NODE 5 WP 12

D12.1 ICZM Graduate Level Courses
(Review Report)

July 2007

SPICOSA Deliverable D12.1

This is SPICOSA Deliverable D12.1:
D12.1 ICZM Graduate Level Courses (Review Report)

From the DOW:
This report will report on the results of the survey of graduate level courses in existence within EU and notable universities in non-EU countries. It will report on the completeness of these courses with respect to establishing a curricula specific to the science and methodology requirements for implementing the SAF. The report will focus on those specific universities that have well-organized curricula leading to graduate degrees in multidisciplinary fields, which relate to the coastal zone sustainability. It will evaluate these results in regard to establishing links with those universities, which wish to seek complementary to fund students for training and/or which would like to collaborate with SPICOSA in designing such a SAF based curriculum.

Nature	–	Report
Dissemination Level	–	Restricted to project
Delivery Date	–	Month 6
Evaluation	–	The quality of this deliverable can be judged by its completeness and applicability to establishing a SAF-based curriculum.

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1 Introduction

SPICOSA considers training, both academic and professional, to be an important part of the project; this report supports the provision of an academic Post Graduate teaching package in Integrated Coastal Zone Management (ICZM) specifically focussing on the SPICOSA Systems Approach Framework (SAF). An output of SPICOSA is to develop a teaching package based up on the concept of the SAF accessible to teachers/lecturers and students throughout the SPICOSA region. SPICOSA is a large project involving many partners, including some leading academic institutions. These already deliver many graduate courses in ICZM and represent a huge Higher Education portfolio. This report reviews the post graduate academic courses currently available in the SPICOSA region that focus on ICZM and how they are delivered in four sections.

1) A survey of the current ICZM related post graduate courses available within the EU including the subjects of those courses.
2) A survey of which skills are perceived to be under-represented in current ICZM post graduate courses.
3) A review of the different methods currently in use for the dissemination of course materials for ICZM.
4) Proposals on which subject areas should be concentrated on in a SPICOSA teaching package and how best to disseminate this package to maximise its uses and maintain its relevance.

These results will be discussed in terms of what the SPICOSA teaching package should include and how it should be delivered.

2 Current courses

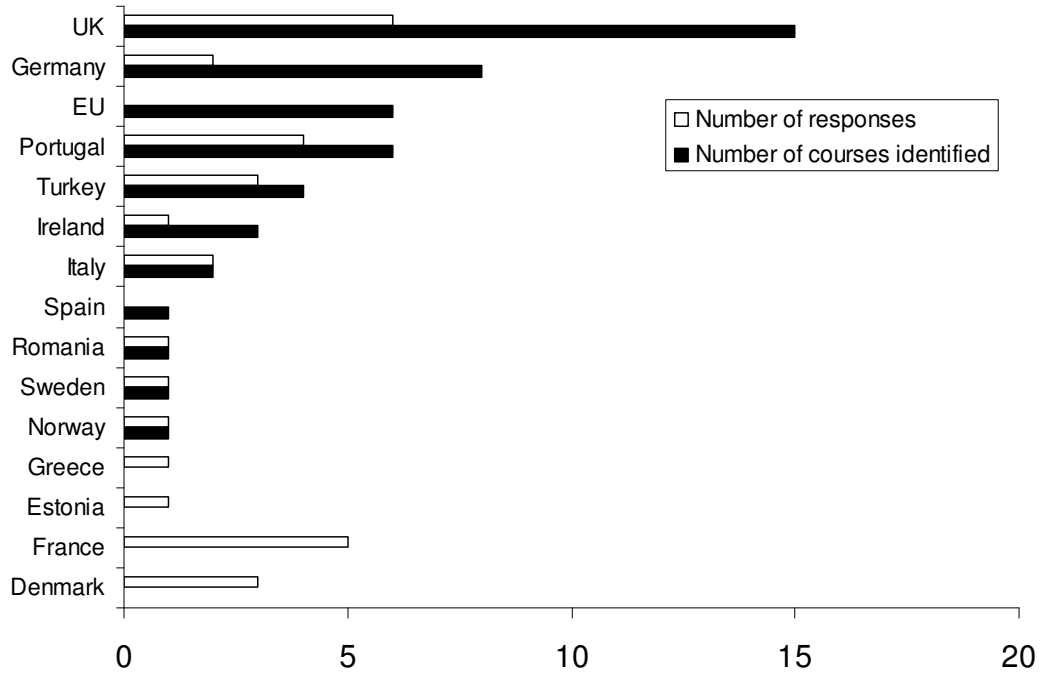
SPICOSA is not the first European project to investigate ICZM courses within the EU; the Framework 6 project, ENCORA has compiled a list of these courses. The two projects have worked to complement and not repeat efforts and agreed to share results as they become available. At the time of writing, the ENCORA information was unavailable to SPICOSA, so a questionnaire was disseminated around the SPICOSA partners to gain some data. When the ENCORA dataset is provided to SPICOSA, it will be used to flesh out the information on the available courses. This material will be provided as an annex to the current report.

The aim of the questionnaire was not only to collect information on the courses already available within the SPICOSA region but also an indication of those subjects and skills which are perceived to be under represented in today's post graduates. The questionnaire (appendix A) was designed to be filled in quickly online, so as to maximise the number of respondents. Further responses were gathered in person during a SPICOSA meeting and entered into the database.

