure
MSFD	Marine Strategy Framework Directive
MSP	Maritime Spatial Planning
MSP	Marine Spatial Planning
NDG	NERC Data Grid
NERC	Natural Environment Research Council (U.K.)
NERSC	Nansen Environmental and Remote Sensing Center
NETMAR	Open Service Network for Marine Environmental Data
NGO	Non-Governmental Organization
NIMS	National Information Management System (U.S.)
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
OCA	Oregon Coastal Atlas
OCMP	Oregon Coastal management Program
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
REST	Representational state transfer
RTD	Research and Technology Development
SDI	Spatial Data Infrastructure
SEIS	Shared Environmental Information Systems
SEPA	Scottish Environment Protection Agency
SIGLA	Sistema de Información Geográfica del Litoral de Andalucía (GIS for the Coastal Zone Management of Andalusia)
SIL	Lagoon Information System (Italy)
SISE	Single Information Space in Europe for the Environment
SKOS	Simple Knowledge Organization System
SNH	Scottish Natural Heritage
SOAP	Simple Object Access Protocol
SPINCAM	Southeast Pacific Data and Information Network in Support to Integrated Coastal Area Management
SSE	Service Support Environment
SVN	Sub-version
SWS	Semantic Web Service
TNC	The Nature Conservancy
THREDDS	Thematic Realtime Environmental Distributed Data Services
UCAR	University Corporation for Atmospheric Research
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)
WC3	World Wide Web Consortium
WCA	Washington Coastal Atlas
WCS	Web Coverage Service
WFD	Water Framework Directive
WFS	Web Feature Service
WHOI	Woods Hole Oceanographic Institution
WMO	World Meteorological Organization
WMS	Web Map Service
WPS	Web Processing Service
XML	eXtensible Markup Language

EXECUTIVE SUMMARY

From August 31st to November 2nd, 2011, the International Coastal Atlas Network (ICAN) held a workshop on “Coastal Atlases as Engines for Coastal & Marine Spatial Planning”, at the UNESCO IOC/IODE headquarters in Oostende, Belgium. The workshop (aka “ICAN 5”) engaged 43 participants from 15 countries, representing 36 organizations and multiple areas of scientific and technical expertise. This meeting was a follow-up to the successful 2009 workshop on “Formalizing the Network, Engaging the Mediterranean” (aka “ICAN 4”) held in Trieste, Italy, as well as workshops in 2008, 2007 and 2006.

ICAN 5 participants discussed the current and future potential of CWAs for coastal and marine spatial planning and explored the subject area in dedicated breakout sessions. A number of opportunities for how CWAs can contribute to the development of CMSP were identified whilst challenges were also highlighted. Other key activities at the workshop included:

- Presentations from ICAN members who have raised the profile of ICAN via participation in workshops and conferences. Activities from a dozen different events were formally presented. This demonstrates the relevance of, and interest in, CWAs and the reputation that ICAN is garnering as the reference point for CWAs.
- A number of Atlas developers presented significant updates since ICAN 4, while the Atlas of Scotland, the European Commission’s Joint Research Centre’s Environmental Marine Information System and The European Atlas of the Seas were presented for the first time. There are now almost 60 members of ICAN who have formally agreed to ICAN’s Statement of Support.
- The meeting saw the organisation of a mini workshop on Atlas users. A number of Atlas developers presented on how users are engaged before, during and after initial Atlas developments. The results of a questionnaire which was disseminated to a large number of Atlas developers were presented. The mini workshop concluded that it would be useful for the ICAN developer community to prepare a concise help document on how to engage with the CWA end user.
- A mini workshop was also organised on Semantic Frameworks and Ontologies and how to connect atlases to the ICAN Catalogue Services for the Web (CSW) Mediator. This provided an opportunity to demonstrate some of the activities and tools developed in the EU funded NETMAR project, that are of relevance in the development of the ICAN interoperability demonstrator, in particular how an ontology can be constructed and delivered through NERC’s vocabulary server. It also demonstrated a new version of the CSW mediator which uses alternative and more flexible technology that that used in the previous interoperability demonstrator.

The workshop also saw the official launch of the latest version of *De KustAtlas*, Belgium’s extremely successful CWA and there was also an opportunity to celebrate the publication in 2010 of the book *Coastal Informatics: Web Atlas Design and Implementation*. This book is a compendium of experience of many ICAN members and is a must read for anyone contemplating or currently developing a CWA.

Since ICAN 5 there have been significant developments with regard to putting ICAN governance on a more stable footing. A decision was taken to request the Intergovernmental Oceanographic Commission (IOC) of UNESCO to approve ICAN as an official IODE project. This request was considered and approved at the IOC IODE Officers Meeting in February 2012. Therefore an IODE ICAN Pilot Project has been established. This is a precursor to the establishment of a full IODE ICAN Project which will be proposed to the 22nd session of the IOC Committee on

International Oceanographic Data and Information Exchange (IODE-XXII) in March 2013. The coming months will see the development of a work plan to be presented at that session.

ICAN is entering a very exciting period in this new relationship with IODE and we look forward to seeing you at the **6th International workshop** (aka ICAN 6) which will be hosted at the University of Victoria, Canada from **June 16th to 18th 2013**, just before CoastGIS 2013.

INTRODUCTION

The International Coastal Atlas Network (ICAN) has developed from a meeting of an informal group of organisations that shared common interests in 2006 to a formalised network that aims to be a global reference for the development of coastal web atlases (CWAs), which we define as: "...collections 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." (O'Dea et al., 2007, Trans-Atlantic Workshop Report)

The long-term strategic goal of ICAN is to encourage and help facilitate the development of digital atlases of the global coast based on the principle of distributed, high-quality data and information. These atlases can be local, regional, national and international in scale. This can be achieved by sharing 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.

The ICAN community met for the 5th International Coastal Atlas Network workshop - Coastal Atlases as Engines for Coastal & Marine Spatial Planning, at the UNESCO IOC/IODE headquarters in Oostende, Belgium from the 31st of August to the 2nd of September 2011, in advance of the CoastGIS 2011 conference. This workshop followed on 2009's successful workshop ICAN 4: "Formalizing the Network, Engaging the Mediterranean, held at the International Centre for Theoretical Physics, UNESCO University, Trieste, Italy, in November 2009, as well as three previous workshops held in 2006, 2007 and 2008 in Cork, Ireland, Oregon, USA and Copenhagen, Denmark respectively.

ICAN 5 focused on how CWAs can support and drive the coastal/marine spatial planning (CMSP) process. There are numerous definitions for CMSP and depending on country and jurisdiction different terms may be used to describe essentially similar processes e.g. Coastal and Marine Spatial Planning by the Interagency Ocean Policy Task Force/US, Maritime Spatial Planning by DG Mare/EU or Marine Spatial Planning by DG Environment/EU. The UNESCO/IOC defines Marine Spatial Planning (MSP) as "*a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process*" (Ehler and Douvère, 2009).

The provision of spatial and temporal information across a range of thematic areas and the mapping of these are indispensable for the CMSP process and this is essentially where the ICAN community sees the relevance and value of CWAs. CWAs may not only serve as mapping tools and providers of data but can potentially play a role in communicating CMSP to both specialist and general audiences, engaging stakeholders and serving as educational tools.

The workshop participants investigated the current and future potential of CWAs for coastal and marine spatial planning and explored the subject area in dedicated breakout sessions to answer:

- What opportunities exist for CWAs to support CMSP?
- What are the challenges for CWAs that support CMSP?

This report presents the outcomes of the workshop deliberations, which includes the progress made on the international, national and regional-level efforts to improve and build atlases since the last ICAN meeting. Updates on recent relevant workshops, meetings and conferences at which ICAN members presented and participated are also detailed. These activities are key outreach occasions for ICAN and also help in raising the Network's profile around the world. Technical developments in relation to semantic interoperability remain a core activity of ICAN. In recognition of this a "workshop within a workshop" was held for atlas developers and administrators on how to become a new node in the updated ICAN interoperability prototype.

This builds on work carried out as part of the EU FP7 funded NETMAR project, which includes a number of ICAN members as partners. Atlas users are central to the work carried out in ICAN. Therefore another mini-workshop was organised on atlas use and evaluation. This allowed atlas developers share experience on how users can be involved throughout the lifetime of a CWA. ICAN governance structures were also discussed and a structure for longer term sustainability of the Network is being put in place and is presented in this report. An action plan for near-future ICAN activities is also included here

At the end of formal activities on the first day of the workshop, the Coordination Centre for ICZM organised a launch event for the latest version of De KustAtlas, Belgium's extremely successful CWA. This was attended by local dignitaries and also Atlas users who spoke about the practical value of the Atlas to them in their professional activities. This was followed by a very sociable and enjoyable reception.

After closing proceedings on the second day there was another reception to celebrate the publication in 2010 of the book *Coastal Informatics: Web Atlas Design and Implementation*. This book is a compendium of experience of many ICAN members and is a must read for anyone contemplating or currently developing a CWA.



Ned Dwyer at the launch of the ICAN publication
Coastal Informatics: Web Atlas Design and Implementation.

RELEVANT EVENTS AND INITIATIVES UPDATE

Since ICAN 4 in 2009, a number of workshop participants have organised and participated in events and initiatives of relevance and interest to the CWA community. A number of these were presented at the workshop and are reported on briefly below.

ICAN Great Lakes Meeting

David Hart (University of Wisconsin)

The ICAN- Great Lakes meeting was held from September 13-15, 2010 at the Pyle Center on the University of Wisconsin-Madison campus. The meeting brought together key professionals interested in developing Coastal Web Atlases and linking them to build a coastal spatial data infrastructure at the regional and even global scale. The meeting location in Madison, Wisconsin allowed a focus on the benefits of networked atlases for Great Lakes management and restoration. Over 50 people attended the meeting, the majority were from State and Federal agencies, but there were also representatives from academia, local bodies and regional Great Lakes bodies.

Some of the key sessions focussed on the impacts of mature CWAs; use cases for networked CWAs; ways of promoting CWA networks and hands-on atlas interoperability training. One of the use cases discussed was marine spatial planning. Participants in the breakout group believed that often CWAs evolved to meet user needs and that currently the CWA community is looking at how it can respond to the requirements of MSP. It was believed that CWAs would need to develop specific tools to aid MSP, and that as currently conceived CWAs addressed a broader audience. In order to define these tools, CWA developers need to identify clearly the clients and the relevant policies and determine who will develop the criteria for development of tools.

Fuller details and outputs from the meeting are at: <http://www.aqua.wisc.edu/ican/>

Littoral 2010, EuroICAN and Options for Coastal Information Systems

Ned Dwyer (CMRC)

The Littoral conference held in London, 21-23 September 2010 had the theme of “Adapting to Global Change at the Coast”. ICAN partners made a presentation entitled “improving participation of users in coastal web atlases” in the session on “Technologies and tools for coastal adaptation”. Over 30 people attended the session. It was very useful for raising awareness of ICAN and links were made with people developing other coastal information systems across Europe.

