

Final Report
Information Context
for
Biodiversity Conservation

Union of International Associations
UNEP World Conservation Monitoring Centre
Institute of European Environmental Policy
Nordic Center for Innovation
AIDEnvironment

22-08-2000



Project No. 5052



UNEP WCMC



Institute for
European
Environmental
Policy



AIDEnvironment
Advice and Research for Development and Environment

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1.1 Introduction

Overview

This is the Final Report for the project called *Information Context for Biodiversity Conservation*¹. The project has developed an integrated information package for biodiversity conservation. It is intended to help policy-makers, and other professional and non-professional users, understand the links between the threats to biodiversity and the various responses society is making to counter the impact of both on the conservation of species and ecosystems².

The work has explored, developed and applied a variety of software for Web delivery, searches, multilingual access and translation, visualisation and mapping. It has sought and incorporated user feedback through external consultations, workshops and through online interactions. Other activities have included product testing and marketing, and consideration of long-term project financing and commercialisation.

The product integrates content from two previously unrelated information clearinghouses, also providing online access to data that were previously difficult or expensive to access. It is internally hyperlinked to a high degree and has extensive linkages with other online sources. Notable features are user interactivity and various forms of data mapping.

The product is called *Ecolynx* and is available online at <http://www.ecolynx.org/>.

The **project partners** are:

- UIA: [Union of International Associations](#), Brussels, Belgium
- WCMC: [World Conservation Monitoring Centre](#), Cambridge, UK
- NSM: Nordic Innovation Centre, [Norwegian School of Management](#) (Handelshøyskolen BI), Oslo, Norway
- IEEP: [Institute of European Environmental Policy](#), Arnhem, Netherlands (Definition Phase)

¹ This report is a summary of activities for the entire contract period of the project (1 Jan 1997 to 30 Apr 2000, Definition and Implementation Phases). The sources are the progress reports and final reports deliverable under the contracts (see Section 1.2.5: **Error! Reference source not found.**; this report is Deliverable 5052-3 of the Implementation Phase). This report is also available online at http://www.uia.org/projects/summary_report.doc or via the *Ecolynx* website (Project Information > Reports).

² In particular, this project would help organisations and individuals to build on information services that are *already being requested*, and which support *existing international activities*. For example, this product addresses the requirement for inter-sectoral information transfer called for by *Agenda 21*, complementary regional agendas and national agendas, such as the development of *National Environmental Sustainability Plans*. It supports the implementation of commitments under international agreements concerning environmental conservation, such as the Bern, Bonn and Ramsar Conventions, the *Global Biodiversity Strategy*, *Framework Convention on Climate Change*, the *Desertification Convention*, and the *Convention on Biological Diversity*. The product directly serves the programme objectives of several pan-European activities, including 'state of the environment' studies, *Natura 2000*, and the *Pan-European Biological and Landscape Diversity Strategy* (Council of Europe 1996).

- AIDE: [AIDEnvironment](#), Amsterdam, Netherlands (Implementation Phase)

UIA and WCMC have provided the information content and knowledge management expertise. NMS, IEEP and AIDEnvironment have been advisors in their specialist areas of expertise. All partners have contributed significantly to developing an understanding of the product, its market and users.

The project was co-funded by the European Commission's INFO2000 programme, (DG Information Society and Technology, formerly DGXIII). The Commission contributed around 39% of total costs and the project partners around 61%, some of which was counterpart funding derived from complementary (non-EU) projects. There were two phases, each under separate contract with the Commission.

Definition Phase Contract No STM5052 CONSERVATION 20529
Implementation Phase Contract No INFMM5052 CONSERVATION 22895

The following table provides an approximate breakdown of the costs in Euro³:

Phase	Total Costs (Euro)	Partners Contribution (Euro)	Partners Percentage	EC Contribution (Euro)	EC Percentage
Definition	232,745	136,545	58.67%	96,200	41.33%
Implementation	1,175,958	725,958	61.73%	450,000	38.27%
Project Totals	1,408,703	862,503	61.23%	546,200	38.77%

Contractually, the Definition Phase was six months (1 Jan – 30 Jun 1997); the Implementation Phase was 28 months (1 Jan 1998 – 30 Apr 2000), extended by four months from the original 24. Practically, activities have run continuously during, between and after the official contract periods. The project has generated activity that continues to the time of this report, and is planned to continue indefinitely under partner support.

Scope and objectives

This project, and multimedia product, was formulated to serve the needs of professionals and the general public for comprehensive, “one-stop-shop” information on biological conservation⁴. It was intended to be different from other existing information services.