The simplicity of the questionnaire allowed a basic survey of courses available that were known to the respondents; a list of these courses is shown in appendix B. The general nature of the identification of these courses is such that at this stage only general inferences can be made; further analysis will be made upon receipt of data from the ENCORA project. Only 12 responses were received from the online questionnaire, and a further 20 were provided during the June 2007 SPICOSA Barcelona meeting, giving a total of 32. This method meant that all respondents were part of the SPICOSA project; however by design SPICOSA represents a cross section of ICZM academics and professionals within the EU and so is an effective resource for undertaking such a questionnaire. The responses suggest that provision of post graduate courses within Europe is patchy; 50 courses were identified in 10 countries, very much biased towards Western European countries. The responses largely centred in the UK where 15 courses were identified as shown in figure 1. This figure also shows that this bias was not entirely

due to the country of origin of the respondents as two of the top three responding countries. France and Denmark did not report any ICZM courses. As noted by Chircop [2000], although the majority of ICZM courses were originally run in the USA and UK, this is becoming less pronounced and courses are available globally. To give an indication of how well the survey represented available courses. A search of Post Graduate courses in ICZM related disciplines in the UK was carried out searching centralised online databases[1] for courses containing the words coastal or marine and management, tourism or studies (Appendix C) and compared to the response received (Appendix B). Questionnaires identified 11 courses in eight institutions while official figures showed a total of 17 courses in 14 institutions. This suggests that responses to the survey cover approximately half of the available courses.

The Erasmus Mundus Joint Master in Water and Coastal Management links universities throughout Europe suggesting that the capacity is present to be able to develop these courses and that a teaching package like the proposed SPICOSA product could be useful in developing this resource.



[1] UCAS (http://www.ucas.ac.uk/); Prospect (http://www.prospects.ac.uk).

Figure 1: Responses to the online questionnaire showing the location of courses being offered (black bars) and the home institutions of the respondents (white bars).

Figure 2 considers the topics covered by courses in the survey and shows that, although some courses related to social sciences and economics are offered, the majority of post graduate courses are based around the natural sciences (as also implied by the available skills in figure 3) and practical management. Courses that focus on coastal or marine management were included in this category. These courses are often non specific, and so this may partly account for the lack of courses being offered in some areas.

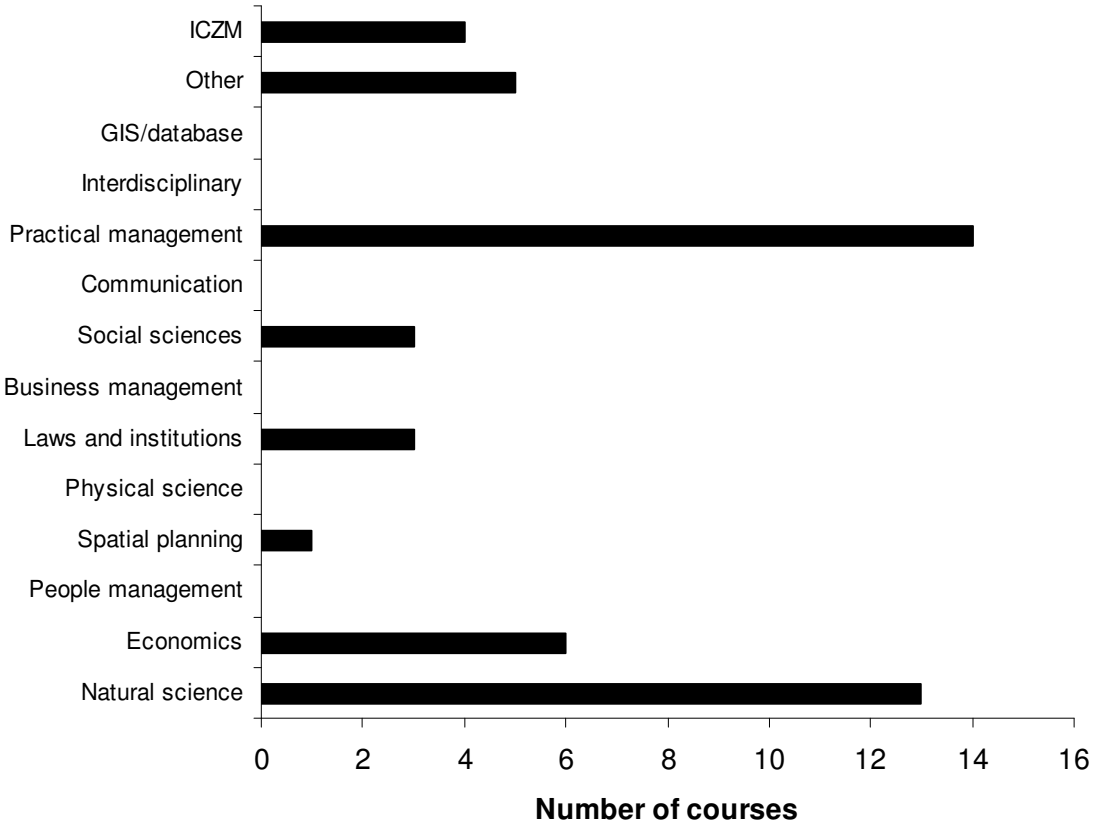


Figure 2: Responses to the questionnaire showing the subjects of post graduate courses currently offered as determined by course title. A more specific analysis will be provided when ENCORA data become available.