A half-day EuroICAN meeting was held in conjunction with the Littoral conference. There were 13 participants from the European and African membership. This was an opportunity to get updates on the EU funded NETMAR and PEGASO projects; find out the most recent developments of the Belgian Coastal Atlas and the African Marine Atlas. The workshop welcomed participation from the European Commission’s Joint Research Centre, Italy, Aberdeen University, Scotland and NERSC, Norway. An overview of MarAtlas – the European Atlas of the Seas and updates on various ICAN activities were provided. A full meeting agenda is posted at: http://ican.science.oregonstate.edu/en/ican_events

The EU funded project “Options for coastal information systems” aimed to identify a set of policy requirements for coastal information systems (CIS), i.e. actions that can be concretely implemented in order to improve the use of CIS in supporting the dissemination and implementation of the ICZM process at various scales (international, national, sub-national – regional and local). This project was part of a range of activities promoted by the European Commission to assist it with a follow-up to the EU ICZM Recommendation. Stakeholder involvement and participation included the organisation of a 1-day workshop, held in Marseille, France on the 6th of May 2011 in which ICAN participated. The workshop objectives were i) to

identify development requirements for coastal information systems and ii) assess the impact of these requirements on ICZM policy. To achieve these objectives the workshop participants ranked 17 CIS requirements in relation to 11 potential impacts. The top four ranked CIS requirements were:

- Ensure data and metadata availability
- Establish strong links and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process
- Address different user expectations and needs
- Improve economic and in particular social and governance information within CISs

Four of the key areas where CISs can have a positive impact on ICZM were:

- Integrated Knowledge on the Coastal System
- Bridge gap between science and policy making
- Adoption of a long-term perspective for ICZM
- Assist cooperation between different institutions

This workshop was a very useful networking experience for ICAN and placed coastal atlases in the context of wider Coastal Information Systems. Links were made with a number of European atlas activities that were previously unknown to ICAN. A full report on the workshop and the final project report can be found at: http://ec.europa.eu/environment/iczm/ia_studies.htm



Hristo Stanchev (Bulgarian Black Sea Coastal Atlas) and Andrus Meiner (EEA) at ICAN 5

The Mid-Atlantic Regional Council on the Ocean (MARCO)

Kathy Taylor (Washington Dept. of Ecology), Marcia Berman (VIMS)

The Mid-Atlantic Regional Council on the Oceans (MARCO) was established in June, 2009 when the governors of five states in the United States (Virginia, Maryland, Delaware, New Jersey, and New York) signed the Mid-Atlantic Ocean Governors' Agreement on Ocean Conservation. This agreement recognizes the importance of a regional approach to managing the ocean and coastal resources to maintain healthy ecosystems, support economic vitality, and enhance regulatory efficiency.

MARCO has identified four major issues to target for a regional management approach. They are: key marine habitat, renewable offshore energy, water quality, and climate change adaptation. Ongoing initiatives in habitat protection and wind energy siting have prioritized activities around key ocean habitat and renewable energy.

To facilitate marine spatial planning surrounding these two issues a web mapping portal was developed to display regional scale data. The portal, developed and maintained by The Nature Conservancy (TNC), is leveraging data and resources developed to support the Northeast Regional Ocean Council's (NROC) portal as well. In developing the portal TNC staff surveyed a small group of potential users to get feedback on their needs, as well as contributions they may make to the site. An internal test portal was designed to gather feedback. User comments helped improve the site which went live in December, 2010.

The MARCO portal has 6 data themes: administrative, decision support, human use, biological, geophysical, and state specific. Currently the portal includes 29 different data layers and offers the viewer three different base maps to choose from. Links to data downloads can be found on the site. While primarily an interactive map viewer, there are plans to add tools that will enable and facilitate marine spatial planning. The website for the MARCO portal can be accessed through the organization's homepage: <http://www.midatlanticocean.org/index.htm>.

Woods Hole CMSP Discovery Vocabularies Workshop

Tanya Haddad (OCMP)

In December 2010 the Woods Hole Oceanographic Institute hosted a workshop on CMSP vocabularies in response to requirements in the National Ocean Policy.

This workshop focused on a critical challenge for participants in CMSP efforts: that of populating data catalogues with appropriate metadata so that information assets can be more readily discovered, evaluated for suitability, integrated with data provided by other agencies, and used more effectively by planning bodies, resource managers and stakeholders across the country. Participants were from USGS, NOAA, and WHOI, plus Gulf of Maine Research Institute, Lamont-Doherty Earth Observatory, Marine Biological Laboratory and the Oregon Coastal Management Program.

The outputs from the workshop were summarized in a workshop report that is available online at: <http://www.whoi.edu/sites/cmsspworkshop>. The main results can be summarized as five recommendations and seven suggestions directed to the developers of the national information management system for CMSP data. These recommendations and suggestions all relate to encouraging use of vocabularies in information discovery systems and best practices for doing so. From an ICAN perspective, the list of suggestions may be of particular value for developers of individual atlases:

Suggestions for the National Information Management System

- Define a relatively small number of key top-level concepts needed to enable smart and faceted discovery searches for CMSP information
- Design the information system to enable access to authoritative sources of data, at whatever geographic or institutional scale
- Avoid making the requirements for data sharing so onerous that small data providers opt out due to constrained resources. (i.e. Make it 'easy to do the right thing')
- Facilitate the development of vocabularies so CMSP information will have metadata sufficient to be discovered, evaluated, integrated, and used
- Two-way communication - between information producers, collection managers, portal managers, users

- If possible, vocabularies for discovery should occur close to the source of the data (degree of federation of the information system affects the choice of vocabularies)
- Draw on Federal Enterprise Architecture concepts (the Geospatial Platform)

SPINCAM Workshop in Guayaquil, Ecuador

Alejandro Iglesias Campos (Junta de Andalucía-CMA-REDIAM / ETC-SIA)

ICAN was invited by IOC-UNESCO to participate in the SPINCAM Project (<http://www.spincamnet.net/>) workshop dedicated to ontologies and metadata; this workshop took place in Guayaquil (Ecuador) 1-4 March 2011. The Project aims to establish an ICAM indicator framework in each country of the Southeast Pacific region (Chile, Colombia, Ecuador, Panama and Peru), focused on environmental and socio-economic conditions within the context of sustainable development and integrated coastal area management.

A general description of ICAN was offered to all the participants in the project, mainly national representatives from the Ministries in charge of coastal management and planning, as well as the regional representatives of IOC-UNESCO and ODINCARSA.

ICAN partners contributed to the discussions on ontologies, as well as defining a common metadata structure and standard parameters to facilitate data comparison and integration among the different national atlases.

Coastal GeoTools and Coastal Marine Spatial Planning/ICAN Special Interest Meeting

Tony LaVoi (NOAA)

A Special Interest Meeting “Building Coastal Web Atlases and Regional Portals to Support Coastal and Marine Spatial Planning” was held at the Coastal GeoTools Conference 2011 in Myrtle Beach, SC, USA. The purpose of the Special Interest Meeting was to convene a multi-regional group with experiences in developing and maintaining regional mapping portals and coastal atlases to share information and lessons learned. Major topics discussed during the 3-hour session included: technology considerations including mapping approaches (COTS and open source), geospatial standards adoption, and application hosting options; integrating mapping portals between local, state, regional, federal, and global; building a community of technologists and users; outreach, training, and communications, and funding options. All meeting materials, including notes are posted at:

http://ican.science.oregonstate.edu/en/ican_events.

ICAN at the European Maritime Day, Gdansk, Poland,

Alejandro Iglesias Campos (Junta de Andalucía-CMA-REDIAM / ETC-SIA)

ICAN and three European partners (REDIAM, MIDA, MARATLAS) organized a coastal, marine and maritime information systems workshop to raise awareness at the European Maritime Day Event that took place in Gdansk (Poland) 18-20 May 2011

(http://ec.europa.eu/maritimeaffairs/maritimeday/conference_2011/index_en.htm). This annual conference highlights the importance of the sea and oceans for everyday life, both in coastal communities and in landlocked areas across Europe. It also highlights the opportunities and challenges currently facing maritime regions and sectors, including the role of coastal and marine information systems and atlases.

The audience was predominantly made up of institutional representatives from Europe, national and regional governments in Europe, as well as private companies from the software solutions sector.

The workshop profiled some existing environmental data management systems for coastal and marine areas and the status of those tools that are already in use or under development in Europe, mainly atlas and data viewers to facilitate data accessibility to citizens and other end users.

The workshop was successful in raising awareness of ICAN and the role of coastal and marine information systems in assisting coastal management and planning.

ICAN assists ODINAFRICA developments

Marcia Berman (VIMS)

ICAN and four partners (CMRC, VIRGINIA, REDIAM, CMA) participated in the 3rd ODINAFRICA Coastal and Marine Atlases workshop that was hosted by the Mauritius Meteorological Services in Grand Baie, Mauritius, from 25-29 July 2011 <http://193.191.134.9/odinafrica3/data.html>. The participants were national representatives from all coastal countries in Africa.

The workshop provided a good opportunity to review the national atlases, and in particular their usability and design. All the participants reviewed technical issues related to data, metadata, data catalogue and Mapserver tasks, with the support of ICAN invited experts.

ICAN's objectives and activities were also presented during the workshop, as well as ICAN partners' experiences developing coastal and marine information systems and atlases.

LATEST DEVELOPMENTS ON SELECTED ATLASES

A number of CWAs, which have been presented at previous ICAN workshops have undergone significant developments and upgrades. This session provided an opportunity to update attendees on this work, as well as introducing new Atlases from recent ICAN members. Ensuring the relevance of atlas content to users was a common theme as well as developing user interfaces that were easy to use. New technologies have also been incorporated in a number of the Atlases. Another common challenge is that of ensuring efficient collaboration between the many data providers and partner organisations that are usually involved in Atlas development.

The Belgian Coastal Atlas

Kathy Belpaeme & Sofie Vanhooren (Coordination Centre for ICZM)

A first website was developed in 2005, as an answer to the big demand for the book 'The Coastal Atlas Flanders/Belgium'. Given the interest in the maps of the book, a website was developed to provide the maps, information and photos to the users. Since the beginning, the website has attracted substantial interest (about 2000 unique visitors/month). The European funded C-SCOPE project enabled the Coordination Centre for Coastal Zone Management to develop a second version of the website in 2011, as upgrading the Belgian atlas was one of the activities within the project.

Feedback on the earlier website pointed out that the cartography is the main feature of interest on the site. The existing site already had some ready-to-use maps, and a small interactive map section. It was therefore the aim to make the cartographic part of the atlas much more interactive, without abandoning the look and feel and the thematic, easy approach of the first site.

The target audience of the Belgian Coastal Atlas is wide and includes coastal stakeholders, scientists, policy and decision makers, educational users, public users and (marine) industry.



Figure 1: Interactive web GIS within the Belgian Coastal Atlas

The coastal atlas, which can be accessed at <http://www.kustatlas.be> is arranged by topics and cross-references, so the user can seamlessly navigate between the different themes and topics. The same thematic approach was used as in the first atlas - thirteen chapters in total, describing the coast and sea in their complexity. Some new chapters, such as policy and administration, and education and research were integrated and the chapter on sustainability was extended significantly. Core policies and data per sector were integrated in each chapter. Integration of land and sea is an important topic, both in the textual and cartographic parts of the atlas.

The user-friendly map viewer (Flamingo Map Component, a GPL open source map viewer developed in Flash) offers maps on a wide range of topics. These maps can easily be downloaded as pdfs and used in presentations or publications. Forty five ready-to-use maps were foreseen. In the interactive part of the viewer personalized maps can be created and downloaded by combining different layers. Other standard tools such as zoom-in, zoom-out and measure are included. GIS ready data can also be downloaded. From each of the thirteen thematic chapters a prepared interactive map, with the relevant layers already turned-on can be accessed.

In the atlas, reference is made to the sustainability indicators, giving an insight on the state of the coast and the sustainability of its development. These indicators are connected to relevant data, figures and trends about the coast which can be downloaded to increase the utility of the atlas for coastal management.

During the ICAN conference the new book 'The Coastal Atlas Flanders/Belgium 2' was launched. Such a publication is a very useful for awareness raising and complements an information rich online tool.



Ned Dwyer receiving the hardcopy of the new Kustatlas from Kathy Belpaeme at the Belgium Atlas Launch

The African Marine Atlases

Mika Odido (IODE), Lucy Scott (ASCLME)

The African Marine Atlas was initiated as a continental-scale online resource of public-domain geospatial data for the support of coastal and marine research and management in Africa. The project was designed to identify, collect and organize data sets into an atlas of environmental themes. A second aim was to provide training to increase the use of Geographic Information Systems (GIS) and spatial data products for the dissemination of appropriate, timely and relevant information. The inventory of data sets in the atlas is also a useful indicator of gaps, either in the knowledge base or the availability of the data in the public domain.

