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ICAN - Best Practice Guide to Engage your Coastal Web Atlas User Community

Editors: Kathrin Kopke and Ned Dwyer

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TABLE OF CONTENTS

ANNEX

1. SUMMARY

The long-term strategic goal of the IODE ICAN (International Coastal Atlas Network) project 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. ICAN aims to achieve this 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.

User interactions between CWA developers and hosts and their target audiences have been explored since the beginning of the ICAN project, through workshops, and practically through the development of the various atlases by the membership of ICAN. We believe that the wealth of experience gained within ICAN should be made available to new and existing atlas developers in order to provide practical guidance on how best to interact with atlas audiences.

This hand book was compiled by gathering information from ten atlas developers as well as extracting relevant information from ICAN workshop reports. This information is summarised and analysed here leading to two sets of recommendations, one focused on the development of new atlases and the other focused on how to maintain interactions with audiences of already developed atlases. The handbook will therefore allow both new and established CWA developers and hosts to benefit from best practice examples as well as learn from mistakes made in the past, in order to increase capacity to successfully interact with user communities and target audiences, while managing coastal and marine data and information in a user friendly way. The final product is a resource that hopes to complement and link to a variety of OceanTeacher activities, support IODE training in courses, and it will be made available within the OceanTeacher Digital Library, thereby being of value to all who manage and present marine data and information.

2. INTRODUCTION

Kathrin Kopke

The International Coastal Atlas Network (ICAN)

The International Coastal Atlas Network (ICAN) emerged from a series of trans-Atlantic meetings held in 206 and 2007 between a group of organisations that shared a common interest in Coastal Web Atlas (CWA) development. The ICAN grew in subsequent years into a community of practice developing best practise examples for technical solutions to CWA development, scoping and implementing data interoperability approaches and exploring end user interaction with CWAs. Since 2006, the network has organised seven workshops across the globe in Europe, North America and Africa and is increasing awareness of opportunities for coastal and marine information sharing through the CWAs, while growing the ICAN community.

Figure 1: ICAN 5 workshop participants 2011, Ostend, Belgium.

ICAN became a project of UNESCO IOC´s International Oceanographic Data and Information Exchange (IODE) Programme in 2013. The IODE International Coastal Atlas Network (ICAN) project aims to be a global reference for the development of CWAs, which ICAN defines 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).

The long-term strategic goal of the IODE ICAN project 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. ICAN aims to achieve this 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. In order to reach this goal, ICAN has the following objectives:

- ✓ Ensure that ICAN has representation from coastal web atlas development and user groups from across the world.
- ✓ Develop technical and policy guidelines to assist coastal web atlas developers in acquiring data and engaging with data providers. Accordingly, collate and publish a set of best-practise guidelines for the development of coastal web atlases.
- ✓ Highlight the benefits of interoperability and standards based systems to the coastal atlas developer communities.
- ✓ Develop collaborative projects for the sharing of know-how, implementation of technical solutions and demonstration of atlas benefits to users.
- ✓ Align the atlas efforts of the Network partners in order that interoperability can be facilitated.
- ✓ Engage with other relevant international IODE projects and developments as well as relevant activities outside of IODE.
- ✓ Involve representatives of the relevant user communities to help in tailoring coastal web atlases to their needs.

To further these objectives ICAN has identified a range of activities in the areas of technical implementation, atlas assessment, outreach, training, and participation in scholarly communities, and strategic planning and funding. ICAN members seek to play a leadership role in forging international collaborations of value to the participating organisations, thereby optimizing regional governance in coastal zone management.

The ICAN is compiling **this best practice user interaction guide** because successful interactions with potential CWA users during the development of any CWA are as vital for the success of the resource as the continued interaction with existing audiences to ensure longevity and continued use. Although ICAN members have considerable experience with their user communities, this knowledge is dispersed among the network and ICAN hopes to bring this knowledge together in a way that allows mutual learning from each other and benefits new and established CWA developers to support and improve the use of CWAs.

Exploring CWA user interaction through the ICAN workshops

User interactions between CWA developers and hosts and their target audiences have been explored from the very first ICAN workshop, *Potentials and Limitations of Coastal Web Atlases*, in Cork, Ireland, in 2006. The workshop brought together 40 participants from academia, government agencies and conservation organizations from Europe and North America to share technologies and lessons learned from the development of CWAs (O'Dea et al., 2007). This workshop stated that the advancing technologies and the community needs have led to the development of a niche group of interactive coastal web atlases (CWAs) around the world. The meeting further emphasized that development of Geographic Information System (GIS) based web mapping products has improved the usability of GIS by non-specialists and CWA development has to be responsive to the needs of the user community (O'Dea et al., 2007).

Figure 2: Pictures taken at ICAN workshops.

The ICAN 2 workshop, *Coastal Atlas Interoperability*, took place in 2007 in Corvallis, Oregon, USA with 27 participants from 6 countries, representing 17 organizations. The workshop looked into best practices for achieving interoperability between CWAs, referencing its potential uses and users. ICAN 2 envisioned users to be able to conduct complex and meaningful queries across a range of atlases through the application of semantic interoperability's facilitating interoperable CWAs (Wright et al., 2007).

In 2008, ICAN had its third workshop, *Federated Coastal Atlases: Building on the Interoperable Approach*, in Copenhagen, Denmark and engaged 29 participants from 10 countries,

representing 25 organizations. In relation to CWA user interaction, ICAN 3 explored the importance of policy context to CWA user needs and CWAs as information tools that are utilised by disparate user communities, including non-technical, high level decision makers (Dwyer and Wright, 2008).

ICAN 4, *Formalizing the Network, Engaging the Mediterranean*, took place in November 2009, in Trieste, Italy and engaged 32 participants from 12 countries, representing 26 organizations. As part of ICAN 4, a specific mini workshop on CWA users was held to investigate feedback mechanisms and ways to measure the impacts of CWAs in relation to users and user communities (Wright et al., 2010).

The ICAN 5 workshop, *Coastal Atlases as Engines for Coastal & Marine Spatial Planning*, was held in Ostend, Belgium in 2011 and brought together 43 participants from 15 countries, representing 36 organizations. Following the interest and success of the ICAN 4 mini workshop on CWA users a follow on mini workshop at this meeting explored how atlas developers engage their user communities before, during and after initial CWA development. The mini workshop concluded that it would be valuable for the ICAN developer community to prepare a synthetic guidance document on how to engage with CWA end users (Dwyer et al., 2012).

ICAN 6, *Expanding Participation in Coastal Web Atlas Development and Use*, was held in Victoria, BC, Canada in 2013 with 29 participants from 9 countries, representing 22 organisations. In relation to CWA user interactions this workshop specifically explored data integration platforms that allow two-way information and data flow between developer and the user and established that experts within the ICAN community have been very successful at engaging users through the full cycle from atlas conception to development, implementation and use. A questionnaire circulated at ICAN 6 and subsequent discussion confirmed interest and willingness of ICAN experts to contribute to an ICAN user interaction guide (Dwyer and Kopke, 2014).

ICAN 7, *Coastal Atlases – Supporting Ecosystem Based Management*, took place in Cape Town, South Africa in April, 2015 with 35 participants from 17 countries, representing 27 organisations. ICAN 7 further formalised the idea for an ICAN user interaction guide through a mini workshop, where ICAN experts agreed on potential chapters, aim and target audience for this guide book and how best to collate experiences from within the network.

ICAN CWA USER INTERACTION AT A GLANCE

The ICAN workshops addressed different aspects of user interaction with CWAs, their developers and hosts; however, some considerations, topics and issues are reoccurring, which are summarised below.

- ✓ **CWAs need to meet the user needs:** Data and information needs to be delivered on time through reliable CWAs (O'Dea et al., 2007) in a format that meets the users interest e.g. the CWA content has to be relevant to the target audience (O'Dea et al., 2007; Dwyer et

al., 2012). Furthermore, the CWA needs to meet the user skill level for example through the development of an easy to use interface (O'Dea et al., 2007; Dwyer et al., 2012).

