

Aquatic Litter Information System

Using Digital Technologies

University of the West of England

R & D Technical Report P53

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This report summarises the findings of research carried out on an Aquatic Litter Information System using digital technologies. The information in this document is for use by EA staff and others involved in managing aquatic litter. The document also supports a demonstration CD-ROM held by the Agency's project manager.

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EXECUTIVE SUMMARY

There is growing awareness that aquatic litter is a very costly and damaging form of pollution. The outcome of a series of conferences during 1994-96 has been the establishment of a constituency of people from a wide spectrum of users who are actively engaged in aquatic litter research and management. There is a strong ethos among this group to base management measures on a sound information base. Fundamental to this is the understanding that if the source of aquatic litter can be established then effective preventative measures can be developed.

The aim of this project was to enable different types of litter to be identified and linked to their input source. The opportunities for re-assessing technical publication with the development of a wide range of digital technologies is enormous. In relation to this project the use of photographs of litter items to facilitate identification opened up a range of novel possibilities.

This project was undertaken to create a prototype of an information system (on a CD-ROM) for identifying aquatic litter using digital media technologies designed with the potential for use on the World Wide Web. The resulting Aquatic Litter Information System (ALIS) contains linked volumes which have been developed during the project. The primary design approach included text and images with an emphasis on the use of images.

The development of the project, and in particular the use of the photographic images, prompted a re-appraisal of how sourcing aquatic litter could be undertaken. The sourcing part of the guide was orientated finally at socio-economic and input sources rather than identifying individual items. Because it is possible to view the litter items collectively from a particular source on the screen at one time e.g. sewage related debris or fishing, it is possible then to access specific information on items more easily. This also makes access to information on other aspects of that input e.g. impacts, costs, prevention, much more direct.

Litter is a very visual form of pollution, and whilst photographs have been used to a limited extent in the past their use in publications has been constrained by the high costs of publishing. Modern digital technology is removing that constraint and the photographic images of individual items and groups of items, and litter *in situ*, enabled a number of issues to be demonstrated effectively.

The ALIS project was demonstrated to the audience of a three day aquatic litter conference in 1996 and their reaction to the information system assessed. These reactions and the information from the development process have been discussed. Ideas for how further work using this technology can be taken forward have been outlined.

It is recommended that information systems on an internet site could be a significant way of enabling access and adding value to project information. This would couple the power of existing information, photographic and other graphics in the information system with focused project outcomes.

The need for high quality technical information in the form of manuals has been recognised for many years. This project showed how, using this technology, many of the past limitations of such publications can now be successfully overcome in a cost-effective manner.

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The project was a partnership between the Environment Agency, Welsh Water, The University of West of England and Marine Environmental Management and Training (MEM&T). All the photographs incorporated in the CD-ROM were provided by R.Earll of MEM&T who retains the copyright. The text was generated during the project by Bob Earll, or was derived from two multi-authored conference reports edited by R.Earll. The project was managed by Glenn Hall and Sue Marriott and the Java programming and meeting demonstration undertaken by Tom Statter. Thanks must also go to Delia Whitman for organising the logistics.

1. INTRODUCTION

1.1 Project Aim

The project was undertaken to create a prototype of an information system for identifying aquatic litter using digital media technologies designed with the potential for use on the World Wide Web. The system contains linked sections which have been developed during the project. The primary design approach included text and images with an emphasis on the use of images. The project was designed to provide a proof of concept prototype to be demonstrated to an aquatic litter conference to seek views on how such an approach could be developed further.

1.2 Background to the project

Conferences on aquatic litter in 1994 and 1995 have brought together a constituency of researchers and managers who have a strong interest in basing their management programmes on a sound scientific information base. One of the key values held by this group is that if the sources of litter can be identified then this would be a key step towards finding prevention measures. Earll and Williams (1995) proposed a format for compiling details of the litter items which would enable this information to be exchanged in a systematic manner and which was based on the use of photographs of the litter items. In discussing the potential of using digital technologies for compiling such information with staff at the University of the West of England the project was developed with a number of partners.