The initial list of over 200 data sets which were identified for the atlas was based on an extensive survey of coastal and marine data needs undertaken in early 2006 by all the countries participating in the Ocean Data and Information Network for Africa (ODINAFRICA). A website was set up as a clearinghouse of data sets (<http://omap.africanmarineatlas.org>). The site is hosted by the International Oceanographic Data Exchange (IODE) programme of the Intergovernmental Oceanographic Commission of UNESCO. It currently serves over 800 downloadable spatial data products in the fields of marine geosphere, hydrosphere, atmosphere, biosphere, and human environment. In addition, more than 60 basemap data sets are provided to give spatial reference to the other data layers.

However, the scales for the layers in the continental atlas was coarse, and this limited its usefulness for integrated management of the environment and resources at the local and national levels. It was thus necessary to develop national coastal and marine atlases, and additional value-added products and content that could support interrogation and information services at national and local level. The institutions participating in ODINAFRICA have therefore embarked on an initiative to develop National Coastal and Marine Atlases that will provide maps, images, data and information to a wide range of users, including scientists, students, coastal resources managers, planners, and decision-makers from national institutions and other specialized agencies in Africa. National Atlas teams have been established and training provided to equip them with the necessary skills to develop the national atlases. The teams are using SAGA to generate the layers, and GeoNetwork for the metadata. The Marine Irish Digital Atlas (MIDA) software engine will be utilized for building the atlases. The national atlases can be accessed at www.africanmarineatlas.net while the metadata is available at <http://geonetwork.ioode.org/geonetworkAMA/>

Some of the challenges faced in developing the atlases include: (i) expectations of an online data atlas were very varied, (ii) management of the metadata, (iii) choosing data formats and standard legends, (iv) selecting appropriate data of interest and meaning at continental scale, (v) logistics of working together from several countries, (vi) remote access to servers, (vii) access to the Internet from some of the countries, (viii) getting and recording specific permissions and

complex data citations (especially for biological data). An editorial board was set-up to address some of these issues.

Environmental Marine Information System (EMIS)

Pascal Derycke (EC-JRC)

Understanding the inner workings of European seas and coasts is essential to support political requirements underlined by recently adopted European marine and maritime policies, as well as to achieve EU commitments with regard to International Conventions, addressing biodiversity targets, climate change and efficient use of natural resources. In this context, EMIS has been developed to facilitate access to key environmental products, enabling the scientific and managerial community to create maps and conduct basic environmental assessments at European and regional scales (geographical cover: Lat. 70°N – 10°N; long. 42°W – 30°E).

EMIS is a web-based GIS relying on the open-source Minnesota Map Server engine. The EMIS web-GIS is written in PHP (Hypertext processor) and in Perl; the interaction with MapServer is achieved using PHP/MapScript functions. The direct access to datasets in scientific format (HDF-EOS and netcdf) makes it easy to adapt the GIS features to different datasets and to extend the same technology to other websites.

The system's operations include i) the provision of continuous, detailed and accurate marine /coastal environmental data as derived from satellite and model outputs; ii) the generation of indicators for global diagnostics of the coastal state and analyses of changes in marine ecosystems; iii) basic navigation and interrogation tools with a range of time-series and statistical analysis generated automatically in a format ready for publication / reporting, and enabling decision makers to make full and lasting use of this information.

Statistical functions include:

- Trend analysis – time series, multi-annual variability and seasonal analysis;
- Threshold analysis – highlighting in a map all values above (or below) a given threshold;
- Multi-variable analysis – cross-correlation and scatter plots of related variables
- Reporting – export results (both maps and plots) into ISO/IEC standard image format, as well as pdf file and ASCII files for documents and statistics.

Due to the application's optimized size, the process to create and query maps is extremely fast and simple, resulting in a very practical and useful high level user application.

The 2nd version of EMIS, released in June 2011, included a new design and improvements in the user-interface. The geographical cover has been extended. The resolution of the datasets will move progressively from a 4km to a 2km grid. Additional information layers have been included in the GIS application (e.g. isobaths, maritime boundaries, and coastline typology). Finally, users have the possibility of being notified in real time of any new updates if they subscribe to the mailing list

Note that EMIS has been mirrored for Africa as the African Marine Information System (AMIS; <http://amis.jrc.ec.europa.eu/>), extending from Lat. 40°N to 50°S and from long. 30°W to 60°E.

Caribbean Marine Atlas (CMA)

Sean Paddy (Inst. of Marine Affairs, CMA team)

The purpose of the CMA (<http://www.caribbeanmarineatlas.net/>) is to identify, collect and organize available geo-spatial datasets into an atlas of environmental themes for the Caribbean region as a support service to the sustainable development and integrated management of marine and coastal areas in the region. Furthermore it should help build capacity and expertise in the region to enhance data management practices. The CMA is intended to provide essential datasets directly to concerned scientists, coastal zone management practitioners, and natural resource managers, and will also set the stage for the development of decision-makers' toolkits that rely on geo-spatial information.

The CMA is supporting the use of Open Source technologies. At present, the following applications are used: PostgreSQL DBMS, PostGIS, GeoServer, OpenLayers and GeoNetwork. The most significant upgrade and enhancement of the CMA since it was first launched has been the move from Mapserver and a simple HTML-based front-end interface to a combination of GeoServer and OpenLayers which allows for a more dynamic and rich presentation of the CMA's content via Java.

While the prototype CMA was created with basic functionality and features, it has since been upgraded with more conventional and standard web map features and will soon include more robust functions such as preview, catalogue and search capabilities. The most significant feature planned for the CMA however, stems from its potential to act as a portal atlas through which users may gain access to the atlases of individual participating member countries.

The major challenges of executing the CMA have centred on both coordinating and sustaining the participation of all the individuals involved. Many if not all of them are located in different countries and each maintains a full time job separate to their contributions to the atlas.

Scotland's Marine Atlas

Martyn Cox (Marine Scotland)

Scotland's Marine Atlas (<http://www.scotland.gov.uk/marineatlas>) was prepared to inform the first National Marine Plan that will assist in making key planning decisions as marine planning is implemented in Scottish seas in line with the Marine (Scotland) Act 2010. It fulfils the requirement in section 3 of the Act to prepare an assessment of the condition of the Scottish marine area and a summary of the significant pressures and impacts of human activity. The Atlas will also provide an accessible and detailed insight into the geography and vast richness of Scotland's seas. It follows on a study published in 2007, "**Scotland's Seas - Towards understanding their state**" which gave a preliminary state of the Scottish seas. **Scotland's Seas** included information on a range of topics but, due to the time constraints in its production, lacked detail on the parameters studied and didn't complete a comprehensive overall assessment of the seas.

Scotland's Marine Atlas is based around the Scottish Government vision of "*clean, healthy, safe, productive, biologically diverse marine and coastal environments, managed to meet the long term needs of nature and people*". The chapters cover the following topics related to the sea: physical characteristics; clean and safe; healthy and biologically diverse; productive; and climate change. It is the first time that data and information has been compiled like this for Scottish seas.

The main audience is for current and future marine planners and policy makers. However, Scotland's Marine Atlas has been developed with a wide ranging audience in mind including the full range of stakeholders and the general public as well as politicians. It will also help in the development of the Scottish part of the Initial Assessment that needs to be undertaken for implementation of the European Marine Strategy Framework Directive. The Atlas is also considered suitable for future generations of decision makers and an Education Pack, including copies of the atlas, a DVD and posters were sent to all schools. The DVD can be viewed at <http://www.youtube.com/watch?v=WVVINp9uKLo>

At this stage Scotland's Marine Atlas is available in hard copy (the coffee table version) as well as HTML and pdf via the web site. National Marine Plan interactive has started to be developed and this uses GeoServer and OpenLayers.

The Atlas development work was led by Marine Scotland but was a collaborative venture with other bodies that have responsibility for the Scottish marine environment - Scottish Environment Protection Agency (SEPA) www.sepa.org.uk, Scottish Natural Heritage (SNH) www.snh.gov.uk, Joint Nature Conservancy Committee (JNCC) <http://jncc.defra.gov.uk/> and the Marine Alliance

for Science and Technology Scotland (MASTS) www.masts.ac.uk . The main challenges centred around working across so many organisations to gather the relevant data and present it in a consistent and easily accessible way and do so to meet the atlas publication target date. The usual challenges of ensuring that data were as up to date as possible, relevant, appropriate to a national level document, understandable but, most of all, spatially presented were also encountered.

From the Venice Lagoon Atlas Towards a Collaborative Federated System,

Alessandro Mulazzani (City of Venice), Stefano Menegon (ISMAR)

The WebGIS prototype, named “Lagoon Information System(SIL)” (<http://www.silvenezia.it>), presented at ICAN 4 in Trieste (Italy), has been developed and officially presented to the public (3rd February 2011) with the name of the original hard copy book: Atlas of the Lagoon. Since then the Atlas of the lagoon has been highlighted in the European Atlas of the Seas (http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm), as an example of a local scale atlas. The Atlas has also been fully described in the recent EU Commission report on “options for coastal information systems” (http://ec.europa.eu/environment/iczm/ia_studies.htm) .

A number of bodies involved in the management of the lagoon area are keen to collaborate in the publication of their spatial data. At present the City of Venice is actively working to consolidate collaboration agreements, especially with the Marine Science Institute of the National Research Council (ISMAR-CNR) and the Consortium for Coordination of Research Activities Concerning the Venice Lagoon System (CORILA), who are working on a project named CIGNo (Collaborative Interoperable Geographic Node: <http://cigno.corila.it/>) which could become very useful for the Lagoon Atlas.

CIGNo is a model for an information platform to manage, share, disseminate, query and use scientific and geographic data. CIGNo was built using several open source resources: GeoNode, the main package facilitates the creation, sharing, and collaborative use of geospatial data; GeoServer, a standard-based server for geospatial information and GeoNetwork, for powerful metadata editing.

Interoperability is the key feature of CIGNo. It has the ability to talk to each Catalogue Web Service (CSW), allowing the exchange of resources (information, metadata, data or maps) providing transparent access to users even though they use different IT standards. Cooperation between the data producers and owners is a crucial aspect of the work, which is focussed on developing a simple, flexible and open system. CIGNo should become the information system mostly used by specialists (especially researchers) to upload all data produced on the Venice Lagoon, including raw and complex data. The Atlas will provide a systematically organised content, “distilled” from CIGNo for a more general public (citizens, policy maker). To facilitate the “federation” of the two tools, the Atlas is moving from MapServer and Pmapper technology to the GeoNode technology.

The main challenge of the Atlas is the establishment of a functioning “federation”, which should also include other bodies involved in data production for the Venice Lagoon. From a technological point of view the main challenges include the enhancement of the linkage between CIGNo and the national and international environmental-data sharing systems and frameworks (eg. GEOSS SEADATANET, GIIDA), adopting catalogues like GI-cat, THREDDS (Thematic Realtime Environmental Distributed Data Services) Data Server to support environmental modelling, and the combination of the traditional metadata-based and CSW-based solutions with a Geographic Information Retrieval (GIR) system to automatically discover and search geographic information.

ATLASES AND CMSP

CMSP Policy Developments and Coastal Information Systems in the United States

Tony LaVoi (NOAA)

President Obama signed an Executive Order establishing a National Policy for the Stewardship of the Ocean, Coasts, and Great Lakes on July 19, 2010. That Executive Order adopts the final recommendations of the interagency ocean policy task force and directs federal agencies to take the appropriate steps to implement them. Coastal and Marine Spatial Planning (CMSP) is one of 9 priority objectives called for in the National Ocean Policy.