- ✓ **CWA Design:** Depending on the target audience some atlases focus on being accessible to a more general audience while others aim for a specific user group. Existing atlases are more often designed to meet the basic needs of a broad range of users, but are sometimes too complicated for general audiences. A simpler atlas can be more effective than one with a lot of functionality. Developers should consider designing multiple versions which provide a range of services to make a system accessible to both the public and specific user groups (O'Dea et al., 2007).

- ✓ **CWA user feedback:** The analyses of user feedback is as important as the identification of existing, new and emerging technologies to provide good quality and reliable user feedback. Collecting detailed information from CWA users can be useful but mechanisms need to be evaluated favouring the less intrusive ways e.g. pop-up windows which request a user to identify themselves could annoy end users, lead to inaccurate information being collected and could discourage atlas use. Popular mechanisms associated with Web 2.0 applications such as "like/dislike" buttons may not provide as detailed information but can indicate trends and offer fast impressions of user opinion on information, format or layers in a CWA (Wright et al., 2010). User surveys may be perceived as tedious, if a large amount of information is requested but can provide a required detail of information through effective design. Targeting focus groups through semi - structured surveys can provide answers to specific questions at the desired level of detail (Wright et al., 2010); similarly, to the presentation of a prototype CWA in combination with facilitated user evaluations (Dwyer et al., 2012).

- ✓ **CWA publicity:** The CWA success depends to a large extent on continuing dissemination and publicity of the atlas and while publicity may be limited to landmark events such as the atlas launch or the development of new tools, these outreach events increase the number of users. Email lists keep current audiences and users informed of developments and are reassuring that maintenance of the CWA is on-going. Press publicity, appearances at events and conferences, brochures and innovative giveaways (e.g. calendars) increase exposure of an atlas to potential new audiences. Although maintaining momentum is important to increase an audience base, it is important not to oversell the ability of atlases or to make unrealistic claims (O'Dea et al., 2007; Dwyer et al., 2012).

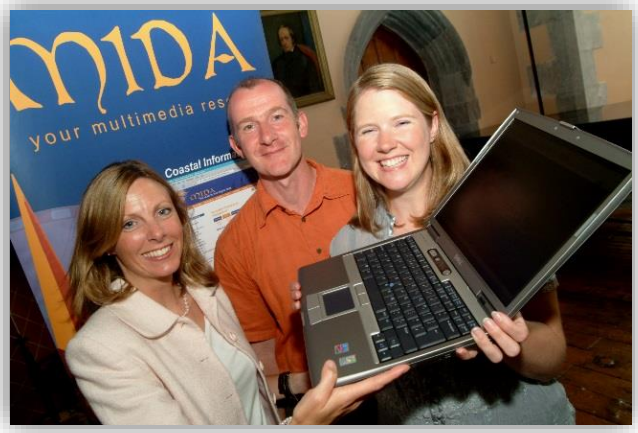

Figure 3: Dr Valerie Cummins, Liz O'Dea and Dr Ned Dwyer at the MIDA launch in 2006, Cork, Ireland.

- ✓ **Web statistic software:** Baseline information e.g. IP address, data downloads, visitor numbers, type of browser or country code is collated by many CWA developers within the ICAN through web statistical software. This non-intrusive way of collating user information enables site managers to study atlas usage and to gauge trends (O'Dea et al., 2007; Wright et al., 2010). This method is however limited as many CWA developers require more detailed information such as an indication of how data downloads have been used or more qualitative evaluation of CWA elements to enable atlas improvement based on user experience (Wright et al., 2010).

- ✓ **Considering new approaches/technologies:** Exploring and implementing new approaches and technologies has to be balanced against maintaining a stable and functioning system. However, atlas developers are challenged to meet design expectations of users for example through the Google Earth paradigm, where the public is used to a certain look and feel and aspects of functionality of a popular Web-GIS (O'Dea et al., 2007). Furthermore, recent web applications have become much more of a two-way flow of information and data. Data and information is coming from the general public through applications such as Wikipedia, Wikimapia, Flickr, OpenStreetMap and the overall concept of web mashups including Volunteered Geographic Information (VGI) (Dwyer and Kopke, 2014). These web applications often allow direct user input and provision of data, which should be explored at individual CWA level, because such interaction not only fosters an increased sense of ownership in the CWA user community and associated recurrent visits of the resource but increases understanding of user needs and improves the relationship of the atlas developer with the user community. Data and information quality control as well as access rights to the atlases and security concerns would have to be addressed, and these may significantly differ depending on the type of CWA host organization (Wright et al., 2010).

- ✓ **Measuring the impact of CWAs:** There is limited capacity to measure the impact of CWAs in the coastal community. Better methods need to be developed in how to measure impacts of CWAs in the coastal community, such as a cost-benefit analysis. There is certainly a value to the convenience of quick access to data, which users would have previously had to acquire themselves as well as benefits of providing a way to communicate coastal and marine issues to the science community and the general public. It is however important to ascertain what is that value or the impact of CWA. A first step in the direction of putting such a value on the impacts of CWAs is assessing how CWAs are used by different user communities and to see if user expectations are being met and who is benefitting from the CWAs e.g. potentially determining how much money is saved as a result of such a resource (O'Dea et al., 2007; Dwyer and Wright, 2008).

Aim and Audience of the User Interaction Guide

This hand book is conceived as a practical "cookbook" rather than a fully peer-reviewed publication but aims to systematically identify and address issues and challenges related to Coastal Web Atlas (CWA) user interaction through examples and expertise from within the International Coastal Atlas Network (ICAN). This best practice guide will explore how atlas developers can engage with their user communities through conception, development, implementation, operation and revision of their atlases.

The book will allow new and established CWA developers and hosts to benefit from best practice examples as well as learn from mistakes made in the past, in order to increase capacity to successfully interact with user communities and target audiences, while managing coastal and marine data and information in a user friendly way. The final product will be a resource that hopes to compliment and link to a variety of OceanTeacher activities, supporting IODE training in courses, and will be made available within the OceanTeacher Digital Library, thereby being of value to all who manage and present marine data and information.

The following sections are based on information collated via questionnaire surveys from ten ICAN CWA developers (see Table 1 and Annex I). Contributors to this handbook represent regional CWAs such as the Coastal and Marine Information System of Andalusia in Spain to CWAs that operate on a national level e.g. Belgium's De Kustatlas all the way to experiences with a CWA for an entire continent, the African Marine Atlas (AMA).