1.3 Project deliverables

The project deliverables were specified as:

- a sample off-line web site, running on hard disc, with a data copy on gold CD ROM.
- a demonstration of the prototype at the conference of the Aquatic Litter Steering Group in November 1996.
- a short written report, including the outline of a phase 2 project, to contain recommendations for future development.

2. METHODS & DEVELOPMENT

2.1 Development process

The development process included:-

Meetings of the partners twice at the outset of the project to discuss what was possible, to decide the main emphasis - upon the sourcing guide and to ensure that the project met key requirements. UWE Bristol provided demonstrations to the partners of available technologies and in discussion an appropriate level was chosen.

There were meetings between the team members to merge the developing litter technical input and the computing ideas. An important point is that the use of new technologies may well, as happened with this study, open up completely new ways of structuring the information. The programming work became much more straightforward once structures had been developed.

2.2 Machines and technical specifications

The Media Lab at UWE Bristol has several machines available to it, and these were used to ensure data compatibility across different platforms. Silicon Graphics (Reading UK), provided a higher powered machine for the final development and demonstration at the conference. The specification of the machine was an Indigo2, R4600 processor at 200 Mhz, 64Mb of memory running SGI Irix 6.3. Other machines used included an SGI Indy, R4400 at 200 Mhz, 64Mb, a Hewlett-Packard (H-P) 725 PA-6 at 185 Mhz, 64 Mb memory running H-P UX 9, Macintosh 5300c PPC603E at 177 Mhz running 7.5.3 (used portable for meetings), other Pcs for text entry.

The Silicon Graphics machines were used with WebMagic, CosmoCreate, Photoshop 3 and Netscape Suitespot HTTPD server. The H-P machine used various C programming tools and Apache HTTPD server. The Macintosh use Photoshop 4 and Netscape and other public domain tools, and trialed Microsoft front page. Image scanning was undertaken on a Hewlett-Packard Scanjet 4 single Pass scanner directly into Photoshop, on both Macintosh and PC.

A high speed network was used to link all the above computers.

Access for the development partners to work in progress was afford by UWE providing Web space hosting using Apache on the Hewlett Packard machine. The material created was subsequently transferred to a simple distributable form in terms of a Gold CD ROM, with installers for Netscape 3, Macintosh and PC included. This is intended to be a tool for demonstration and to enable the development of a phase 2 project.

The use of Java Script within an integrated environment was found to be appropriate and effective. It was learned that it is desirable to ensure that user browsers (typically Netscape) are of the latest Java enabled version.

The CD ROMs were produced on a Yamaha CD ROM burner using Gear (Astarte) software. H-P Unix boxes running Python provided the translations for PC (only needed for the CD ROM).

2.3 Meeting Demonstration

The Aquatic Litter Information System (ALIS) was demonstrated to the delegates at the 1996 meeting entitled '*Litter in the Aquatic Environment and Local Authorities and Coastal Pollution*' held in London from 26th-28th, November 1996. Delegates were shown the system either on a 1:1 basis or in small groups. Their views were noted by T.Statter and they were encouraged to complete an unstructured questionnaire on how they thought they might be able to use the system; ten forms were completed (Appendix 1).

3. RESULTS

3.1 Conceptual Developments

There is no doubt that this technology overcomes many of the traditional constraints of technical publishing. More than this it enables issues to be addressed from completely new perspectives which would not otherwise be possible. Some of the issues raised are discussed below.

3.1.1 Encyclopaedia & Toolkit

One convenient analogy for this information system is as books on a shelf or an *encyclopaedia* and this is how the opening menu was framed (Fig.1). The technology also enables menu driven checklists and recording forms to be designed and for this data to accumulate in the information system. In this mode it acts like a *toolkit* enabling different tasks to be completed using a variety of forms and tools.