The final recommendations of the interagency ocean policy task force states that the development of 'a robust national information management system dedicated to coastal and marine scientific data and information products is required to meet the diverse data and application requirements of CMSP, and the varying technical capabilities of users.' Under the leadership of the National Ocean Council an interagency team of 15 federal agencies was tasked to develop the prototype National Information Management System (NIMS). This website serves as a centralized point to access federal data on oceans and coasts directly. The initial NIMS prototype has five key components:

- **Data:** ability to discover and access datasets and web mapping services identified by Federal agencies as supportive of CMSP planning activities.
- **Tools:** information on a variety of decision support tools, analytical methodologies, and visualization techniques to support CMSP in the regions.
- **Community:** a "community of practice" that will provide a venue for sharing information and resources on technical issues such as data standards and web services for GIS practitioners and data managers.
- **Regional Planning:** an interface to regional CMSP data and information system efforts, providing a single access point for all information on evolving regional and state efforts.
- **Forums:** enable the users of the NIMS to share their thoughts and ideas for growing the NIMS, suggesting data contributions, decision support tools, and providing feedback about the site.

The NIMS went live towards the end of 2011 at <http://www.data.gov/ocean>

EMODnet Hydrography

Dick Schaap (MARIS)

The European Commission has concluded service contracts for the creation of pilot components of the European Marine Observation and Data Network (EMODnet). The overall objective is to create pilots to migrate fragmented and inaccessible marine data into interoperable, continuous and publicly available data streams for complete maritime basins. The EMODnet-Hydrography portal (<http://www.emodnet-hydrography.eu>) development started in June 2009 and now provides a range of options for freely browsing and downloading new Digital Terrain Models (DTM) for a large part of the European seas. The downloadable tiles are freely available in a number of formats, including the Fledermaus SD format for 3D viewing. The EMODnet digital bathymetry with a grid size of 0.25 by 0.25 minutes has been produced from bathymetric survey data and aggregated bathymetry data sets collated from public and private organizations. These are processed and quality controlled. A further refinement is underway, also by gathering additional survey data sets, and will result in new releases in time.

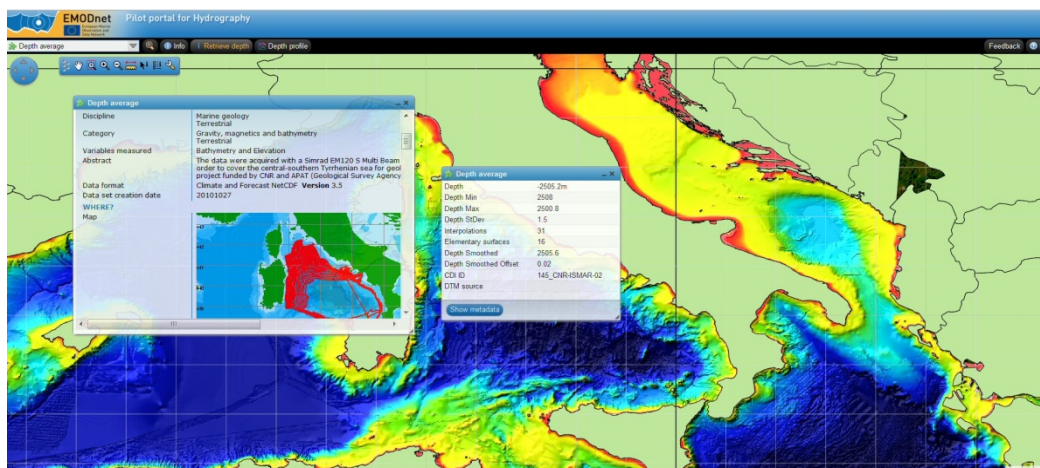


Figure 2: Mediterranean Bathymetry from the EMODnet Pilot Portal.

The portal also includes a metadata discovery service, by adopting the EU SeaDataNet CDI standard, which gives clear information about the background survey data used for the DTMs, their access restrictions, originators and distributors. This way the portal provides originators of hydrographic data sets an attractive shop window for promoting their data sets to potential users, without losing control. So far the inventory covers more than 7000 survey data sets, managed by 13 data centres from 9 countries and originating from 114 institutes (public authorities, hydrographic services and research institutes).

It appears that data providers welcome the SeaDataNet concept, that their datasets are described by metadata in the public CDI data discovery and access service, while they can keep control of the access themselves by means of the data access restriction metadata field. The CDI service functions as a shop window to inform users of their data holdings. Especially in the field of bathymetric survey datasets it appears that data providers do not simply want to give open access to their precious datasets, but want to negotiate with potential users about access and use. Therefore all datasets included so far have been labelled as restricted, leading to a negotiation in case of user requests. Also it appears that the data providers do not object that the generated EMODnet digital bathymetry is made available to users without any constraints for viewing, sharing as a WMS service and downloading as DTM tiles in various formats. The spatial resolution is considered to be low and the derived product is a good way to attract potential users.

Dorset Atlases for Marine and Coastal Planning

James Feaver (Dorset Coast Forum)

As part of a European Union Interreg IV A project - C-SCOPE (Combining Sea and Coastal Planning in Europe) the Dorset Coast Forum in England is producing two “coastal atlases”:

- A GIS-based tool to support decision-making and planning in the marine and coastal zones (Coastal Explorer Planning).
- An interactive map-based website for locals and visitors to plan recreational activities along the coast and within coastal waters (iCoast).

Coastal Explorer Planning

This atlas is being used to present the marine spatial plan being developed as part of the project, its policies and evidence base. Its intended audience is a professional one – planners, developers, consultants, consultees and academics. It contains a very broad range of geographic datasets that relate to marine and coastal planning – environmental, governance and policy, human use and activity. In addition to a map based component it also includes flowcharts of the approval process for different type of development and a database of all policies that affect marine and coastal areas. The tool has been developed by the Dorset County Council GIS Team and is a version of the corporate GIS. The system is currently under development.

iCoast (www.icoast.co.uk)

iCoast has been developed to allow visitors and local people to plan recreational activities along the Dorset coast and within coastal waters. It also allows "soft" management of visitors by promoting less sensitive areas, such as fossil hunting, and raising awareness of sensitive areas and affecting behaviour. It contains data on the locations of recreational activities / businesses / clubs, transport, weather (forecast and live), facilities and restricted access areas / sensitive habitats. Additionally it contains activity information - how, where, planning, safety etc and "Codes of Conduct" - to ensure people use the coast in a sustainable way. It was developed with a commercial partner.

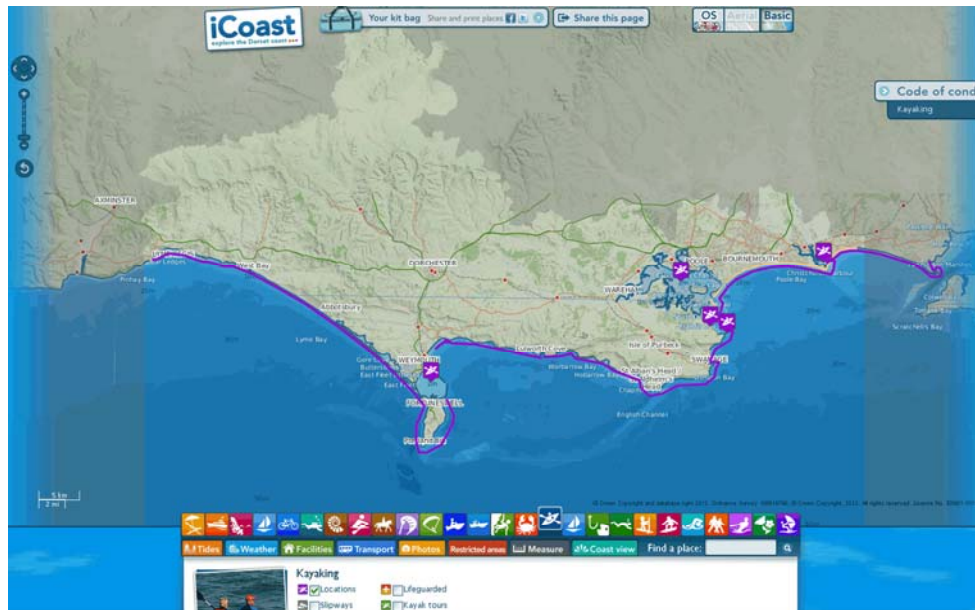


Figure 3: Homepage of the Dorset iCoast website with the location of kayaking areas highlighted

Opportunities and Challenges for CWAs CMSP

ICAN 4 identified coastal and marine spatial planning (CMSP) as a subject area of relevance to CWA developers. CWAs are seen to have the potential of contributing to several aspects within the CMSP process, for example providing relevant data, offering analytical tools for interactive data query and reaching a specific target audience. During ICAN 4 these ideas were explored in relation to funding opportunities for CWA support and development. In ICAN 5 four dedicated breakout groups investigated this subject area further with the aim to identify opportunities and challenges. The ICAN 5 participants were asked to address two main questions:

- What opportunities exist for CWAs to support CMSP?
- What are the challenges for CWAs that support CMSP?



Calvin Gerry (Seychelles Fishing Authority) and
John Pepper (OceanWise Limited)
at ICAN 5

Opportunities for CWAs to support the CMSP processes were mainly seen in

- Data/information requirements,
- Aiding communication and
- Promoting best practice.

Table 1 presents a more detailed breakdown of the issues raised under these broad headings.

Table 1: Opportunities for CWAs to support CMSP

Data/Information	Communication/Outreach	Best Practice
<ul style="list-style-type: none"> • Access to Data • Data quality control via metadata provision (highlight strengths and weaknesses of data) • Identifies data gaps • Bridging dichotomy between small and large scale information • Interoperability of CWAs provides a mechanism to access data and information across different organisations, countries, language barriers and spatial extent • Harmonisation of data sources and providers • Providing socio-economic data which is a gap area that CWA could fill 	<ul style="list-style-type: none"> • Vehicle for communicating complex data in understandable ways • Simplifies the mystique of CMSP • Engagement with a broader readership to foster public participation, provide transparency and gain trust • Diversity of CWA can serve different communities e.g. multiple interfaces to cater for the needs of different users • Multi - lingual capabilities for regional planning • Enable two way communication allowing queries and questions from the user community 	<ul style="list-style-type: none"> • Provide guidance for MSP by delivering a baseline inventory • Promoting best practice – CWAs can act as global benchmarking mechanism • CWAs providing stewardship of data, information and knowledge

Challenges identified for CWAs supporting CMSP were related to

- Change in governance regimes and lack of institutional support
- Lack of focus on the CWA purpose and
- Methodological difficulties.

These are noted in more detail in Table 2 below:

Table 2: Challenges for CWAs to support CMSP identified by participants of the ICAN 5

Change in governance	Lack of focus	Methodology
<ul style="list-style-type: none"> • Overreliance on government funding and political will, may hinder long term planning for a CWA • Some users of CWA's may not like too much transparency • Chasing short term incentives and funding related to MSP may result in lack of content and focus 	<ul style="list-style-type: none"> • Overcomplicating the CWA by trying to cater for MSP process and loosing focus • Strong IT pull to include/develop or try out new technology supporting the MSP process may be unbalanced with provision of data/information 	<ul style="list-style-type: none"> • Timelines are not always well synced between the development of CWAs and MSP time frames • Scale: are CWAs being developed at scales sufficient to support MSP – local vs. national vs. regional.

In plenary discussion the participants raised a number of questions for further consideration by the ICAN community in order to progress on this subject in a practical way:

- a) How are atlases currently being used and who are the users?
- b) What does CMSP really mean and can that be captured in a CWA?
- c) What functions should the CWA fulfil within the CMSP process?
 - i) CMSP requirements driven CWA
 - ii) Issues driven CWA e.g. could contain a defined suite of questions to be answered
 - iii) What-if tool CWA e.g. provides data to a specific CMSP as baseline information
- d) What is required? e.g. tools, aggregate and synthesise many data layers, various/simple interfaces, increased focus on economic cost/benefits of resources.