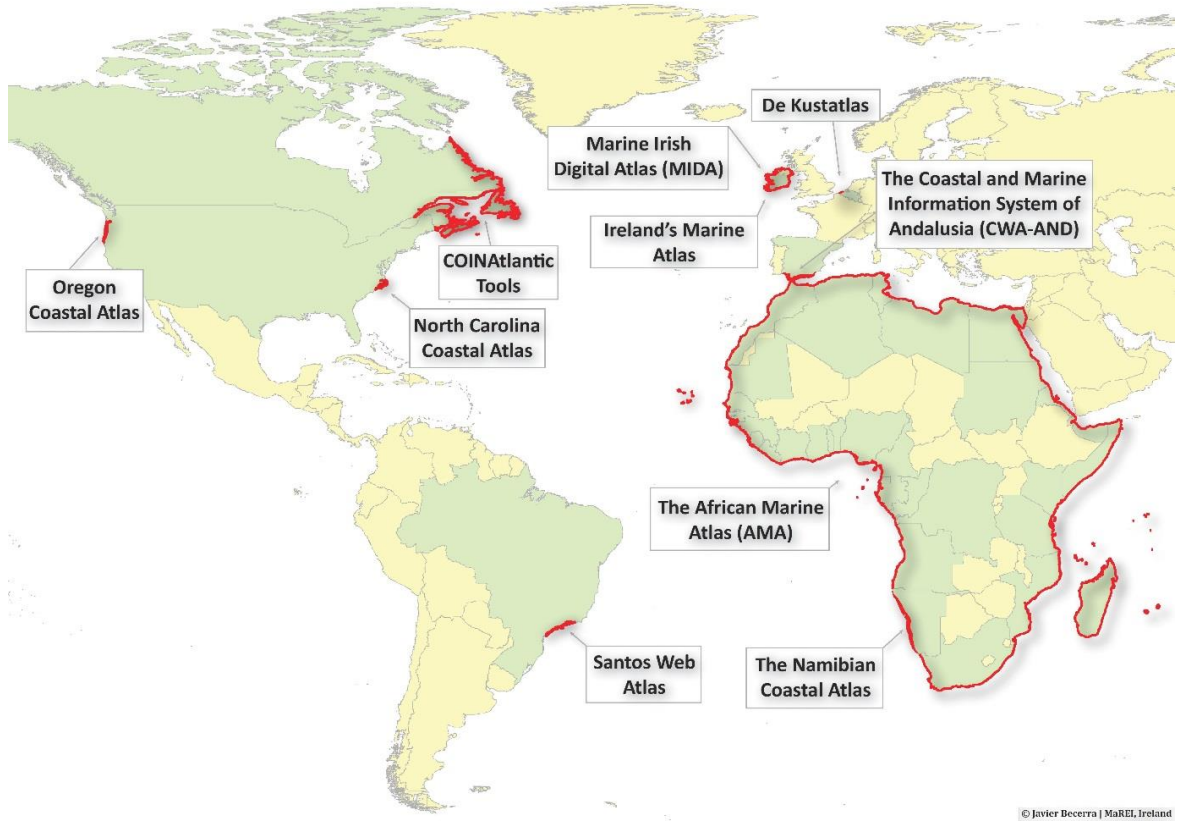

Figure 4: Indication of coastline location and extend associated with the ICAN CWA's that contributed to the handbook.

Table 1: ICAN CWAs contributing to this handbook and their target audience

Atlas	URL	Target Audience
The Coastal and Marine Information System of Andalusia (CWA-AND)	**http://www.juntadeandalucia.es/medioambiente/site/rediam**	**Wide ranging:** *'…. anyone interested in the coastal and marine environmental information of Andalusia.'*
The African Marine Atlas (AMA)	**http://www.africanmarineatlas.org/**	**Wide ranging:** *'…. including scientists, students, coastal resource managers, planners and decision makers from institutions and specialized agencies across Africa, as well as the general public...'*
The Namibian Coastal Atlas	**http://www.africanmarineatlas.org/**	**Wide ranging:** *'…anyone who needs information on the Namibian coast….'*
De Kustatlas (Belgium)	**http://www.kustatlas.be/**	**Wide ranging:** *'…coastal managers and stakeholders, state agencies, local and regional governments, federal agencies, researchers/scientists, students & teachers, consultants, and interested citizens and tourists.'*
Santos Web Atlas (Brazil)	**http://santoswebatlas.com.br/**	**Specific:** *'…the environmental manager is the primary user focus.'*
COINAtlantic Tools (Canada)	**http://coinatlantic.tools/**	**Specific:** *'…The Integrated Coastal and Ocean Management (ICOM) Community of Practice (CoP) in Atlantic Canada.'*
Marine Irish Digital Atlas (MIDA)	**http://mida.ucc.ie/**	**Wide ranging:** *'…broad range of users, which includes people searching for general information to the specialist that requires specific data sets.'*
Ireland's Marine Atlas	**http://atlas.marine.ie/**	**Specific:** *'…a decision support tool for reporting requirements under the Marine Strategy Framework Directive (MSFD).'*
Oregon Coastal Atlas	**http://www.coastalatlas.net/**	**Specific:** *'…constituents of the Oregon Coastal Management Program.'*
North Carolina Coastal Atlas	**https://www.nccoastalatlas.org/**	**Wide ranging:** *'…users ranging from educators to specialists to the general public.'*

3. CWA DEVELOPMENT AND THE USER COMMUNITY

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ICAN CWA Developers: Trevor Alcorn, Tom Allen, Kathy Belpaeme, Tanya Haddad, Anja Kreiner, Mercedes Garcia Padilla, Greg Reed, Sílvia Sartor, Lucy Scott and Andy Sherin

Defining your target audience

As a Coastal Web Atlas (CWA) developer, defining your target audience will provide direction on design and content requirements. The end-users are the ones who are going to benefit the most from this product, and so the resource should cater for their needs. It is extremely useful to identify potential audiences of your CWA at the start of the development process, and to remain engaged with them throughout. Identifying such user groups and target audiences will help to steer the development of your CWA. In general, you should aim to answer the following questions:

i) Who are you developing the CWA for?
ii) How are you going to engage with potential CWA audiences?
iii) How are you going to use information provided by potential CWA target audiences and/or end-users?

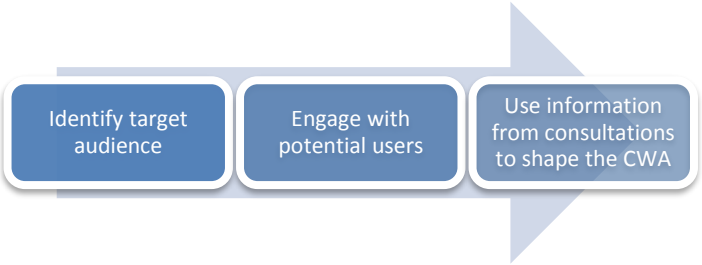

Figure 5: Steps for identifying, engaging and consulting end users of your CWA.

At the start of the process setting some clear aims and goals that include which audience would you *like* to engage considering what products, tools and services the CWA is aiming to provide will allow you to work towards establishing contact with potential end-users of your CWA. Resources catering for a specific audience are often doing so based on an existing demand or need. In this case, it is advisable that representatives of the group are continuously engaged throughout the development process. Engaging with representatives of a specific audience will help tailor content, system interface and overall design to their needs. In addition, end-users that are engaged from the start will also have a sense of ownership and actively support your CWA.

Other CWAs aim to target much wider audiences that include disseminating information to the general public, the education sector as well as environmental managers or specialists.

Developers should aim to create a resource that does not lose focus and may need to identify the various end-user groups that can help with resource development. CWA developers could start with internal consultations and use existing contacts covering different disciplines and interests to assist with both; providing feedback on CWA user requirements from different perspectives and building up a network of potential end-users groups that represent diverse audiences. The following sections aim to support your interaction with your CWA user community and focuses on:

i) Examining different audiences that ICAN members have engaged with before and during the development of their CWA
ii) Looking at how these end-users were identified and
iii) Seeing how engaging with end-users shaped the development of CWAs

TARGET AUDIENCES AND END-USER CONSIDERATIONS FOR YOUR CWA

CWAs targeting a particular audience or end-user group, similarly to the COINAtlantic Tools or the Oregon Coastal Atlas (see Table 1), should consider user engagement a particularly important part of the development process. Although the resource may attract the attention and use of other audiences, the initially identified target user should remain the focus of the project during CWA development. Even the smallest suggestions on their part can influence and change the product. Involvement of the specific audience in all aspect of CWA development ensures that product design suits the specific needs and subsequent success of the resource.