3.1.2 Volumes

The volume titles of the information system were chosen and developed through the project to cover the major topics which people would want to access in the conventional, 'front end' way that would be used to access the contents of a book.

3.1.3 Internal connectivity

One major attribute of such systems however is that they allow internal connectivity. This means that by clicking on hypertext it is possible to go directly to other volumes information without going to the beginning of a particular volume. It was particularly apparent when writing text for the sourcing guide that this would be a major feature of such systems and indeed much information on topics such as solutions and impacts would already have been written and included elsewhere in the text. Even when focusing on the sourcing guide part of the project issues of internal connectivity arose routinely.

3.1.4 Use of existing text based information

Information on aquatic litter was available in disc form from two previous conferences held on this subject in 1994 and 1995. The transfer of this information to the system and its recall constitute one of the most straightforward of the development tasks. The potential of coupling existing computer based information into such a system provides major opportunities to harmonise approaches and avoid duplicating information and effort.

3.1.5 Important new ideas emerged

During the development process important new ideas emerged not only because of the use of photographs, but also from considering how the guide would be used. For example, in relation to sourcing the importance of demonstrating the range of litter materials in groups of



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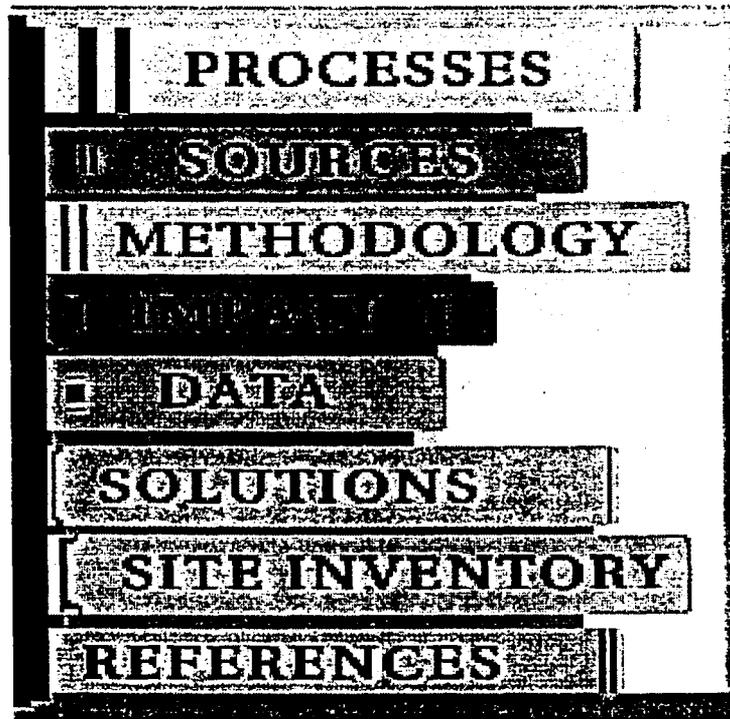


DER CYMRU
WELSH WATER

Welcome to the Aquatic Litter Encyclopedia

Topics

Click on the Topic Below for Further Information.



[Processes](#) || [Sources](#) || [Methods](#) || [Impacts](#) || [Data](#) || [Solutions](#) || [Site Inventory](#) || [References](#)

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Figure 1.

items from particular social and input sources could be illustrated and linked more directly to prevention. In the past the focus has been on identifying individual litter items in great detail.

3.1.6 Levels and detail

It is apparent from the way this project worked that a concept of levels of information (and detail) is helpful. At the highest levels brief descriptions, contents lists, collections of images on the screen together enable access to much more detailed information. In the initial stages of such a project one is mapping out the structures to which the different levels of information can be added.

3.1.7 Information and data

Most of ALIS is orientated to *information* in text form which operates in the encyclopaedic manner. The opportunity to insert *data* in terms of ‘raw numbers’ which are then processed has not arisen yet, but is likely to be possible with development of more tools.