WORKING GROUP UPDATES

Steering and Management Working Groups

A focus of activities since ICAN-4 has been to formalize membership of ICAN. Conditions of becoming a member have been kept simple in order to attract as many people and organizations as possible. Potential members must sign up to seven conditions:

- Place the ICAN logo prominently on your atlas web site AND providing a link back to www.icoastalatlases.net.
- Collaborate on a wide range of ICAN projects and activities. This may include proposals for funding as appropriate opportunities arise, contributing expertise and/or tools for projects, developing best practices for coastal web atlases, participating in an ICAN working group, and promoting ICAN within your organization and partner networks.
- Attend ICAN workshops or meetings as time, interest, and funding allow.
- Raise awareness of ICAN and present ICAN-related activities at appropriate events as opportunities arise.
- Implement at present or at some point in the future an installation of OGC's Catalog Services for the Web (CSW), so as to eventually be federated globally, regionally or nationally (includes harvesting of your atlas' metadata).
- Post a logo and summary details about your atlas project and personnel for inclusion in ICAN's member and expertise directories.
- Inform ICAN's management working group co-ordinators if you wish to withdraw your membership.

As of June 2012, there are 57 members. The organisations, contact points and summary of CWA related activities can be accessed at: http://ican.science.oregonstate.edu/en/member_dir.

Discussion in this session examined if ICAN objectives were being achieved and if the working groups could improve their support of these objectives. Evidence of ICAN success to date related to the large and representative membership, the publishing of the ICAN Handbook in 2010, the support given by the EU funded NETMAR project to advancing interoperability, the large number of workshops, meetings and events organised by or with participation of ICAN members, and the sharing of software and know-how between members.



ICAN members celebrating the official launch of the ICAN Handbook

Other issues that were discussed included:

- Reviewing and improving the ICAN governance structure
- Improving communication in the steering and management working groups and spreading the work load between all members
- Improving connectivity and communication within the ICAN membership and enhancing outreach beyond the current ICAN community
- Achieving a “wow factor” of an actual, working demonstrator on both discovery and display of metadata and data. This will show the real value proposition of ICAN to the CWA and ICZM/CMSP communities and can be presented and published broadly. NETMAR can contribute to this
- Maintaining the importance of the original goals of ICAN for the human network, assistance, building of a community of knowledge and a community of practice.

Some developments since the workshop which are addressing the above include the compilation of a regular ICAN newsletter, edited by Andy Sherin, the first issue of which was published in March 2012 (<http://ican.science.oregonstate.edu/en/node/644>). Another key development which addresses ICAN governance explicitly is that in January 2012, ICAN applied

to and was provisionally accepted by the International Oceanographic Commission (IOC) as a project within the International Oceanographic Data and Information Exchange (IODE) programme. IODE has been a great advocate for ICAN and an active member of the Network over recent years. This new relationship will give ICAN a higher international profile than it has had and there is potential for enhanced global reach. Moreover, being represented by an International entity allows ICAN to join with other organisations and networks, compete for funding and become a full project partner. There is also the potential for funding for certain activities from within IODE itself. A key activity in 2012 will be to reconstitute the ICAN steering and management working groups as a steering group within the IODE ICAN project and devise an updated work plan.

Technical Working Group

Progress Overview and Activities

Liz O’Dea and Tanya Haddad gave a summary of ICAN technical activities for new ICAN members and also presented progress since ICAN 4. They presented the background to the ICAN interoperability work and the two prototype demonstrators developed to date (<http://ican.ucc.ie>). Work on interoperability has continued under the EU FP7 funded NETMAR project, including the development of an interoperability cookbook. The prototype of this demonstrator is available at: <http://netmar.ucc.ie/discovery>. Since ICAN 4 the ICAN technical group has also participated in training activities and contributed substantially to the ICAN Handbook published in 2010.

NETMAR overview

Roy Lowry gave an overview of the EU FP7 funded Open Service Network for Marine Environmental Data (NETMAR) project and its linkages with ICAN. The key aims of NETMAR are to:

- Make it easier for real users to perform *ad hoc* processing tasks online in their web browser.
- Create an open and extensible platform based on established standards and open source software.
- Develop a novel semantic framework that enhances discovery of data and services with uncertainty measures available and propagating through the service chain.
- Link the system to the European Marine Information System (EUMIS).

ICAN is one of the NETMAR use cases. Developments of relevance include the design of an interconnected semantic resource with content derived from existing resources. This is being built on standards incorporating XML, RDF and SKOS for delivery and ReST and SOAP for access. A cookbook on metadata, semantics and connecting a coastal atlas to the ICAN semantic interoperability pilot is also in production.

Technical developments of relevance to ICAN that are currently underway include the creation of a 3rd interoperability prototype. This will have a semantic discovery engine with an ontology browser interface. It will search for federated metadata exposed through CSW. The thematic focus for this prototype will remain coastal erosion, as with the previous versions. In order to enhance this prototype the ICAN community needs to assist by backing up discovery with data and developing additional thematic semantic domains. NETMAR can assist in advancing these activities.

In subsequent discussions during the ICAN meeting three topics were chosen for the creation of additional semantic domains. These are:

- Water Quality,
- Coastal Vulnerability,
- Coastal and Marine Spatial Planning.



Roy Lowry,(standing) (BODC), Tanya Haddad (Oregon Ocean-Coastal Management Program) and John Helly (San Diego Supercomputer Center) at the ICAN5 Technical Working Group Session

MINI WORKSHOP ON ATLAS USERS

ICAN 5 hosted a Mini workshop on Atlas Users facilitated by Kathy Belpaeme, Marcia Berman, Kathrin Kopke and Ned Dwyer. The workshop aimed to explore the relationship between atlas developers and atlas users; in particular how atlas users are involved over the lifetime of an atlas, how the atlas is used and the level of communications between developer and user.

To kick start the workshop and open up a discussion a number of presentations were given:

- **Policy Options for Coastal Information Systems (CIS) in relation to ICZM, Ned Dwyer (CMRC)** summarised an analysis of over 40 CIS carried out by Thetis Spa for the European Commission, which involved a wide range of stakeholders. The study was undertaken in order to establish how CIS can respond better to user needs in regard to implementing ICZM policy. The analyses showed that all development phases need to be supported by user views/requirements. Furthermore the study showed that a CIS can be viewed from different perspectives and that the different policy led objectives influence the development focus of any CIS. In conclusion constant adaptation and upgrade of a CIS is essential to cater for changing user requirements.
- **Experience from the European Atlas of the Seas, Anne-France Woestyn (EC-DG Mare)** reviewed the relationship between developers and users during the development phase of the Atlas. A number of consultation tools were used during various development stages such as public consultations, expert meetings, public survey, user testing and

workshops. Website statistics were utilised to establish the website popularity, visitor loyalty, back links and page rank.

- **Experience from the Belgian Coastal Atlas (C-Scope project), Sofie Vanhooren (Coordination Centre for ICZM)** shared knowledge gained during the development of the Belgium Coastal Atlas specifically in relation to small scale testing of CWAs in development. The CWA developers gained valuable input from potential end-users, using workshops early in the development process. The small scale testing was inspired by the experience from the European Atlas of the Seas and took place in the final phase of atlas development. The test involved a questionnaire to determine personal data, profession, organisation, use of internet and interest in marine and coastal themes. Exercises were undertaken with the participants to establish the average time it took to find specific information, study surfing behaviour and ask questions related to the text and cartographic part of the CWA. The small scale test commenced with a limited number of participants from the target audience had short time duration and was low cost. The test proved to be highly effective and led to vital changes of the interactive map for the final version of the atlas.
- **Experiences from the African Marine Atlases, Mika Odido (IODE)** described how the African Marine Atlas Project achieves its objective while covering an extensive geographic scope. The process involved national workshops, input from regional programmes, dedicated seminars (ODINAFRICA, 2006) and the composition of an editorial team. Further workshops were held in order to advance data mining, coordination and protocols and data assembly. The project received national level input through questionnaires, consultation meetings, atlas workshops and end user reviews. On a regional level, contributions to the project came from workshops and provision of regional scale data. The identification of regional product requirements allowed for a more refined project.
- **Experience from the United States and the Caribbean, Marcia Berman (VIMS)** provided an overview on Atlas user observations from the US and progress with the Caribbean Marine Atlas project. Evidence from the US suggests that while Atlas development is increasing, these CWAs are developed without considerations of interoperability. Lack of knowledge has been identified as the main reason for this and participation in ICAN is seen as an opportunity for CWA developers to incorporate knowledge on interoperability in the CWA development process. The Caribbean Marine Atlas project consists of six participating countries that have the objective to develop regional prototypes as well as national atlases. So far progress has been made in training technical staff, development of the regional prototypes and the hosting of workshops in four of the six countries. Stakeholder interest is strong but the actual engagement of stakeholders needs to be improved. A defined point of contact was believed to be crucial in order to facilitate improved stakeholder engagement and resolve conflict situations. Current challenges within the project are related to identifying priorities, resolving issues related to data exchange and sharing, as well as the lack of support coming from the national level.

A discussion followed the formal presentations and a number of points were raised which are briefly presented here.

The European Atlas of the Seas questionnaire user survey was acknowledged by workshop participants as particularly impressive (120 responses). The success of this method was also discussed in terms of experiences from US federal agencies, who have to undergo a review process that can take up to ten months, if they want to survey more than ten participants.

The Caribbean Marine Atlas project was discussed in relation to the absence of any ocean policy in the countries involved. The sustainability of CWAs was questioned when such a

national level support mechanism is missing. However, experience from the African Marine Atlas project was presented as an example where support for national atlas development has been increasing subsequent to the initial development of the African Marine Atlas.

The Belgium Kustatlas experience inspired a discussion on the different ways to get end user responses. The group agreed that for constructive end user feedback the user needs more than a blank pop-up-window asking for input. Presentation of a prototype CWA, with facilitated user interaction to garner feedback is one approach. A suggestion to make ICAN experiences available online in a “*CWA end user engagement cookbook*” received positive feedback from the workshop participants.

Atlas user questionnaire results and discussion

Marcia Berman and Kathy Belpaeme presented the results of an Atlas user survey undertaken with CWA developers from Europe, the USA, the Caribbean and the Indian Ocean prior to ICAN 5. The survey showed that CWA developers use workshops to engage with potential user groups prior to the actual CWA development. Stakeholder interest and engagement is mainly driven by data requirements and the ability to access data via CWAs. Most CWA developers monitor atlas use often for grant reporting. User feedback focuses to a large extent on data quality and requests for new data. CWA developers are responsive to problems encountered with existing data but in many cases are less able to react to queries concerning new data, changes and additions to the CWAs because they lack resources. The survey showed that CWA developers utilise a number of approaches to publicise their CWA, such as conference presentations, newspaper/newsletters, social networks and journal papers.

Workshop participants found that this survey gave a great summary of informal and formal ways to communicate with their CWA user community. It was of interest to the group to learn how some developers can identify more precisely who their users are. NOAA Digital Coast was mentioned as an example, where the directors were able to use the networks in which they are involved as a conduit to users – essentially personal contact was very effective. Registration on CWA websites was noted as a method of identifying users, however its potential deterrence effect was also mentioned. Google analytics was acknowledged to be practical in terms of acquiring certain information on users in a relatively easy manner, however, this method does not give an insight into how users utilise the CWA, information which is possible to retrieve using specialised software.

Workshop participants discussed new ways to reach audiences, such as social networking sites. Risks were highlighted with regard to the use of Twitter and Facebook and the requirement to police usage of social networking sites, which may not be possible when resources are restricted. Establishing e-mail contact with the CWA user base was suggested as a way to receive additional information. Further suggestions were made such as enabling users to have a discussion forum via which they could help each other with technical queries, while at the same time providing feedback to the CWA developer. This concept was further expanded to the use of webinars and online threads on certain topics. The idea of creating a concise help document on how to engage with the CWA end user was raised again and seen to be a potential workshop recommendation.



Roy Lowry talking about the NETMAR project at ICAN 5

MINI WORKSHOP ON SEMANTIC FRAMEWORKS AND ONTOLOGIES

Demonstration of the NERC Vocabulary Server V.2.0, Roy Lowry (BODC)

Roy demonstrated a new simpler method for semantic mappings which should make the process of organizing knowledge easier for atlases that would like to connect to a global system. The new method is based on the concept of SKOS – Simple Knowledge Organization System. In SKOS, concepts can be organized into collections and into schemes.