> 'CWAs are influenced by end user requirements (e.g. reporting or planning functions)'.
>
> Irelands Marine Atlas

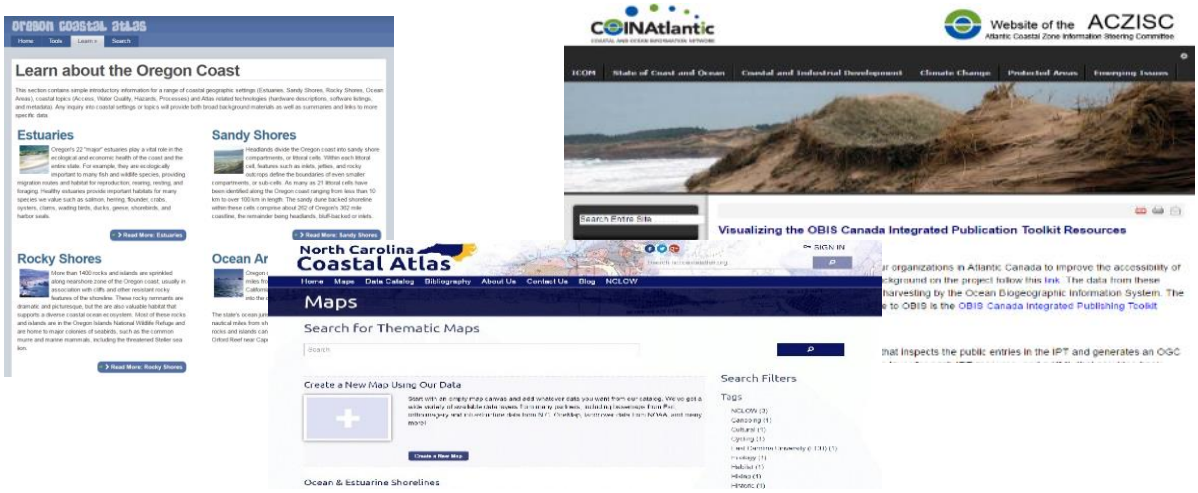

Figure 6: Screengrabs of the Oregon Coastal Atlas learn page, The North Carolina Coastal Atlas search thematic map feature and the COINAtlantic Visualization tool for the OBIS Canada Information Publishing Tool.

Some CWAs e.g. the Santos Web Atlas and the Irish Marine Atlas (see Table 1), are established to fulfil regulatory and legal requirements, which pre-defines the user group for the developer.

The Santos Web Atlas was established to replace a pre-existing system of accessing environmental information for the Santos coastline and is designed to assist planners and managers to complete their Environmental Information Assessment. As the resource developed additional user and interest groups emerged. Irelands Marine Atlas aims to assist with legal reporting requirements under the Marine Strategy Framework Directive (MSFD) (2008/56/EC), providing stakeholders with the necessary spatial data. Experts users participated in workshops, to ensure the system meets their needs. Similarly, to the Santos Web Atlas, Ireland's Marine Atlas is useful to a much wider end-user base but stays focused to support their target audience.

A number of ICAN CWA's target wide audiences e.g. De Kustatlas, CWA-And, the AMA, the Namibian Coastal Atlas, the MIDA and the North Carolina Coastal Atlas (see Table 1), often acting as a data dissemination service and awareness raising tool. These CWAs should be simple enough allowing users without prior GIS knowledge to find their way around and to get the information they are interested in, while providing metadata for those who wish to access it. These CWAs often serve more than one function e.g. a data repository as well as an interactive display tool. It can be more difficult to decide on product content and design, when aiming to cater for diverse end-user groups, as it is difficult to suit everyone's needs. A CWA aimed at multiple audiences needs to be:

i) **Informative and useful** for planners and managers
ii) **Accurate** for the scientific and education communities
iii) **Attractive and interesting** for the general public

Table 2: Target audiences of ICAN CWAs

Audience	Criteria to consider for CWA development
Scientific Audience	This audience is looking for detailed and complex information and is familiar with using graphs, maps, scientific terms etc.
Policy and decision makers	This audience requires less scientific detail but needs meaningful information in relation to policy and law. Data and information should support informed decision making, while technical and scientific jargon should be avoided. The atlas could integrate policy support tools e.g. sustainability indicators and case studies.
Public	This audience is looking for easily accessible data and information of general interest and the CWA should allow for easy navigation to cater for users that are not familiar with GIS or indeed web-GIS applications.
Schools/education	CWAs catering for this audience need to consider different age groups and the atlas could include ready to use educational tools and downloadable education packs.

Table 2 highlights various user groups that ICAN CWAs target. Of the ten CWA developers that answered questions towards compiling this guidebook, four had predefined user groups that the resources were particularly designed to serve. Predefined user groups in this case are groups that are directly involved in coastal and marine management and/or policy and legislation. In this situation, the audience is relatively easy to engage with, as they can exist either within a particular organisation, network or consortium, or are members of a particular

sector for a defined region. The flow chart in Figure 7 may help you to initially distinguish who your target audience may be and support the identification of criteria your CWA may need.

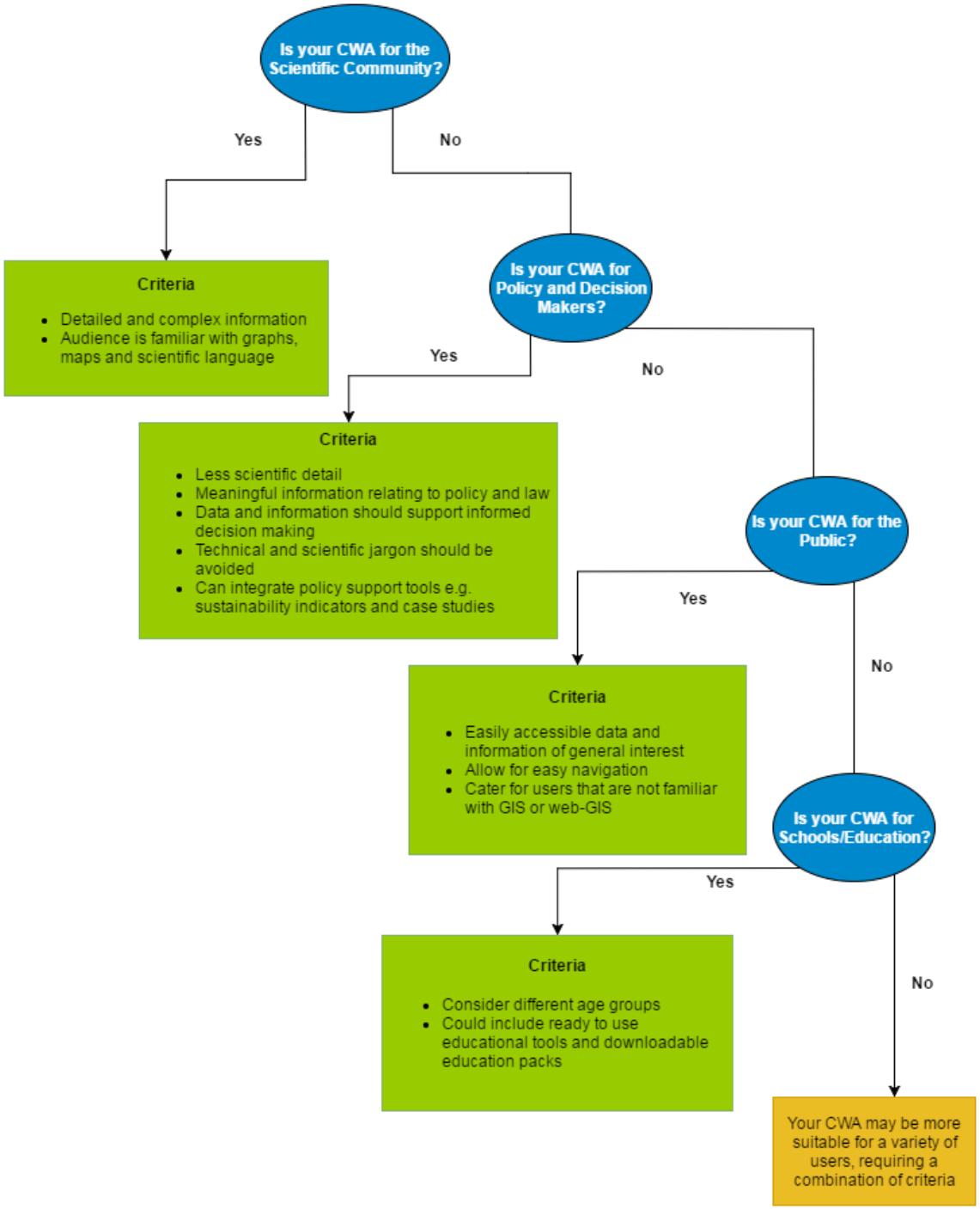

Figure 7: Flow chart to aid criteria identification for your CWA in relation to target audience.