3 Skills present and required in current post graduates

To be useful, the SPICOSA postgraduate teaching package must provide something that is new, (i.e. not currently provided throughout Europe), and necessary for ICZM. A key aim is to provide information on the SAF itself but to make the best use of this the students must be given the knowledge and skills for their role. For a SAF it is necessary for students to have grounding in social, economic and environmental disciplines. To gather this information about current provision and skills and knowledge required, a questionnaire was produced and disseminated through the SPICOSA participants.

The questionnaire also enquired about the skills required for ICZM and identifies those skills which are currently missing. Participants were asked which skills and knowledge they considered to be most important for ICZM professionals. Participants were also asked to identify those skills which they currently feel are not catered for by existing courses. The results of the questionnaire responses are summarised in figure 3[2].

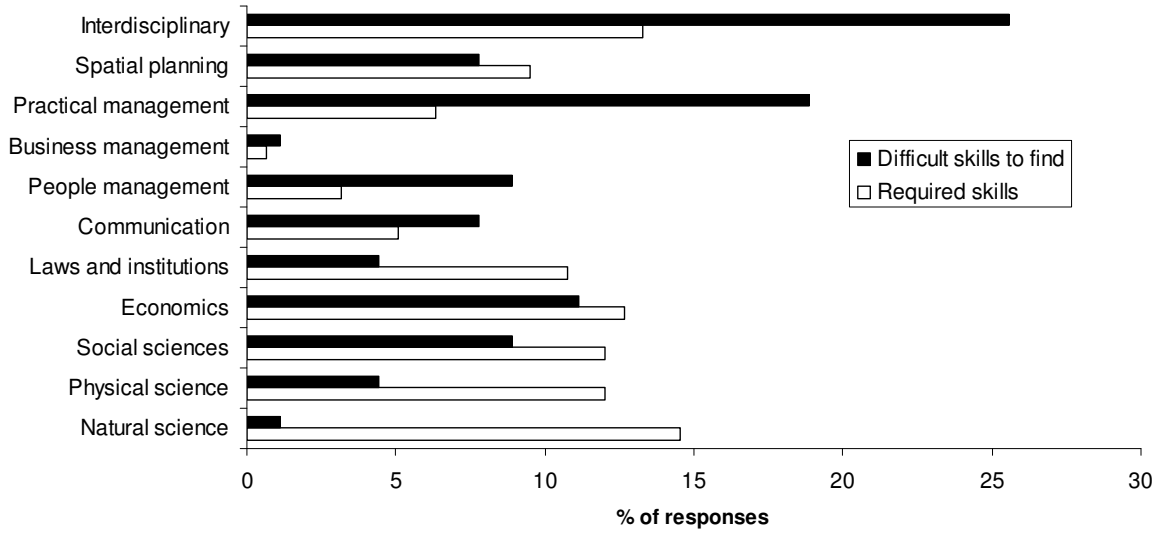


Figure 3: Responses to the online questionnaire showing those skills considered important to undertake a SAF management plan. Required skills are shown in black, skills

[2] Although not explicitly stated in the questionnaire, natural sciences include biology, ecology and those subjects which include the living environment. Physical sciences include physics, geology, chemistry and those subjects which do not include the living environment. Practical management is experience or skill in hands on management of a system rather than theoretical knowledge of a subject.

that are currently considered to be lacking in post graduates entering marine management careers are shown in white with black boarder.

These results indicate the spread of skills required and available for undertaking SAF type management. The responses show that traditional subjects for both undergraduate and post graduate courses; the natural, physical and social sciences, economics and to a lesser extent legal skills are all essential in ICZM and skills which could be required for the SAF, as is the ability to work in more than one field. Surprisingly, in contrast to the low availability of interdisciplinary skills shown in figure 3, several ICZM courses are offered (see section 2). This implies that the interdisciplinary nature of ICZM is not being effectively taught, or as reported elsewhere that this is a skill which only really develops with time within the field and that teaching it is not effective [Kullenberg 2002, Chircop 2000]. Practical, business and people management skills were all considered to be less important. Perhaps surprisingly, given the requirements of coastal zone managers to talk to stake holders, communication was not considered to be important by the majority of respondents. This is certainly something required for SAF as are social science skills.

It seemed that graduates of natural science degrees are likely to move into environmental management positions Physical and social scientists are also quite well represented, however economists are seen to be difficult to recruit in the field. This may be because environmental management is not a traditional career for economics graduates, and as such it is not usually considered. The capacity to work in more than one field is considered to be both highly desirable and difficult to find in graduates. This is probably as a result of specialisation within a subject as part of university degrees and highlights the advantage of more holistic management courses that require some interdisciplinary thinking. Although this may not be the case with the SAF, people and business management were neither considered important or difficult to find. Practical management was considered only moderately important, but was very difficult to find in recent post graduates, this is not surprising as post graduates will often not have had the opportunity to act in a managerial position. Spatial planning, which is becoming a more prevalent discipline in ICZM being major aspects of the upcoming UK Marine Bill and EU Marine

Strategy Directive, was seen to be relatively important and relatively difficult to find in the workforce.