One outcome of the NETMAR project is that an API now exists for individual atlases to take advantage of Natural Environment Research Council's (NERC) Vocabulary Server (NVS) semantic knowledge in a local atlas without going through the full NETMAR project interface. This API operates as a web service accessible via a REST interface or SOAP interface, which delivers results in XML that is RDF compliant, so that it can be ingested with standard RDF tools. Other advances include the mapping of terms to definitions housed outside the NERC vocabulary server.

The old method for connecting to the ICAN prototype involved using tools like Protégé to generate OWL files for documenting terms used in local data collections, and perhaps using an online tool like MMI's Vine to do the mappings to another vocabulary. Previously the ICAN tech team referred to broad search terms as the "global ontology", and local terms for metadata as the "local ontology". This process was difficult for newcomers to execute because of the disparate specialty tools involved, not to mention that what was being produced were not full-fledged ontologies. Roy's new method is much simpler. It uses familiar tools like Microsoft Excel to treat local terms as simple vocabulary, and allows for the mapping of local terms to global terms to create simple Thesauri.

The Lowry method is as simple as listing all the "leaf nodes" of a local atlas in a 3 column excel table. One column contains the local vocabulary term, the second column is the relationship (like "narrower than") and the third column is the relevant global term. Local terms are allowed to be mapped to more than one global term. Definitions of local terms are provided on a separate excel sheet.

Once uploaded to the NERC vocabulary server, the mapped list of terms is made available via the NVS API. The API returns XML that contains everything that is needed to power a smart discovery interface. (i.e., all of the global terms needed for the discovery interface and all of the

mappings to the local terms). The thesaurus created by Roy's NVS system can be accessed via a URL that returns RDF documents that are ingestible for any local semantic purposes.

The fact that the NVS vocabulary editor is available via an API, means that a new ICAN interface could be built which allows ICAN member atlases to do mappings from their own local terms to global ICAN terms entirely within a simple ICAN ecosystem. There is no need to exit to an external system like MMI. ***The building of such an interface could be a potential future project of the ICAN tech team.*** It also means that ICAN Atlas users now have a choice to put their searches into the ICAN mediator and make their data available via search in that way, or they can access the underlying NVS API to do some semantic work locally.

Currently the NERC API is only accessible via BODC login credentials, and obviously individual lists of vocabulary need to be secured so that terms in a project are not altered (accidentally or otherwise) by people in another project. This is an example of a hurdle that a potential ICAN tool could solve for users by enabling registration in the NERC system for any ICAN registered project.

Remaining technical issues to be resolved on this topic include the fact that while SKOS is a standard, the XML payloads returned by such a system can be different in different cases. There is a W3C working group that is looking at this problem.

Capturing ICAN end-user requirements for NETMAR, Declan Dunne (CMRC)

Declan explained that user feedback from Atlas developers is required for the NETMAR work. He gave an overview of two main areas of work:

- **Geo-processing services (WPS):** CMRC has resources to demonstrate the utility of WPS services to an ICAN audience. The example use case will be the dynamic creation of hillshade and color relief products from web coverage service (WCS) data resources accessed across multiple systems.
- **Cookbooks projects:** CMRC will be working on the four cookbook topics outlined by ICAN:
 - Understanding metadata
 - Installing GeoNetwork
 - Understanding Semantics
 - How to connect a coastal atlas to the ICAN semantic interoperability pilot.

Feedback is needed from the ICAN community on the utility of the cookbooks as composed to date, and suggestions can be made on future topics. Two items discussed were:

- Work on the vocabulary topic presented by Roy is not included in the NETMAR cookbooks contract work, but needs to be documented for ICAN users.
- The topic of the various methods of data search/discovery is not one that has been clarified for ICAN users in any sort of cookbook form. This may not be a topic that needs a cookbook in itself, but may need to be covered as an "About Search" section in an existing cookbook.

Connecting Atlases to the ICAN CSW Mediator, Yassine Lassoued (CMRC)

The ICAN prototype version 3 (ICWA3) is being developed as part of the GeoDI and NETMAR projects. There are five main components of the new prototype:

- An Ontology browser (OB)
- A discovery Interface (Geofinder)
- A Metadata viewer (Metaviewer)
- A Semantic Web Service (SWS)

- Catalog Services for the Web (CSW) Mediator (CSWM)

The first three items are analogous to elements of the version 2 prototype. The second two are outlined as follows:

- The Semantic Web Service (SWS) houses improved SKOS-based ontologies in a DBMS (RDB or triple store). The SWS is accessible as a service via the web and supports a set of high-level operations (GetConcept, GetConceptSched, GetRelatedConcepts, SearchConcept, etc).
- The CSW Mediator (CSWM) supports CSW 2.0.1, 2.0.2 and other CSWM nodes. It behaves as a CSW service and Ontologies are not required. Performance is improved over the previous prototype in that registered nodes are interrogated in parallel. An additional interesting characteristic is that CSWMs may be nested, which could lead to the concept of regional CSWMs.

The current NETMAR prototype is available at <http://netmar.ucc.ie/discovery>. The coming ICAN prototype 3 (ICWA3) will be derived from advances made in the above described technical developments and example interface.

Future Overview of Becoming an ICAN Node: In the future, the following steps will be used for an atlas to become a node in the ICAN Global Atlas:

1. A Local Atlas creates a Local Vocabulary.
2. The Atlas registers their Local Vocabulary with the NERC Vocabulary Server Semantic Resource.
3. The Local Vocabulary is pulled by the ICAN mediator.
4. The local Atlas data is then available via a global ICAN mediator search.

Discussion

Movement to the use of APIs and Portlets or Widgets within the component projects of NETMAR makes a future possible where individual atlases can build their own clients to access the NVS and the ICAN mediator to build custom interfaces for local users. This is seen as an advantage by local atlas developers because a semantically intelligent search can then be conducted within an Atlas's home interface, in a way that is transparent to local users. Atlas developers could customize the search from their Atlas to meet user needs by searching local, regional or global data.

This suggests two new products that the ICAN tech community could produce:

- Full documentation of the various new APIs so that local Atlas developers have enough documentation to develop client interfaces.
- Sample client interfaces that are simple, embeddable, and customizable by local Atlas developers (such as semantic search starter packs for local atlases).

This second topic could be a priority because it would empower local atlases to use the work products from NETMAR to advance the discoverability of atlas products. Regional interest in data search among neighbours, such as in Europe, the western US states and the Great Lakes region, could benefit from having data discovery tools that could be easily embedded in their own atlases while also being discoverable on a global level. This in turn would motivate further use of interoperability methods in future local atlas work, and also benefit the larger prototype effort.

Potential IODE Collaborations

Mika Odido (IODE) gave a presentation on the history of IODE and some of its current activities. IODE has been a strong supporter of ICAN since its inception and has built a strong relationship with the Network through activities related to the African Marine Atlas and the Caribbean Marine Atlas.



Mika Odido (IOC/IODE) at ICAN 5

The key areas where IODE believes that interaction with ICAN can be enhanced include:

- **Preparation of practical manuals for people developing atlases.** IODE, within the framework of its regional ODIN networks has been promoting the development of national and regional atlases. In order to ensure a long-term impact the development of practical manuals and guides is desirable.
- **Training activities on atlas development.** In order to ensure the availability of local expertise in developing and maintaining atlases, as well as to provide continuous professional development opportunities related to atlas development and use, a joint ICAN/IODE training programme could be envisaged. The OceanTeacher system (for management of training content) as well as OceanTeacher Academy (to organize live courses as well as distance learning courses) could be used. The potential of involving trainers from the ICAN community needs to be explored.
- **Mobilizing the data resources of IODE in support of atlas development.** The quality and reliability of atlases can only be assured if the source data are of the highest quality. Cooperation with IODE will lead to increased reliability of atlases thanks to the quality control and quality assurance methodology used by IODE NODCs.
- **IODE hosting websites and atlases on its servers.** IODE has a tradition of hosting content for other projects, and for its NODCs (especially in developing countries). The same applies for atlases. This service can be extended to ICAN and its members.
- **Collaboration with ICAN members on small projects.** ICAN members can supply technical solutions to IODE to assist it with implementing its programme. For example, as an enhancement of its MIDA atlas the CMRC, with funding from IODE, is developing SmartAtlas, an open source technology framework which will be used by countries participating in the AMA to implement customised national atlases.

OGC Interoperability and High Resolution Shoreline Project

Ben Domenico (UCAR); John Helly (San Diego Supercomputer Center, Scripps Inst. of Oceanography)

- **Mid-course Progress and Opportunities for Unidata Outreach, Ben Domenico (UCAR)** introduced the ICAN community to the Unidata Program Center, which is working with a number of international partners on projects aiming to make data available to a broad audience and gain access to other data source in useful forms, while supporting standard interfaces using bottom up approaches. The projects involve for example the implementation of a web services interface to traditional atmospheric and oceanographic datasets which will result in a gateway service using Web Coverage Service (WCS) specification of the Open Geospatial Consortium (OGC).
- **Interoperability Discussion, John Helly (San Diego Supercomputer Center, Scripps Inst. Of Oceanography, UCSD) and Ben Domenico (UCAR)** talked about advancing metadata, data and document interoperability, improving related standards and conventions by proposing a high-resolution shoreline project as an OGC interoperability experiment. The idea of producing a world wide high resolution shoreline has arisen from the current need to connect geophysical to engineering scales and considering requirements for best possible sea-level rise impact assessments.

The presentations were followed by a lively discussion in relation to a potential ICAN shoreline project. The group recognized that this would be a very large project and that such a task would need to gain substantial momentum and enthusiasm to be successful. Issues relating to data collection and securing funding were noted. Participants suggested an examination of relevant, existing data and how a better quality product could be produced. Local expertise to incorporate knowledge of local and regional coastal systems was highlighted as a project requirement. Questions were raised in terms of the intended end user community of such a shoreline and that such may vary from country to country. Another concern was voiced with regards to the cost of getting involved with OGC and that ICAN may require legal advice on the matter. In summary the group agreed that the first steps to advance the shoreline project are:

- Establishment of an inventory of relevant data and projects
- Refinement of the proposal with feedback from the ICAN community

CONCLUSION AND FUTURE DIRECTIONS

Many International Coastal Atlas Network participants felt that by ICAN 4 in 2009 the Network had reached maturity. Members were successfully collaborating and advancing a number of activities in parallel. As a result, it was agreed that ICAN 5 would take place not in 2010 but in 2011, as the Network had gained sufficient momentum to maintain itself in the absence of an annual meeting. Nonetheless it was seen as important to convene regional meetings to ensure the cohesion of the Network. To that end an ICAN Americas workshop was held in Wisconsin, USA and a EuroICAN meeting was held in London, both in September 2010. These provided an opportunity to update the community on relevant activities, welcome new members to the Network and discuss and collaborate on ongoing initiatives.

The constant need to ensure the relevance of Coastal Web Atlases (CWAs) was at the core of the discussions at ICAN 5. The focus of the workshop was on how such Atlases can support coastal and marine spatial planning. To this end there were presentations on Coastal and Marine Spatial Planning (CMSP) policy development in both Europe and North America. Breakout discussion groups allowed for deeper analysis of the opportunities and challenges offered by CMSP. The main opportunities identified can be summarised under three headings:

1. **Data and information requirements:** CWAs can provide access to a range of well documented data at different scales and across country, language and cultural boundaries. They can highlight data gaps.
2. **Aiding communication and outreach:** CWAs can communicate complex data of relevance to CMSP in understandable ways. The diversity of CWAs caters for a range of communities; they can foster public participation and lead to transparency and trust in the planning process.
3. **Promoting best practise:** Atlases can provide guidance for CMSP by providing a baseline inventory, and could act as a global benchmarking mechanism.

The three major challenges were seen as:

1. **Change in governance regimes and institutional support:** Over reliance on government funding, short term incentives and lack of political will may hinder long term planning for a CWA and may result in lack of content and focus.
2. **Lack of focus on the CWA purpose:** Overcomplicating CWAs or trying out new technologies within CWAs for CMSP may lead to lack of focus and an imbalance with respect to providing data and information.
3. **Methodological difficulties:** the spatial and temporal scales of CWAs and CMSP may not always match.