How to engage potential end-users during CWA development

The most common mechanisms to engage a potential target audience and end-user groups utilised by the ten participating ICAN CWA developers in the development phase of their resources were:

- Working groups
- Workshops
- Target audience meetings
- Presenting the CWA at events
- User training
- Sector specific events
- Questionnaires and surveys
- Informal and personal communication
- User testing of the CWA

WORKING GROUPS, WORKSHOPS, MEETINGS AND TRAINING

Many ICAN CWA developers used dedicated working groups and user workshops to engage potential end-users in the development phase to determine relevant CWA content, desired look and feel as well as required tools for their audiences and to encourage data holders to provide data. In the development phase of Belgium's De Kustatlas, sectoral working groups were established and follow up consultation meetings determined atlas content. Similarly, the developers of the Andalusian CWA-And held meetings with target audience administrations to ensure CWA content is going to be relevant prior to the development of the resource. Canada's COINAtlantic tools developers determined initial work progress through several user design workshops. These primary events were followed by training workshops with multi-sector working group and provided evaluation and input for subsequent development of the resource. In Canada and Belgium, developers looked for multi-sector input to enable their resources to be inclusive to many relevant users but specific enough for the individual sector.

Figure 8: workshops and training event.

Irelands Marine Atlas held specific data expert workshops focusing on European marine environmental legislation (the Marine Strategy Framework Directive) and invited expert input from disciplines such as oceanography, chemistry, biology and geology. The resource was developed in answer to the European legislation and the focus of the workshops was specific

to associated data requirements. The MIDA (Marine Irish Digital Atlas) also used workshops but engaged representatives from a broader range of disciplines and organisations, as this CWA targets a wider audience base including the general public. The MIDA workshops took place after the development of a first prototype CWA, which participants could interact with. Subsequently, structured and semi-structured feedback was collected with focus on CWA content, functionality as well as look and feel of the resource. Training as a user engagement tool was used by several CWA developers e.g. for the African AMA, often in combination with workshops or in face to face meetings. The North Carolina Coastal Atlas developers engaged state coastal management personnel in face to face training sessions, which not only raised awareness with the target audience but ensured these future users know how to best utilise the resource.

INFORMING THE POTENTIAL USER

Several ICAN CWA developers presented their CWAs at regional, national and international events such as high level management meetings or scientific conferences. The Namibian Coastal Atlas was presented at a science forum several years in a row before the first version of the CWA was available, raising awareness with and engaging the science community right from the start of CWA development.

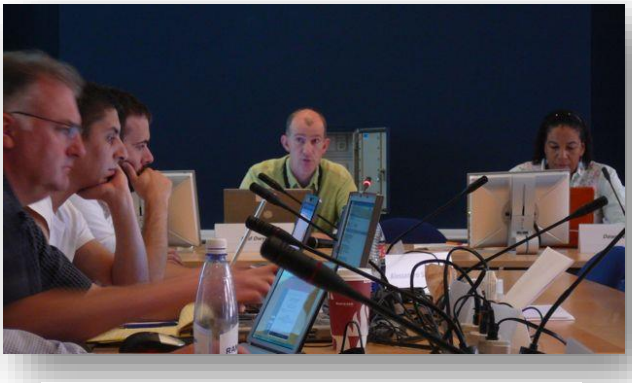

Figure 9: ICAN 4 workshop in Trieste, Italy 2009

Brazils Santos Web Atlas was presented to different public agencies concerned with environmental management in the State of São Paulo the target audience of this resource, in addition to oceanographic conferences and in lectures at environmental themed events. This raised awareness with multiple potential future users ranging from scientists to planners all the way to environmental decision makers.

The Andalusian CWA-And presented in congresses, workshops and technical sessions, where the resource was either the central element of a presentation or part of a presentation e.g. one tool in relation to managing coastal, marine or geographical issues. This allowed linking in with relevant multiple future audiences. Other related dissemination activities of the Andalusia resource included a dissemination campaign in regional media and several services carried out for the REDIAM with specifics references to the Atlas e.g. a periodic news bulletin, the “REDIAM atiende” (REDIAM assists) web service and the introduction of a REDIAM’s partner’s system to support the CWA and its users. The North Carolina Coastal Atlas developers used presentations to introduce their resource but also an exhibit with interactive displays at state and regional conferences, internal university colloquia, and posters at national GIS and coastal conferences to engage potential users.

LOOKING FOR SPECIFIC FEEDBACK

Surveys and questionnaires were used by many CWA developers looking for more specific feedback either at events or via their websites and e-mails lists, for example at the launch of Belgium's De Kustatlas, visitors were encouraged to fill in a survey in which they were asked their reasons for attending, providing insight into who is interested in the resource and why. The Oregon Coastal Atlas developers targeted their core constituent groups (coastal planners) with an interview survey to ensure they were meeting their needs and to determine emerging interest trends. Brazil's Santos Web Atlas included a questionnaire in their website to better understand potential practical use of the tool and to identify where adjustments need to be made.

Many CWA developers found informal meetings and personal communication extremely valuable during the development phase of their resource. The Oregon Coastal Atlas developers undertook work with users on an informal one-on-one basis and issues raised in these individual settings were subsequently discussed at the project group level, to arrive at a preferred solution or approach to the topic. Personal contacts and meetings were also seen as key for the developers of the Santos Web Atlas, as contacts were made with people who could potentially be interested in different aspects of the CWA and researchers were encouraged to contribute to new themes and topics within the Geoportal.

EVALUATING THE CWA

ICAN CWA developers also used testing and evaluation of their resources either in the post development phase of the resource to check if an upgrade or change is working or via a prototype. Irelands MIDA developers used a prototype test-drive with potential users to gain feedback in the development phase of the CWA, while Belgium's De Kustatlas developers organised a test with known users of the resource to evaluate if the different types of users can easily find information and if users can find their way around the interactive map.

> 'Feedback at product demonstration events proves useful as such users are typically very engaged. They are willing to tell you how they would like to see features improved and what services would benefit their work'.
>
> North Carolina Coastal Atlas

The Canadian COINAtlantic tools developers had a formal evaluation undertaken by an independent organisation and the North Carolina Coastal Atlas developers engaged a dedicated researcher for formal user research to address the needs of the resources multiple users in order to develop the project in a manner that meets diverse user requirements.

The Santos Web Atlas carried out a large scale symposium with 300 participants, where a prototype was presented before full development. This initial event was held to assess whether there was a need to review the Impact Assessment Model to license coastal areas in Brazil, which links to the original remit of this CWA. The symposium led to the creation of an

atlas network that highlights issues and makes recommendations, providing an additional means of communicating with potential audiences and end users of the resource.

DID END USER ENGAGEMENT INFLUENCE THE CWA?

Overall, ICAN CWA developers contributing to this handbook concurred that engagement with potential end users influenced their CWA, especially in relation to content, interface design and data requirements. The type of undertaken engagement and type of feedback sought after determined the extend of end user influence on CWA development e.g. the MIDA and Santos Web Atlas developers were able to obtain information about additional relevant data holders or indeed acquire further data and information through the engagement process.

> 'Even small bits of information or feedback can help with a systems success. Nuggets of information can help tweak elements of the CWA, from the interface to layer organisation, printing options etc…'.
>
> Oregon Coastal Atlas

Successes and Challenges

ICAN CWA developers reported as successful end-user engagement the interactions at conferences and meetings e.g. with colleagues from different disciplines or indeed the targeted end-users of their CWAs. Direct interaction was emphasized as important as it allows for critical issues to be dealt with in a timely manner. Developers highlighted as positive face to face meetings with potential end-users and communicating with other CWA developers to build on their experiences e.g. via the ICAN. In addition, utilizing existing networks for sharing information about product developments and new data resources were seen as very effective.