The responses showed a clear split in the availability and desirability between those 'skills' that are traditionally taught, such as the natural sciences and economics and personal skills such as people management and communication. The difficulty to find the latter skills in recent post graduates implies that these are skills which may be developed through a career as opposed to the relatively short, structured experience of a degree course. The high importance of interdisciplinary skills and practical management and the difficulty in finding people with those skills also fits this model. Knowledge of several fields often only becomes possible having worked in a multidisciplinary environment for some time. Any SPICOSA teaching package must consider not only the skills identified here as being important, but also the extent to which these skills are available and integrated. Teaching packages should provide some training and experience in those skills currently not well represented in post graduates and yet identified as necessary.

4 Information delivery

4.1 Book/paper based courses

As an educational discipline ICZM is not even 20 years old; it is only in the last 15 years that ICZM has been a taught subject, following its conception in the US and development in the EU around the EU demonstration project (1996-2000, [King 2003]). Historically, postgraduate courses have been developed in-house by lecturers using standard textbooks as ancillary material. A number of ICZM textbooks are available for both practising managers and use within taught courses[3]. This traditional approach to teaching has the advantage of the material being tailored within the course to the local conditions and perceived requirements for employment. However, it may limit the scope of the programme, and present a narrow view of ICZM which is not in keeping with the need for integration of management approaches around coasts and seas. ICZM seeks to integrate across issues, stakeholders and activities and it is a real challenge for one or two academics in a local team to present the full range of perspectives which may be encountered when considering a problem such as eutrophication. For example, in the case of eutrophication there are concerns about the impacts on the natural ecosystem and the effect on conservation efforts, the impact on the tourism and fisheries and those whose livelihood depends on these industries while the cause may be driven by legislation concerning agriculture many kilometres upstream in a different country. Many disciplines are relevant to the consideration of this problem and teaching across disciplines is a skill in itself. Provision of more background and supporting materials broadening the perspectives offered will therefore be beneficial.

[3] Some recent examples of texts include the following.
Cicin-Sain, B. & Knecht, R.W., 2006. Integrated Coastal and Ocean Management, Island Press, 543p
French, P.W., 1997. Coastal and Estuarine Management, Routledge, 251p.
Kay, R., & J. Alder, J., 2005. Coastal Planning and Management, Spon Press, 380p.
Salomons, W et al, 1999. Perspectives on Integrated Coastal Zone Management, Springer Verlag Berlin and Heidelberg GmbH & Co. K, 386p.
Vallega, A., 1999. Fundamentals of Integrated Coastal Management, Kluwer Academic Publishers, 288p.
Vermaat et al., 2005. Managing European Coasts: Past, Present and Future, Springer Verlag Berlin and Heidelberg GmbH & Co. K, 387p.

4.2 Computer based learning tools

Computer based learning tools have been developing alongside ICZM programmes, as the technology was introduced [Kullenberg, 2002]. In the 1990s, many novel and engaging ways of using computers for improving the learning experience and providing access to it were introduced [Ducrotoy *et al* 2000, Holsapple and Lee-Post 2006, Luckin *et al* 2006]. A number of attempts were made to standardise the hardware and software requirements within regions and to enable the results of research projects to be brought into teaching schemes. CoastLearn and Eloise, discussed below, are two examples within ICZM which fall into this category. During this period, the use of computers on a large scale within education was in its infancy and attempts to provide courses electronically, generally through courses provided on CDROM, were viewed with suspicion [Browne *et al* 2006, Luckin *et al* 2006]. There were concerns about the technology with slow response times, fears of viruses and unreliability which made these unpopular in traditional academic circles [Moore 1991, Luckin *et al* 2006]. The extra effort required to implement these courses into existing material and lack of comfort of using computers in the teaching environment also led to slow uptake of these methods. In addition, it was often the case that even when resources such as these were well developed and functional, they were often badly advertised and underutilised and this is still the case today [McWilliams 2004]. This may be because lecturers do not want to use someone else's materials (since it is their job to write their own courses) or it may be that the materials provided do not meet their needs in terms of the style or content.

However, in the last decade the use of the internet within higher education establishments has become ubiquitous while at the same time the technology has improved making it likely that there will be an improved willingness to adopt electronic materials made available [Rossiter 2007]. Students' research relies heavily on internet searches and much information required for the development of case studies is now easily accessible. Communication between teachers and pupils is frequently through e-mail. Resources for courses and lectures are often made available by lecturers through internal web sites [Waits and Lewis 2003, Holsapple and Lee-Post 2006, Shah 2007]. This increased integration of computers into the everyday reality of Higher Education has facilitated the

development of online teaching packages [Kullenberg 2002, Luckin *et al* 2006]. These resources can range from essentially a high tech version of the traditional standard text book[4] to complete distance learning courses. Within the UK the Open University (http://www.open.ac.uk) has been providing distance learning degrees since the 1960s incorporating television programmes and now online material. More specifically the University of Ulster provides an e-learning ICZM course[5]. While there are advantages to this mode of delivery with wide accessibility, ease of use and low or negligible costs once the material is prepared there can be disadvantages [Kullenberg 2002].