Other key activities at the workshop included:

- Presentations from ICAN members who have raised the profile of ICAN via participation in workshops and conferences. Activities from a dozen different events were formally presented. This demonstrates the relevance of, and interest in, CWAs and the reputation that ICAN is garnering as the reference point for CWAs.
- A number of atlas developers presented significant updates since ICAN 4, while the Atlas of Scotland, the European Commission's Joint Research Centre's Environmental Marine Information System and The European Atlas of the Seas were presented for the first time. There are now almost 60 members of ICAN who have formally agreed to ICAN's Statement of Support. The full list of members is at: http://ican.science.oregonstate.edu/en/member_dir
- Identifying and engaging with users has been an ongoing issue for ICAN. The meeting saw the organisation of a mini workshop on Atlas users. A number of Atlas developers presented on how users are engaged before, during and after initial Atlas developments. The results of a questionnaire which was disseminated to a large number of Atlas developers were presented. Some of the key results of that survey were:
 - Developers use workshops to engage with potential user groups prior to the actual CWA development.
 - Stakeholder interest and engagement is mainly driven by data requirements and the ability to access data via CWAs.
 - Most CWA developers monitor Atlas use, often for grant reporting.

The mini workshop concluded that it would be useful for the ICAN developer community to prepare a concise help document on how to engage with the CWA end user.

- A mini workshop on semantic frameworks and ontologies updated participants on relevant developments facilitated through the NETMAR project. Via the NERC vocabulary server a new simpler method for semantic mappings is now available.

A number of technical cookbooks are being produced which will require feedback from the ICAN community. The process of becoming a node in the ICAN prototype 3, which is currently being developed, has been significantly simplified. The workshop concluded that there are two new products that the technical community could produce:

- Full documentation of the various new APIs so that local Atlas developers have sufficient information to develop client interfaces.
- Sample client interfaces that are simple, embeddable, and customizable by local Atlas developers (such as semantic search starter packs for local atlases).

Appendix E details the actions resulting from ICAN 5 that the group intends to address over the coming months. These are categorised under **governance**, **work programme**, **outreach** and **funding**.

Since ICAN 5 there have been significant developments with regard to putting ICAN governance on a more stable footing. A number of alternative options were discussed within the Steering and Management Working Groups. A decision was taken to request the Intergovernmental Oceanographic Commission (IOC) of UNESCO to approve ICAN as an official IODE project. This request was considered and approved at the IOC IODE Officers Meeting in February 2012.

This is a great step forward in consolidating the Network's governance. Some of the main benefits for ICAN of being an IODE project are:

- ICAN will retain almost complete autonomy with regard to its membership and will be responsible for drawing up its own work plan which will need to be coherent with IODE's overall objectives.
- ICAN will gain an enhanced profile and global visibility by being more strongly linked to IODE which potentially buys the network more credibility in the eyes of those not yet familiar with ICAN.
- ICAN can be represented by IODE as a formal entity when seeking external funding. Given that IODE is truly international this will allow ICAN to approach funding agencies in a wide range of jurisdictions. It also demonstrates that ICAN is a Global Network for Atlas development and not aligned with any specific geographical area.
- ICAN can continue to contribute to and enhance its role in IODE capacity building and training initiatives. This will help spread best practise, in the first instance within the IODE's African Marine Atlas (AMA) and Caribbean Marine Atlas (CMA) projects, but in the future to other IODE related initiatives, including potential Atlas development in other regions of the world. There is also the potential for more formal links with ongoing IODE activities, such as the Integrated Coastal Area Management (ICAM) programme.



The participants of ICAN 5

The IODE ICAN Pilot Project is a precursor to the establishment of a full IODE ICAN Project which will be proposed to the 22nd session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XXII) in March 2013. In the coming months the existing ICAN working groups will draw up and propose a work programme for the period 2013-2015. The terms of reference for the IODE ICAN Pilot Project are available on the IODE website at:

http://iode.org/index.php?option=com_content&view=article&id=335&Itemid=100065.

A EuroICAN meeting is planned for **November 26th 2012** in conjunction with Littoral 2012 to be held from 27th to 29th November in Oostende, Belgium. This will be an opportunity to launch officially the IODE ICAN Pilot Project, engage with the NETMAR project team, review progress on the ICAN 5 action items, as well as providing a networking opportunity for ICAN members.

In June 2012 a workshop in the US hosted by NOAA CSC on regional ocean portals and another co-hosted by a separate NOAA/USGS/WHOI group which specifically focused on ontologies for coastal and marine spatial planning took place. US ICAN members will investigate the potential for an ICAN event related to these workshop topics later in 2012.

The 6th international workshop (aka ICAN 6) will be held at the University of Victoria (uVic), Canada from **June 16th to 18th 2013**. The uVic will host CoastGIS 2013 immediately afterwards. The objectives of ICAN 6 will be determined over the coming months, however building on the opportunities of being an IODE project will be a strong focus, whilst progressing with work on ontologies and semantic interoperability and the user experience of CWAs will remain core activities of the ICAN community.

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Appendices

Appendix A: ICAN Members

Membership in ICAN is open to all interested parties, including organizations with an operational coastal web atlas, as well as individuals or organizations contributing to ICAN goals or hoping to design and build a coastal web atlas in the future. The following have agreed to ICAN's Statement of Support/Intent to Collaborate or have been active participants in ICAN since its inception.

African Marine Atlas, **South Africa, Ghana, IODE**
 African Marine Information System, **European Commission**
 Agulhas and Samali Currents Large Marine Ecosystems (ASCLME Project, African Marine Atlas Team, **South Africa**
 Alaska Coastal Atlas, Alaska Coastal Mgmt. Program, **USA**
 Alaska Shorezone, **USA**
 Atlas of the Lagoon of Venice, **Italy**
 Belgian Coastal Atlas, **Belgium**
 British Oceanographic Data Centre, **England, UK**
 Bulgarian Black Sea Coastal Atlas, **Bulgaria**
 British Columbia's Coastal Resource Information System, **Canada**
 California Coastal Atlas, **USA**
 California Ocean Protection Council, **USA**
 California Ocean Uses Atlas, **USA**
 Caribbean Marine Atlas, **9 Caribbean nations including Barbados and Trinidad & Tobago, UNESCO IODE**
 Coastal and Marine Information System of Andalusia, **Spain**
 Coastal Atlas of São Paulo, **Brazil**
 Compass Informatics, **Ireland/EU**
 Council for Scientific and Industrial Research, **South Africa**
 Data Basin Conservation Biology Institute, **USA**
 Department of Geosciences, Oregon State University, **USA**
 Digital Climate Atlas, **Mexico**
 Environmental Marine Information System, **European Commission**
 European Atlas of the Seas, European Commission
 European Environment Agency, **Denmark**
 Flanders Marine Institute, European Network for Coastal Research, **Belgium**
 Great Lakes Commission, **USA**
 HELCOM, Baltic Marine Environment Protection Commission, **Finland**
 Korea Environmental Science and Technology Institute, **Korea**
 Land-Ocean Interactions in the Coastal Zone (LOICZ), **International**
 Living North Sea, University of Aberdeen, **Scotland, UK**
 MAGIC, Coastal and Marine Resource Atlas, **UK**
 Maine Coastal Atlas/Northeast Data Portal, **USA**
 Marine Institute, **Ireland**
 Marine Irish Digital Atlas (MIDA), **Ireland**
 MarineMap, **USA**
 Marine Metadata Interoperability (MMI), **USA**
 MUMM Marine Management Atlas, **Belgium**
 New York Ocean and Great Lakes Atlas, **USA**
 NOAA Legislative Atlas (NOAA Digital Coast), **USA**
 NOAA Multipurpose Marine cadastre, **USA**
 NOAA Multipurpose Marine Cadastre, **USA**
 North Carolina Coastal Hazards Decision Portal, **USA**
 Northwest Assoc. of Networked Ocean Observing Systems (NANOOS), **USA**
 Ohio Coastal Atlas, **USA**

Open Geospatial Consortium, **USA**
Oceanwise Ltd., **UK**
Oregon Coastal Atlas, **USA**
Oregon Explorer: Noarth Coast Explorer, **USA**
Pacific coastal Resource Atlas, **Canada**
Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), **USA**
San Diego Supercomputer Center, **USA**
Scotland's Marine Atlas, **Scotland, UK**
Scripps Institution of Oceanography, **USA**
Southern California Coastal Ocean Observing System (SCCOOS), **USA**
Texas Coastal Communities Atlas, **USA**
UNESCO IOC IODE
US Geological Survey Center for Integrated Data Analytics, **USA**
Virginia Coastal Geospatial and Educational Mapping System (GEMS), **USA**
Virginia Institute of Marine Science, **USA**
Wadden Sea World Heritage Area Atlas, **Netherlands**
Washington Coastal Atlas, **USA**
Water Atlas (Uni. of South Florida), **USA**
Wisconsin Coastal Atlas, **USA**

Appendix B: Workshop Programme, 31 August – 2 September 2011

Time	Day 1 - Wednesday, 31 August 2011 Briefing on Recent Events/Initiatives Atlases and Coastal and Marine Spatial Planning (CMSP)
8:30-9:00a	Registration Secretariat
	Welcome
9:00-9:15a	Welcome participants to Innovocean site, Peter Pissierssens (IODE) Briefing on logistics, Kathy Belpaeme (Coordination Centre for ICZM)
	Introduction to Workshop Objectives & Agenda
9:15-9:45a	<u>Overview of ICAN to date for new participants</u> , Ned Dwyer, (CMRC) <u>Agenda and objectives of ICAN 5</u> , Dawn Wright (OSU)
	Briefing on Recent International Coastal Atlas Events/Initiatives (and the ties to CMSP) (Chair: Ned Dwyer)
9:45-10:00a	<u>ICAN Great Lakes Meeting</u> , David Hart (University of Wisconsin)
10:00-10:15a	<u>Littoral 2010, EuroICAN, Options for Coastal Information Systems</u> , Ned Dwyer (CMRC)
10:15-10:30a	<u>US Regional Ocean Partnership Funding for CMSP and Mid-Atlantic Regional Council on the Ocean (MARCO)</u> (Kathy Taylor, Washington Dept. of Ecology; Marcia Berman, Virginia Institute of Marine Science)
10:30-10:45a	<u>WHOI/NOAA/USGS CMSP Discovery Vocabularies Workshop</u> , Tanya Haddad, (Oregon Coastal Management Program)
10:45-11:00a	Coffee Break (sponsored by EUCC)
11:00-11:15a	<u>SPINCAM Workshop in Guayaquil, Ecuador</u> , Alejandro Iglesias Campos (Junta de Andalucía-CMA-REDIAM / ETC-SIA)
11:15-11:30a	<u>Coastal GeoTools and Coastal Marine Spatial Planning/ICAN Special Interest Meeting</u> , <Tony LaVoi, NOAA>
11:30-11:45a	<u>ICAN at European Maritime Day, Gdansk, Poland</u> , Alejandro Iglesias Campos (Junta de Andalucía-CMA-REDIAM / ETC-SIA)
	Latest Developments on Selected Atlases
11:45-12:00p	<u>Washington Coastal Atlas</u> , Kathy Taylor (Washington Dept. of Ecology)
12:00-1:30p	Lunch (sponsored by Coordination Centre ICZM)
	Latest Developments on Selected Atlases continued
1:30-2:00p	<u>Belgian Coastal Atlas</u> , Kathy Belpaeme & Sofie Vanhooren, (Coordination Centre for ICZM)
2:00-2:15p	<u>Evaluation of African Marine Atlases</u> , Mika Odido (IODE), Lucy Scott (ASCLME)
2:15-2:30p	<u>African Marine and European Marine Information Systems</u> , Pascal Derycke, (EC-JRC)