3.2 Sourcing Guide

3.2.1 The basic idea

The emphasis of the project was to develop a sourcing guide to aquatic litter using photographs of litter to assist in its identification (Earl and Williams, 1995). The issue is that whilst the constituency believe that sourcing is a key element to litter prevention there is no published information on this. The idea was based on the use of this approach to produce identification guides to underwater life in the 1980s. The basic idea was that a simple A4 form with systematically structured information could be compiled along with a photograph to help workers identify particular litter items.

3.2.2 The unit form

An ALIS version of this form (*the unit form*) was produced to enable new items to be described in text form. A scanner, generating a Graphic Information File (GIF), is also needed to attach the text and the form. A small number of forms were completed to illustrate the idea. Any systemic description of types of litter would generate many (hundreds) of these unit forms.

3.2.3 How to access the ‘units’

Whilst the description of individual items using the structure form is quite straightforward what soon became apparent was that the issue of accessing the individual items would be rather less so. Two questions arose:-

1. Which classification should be used?
2. What do we mean by sourcing?

3.2.4 A source based classification of litter items

There are a number of published classifications of litter items which are used by the various recording projects and initially classification produced by the MCS Beachwatch project was programmed. It was clear that photographs of *collections* of classification groups e.g. sewage related debris, fishing debris, could be used to access the unit forms.

The problem with the Beachwatch classification is that it is mainly (apart from SRD) a *material* based classification e.g. glass, plastic, wood. etc. This is self evident in many respects but not terribly helpful when it comes to linking the litter to socio-economic groups or inputs which are giving rise to the litter. It became apparent that a *sources* based classification would be far more useful because items produced by these socio-economic groups and inputs could be grouped together. Such a classification was produced and items classified and programmed.

Photographs of objects derived from particular sources were projected on the screen (Fig.2) as thumbnail images which could then provide click-on access to the unit forms. In the case, for example, of sewage related debris this then enables a wide range of objects including cotton bud sticks, tampon applicators and colostomy bags to be viewed. It is surprising how many people have never seen or cannot recognise these items! One recorder for a popular survey was recording cotton bud sticks as lollipop sticks! This, and other comments at the demonstration of the variety “Oh, so that is what that is” suggest that an ALIS based sourcing guide could be an invaluable training aid.

3.2.5 Text on sourcing

It became clear that at the same level as thumbnail descriptions of the types of litter associated with any particular input or socio-economic grouping it would be useful to have a generic text. A structured approach to this was attempted in several instances but once again the text already existing on this topic from the conference reports became useful at this level especially in relation to solutions and impacts.

3.2.6 Methodology development

One of the ‘toolkit’ ideas which was discussed initially but not developed was a ‘counting’ system to enable a profile of litter items to be built up and then linked to particular sources. Data for this was collected which showed how a litter profile for a particular location could be derived in a cost effective fashion. In short, it is possible to collect a specified number of litter items 100, 150, 200 or 250 items and decide how many are sufficient to describe a particular site. Photographs of the ‘collections’ of litter items in such studies could also provide a valuable reference source.

3.3 Other Volumes

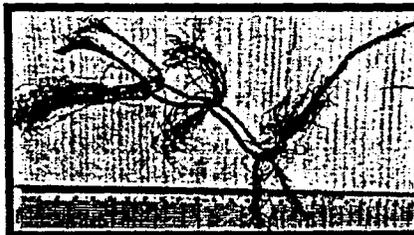
Even though the main focus of the project was on the sourcing element some work was done on a number of other volumes.