Unlike a book which can be kept on a shelf and referred to over a period of years, online courses are dynamic and may be removed from a web site with virtually no warning. There can be an expectation that online materials should be kept up to date, but this requires resources to fund the necessary time for maintenance of the website. Also it is necessary to ensure the credibility of the methods and course as a whole. A publisher has a reputation to maintain, while anyone can set up a website on any topic. As with CD based material, advertisement of these courses is problematic. Attempts to advertise courses through e-mail even resulted in litigation against Kennedy-Western University (California) in 2003 under anti junk mail legislation [McWilliams 2004]. Since a book is paid for, it is in the interest of the publisher to advertise successfully to sell many copies but few such incentives exists for website based materials, the inclusion of banner adverts where users clicking on adverts[6] or paid for content[7] being the only way this can be done. Nonetheless, there are a number of different types of computer based teaching materials on ICZM available and the advantages and disadvantages of these are considered below. This discussion is not exhaustive but aims to give an overview of how courses can be delivered.

[4] Examples include recent projects to digitalise printed material (http://books.google.com), supplementary material provided on CDROM in printed books and text written directly for the internet (an example discussed below being CoastLearn, http://www.coastlearn.org)
[5] http://prospectus.ulster.ac.uk/course/?id=5605
[6] For example using advertising companies such as http://www.valueclickmedia.com/
[7] Several examples of this method exist online, the nature of which making the author leaves it to the reader's discretion to find them…

Coastlearn

The EU Coastlearn project (`A multimedia distance training package on Integrated Coastal Zone Management', http://www.coastlearn.org/) aims to teach the skills required to manage coastal zones in Eastern European countries, although the information provided is not restricted to this region. It is a distance learning tool aimed specifically at ICZM, aimed primarily at ”coastal managers and planners working at local, sub-national, and national levels”. The secondary target groups are university students and NGO's. Coastlearn is provided through two media, online and via CDROM, thus eliminating problems with internet connections. Fully formed modules are provided for the student to work through. These cover a range of topics required to carry out ICZM. An ICZM simulation game is also provided. It is a distance learning tool rather than a teaching resource for lecturers and, consequently, the material is prescriptive, not allowing for the inclusion of local case studies in the module itself. It is a stated intention that the modules available for Coastlearn will be updated over time and translated into different languages. The `newsletters' available on the site however run from January 2005 to December 2005 implying that the site has not been updated since. Dated Newsletters that imply that the material has not been updated for several years may reduce the attractiveness of the resource, even if it is a good one. This highlights two points:

(i) the SPICOSA teaching package should have resources in place to allow updating after the completion of the project so that it remains a relevant resource;

(ii) if updates are going to be infrequent, material with dates should not be used.

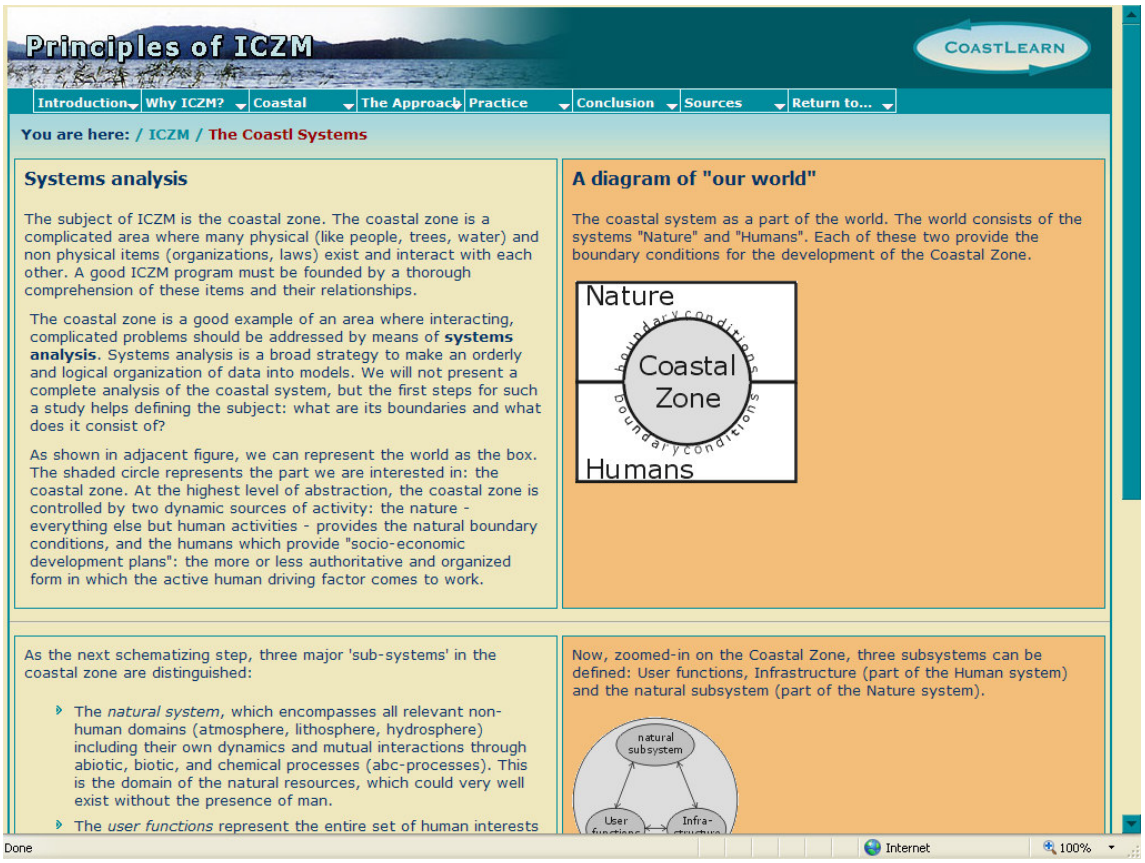


Figure 4: An example of the information available through the CoastLearn website, http://www.coastlearn.org.