2:30-2:45p	Caribbean Marine Atlas and National Atlas Initiatives , Sean Paddy (Inst. of Marine Affairs, CMA team) [off-site via GoTo Meeting]
2:45-3:00p	Scotland's Marine Atlas , Martyn Cox (Marine Scotland)
3:00-3:15p	From the Venice Lagoon Atlas Towards a Collaborative Federated System , Alessandro Mulazzani (City of Venice), Stefano Menegon (ISMAR)
3:15-3:45p	Coffee Break (sponsored by NETMAR)
	Atlases and CMSP (Chair: Ned Dwyer)
3:45-4:00p	CMSP Policy Developments and Coastal Information Systems in the United States , Tony LaVoi, (NOAA)
4:00-4:15p	EMODnet Hydrography: Developing a Digital Bathymetry for European Maritime Basins , Dick Schaap (MARIS)
4:15-4:30p	Dorset Atlases for Marine and Coastal Planning and Part 2 , James Feaver (Dorset Coast Forum)
4:30-4:45p	Coastal Information Underpinning EU Marine Directives , (Roger Longhorn, Compass Informatics)
4:45-5:15p	SWOT (Strengths, Weakness, Opportunities, Threats) Breakouts/Discussion: Coastal Atlases for Coastal/Marine Spatial Planning
5:15-5:30p	Reports from Breakouts/Conclusion
5:45p	Group Photograph
6:00-8:00p	Reception (sponsored by Coordination Centre ICZM) Including Launch of New Belgian Coastal Atlas

Day 2 - Thursday, 1 September 2011	
Time	Working Group Updates Mini-Workshops Broad CMSP Initiatives in Europe
8:30-9:00a	Registration Secretariat
	Working Group Updates
9:00-9:45a	ICAN Membership Procedures/Progress Steering and Management Working Group Updates Dawn Wright (OSU) [off-site via GoTo Meeting]
9:45-10:30a	Tech Team Progress Progress Overview and Activities Liz O' Dea, (Washington State); Tanya Haddad, (OCA) NETMAR Overview Roy Lowry, (BODC) Taking ICAN Forward Technically, Including Prototype - 3 Roy Lowry, (BODC)
10:30-11:00a	Coffee Break (sponsored by NETMAR)
	Mini Workshop on Atlas Users (Facilitators: Kathy Belpaeme, Marcia Berman, Kathrin Kopke)
11:00a-12:30p	Policy Options for Coastal Information Systems in relation to ICZM , Ned Dwyer (CMRC)

	<p>Experience from the European Atlas of the Seas, Anne-France Woestyn (EC-DG Mare)</p> <p>Experience from the Belgian Coastal Atlas (C-Scope project), Sofie Vanhooren (Coordination Centre for ICZM)</p> <p>Experiences from the African Marine Atlases, Mika Odido (IODE)</p> <p>Experience from the United States and the Caribbean, Marcia Berman (VIMS)</p> <p>Discussion</p>
	<p>Concurrent Mini Workshop: Semantic Framework and Ontologies: NETMAR experience and ICAN feedback (Facilitators: Declan Dunne, Yassine Lassoued, Roy Lowry)</p>
11:00a-12:30p	<p>Demo of the NERC Vocabulary Server V.2.0 Roy Lowry, (BODC)</p> <p>Capturing ICAN end-user requirements for NETMAR Declan Dunne, (CMRC)</p> <p>Demo of adding content to an ICAN semantic resource Roy Lowry, (BODC)</p> <p>Discussion and feedback</p>
12:30-1:30p	<p>Lunch (sponsored by Coordination Centre ICZM)</p>
	<p>Mini Workshop on Atlas Users Continued (Facilitators: Kathy Belpaeme, Marcia Berman, Kathrin Kopke)</p>
1:30-2:30p	<p>Results of user questionnaire Discussion based on the workshop questions Recommendations and conclusions regarding atlas user needs</p>
	<p>Concurrent Mini Workshop: Connecting Atlases to the ICAN CSW Mediator (Facilitators: Declan Dunne, Roy Lowry, Yassine Lassoued)</p>
1:30-2:30p	<p>Workshop focus on how to become a new node in interoperability prototype. Demo of connecting to the CSW mediator: ICAN Prototype Version 3 Yassine Lassoued, (CMRC)</p> <p>Discussion and feedback from both workshops</p>
2:30-3:00p	<p>Potential IODE Collaborations - How can ICAN Benefit IODE Activities? Mika Odido (IODE)</p>
3:00-3:30p	<p>Coffee Break (sponsored by NETMAR)</p>
3:30-4:30p	<p>OGC Interoperability Discussion: Ben John Ben Domenico (UCAR); John Helly (San Diego Supercomputer Center, Scripps Inst. of Oceanography)</p> <p>Including update from John Helly on high-resolution shoreline project and possible OGC interop experiments. Some discussion time focused on advancing data interoperability and the documentation of interoperability standards and conventions (as requested by John)</p>
4:30-5:00p	<p>INSPIRE Thematic Working Group Meeting for "Area Management" Roger Longhorn (Compass Informatics)</p>
5:00-5:30p	<p>Concluding Remarks Ned Dwyer (CMRC)</p>
6:00-7:15p	<p>Reception (sponsored by CMRC) Including Celebration of ICAN Handbook</p>

Time	Day 3 - Friday, 2 September 2011 Internal ICAN Business Everyone Welcome!
9:00-10:30a	ICAN Governance and Technical Action Planning Notes from Thursday Steering/Mgmt session Governance Doc from ICAN 4 Revisit Action Item Spreadsheet from ICAN 4 Governance Discussion Notes
10:30-10:45a	Coffee Break (sponsored by CMRC)
10:45-12:00p	Concluding Discussions (if needed) Scope detailed action plan for tech team activities Clarify ICAN Prototype-3 developments Final discussions, recommendations, collaborations

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

This workshop report has an accompanying web site at <http://ican.science.oregonstate.edu/ican5> 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.



ICAN session about to start



Catching up with old friends



ICAN folk at a well deserved break in between sessions



The Belgium Kustatlas launch celebration during ICAN 5



ICAN 5 Final Meeting



Workshop participants testing the Belgium beer
All photos in this report by Liz O'Dea.

Appendix D: Participant List

NAME	ORGANISATION	COUNTRY	E-MAIL
Kathy Belpaeme	Coordination Centre for Integrated Coastal Zone Management of Belgium	Belgium	kathy.belpaeme@kustbeheer.be
Marcia Berman	Virginia Institute of Marine Science	USA	marcia@vims.edu
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Martyn Cox	Marine Scotland	Scotland, UK	Martyn.cox@scotland.gsi.gov.uk
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Ben Domenico	University Corporation for Atmospheric Research	USA	ben@ucar.edu
Declan Dunne	Coastal & Marine Research Centre, University College Cork	Ireland	d.dunne@ucc.ie
Ned Dwyer	Coastal & Marine Resources Centre, University College Cork	Ireland	n.dwyer@ucc.ie
James Feaver	Dorset Coast Forum	UK	j.feaver@dorsetcc.gov.uk
Calvin Gerry	Seychelles Fishing Authority	Seychelles	cgerry@sfa.sc
David Green	University of Aberdeen	Scotland, UK	d.r.green@abdn.ac.uk
Gigab Ha	Korea Environmental Science & Technology Institute	Korea	ggaha@kesti.co.kr
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
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Eric Honoré	European Commission	Belgium	Eric.honore@ec.europa.eu
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Kathrin Kopke	Coastal & Marine Research Centre, University College Cork	Ireland	k.kopke@ucc.ie
Yassine Lassoued	Coastal & Marine Research Centre, University College Cork	Ireland	y.lassoued@ucc.ie
NAME	ORGANISATION	COUNTRY	E-MAIL
Tony LaVoi	NOAA Coastal Services Center	USA	tony.lavoi@noaa.gov
Roger Longhorn	Info Dynamics Research Assoc Ltd & IODE	UK	ral@alum.mit.edu
Roy Lowry	British Oceanographic Data Centre	UK	rkl@bodc.ac.uk

Hannelore Maelfait	Coordination Centre for ICZM	Belgium	Hannelore.maelfait@kustbeheer.be
Andrus Meiner	EEA	Denmark	Andrus.Meiner@eea.europa.eu
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Liz O'Dea	Washington Department of Ecology	USA	lode461@ecy.wa.gov
Mika Odido	UNESCO IOC Sub Commission for Africa and the Adjacent Island States	Kenya	m.odido@unesco.org
Sean Paddy	Institute of Marine Affairs, Caribbean Marine Atlas Team	Trinidad & Tobago	sean.paddy@gmail.com
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Hristo Stanchev	Bulgarian Academy of Science	Bulgaria	stanchev@io-bas.bg
Kathy Taylor	Washington Department of Ecology	USA	ktay461@ecy.wa.gov
Sofie Vanhooren	Coordination Centre for Integrated Coastal Zone Management	Belgium	Sofie.vanhooren@kustbeheer.be
Anne-France Woestyn	European Commission	Belgium	Anne-france.woestyn@ec.europa.eu
Dawn Wright	Oregon State University, ESRI	USA	DWright@esri.com

Appendix E: ICAN 5 Action Item Spreadsheet

Type	Activity/Task	Time (completion)	Lead	Deliverable	Deadline	Notes
Governance	Establish ICAN as legal entity	before ICAN 6	Roger Longhorn		to be discussed at 1st tele-com	
Work Programme	Develop a SG/MWG work plan to focus activities	July 2012	Roger Longhorn, Kathy Taylor, Ned Dwyer, Dawn Wright	Work plan		Discuss at December tele-conference
	Develop ICAN strategic plan	end March 2012	Ned Dwyer, Dawn Wright, Marcia Berman, Roger Longhorn, Kathy Taylor	Strategic plan	1st draft by December tele-com	
	Improve ICAN internal communication - schedule tele-conference every 2 to 3 months	Ongoing	Roger Longhorn, Ned Dwyer, but with rotating leads		1st tele-com scheduled for December 1st 2011	This should be an issues based meeting, not just internal business. Could also be a forum for short presentations
	IODE/IOC keen to develop enhanced links with ICAN	December 2012	Roger Longhorn, Kathy Taylor, Ned Dwyer, Dawn Wright, Mika Odido	MOU		This will require that ICAN is formally incorporated in some manner
	Ensure that SG/MWG tasks are spread among all group members	Ongoing	Group leads			Group leads to delegate but others to step up to take on tasks
	ICAN e-newsletter to be developed	Q1 2012	Andrew Sherin	newsletter		Frequency of issue to be decided; all ICAN members to provide stories.
	Calendar to be setup on ICAN website	November 2011	Dawn Wright, Tanya Haddad	calendar set up		use to post events, comments

Outreach	Develop an ICAN communications strategy	December 2012	John Pepper, Roger Longhorn, David Hart	strategy developed	1st draft by March 2012	
	Develop an ICAN PPT template and some generic slides	End of March 2010	?	template developed		to be provided as resource for everyone; can be translated into other languages
	Develop new flyer and poster	End of March 2012	Kathrin Kopke, Ned Dwyer	new flyer and poster		pdf versions to be provided on website; flyer could be translated
	Extend ICAN membership - in particular from US	Ongoing	Marcia Berman	new members	review December 2012	This will help in regard to funding bodies
Funding	Review US NSF funding opportunities	Ongoing	John Helly, Marcia Berman	funding applications	1st review end March 2012	
	EEA funding opportunities	Ongoing	Ned Dwyer, Roger Longhorn, Andrus Meiner	funding application		link funding to training; easier to fund travel to/within Europe
	Discuss funding issues at 1st teleconference	Ongoing	all		discuss at tele-com 1st December	
ICAN-6	Schedule ICAN-6;		Dawn Wright, Ned Dwyer	scheduled		Optimal is back-to-back with CoastGIS in Victoria, Canada in 2012; Make effort to attract "real" users to part of the event.
ICAN-5	Workshop report	March 31st 2012	Ned Dwyer, Kathrin Kopke	workshop report	1st draft 31st January 2012	Inputs received from participants. Need to compile and complete sections.