Source Group - FISHING

1.0 Tangles of nets



1.1 Fragments of net



1.2 Frayed net



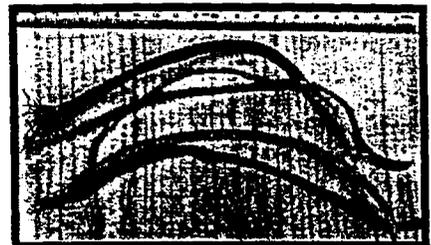
1.3 Thick multi-stranded rope



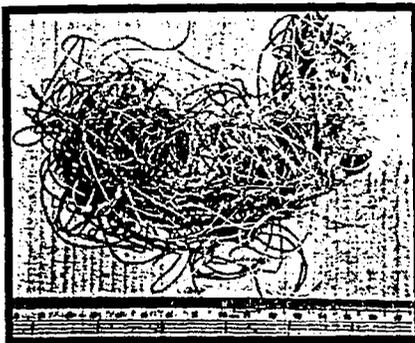
1.4 Thin multi-stranded rope



1.5 Braided woven ropes



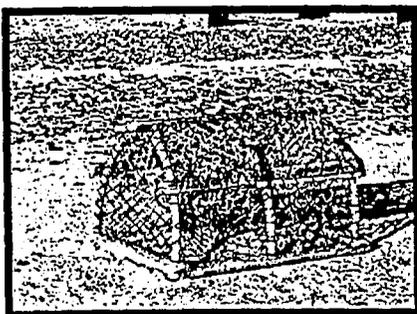
1.5 Monofilament line



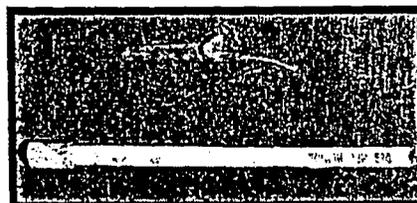
1.6 Coloured Monofilament line



1.7 Lobster pot



1.8 Fish Tags



1.9 Cylum tubes

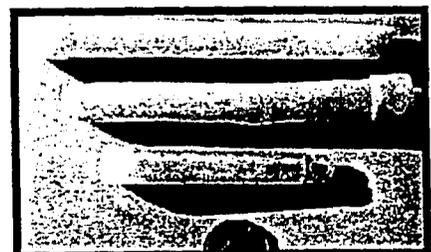


Figure 2.

3.3.1 Shore Processes

From a field perspective many photographic images reveal aspects of how litter becomes a part of shore processes. A range of images were included in this section of observations on how litter is found in the beach environment, e.g. tangled with weed, embedded in sand dunes or eroding from dunes, or accumulating in high above the tide mark behind seawalls etc. More systematic links to process diagrams would enable the photographs to be linked more effectively to the text.

It became apparent when demonstrating ALIS that these 'process' photographs were helpful in showing people *where* to look for aquatic litter. Indeed, since the very perception of litter is a function of aesthetics and values this section could be expanded to provide a better description of levels of littering - using photographs. The photographs would also help to describe otherwise difficult areas like 'windblown litter behind the shore' and the degree to which this was perceived to be a problem.

3.3.2 Solutions

The text of the 1994 conference covered a wide variety of solutions to litter problems and this was included in this section

3.3.3 Impacts

The text of the 1994 conference covered a systematic breakdown of the impacts of litter and this text was included in this section.

3.3.4 Methods

The text of a generic methods guide with case studies from the 1995 conference was included in this section of ALIS (Earl, *et al.* 1995).

3.3.5 Site Map

This was designed to demonstrate the distribution of particular types of litter and begins to illustrate the power of these technologies to demonstrate to third parties the status of litter pollution.

3.3.6 Beach checklists

The Beachwatch site form was used in *toolkit* mode. There is a growing interest in beach assessment methods and such checklists would be one way to develop data bases. The use of photographs of the site could help with training as well as year on year comparisons.

3.3.7 References

It became apparent that a common pool of references was being accessed and hence a reference volume was created.

3.4 Outcome of Demonstration of ALIS at Conference

The feedback from the conference took two forms, firstly , notes made in discussion with conference delegates during the event and secondly, the results of feedback sheets which were handed out at the meeting. The feedback is reported in Appendix 1 using the delegates own words. The overall response to the system was very favourable and the issues raised by delegates are covered in the discussion.