Talessi

Talessi (Teaching And Learning at the Environment-Science-Society Interface, http://w3.gre.ac.uk/bj61/talessi/) was based at, and funded by, the University of Greenwich. It was a project that developed a portfolio of teaching resources to "promote active learning for interdisciplinary, critical thinking and values awareness in higher education". Again it is unclear how well this resource was used. This resource is not specifically aimed at ICZM, or indeed environmental sciences, however many of the resources available from the website are environmental subjects and it is an interesting example of teaching materials on the web.

Materials are provided in a standard format for use by lecturers/teachers in the form of a synthesis of the subject. A large quantity of information is available, and there are full instructions or suggestions about how the material can be used for teaching and assessment. Each lesson provides around 3-5 hours of material authored by one or two

people. It is unclear whether these materials go through a peer review process. The comments available on the website appear to imply that there was use support for its development but that once again, the effort to maintain the resource updated was not available. No indication is available on the site as to the success or the uptake of these resources.

Eloise

ELOISE was a cluster of more than 50 EU funded research projects investigating land-ocean interaction. Part of the website for this project (http://www.eloisegroup.org) provides a digest of the themes of research undertaken by ELOISE. The format is designed to be of use to lecturers and students. Information is provided on four subjects; Habitat Dynamics, Nutrient Dynamics, Climate Change and Contaminants. This information is provided in a hierarchical modular format, organised by theme. An executive summary of the theme is provided, followed by a comprehensive synthesis with references and external internet links, case studies and resources for lecturers in the form of notes and PowerPoint presentations. The PowerPoint presentations are suggested to be a skeleton basis for larger presentations or courses and are provided as complete slides and include case studies. Although the information provided is comprehensive there are some drawbacks. Perhaps the greatest is that the information is buried quite deep within the website and not intuitively labelled. Clear guidance to find the material it is needed on the ELOISE website. Again the information has not been updated; the last time the website was edited is quoted as being November 2004 when the funding for Eloise ran out. Given the amount of effort required to produce a comprehensive teaching resource, it seems a wasted opportunity to make it hard to find and not provide scope for maintaining and updating the information present. However it is difficult to identify an appropriate funder for continued support.

Coastal Wiki

Wikipedias, a family of web based databases, which allow editing by the users are becoming increasingly prevalent as sources of general information. Although not a teaching course in themselves, they are regularly used by students as supplementary

material for taught courses. The EU ENCORA project has developed a `Coastal Wiki' (http://www.encora.eu/coastalwiki) that aims to provide articles on a wide range of marine issues. Although the provision of information in this free manner is laudable, and they can be a useful source of information Wikis do come with distinct disadvantages.

1) The information presented is not peer-reviewed in the classical sense. The ability of other users to edit entries can be considered a form of reviewing; however this is not to the same extent as would be found in a journal.
2) There is often little control as to who edits these pages, allowing subjectivity to appear. Although a history of editing is available, people may not bother to read through it.
3) Students may take a Wiki page as being the sole source of information on a subject and only use those references embedded within the text. This is the equivalent of basing an essay on a subject on a single, (potentially not peer reviewed), paper. However many teachers may be sceptical about their use.

Many of these arguments apply equally to any internet based data source, however the objective of Wikis is to provide reference material, and it is easy to slip into the mindset of the information provided being 'official'.

4.3 Summary

A qualitative summary of the above teaching methods, showing the advantages and disadvantages of each, is presented in table 1. Based on the discussion above, table 1 attempts to present the perceive features of importance for the methods considered and to rate them on a scale of 1-3 with 3 being the most effective. These scores have been allocated using the judgement of the authors and are therefore subject to debate.

Table 1: Advantages and disadvantages associated with methods of delivering course content. Ranking ranges from 1-3 with 3 being the most effective.

	Books	CDROM	Internet	Wiki
Advertising or visibility	3	1	2	2
Access	2	1	3	3
Costs (producer)	3	2	1	1
Costs (user)	3	1	1	1
Updating	2	1	3	3
Review	2	2	2	2
User definable	1	1	2	3
User feedback to author	1	2	3	3
Impact	2	1	3	2
Total	**17**	**12**	**20**	**18**

Traditional book based methods score well in that they are relatively easy to advertise through established methods. Although this is not an issue for SPICOSA, books also provide a possible (often meagre) revenue stream for the author through sales. However, this cost is passed on to the user. It can however be difficult to find a publisher if the topic is not perceived to have a wider audience. This represents one of the greatest advantages of online material; the courses are generally provided free of charge with relatively small outlay to the authors or the users. This is an advantage to SPICOSA as funds are available to provide this resource with no cost to the user. It is generally true that it is difficult to advertise online and multimedia material; any attempt to do so will generally be identified as 'spam' e-mails and is likely to be ignored. Further support is required to make this form of advertising effective; word of mouth can be an effective vector for this. It is unclear for all of the methods of providing information discussed here as to how much peer review they go through. Examples could be quoted of cases where all of these methods had undergone effective, constructive peer review, but equally it is possible for all for them to completely bypass the peer review process. However, SPICOSA includes many Higher Education institutions. Their active participation in the process and provision of web-based material should ensure the quality and encourage the target audience to use the resource.