Experienced challenges linked to lack of human and financial resources for many ICAN CWA developers e.g. to realise some ideas coming forth through the end user engagement process or in relation to keeping social media campaigns running and up to date. CWA developers stated that gathering, managing and harmonisation of data to truly suit end-user requirements as challenging, especially where human and financial resources proofed to be too limited. CWA developer also highlighted that the process of interviewing end–users and establishing coalition is time consuming and underlined the importance of prioritising and focus e.g. avoiding surveys where too many participants only cover a single user group. For example, the developers working on the AMA stated that trying to engage all potential end users for all coastal African countries was not possible and advised to keep engagement to a manageable level e.g. attending conferences and meetings to discuss the CWA and potential improvements.

Some developers experienced conflict of interest between certain user groups and advocated direct interaction between the developers and the end users to mitigate. Other developers had to address perceived issues relating to loss of intellectual property (IP) rights within the

scientific community providing data to the CWA. This again can be addressed through direct interaction with the scientist raising awareness that a CWA can be a vehicle to gain recognition for scientific work and can ensure that the IP of the scientists work stays with the scientist via the metadata for datasets of interest. Furthermore, the development of relevant use case scenarios was emphasised as important but difficult, which can be addressed through collaboration with other projects involving the end-user (e.g. NGOs or universities) so that tools can be demonstrated in a meaningful way for the target audience. CWA developers also stated that engaging users before the resource is available to demonstrate aspects is more difficult compared to using the demonstration of a prototype, where the audience can interact and react.

Recommendations

- Identify your target audience or end-user groups before the development of your atlas so that CWA development is steered by end-user requirements and the developed product is suitable for intended users.
- Establishing clear aims and goals in relation to CWA products, tools, services and desired target audience(s) can help to identify potential end-users of your resource.
- Learn about the end-user requirements to prioritize work, especially if CWA development faces limited resources in relation to a relative large number and diverse types of potential end-users.
- Engage your potential target audience or end-user groups throughout CWA development.
- Although the CWA may attract the attention and interest of other audiences, the initially identified target audience or end-user groups should remain the focus during CWA development.
- Developing a prototype for end-user engagement can be extremely useful when gathering information about end user requirements e.g. in relation to data, overall content and design as it allows the audience to react to a product.
- Direct communication with potential end users can address challenges during CWA development and allows the user to form a sense of ownership and secure end-user support for the developed resource.
- Present your CWA at every opportunity that brings potential end-users together to gather feedback and to let potential end-users know about the forthcoming resource.

4. MATURE CWAS AND THEIR USER COMMUNITY

Kathrin Kopke and Ellen MacMahon
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ICAN CWA Developers: Trevor Alcorn, Tom Allen, Kathy Belpaeme, Tanya Haddad, Anja Kreiner, Mercedes Garcia Padilla, Greg Reed, Lucy Scott and Andy Sherin

How do you keep your user community involved and interested?

> 'Part of working on the web is that there is a lot that you cannot control, assuming that your project is open to access by all. It is best to just accept this and focus on being as helpful as possible to the people who are actively engaging with you. Word of mouth is real, and people who have good experiences will attract other users'.
> Oregon Coastal Atlas

Learning about your users and keeping the interaction between CWA host and user community going can be important for the survival of your resource for example some funding organisations may ask to monitor and report on the CWA use. Initial interaction with your end–users should have occurred in the development phase of your resource. As new technology, data and information becomes available, end-user expectations and requirements change and CWAs have to adapt.

Considering available financial and human resources, CWA hosts not only need to update data and technology but understand the preferences and needs of their end-users to keep their resource useable and indeed used. CWA hosts contributing to this handbook utilise web-analytics, direct feedback mechanisms and link in with other relevant and funded projects e.g. Irelands Marine Atlas is linked to the Irish Spatial Data Exchange and the Marine Renewable Energy portal projects and the Oregon Coastal Atlas is utilised in relevant funded projects for specific uses. A number of CWA hosts are able to employ dedicated staff whose remit not only includes keeping the CWA operational and updated but involves interacting with end-users.

WEB-ANALYTICS

Many CWA hosts use web-analytic tools or services to measure, collect, analyse and report about the use of their CWA. CWA-AND, the Oregon Coastal Atlas, Irelands Marine Atlas, the COINAtlantic tools and the North Carolina Coastal Atlas use Google analytics, a web analytic service that tracks and reports website traffic. The Oregon Coastal Atlas team stated that this is not their primary source of monitoring atlas use because of Google analytics commercial

orientation and have opted to internally analyse log information to determine long term trends and patterns.

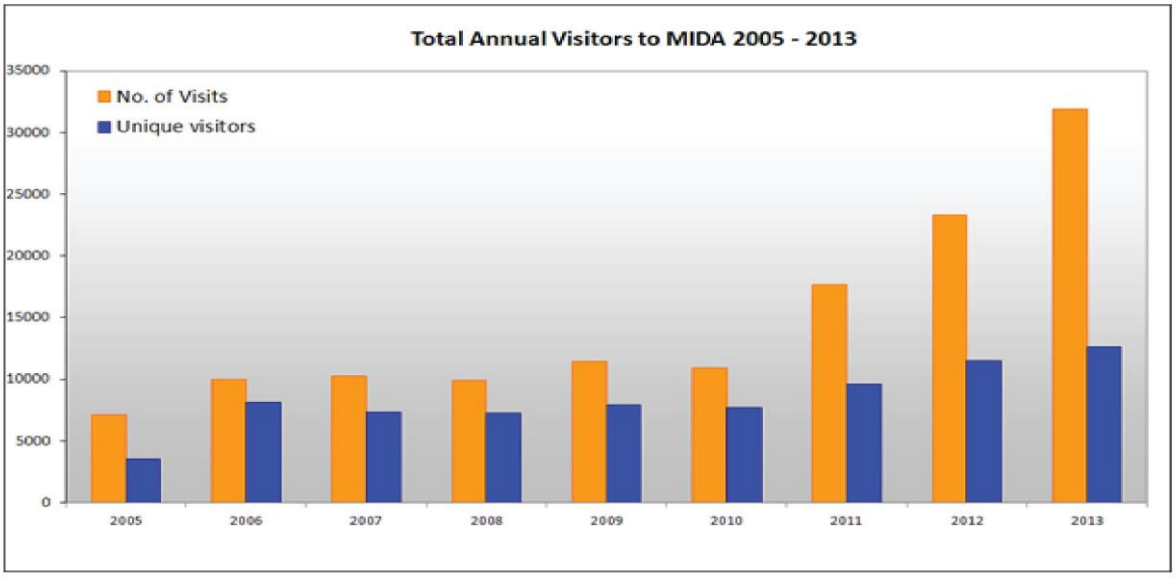

Figure 10: Screenshot of MIDA use statistics based on web analytical services.

Similarly, the MIDA hosts chose the open source AwStats to for example track visitor numbers, visits per month, country of origin and most visited pages of the atlas. The AWStats tool provides useful information in a discreet manner and assists the MIDA team in prioritising layer and page updates and new layers to focus on. However, the tool does not provide detailed information e.g. affiliation of users or how any downloaded data are used and such information could enable the team to more precisely target data and information acquisition to user requirements. Web-analytics are generally perceived as a relatively easy and non-intrusive way to receive quantitative data about CWA visitors and use, while other methods are required to gather more qualitative feedback.

DIRECT FEEDBACK

Many CWA hosts learn about their users through direct contact e.g. CWA-AND users can make suggestions or ask questions via the “buzón del ciudadano” (citizen’s mailbox) through the REDIAM website, which in turn allows the CWA hosts to monitor queries and their status as well as providing information about the user via user identification. De Kustatlas hosts provide a feedback form on their CWA site that allows users to leave comments and suggestions, which are taken into account for example to improve content or rectify experienced difficulties.