4. DISCUSSION

4.1 Who would use such a System?

The 'who will use the system' is a key question in relation to the *design of systems*, however it is very difficult to second guess who the potential users of an internet site would be. A wide cross section of interests responded to the demonstration including researchers, managers and students; it is envisaged that future development would probably be orientated towards this technical audience in the first instance.

ALIS can also be used as a *communication tool* to describe litter effects for:-

- training technical staff, researchers
- managers
- local authority officers and members
- politicians, local, national and european.

Internal connectivity opens up enormous options for enhancing the *value* of any project which adds to such an information system. This is especially so in terms of making the results accessible to a wider audience - whoever they are.

A way forward might be to support the maintenance of information systems long term for minimal outlay on one of the main servers, but then fund specific projects. This would achieve the outcome of the specific project but also enhance the information system at the same time.

The topics for development could be based on market research undertaken to establish user requirements. For example the comments notes highlighted the need to have *network* details in such a system.

4.2 Access, Openness and Security

Although this issue is raised routinely it is an area which can easily be designed in to systems as they are constructed. The use of passwords would facilitate access to particular areas. One of the benefits of ALIS would be to make available 'existing' information in a readily accessible form and so relationships where experts input information should be drafted in such terms.

4.3 Copyright Issues

This demonstration has involved a variety of inputs with a mixture of copyright issues being raised. Among these include:-

- Photographic images
- Text of copyrighted multi-authored texts
- Copyright on project ideas (e.g. the sourcing guide, Earll & Williams, 1995).
- The financial input of multiple sponsors
- Is the 'All rights reserved' phrase appropriate for projects which have an internet product?

If, as seems likely, the project develops by involving the input of a wider range of individual experts who will be encouraged to *use* the system by adding in information, then the question of property rights will become more complex, but will need to be addressed from the outset.

Other information systems operate by acknowledging, in the traditional publishing fashion, the author of particular sections. Such sections could be peer reviewed etc.

Further thought would need to be given to this area if payments were necessary to access the system.

4.4 Potential for Innovation

Litter is a highly visual form of pollution which lends itself to description using visual methods (e.g. DoE Code of Practice). This study has confirmed the potential for using photographs in a variety of ways including to describe:-

- the 'visual' distribution of litter on the shore
- how litter is closely involved in natural processes - hydrodynamics and wind distribution.
- groups of litter items associated with socio-economic and input sources
- to source individual items.

However, more than this, in thinking through how the photographic material was to be structured this has also lead to more effective ways of sourcing the litter to socio-economic and input sources and a quantitative method which enables this to be done in a cost effective manner. There are likely to be such positive spin-offs whenever the need to create information systems is integrated with this technology.

4.5 Technology Transfer

Access and training are real issues - many people were very impressed by what they saw but were not current or expert users of the internet - a real technology knowledge gap exists. There are two areas which need to be designed into projects.

4.5.1 Cutting edge to routine communication

The progress being made with digital technologies at the cutting edge has far outpaced that of the constituency of litter experts. Whilst a great many things are possible in theory, in practice there are real difficulties of working at the cutting edge which have been encountered during this study. Three examples:-

- demonstration not working at the conference on the computer projection system
- cutting the gold CD ROM

- backward compatibility of Netscape versions to ordinary users

The main message from this is that care needs to be taken with design to ensure that the technologies work in practice.

4.5.2 Technical understanding of digital technologies by the user community

The feedback from the conference clearly identified *the lack* of understanding of the user community with the technology. If, as is envisaged, one looks for a far wider *active involvement* of users in a phase II project then this issue would need to be addressed very directly.

If experts are asked to contribute their knowledge to such information systems the trade off should be that they, as users, are enabled to use the system from their office base. This may require a variety of interventions including training audits, training for use of the technology, an equipment audit, etc., to enable them to use the system.

4.6 Developments in Computing Technology

Valuable insight was gained in this project in comparison to the latest generation of integrated web authoring tools. The opinion of the programmers gained through this was that the use of an integrated environment is valuable and the tools on the Silicon Graphics Platforms, notably WebMagic and CosmoCreate (which only became available after the project started), were of great value, easy to use, and stable software. Certain Java tools were only available on the SGI platform or on Windows NT.