4.4 Key lessons for SPICOSA

To maximise the effectiveness of the SPICOSA teaching package it is reasonable to call on the strengths of a range of teaching methods and attempt to avoid the weaknesses. The use of computers to deliver the teaching package must be considered an effective vector, particularly as it is proposed that the package should be used throughout Europe. Using the internet as the mode of transmitting the package also means that it can be changed quickly and with minimum resource expense, and so can be considered to be a dynamic medium. The SPICOSA website will be visible and have a range of features to attract users within and outside the project. The content of the package should not be too prescriptive and available for flexible use. A proposal could be that the package is delivered as a framework, possibly envisaged as a half complete curriculum with a series of suggested exercises associated with that package (Ducrotoy *et al* [2000], Chircop [2000]). For example, as part of the development of the SPICOSA SAF, members of the Study Site Applications (SSAs) have attended workshops during which role-playing scenarios have been effectively employed. These role-playing exercises could be included into teaching packages to give practical experience of SAF type methods. A simple visualisation of this could be a series of PowerPoint slides which are structured in such a way as to walk the student through an SAF type protocol but with boxes and section left for the lecturer to complete with locally relevant examples and case studies. This would also allow the user as well as the vendor (SPICOSA) to change the content of the course over time.

This system would cover the major advantages of computer based learning resources, making them widely and easily available, and allow dynamic changes of content. Critically, it would also play to the strengths of traditional book based courses written by lecturers; they will be able to incorporate locally relevant case studies, and even elements of current courses into the teaching package.

As with all such packages, there is a real danger that a useful resource will be placed on the internet, but it will not be used simply because the target audience is not aware of it, or does not understand how the resource can be used. SPICOSA as a project is a useful

resource to counter this inertia. As the package becomes a valid resource, demonstration of the package to the SPICOSA participants should increase the knowledge of the product and its capabilities throughout a large geographical area. The communications officers in each SSA should also be used to attempt increase product visibility. In addition this should be a mechanism to try to collect information about what is used and how.

5 Recommendations:

It is recommended that a number of criteria need to be fulfilled, in order to make full use of a teaching resource based on the SAF. Fundamentally to support SPICOSA, the major issues highlighted as being necessary to implement a SAF must be covered in the teaching package.

1) The teaching package must try to fill the gaps identified, for example interdisciplinary thinking, and not duplicate what is already provided.
2) The package must focus on the SAF and the skills and knowledge required to implement an SAF.
3) The teaching package should be delivered in such a way as to be editable and made applicable to local conditions (preferably in multiple languages).
4) To maximise uptake and usefulness, and to allow users to implement the resource into their courses as much as possible the teaching package should be scalable so that it is useable as part of a course or up to and including a full post graduate course module.
5) The teaching package must be widely advertised so as to make clear to as many people as possible the existence of the course and more specifically its content and uses. The package should be demonstrated at a late SPICOSA meeting to maximise exposure to SPICOSA participants thus initiating a large (both numerical and geographical) base to 'spread the word'. Universities that provide relevant courses should be actively (personally) approached to access the interest in incorporating the teaching package into existing courses.
6) The teaching package should focus on the practical and interdisciplinary aspects of management. It seems likely that many students in an ICZM course have a background in a single science, such as biology, and need training to apply this knowledge to a field situation.
7) Future maintenance and updating of the package must be considered.

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Appendix A
Online questionnaire

SPICOSA Node 5 questionnaire

Name	
Organisation	
e-mail	
SPICOSA SSA	None

Please select the 5 skills that you see as most important to be applied if undertaking an analysis in a coastal system (as may be done in the SAF).

- ☐ Natural science (e.g. biology, chemistry)
- ☐ Physical science (e.g. hydrology, sediment dynamics)
- ☐ Social sciences (environmental/other)
- ☐ Economics (environmental/other)
- ☐ Laws and institutions (National/EU)
- ☐ Communication (written & verbal)
- ☐ People management
- ☐ Business management
- ☐ Practical management
- ☐ Spatial planning
- ☐ Interdisciplinary (ability to use skill from one field in another, eg using natural science in management).

Other (please specify)

Which **3** skills do you find most difficult to find in current post graduates?

- ☐ Natural science (e.g. biology, chemistry)
- ☐ Physical science (e.g. hydrology, sediment dynamics)
- ☐ Sociology (environmental/other)
- ☐ Economics (environmental/other)
- ☐ Laws and institutions (National/EU)
- ☐ Communication (written & verbal)
- ☐ People management
- ☐ Business management
- ☐ Practical management
- ☐ Spatial planning
- ☐ Interdisciplinary (ability to use skill from one field in another, eg using natural science in management).

Other (please specify)

Can you propose or do you already offer a module in SPICOSA related course, eg Erasmus Mundus Master in Water and Coastal Management?