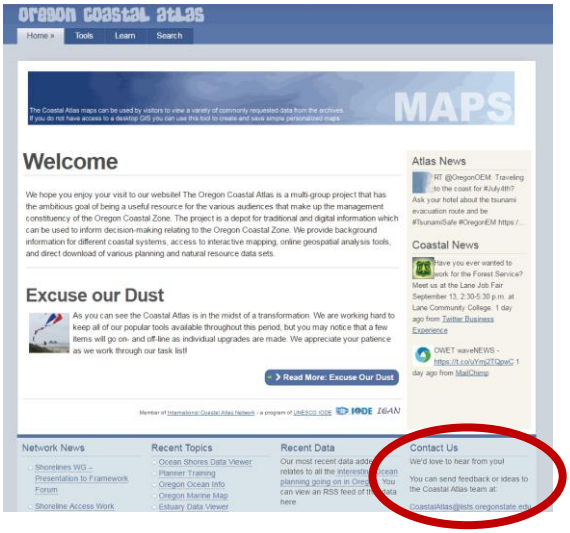

Figure 11: Screenshot of Oregon Coastal Atlas homepage which facilitates and encourages users to directly contact CWA hosts.

The Oregon Coastal Atlas hosts interact with their users directly via e-mail and phone. An e-mail list to inform users of updates was utilised in the development phase of the Oregon Coastal Atlas and the team are now considering to revive such a list to keep in touch with their end-users. Direct interaction with MIDA users is limited to e-mail contact initiated by the user via a specific atlas email address. The MIDA team also stated that they learn about their users when MIDA data layers are used in reports or on other web sites, as the users are required to credit the source of the data.

> 'We learn about our users through direct conversations with them, including surveys, interviews, observations, open discussions, social media, and emailed suggestions. We do not currently prompt visitors for information, but we are working on a method of doing so. …
>
> …We also provide standard web-based feedback forms for user comments. These are helpful since users typically only complete such a form if an issue has occurred or they feel something should be added to the catalogue. Feedback is also solicited via social media channels. Responses to social media queries are approximately the same in number as feedback form submissions'.
>
> North Carolina Coastal Atlas

HOW DO YOU WIN THE INTEREST OF NEW USERS?

ICAN CWA hosts advocate continuous advertising and publishing of your resource to win the interest of new users e.g. via meetings and conferences. De Kustatlas used their atlas launch event and press releases to reach a large number of diverse audiences and achieve a great impact in terms of added website traffic. In addition, the team produced a set of postcards with the atlas web address as well as publishing data and information updates via newsletters. The Oregon Coastal Atlas team uses press releases and articles in coastal newspapers, which increase website traffic and advocated targeting of local newspapers.

The North Carolina Coastal Atlas team use social media outlets e.g. Twitter, Facebook and blogging to keep in touch with their user base and are developing a social media strategy to target new users. The AMA hosts also emphasised to use existing networks to advertise your resource such as ICAN, ODINAFRICA and IODE/IOC activities in Africa.

> 'Developing use cases is the principle methodology for attracting the interest of new users'
>
> COIN Atlantic Tools

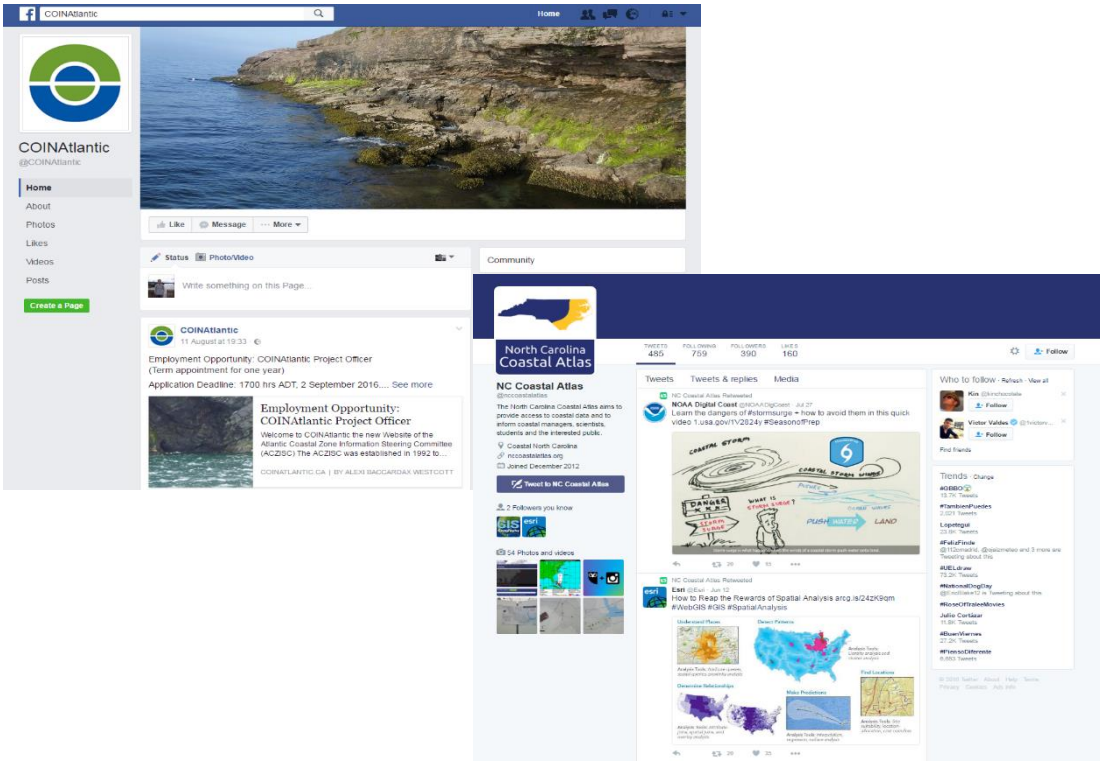

Figure 12: Screengrabs of the COINAtlantic Tools Facebook page and the North Carolina Coastal Atlas Twitter page.

CWA hosts agreed that keeping the CWA relevant and up to date is essential to maintain their user base. In addition, Irelands Marine Atlas team advocated to link data updates and new data to document citation and the provision of good quality metadata, which can facilitate potential new audiences to learn about the resource. The MIDA team undertook facilitated user consultations employing a technique called guided conversation with different research teams within their research centre. The consultation had the objective to integrate colleagues' views into an upcoming upgrade of the resource. The consultation brought together a wealth of information and ideas, which if implemented would make the MIDA more usable and relevant to researchers working with coastal and marine information and data, while still aiming to cater for the current audiences.

Successes and Challenges

ICAN CWA hosts found using a combination of different tools and methods the most efficient to learn about their users and to keep users interested in their CWA. Irelands Marine Atlas hosts stated that advertising and knowing the target audiences is key to attracting new and repeat users. Similarly, the North Carolina Coastal Atlas hosts undertook a formal study of their CWAs usability and subsequently redesigned their CWA user interface, which proved to be successful because the hosts learned about their users and how they use the resource.