For future projects, the use of WebMagic and Cosmo Create are recommended as being cost effective and reliable. This recommendation should not exclude the constant evaluation of newly introduced software. Fortunately the outputs from these tools create industry standard Hyper Text Management Language (HTML). Image quality was considered, Photoshop 3 was able to easily perform the quality and scale transforms needed, running on either SGI or Macintosh or PC Platforms. The photographs provided - simple Kodak colour prints - were of good quality, so no significant enhancement was undertaken.

The use of Java Script within an integrated environment was found to be appropriate and effective. It was learned that it is desirable to ensure that user browsers (typically Netscape) are of the latest Java enabled version.

4.7 A Generic Model for Expert Information Systems - Manuals

There is growing requirement for technical manual style information and yet such paper documents are usually unwieldy to use and do not have photographic or adequate illustrative material . This project can also be viewed in a generic way to help understand how the new digital technologies could be used to address this area. Some weaknesses of traditional paper manuals include:-

- Traditionally manuals become too large to use routinely and therefore they are not used.
- People often seek detailed information in such manuals which has been excluded on the basis of keeping it a reasonable size.

- Photographic information is often not included because of the costs involved with limited editions.

Systems such as ALIS can help to overcome these problems. Simple access through volumes and contents enables very detailed levels of information to be accessed very quickly. Similarly large numbers of people can access the information without the major expense of publishing hard copies. The use of photographic and other images such as video can be used cheaply to communicate subjects which take many words to express (i.e. a picture is worth a thousand words).

5. AQUATIC LITTER INFORMATION SYSTEM (ALIS) - A PHASE 2 PROJECT

There are many topics a phase 2 project could explore. A number are set out below. It would be advantageous if the creation of a web site were a key aspect of any of these projects.

1. Developing ALIS by linking users into the system.
2. Developing digital technology research tools (maps, counters etc.)
3. Incorporating specific projects into ALIS
4. Developing such a project as a generic model for developing electronic manuals on other topics.

5.1 Developing ALIS by linking Users into the System.

There is a wide constituency of some 150+ people working on aquatic litter related topics. An initiative in this area would seek to transfer a large quantity of existing information into the ALIS system but at the same time enable them to use the system by the provision of training etc.

5.2 Incorporating Specific Projects into ALIS

A very direct way of developing ALIS would be to target particular projects to be incorporated into the system. This would offer the direct advantage of completing a particular project but also enhancing the system overall. Some projects which could be considered include:-

- The ABCD site ranking system; two parts including additional guidance on methods and the demonstration of results to map polluted sites;
- The MaLiTT report on the costs of aquatic litter is due to be published in the next year. Many of the issues raised in the MaLiTT report mirror topics in ALIS and the MaLiTT report contents could be incorporated to develop many volumes of ALIS;
- Training aids to sewage related debris identification and methods;
- Systematic photographic river assessment for aquatic litter descriptions;
- The description of network features, names, contacts, expertise, current work - etc.

5.3 Developing Digital Technology Research Tools

There is enormous potential to use a variety of computing techniques to develop the utility of such information systems. Such projects might include:-

- Communication and training
- Counters
- Map based communication of project data
- Automated object identified based on image processing and reference to ALIS.

5.4 Developing such a Project as a Generic Model for Developing Electronic Manuals on other Topics.

The need for high quality technical information arises in many areas of environmental management. The use of photographs to demonstrate environmental effects and management measures is a valuable way of communicating. The development of ALIS could be used to pilot similar approaches in other fields.

6. RECOMMENDATIONS

6.1 That the next stage of development be the creation of a web site for the Aquatic Litter Information System (ALIS) to pilot the development of such systems.

6.2 That further developments of the ALIS system be conducted by developing specific projects whilst at the same time developing the system.