Course 1) Course 2) Course 3)

Please recommend 3 **post graduate** courses (not necessarily in your own country) which you feel provide well trained marine environmental management post graduates. Please include institutions and webpages if known.

Course 1) Course 2) Course 3)

Would you like to make any other comments?

Appendix B
Courses

B.1 Degree courses

Course	Institute	Country
Water and Coastal Management, Joint Masters Erasmus Mundus Joint Master in Water and Coastal Management		EU
ICZM - Coastal Zone Management	Fernstudiengang Umwelt & Bildung der Universitat Rostock	Germany
Biological Oceanography	Kiel	Germany
MSc Environmental Management	Kiel	Germany
MA in Geography (Coastal Management & GIS), http://www.ucc.ie/academic/geography/	University College Cork	Ireland
MSc Applied Science (Coastal Management and Informatics with GIS)	University College Cork	Ireland
PgDip/MSc Coastal Zone Management, University of Ulster http://prospectus.ulster.ac.uk/course/?id=4418	University College Cork	Ireland
Environmental economics www.unive.it/nqcontent.cfm?a id=182	Venice University Ca' Foscari	Italy
Estuarine and coastal studies	Venice University Ca' Foscari	Italy
EMAC-MSc in Marine and Coastal Studies	University of Algarve	Portugal
Marine & Coastal Management MSc, http://courses.bournemouth.ac.uk	Bournemouth University	UK
MSc in "Aquatic Ecosystem Management"	Napier University, Edinburgh	UK
HNC Coastal Zone and Marine Environment Studies (Coastal Management),	Pembrokeshire college	UK
Environmental Economy www.economics.bham.ac.uk	University of Birmingham	UK
MSC Water and Coastal Management	University of Plymouth	UK
MSc/MRes Coastal and Ocean Policy	University of Plymouth	UK
Sustainable Environmental Management	University of Plymouth	UK
MSc Coastal & Marine Resource Management	University of Portsmouth	UK
MSc Marine Environmental Protection, School of Ocean Sciences	University of Wales, Bangor	UK
Marine Geography, Cardiff University (many modules)	University of Cardiff	UK
Marine and Coastal Environmental Management	University of Cardiff	UK

B.2 Modules, Short and Partial Courses

Course	Institute	Country
Biological oceanography relates biological science and economics, management of resources	Southern Denmark university	Denmark
Master "EGEL"	IWEN, Brest	France
Tropical coastal ecology	Bremen	Germany
IKZM-D-Lernen: online training modules for long-distance self studies (in German); topics: ICZM, ICZM in the Baltic, WFD, Natura 2000, Sustainable Coastal Tourism etc. www.ikzm-d.de	http://www.ikzm-d.de	Germany
BB89 An Introduction to Environmental and Resource Economics	Kiel	Germany
BB91 Cost-Benefit Analysis	Kiel	Germany
Intenational Studies in Aquatic Tropical Ecology	University of Bremen	Germany
Short Course in Applied GIS for Coastal and Marine Management (2 days)	University College Cork	Ireland
Institutional analysis	Bodø University College (BUC)	Norway
Selected topics and coastal occupancy,	University of Szczecin	Poland
Coastal lagoons	University of Algarve	Portugal
Coasts of the World	University of Algarve	Portugal
Eutrophication	University of Algarve	Portugal
Introduction to environmental and resource economics	University of Algarve	Portugal
proposal: short course in data base management/GIS	Danube Delta National Institute	Romania
Economy and Management on Fishing Activity, www.gemub.com/GEM2/emaster.htm	Barcelona University	Spain
Aquatic Ecology module in Masters course in Marine Biology (15 ECTS), http://www.big.su.se/hemsida/allmant/engelska/mastereng.htm	Stockholm University	Sweden
Coastal planning (spatial planning)	Tubitak	Turkey
Environmental Economy	Tubitak	Turkey
Environmental management planning	Tubitak	Turkey
Marine and Coastal Resource Management	Heriot-Watt University	UK
"Sustainable catchment management" dealing with WFD - available for distance learning.	Napier University, Edinburgh	UK
Marine and Coastal Resource Management	Portsmouth University	UK
Conflict resolution	University of Plymouth	UK
Marine Science and Regulation	University of Plymouth	UK

Appendix C

UK Courses

The 18 Master's courses available in the UK identified though UCAS and Prospect websites, compared to the 11 determined the SPICOSA survey (appendix B)

Course title	Institution
Marine Environmental Protection	Bangor University
Environmental Practice: Marine and Coastal Zone Management	Bournemouth University
Marine and Coastal Environmental Management	Cardiff University
Marine Resource Management	Heriot-Watt University
Water Resources Engineering Management	Heriot-Watt University
Aquatic Ecosystem Management	Napier University Edinburgh
Tropical Coastal Management	Newcastle University
Marine Ecology and Environmental Management	Queen Mary, University of London
Marine & Freshwater Ecology & Environmental Management	University of Glasgow
Water Resources Engineering Management	University of Glasgow
Maritime Policy	University of Greenwich
Estuarine and Coastal Science and Management	University of Hull
Coastal and Marine Tourism	University of Lincoln
Applied Marine Science	University of Plymouth
Coastal and Ocean Policy	University of Plymouth
Marine Resource Economics	University of Portsmouth
Coastal Engineering for Climate Change	University of Southampton
Coastal Zone Management by e-Learning	University of Ulster