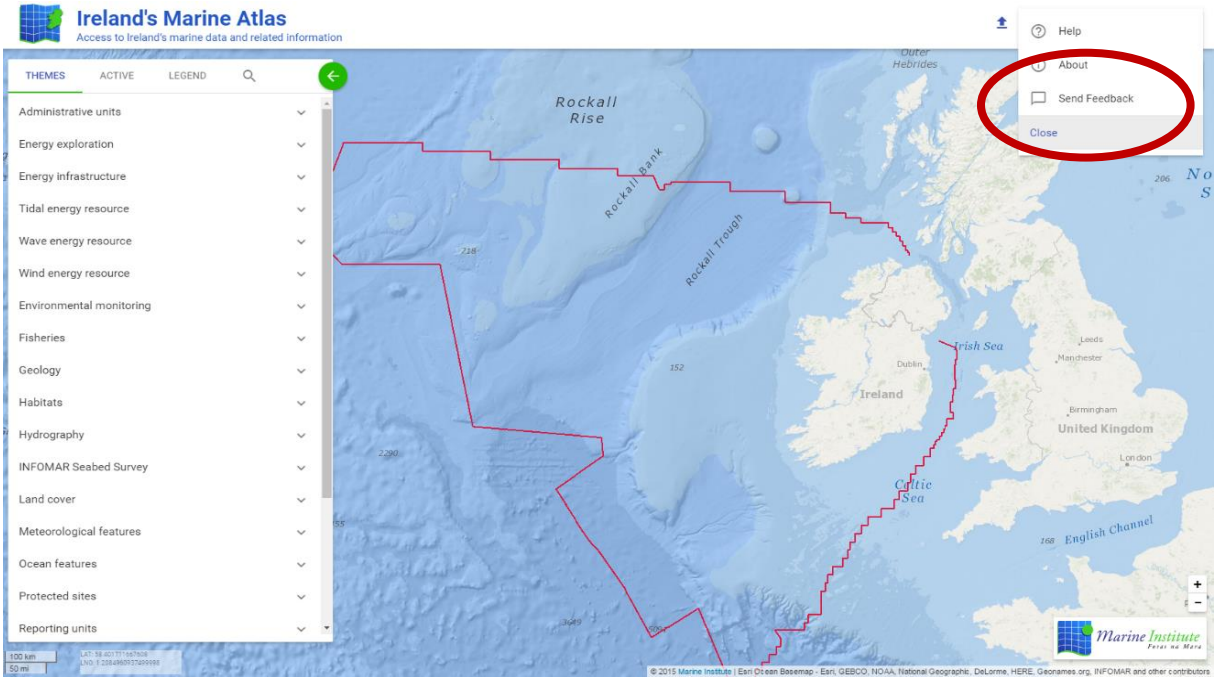

Figure 13: Irelands Marine Atlas facilitating direct user feedback.

ICAN CWA hosts concurred that a mixed approach to CWA end-user interaction and outreach can also address some experienced challenges. Social media and presentations at meetings/conferences were highlighted as very successful ways of attracting new users. The North Carolina Coastal Atlas hosts have started blogging as a way of attracting new users and reported that blogging is used as an outlet for content that they feel may be valuable for their users, but doesn't fit well into the data model for their more structured site features. Furthermore, the team stated that presenting data relevant to a particular user group and focus on what makes your CWA different as effective and advised to avoid generic presentations that skim over details.

Aspects influencing successful end-user interaction that ICAN CWA hosts found challenging include; a lack of resources dedicated to end-user interaction, high technical expectations from the users and lack of technical capacity within some host organisation, insufficient bandwidth for sudden increased amounts of site visits, difficulties to access high resolution data and unreliable internet access.

The COINAtlantic Tools hosts stated that users are expecting access to certain data sets that are often under custodianship of government agencies and sometimes universities and NGOs. The lack of investment in these organisations to support public access to data of interest e.g. via data services, discourages the attraction of new users. In response, the CWA hosts developed the COINAtlantic data accessibility self-assessment tool (CDAST - http://coinatlantic.tools/cdast/) for use within organisations to develop a benchmark in order to monitor progress to improve an organisation's policies and procedures and to gently encourage organisations to improve accessibility to their data.

Resources have to be invested into multiple aspects of hosting a CWA including ICT and technical operation, end user interaction and outreach to successfully and consistently cater for existing and future end-users.

> 'Go hyper-local. Cultivate a list of small local papers in your coastal region, and the relevant contacts therein. Places like that love to receive "free" easy to use content that is relevant to their communities, and people who live in those communities do actually read that content'.
> Oregon Coastal Atlas

Voluntary contribution advertising the CWA or contributing to end-user engagement and use of internships with CWAs allowed some hosts e.g. COINAtlantic Tools and MIDA to partly address experienced challenges relating to lack of human and financial resources. Developing a communication and dissemination strategy can support more reliable end-user interaction e.g. the North Carolina Coastal Atlas hosts apply and divide available human resources and time to targeted and specific user interaction such as updating social media content, direct e-mail/correspondence and administrative tasks.

Recommendations

- Use a combination of tools and ways to interact and learn about your end-users.
- Ensure the data, information and metadata in the CWA are kept up to date and the resource is fully operational.
- Devote resources to end-user interaction, communication, outreach and dissemination.
- Attend workshops and events to publicise your CWA.
- Use local coastal newspapers and larger press releases to advertise your resource.
- Allows the user to contact you directly e.g. e-mail, feedback forms or phone to provide qualitative feedback, make data and information requests and to ask questions.
- Use web-analytical tools and services to study web traffic and collate quantitative data on CWA use.
- Present details of your CWA relevant to your target user groups and avoid generic presentations.
- Develop use case scenarios for your CWA that demonstrate how the CWA can be used.

- Host your CWA as close as possible to the people who keep it operational and updated, preferably in the same institution.
- Utilise social media outlets to interact with your end-users and win the interest of new users.
- Use existing connections and networks to publicise your CWA.
- Develop communication and outreach strategies to keep your end-user interaction and advertisement of your resource focused.
- Utilise voluntary contributions and internships to address lack of financial and human resources.
- Utilise best practice e.g. coming through the ICAN network and by communicating with other CWA developers.

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About the editors

Kathrin Kopke is one of two co-chairs of the IOC/IODE International Coastal Atlas Network (ICAN) and has been involved in ICAN and with the Marine Irish Digital Atlas (MIDA – http://mida.ucc.ie/) project since 2006. Kathrin's specific research interest within the ICAN concerns end user requirements of a coastal web atlas (CWA) and how CWA development can aid communication of coastal and marine topics, coastal management and Marine Spatial Planning (MSP). Since joining University College Cork, Ireland in 2005, Kathrin has been working on research subjects of coastal management and planning and gained extensive experience in stakeholder engagement, group facilitation, outreach and dissemination work, while addressing issues of coastal and marine governance contributing to and as Work Package lead in internationally funded projects.

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Dr. Ned Dwyer has many years of experience in marine data and information management and was the project manager of the Marine Irish Digital Atlas (MIDA). Ned co-chaired the IOC/IODE International Coastal Atlas Network (ICAN) Project from 2008 to 2014 and is still actively involved on the ICAN Steering Group. Ned is the Executive-Director of EurOcean since January 2015, and manages the EurOcean Centre including project and financial management, definition and implementation of work plans and the coordination of EurOcean's participation in H2020 projects. Prior to EurOcean, Ned worked in University College Cork, Ireland as the team leader of the Applied Remote Sensing and GIS group and from 2010 as the Deputy Director of UCC's Coastal and Marine Research Centre.

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ANNEX I. CONTRIBUTING ICAN CWA DEVELOPERS CONTACT INFORMATION AND AFFILIATION

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Dr Anja Kreiner *Senior Fisheries Biologist - Integrated Coastal Zone Management at National Marine Information and Research Center (NatMIRC), P.O. Box 912, Swakopmund, Namibia, E-mail: akreiner@mfmr.gov.na*	**The Namibian Coastal Atlas -** http://www.africanmarineatlas.org/
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Dr Sílvia Sartor *Research Coordinator, Escola Politécnica, Universidade de São Paulo, Av. Prof. Luciano Gualberto, trav.3 ,no.380, São Paulo 05508900, Brazil, Email: silvia.sartor@usp.br*	**Santos Web Atlas (Brazil) -** http://santoswebatlas.com.br/
Andrew Sherin *Director, Atlantic Coastal Zone Information Steering Committee Secretariat, 6414 Coburg Road, Halifax, NS, Canada, Email: a.sherin@dal.ca*	**COINAtlantic Tools (Canada) -** http://coinatlantic.tools/

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No.	Title
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18	User Guide for the Exchange of Measured Wave Data. 1987. 81 pp. (English, French, Spanish, Russian)
19	Guide to IGOSS Specialized Oceanographic Centres (SOCs). 1988. 17 pp. (English, French, Spanish, Russian)
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