6.3 That the system be developed by working with selected litter experts to help develop the approach in order to learn how best to utilise, extend and educate technical audiences with information systems on web sites.

7. REFERENCES

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Appendix 1. Conference feedback

The feedback from the conference took two forms, firstly , notes made in discussion with conference delegates during the event and secondly, the results of feedback sheets which were handed out at the meeting. The feedback is reported below using the delegates own words.

A.1 Conference Feedback reported to the demonstrator

There was a very high level of positive interest in the project. Many questions were along similar lines and the main themes are described below.

Who will use it questions

What is it for? Who is it aimed at? Who will use it?

“Looks like a good educational tool - will it be aimed at school / educational use?” “This looks useful for training.”

“Looks like the sourcing guide could be really useful.”

People seeing the cylume tube were saying “Oh, so that is what that is!”

Inputs to the system

This was one of the main areas of questioning.

“Can it link to data bases - I have excel / access etc can I get it easily on to the web or into this system?”

Can I put data / information in?

Can anyone put data / information in?”

“How / Can I use this layout for my own project - I’d like a ready built / off the shelf project to do myself about my part of the world.”

Access - openness - security - quality control

“Is it an open system? Who can see the data / information?”

Can it be made secure? What are the security issues?

What about people adding rubbish data / information? Who will maintain the integrity of the data / information?”

Many offers of ‘data’

There were offers of information, from Thamesclean and some of the water companies.

Other points

“Is it available now?”

People liked the beach litter map example to be able to visualise the information

Access and training are a real issue - many people were very impressed by what they saw but were not current or expert users of the internet - a real technology knowledge gap exists.

Funding - many people mentioned European funding. No-one really said they had funds they would like to use for this.

A.2 Input from the comment sheets

This listing is a synthesis of the comments on the 10 sheets which were returned. The people responded to the prompt, '*Your comments - it would be really useful if the system could...*'. The text is reported as it was written by delegate, i.e. not in the third person.

Who will use such a system?

"Influence *policy makers and politicians*. A system is required that can be accessed by the various agencies that, collect, analyse and collate data on coastal rubbish pollution. It follows that a standardised methodology needs to be agreed for data collection and analysis.

This system could be a very powerful tool particularly if the impacts could be costed, analysed by the system and presented to *local and national politicians*.

We are developing our own web site and we are thinking of putting Coastwatch data on the internet for exchange between *schools*. (Dutch NGO)

Give my *students* background information on marine litter."

Access

"Allow sub-groups (closed access to specified users) for key areas where the professional group can share information without being 'public', no access by commercial companies, journalists etc (avoids advertising, tiresome meetings etc.)."

Methods

"Provide guidelines on survey techniques for specific information requirements.

Data input: Be used to update 'world-wide' marine litter projects by inputting direct to a data base. The system is the only way to go.

With confirmation from our project sponsors I feel our project could be used in some form or other to test the system."

Assessing litter hotspots and dirty beaches

"Assist in clarifying the issue of how dirty a beach has to be to be declared 'dirty'.

Identifying hotspots for remedial action."

Sourcing litter

"Help me to source items and link to items like solutions, impacts and economics.

Be used to identify the origins of marine litter e.g. in Guernsey most coastal litter appears to be of a shipping origin which will prove harder to control."

Network - who? what? where?

"Provide a list of organisations as they develop over the years with particular involvement in aquatic litter.

I am trying to establish a network of interested people in the south (Kent to Cornwall) so that they can be kept up to date on what is happening with regard to litter in the aquatic environment i.e. studies, initiatives, special expertise. I would therefore like to be kept informed of this project so that

I can pass contact and / or on-line details to network members.

- Be used as a networking directory that might include:
- names of bodies, with statutory obligations and powers plus contact names.
- what research is being carried out and by whom
- what findings there have been - a database

- what initiatives are being undertaken / developed
 - volunteer interests actively involved
 - the evolving legislation / implementation / effectiveness
- impacts on health / indirect impacts - local variations compare with MaLitt project and seasonal data.”