1.1.1 Open responsive information structure

A prime objective of this project was to offer users new ways of understanding, and interacting with, complex information networks relevant to environment policy and nature conservation. The challenge was to provide an information tool, which through its comprehensive scope adapts to narrower or broader needs as required—thus

³ Costs are approximate because (1) some costs claimed in the Definition Phase were disallowed by the EC; (2) costs for the final period of the Implementation Phase have not yet been settled; (3) partner costs outside the contract periods have not been included.

⁴ It was intended to develop a product that carries meaning for both policy-makers and their constituencies—as users with different needs. A failure to do so would encourage the latter to make use of other sources of information, creating a gap in comprehension, which may be significant when policy-makers seek a mandate for their initiatives.

providing the user with a sense of *context* for any specific biodiversity or environmental concern. At the same time, where there was a need for detail greater than that accumulated by the project, the product would serve best when it pointed on to more specialised sources, notably in a Web environment.

1.1.2 Information integration

Knowledge organisation and management, both for sustainable development and in navigating the Internet, demand this contextual cross-disciplinary and multi-sectoral approach. This project, therefore, put emphasis on facilitative tools for showing relationships between data and information, such as cross-sectoral data integration, flexible data structures and user interfaces, data visualisation and mapping on-the-fly, visualization of complex patterns of relationships and data linkage across boundaries which normally act to disassociate relevant information, be they those of disciplines, language or data formats. Specifically emphasised were interlinkages, hierarchies of issues, horizontal associations, chains of causation and response, open boundaries, keyword and subject area searches, “intelligent” query searches, visualisation tools for complex patterns and processes, graphical indexes, and 3D zoom/magnify and perspective-shifting tools.

1.1.3 Contextual planning tool

The project was intended to provide end users with a knowledge management tool to handle the vast amounts of information pertaining to biodiversity issues, including the multi-sectoral and technical information necessary for realistic programme and project planning. The contextual planning methodology behind this project -- using hierarchical structures, lateral linkages (related issues, “cause and effect” pathways), cross-sectoral and inter-disciplinary approaches, and display of complex patterns of relationship between issues -- is an important development in the practical application of sustainable development principles for biodiversity conservation.

1.1.4 Product-Process-Service

The product was framed as a public service. Unlike most public services, however, it was intended to be delivered within a small-enterprise philosophy that is a hybrid of the “non-profit”/“for-profit” approach of the project partners, and which itself models successful activity on the boundary between the traditional NGO and commercial worlds.

Given the integral nature of user/contributor participation in this project, the end result would most accurately be called a hybrid “product/service”. The objective was to combine attributes of:

- a single tangible **product**, in the form of a website⁵
- an **ongoing service**, in the form of a continuously updated Web databases and services, and
- an **interactive process** ensuring effective continuing communication between providers of the information in the database, passive users of that information, and active users concerned to improve / query / debate that information in an interactive mode.

1.1.5 Process orientation

Aside from considerations of quality of content and aesthetic design, the viability of the product was seen to be highly dependent on the integration of several *processes*

⁵ A CD-ROM product was also envisaged, and may be implemented in the future (see Section 19.1: **Error! Reference source not found.**). It would be integrated with the website and capable of updating by web downloads.

involving its information providers and users. These process factors are mutually supportive and can be summarised as:

- **Information-gathering** through contact with those most motivated to provide the information, usually involving free exchange of information and, to an increasing extent, interactive updating. The relationship with information providers is a sensitive one, better considered as provision of a “service” rather than a “product”. This would be reflected in the design of the various trial modes in which the information has been made available to ensure cost recovery, notably incorporating a non-monetary system of information credits and debits.
- **Information-processing** of received materials into standard formats and quality is traditionally demanding of expert resources, both for editing and data manipulation. The objective here was to use automated electronic techniques to the greatest degree possible to streamline associated editorial work, notably by reducing “double-handling” of information in tasks such as storing, locating, reformatting and re-entry of information. The focus would be on the design of interfaces between the non-automated, conventional communications and automated (Internet and email) users.
- **Information delivery** of processed information through interfaces of varying complexity, according to user needs. These would range from simple-to-use variants to those of a more experimental character. They would assist location and application of information relevant to the user and facilitate location by the user of other information sources.
- **Marketing** of the product/service to potential users through Web facilities and hyperlink integration with other Web sites. Of special concern was the need to strike a balance between presentation of information at zero cost (both to satisfy minimal needs of a particular class of users and to attract new users) and implementation of one or more systems of charges. Flexibility and experimentation would be needed to satisfy the differing needs of the principal partners and to take account of any special contractual relationships they may have with collaborators who provide information.
- **Updating and participative development** of the information was seen as a direct and essential consequence of the interactive nature of the product/service and vital to its sustainability. Product development would stress an interactive role for users as “user-partners”, rather than a passive user role. In this sense, the product would be designed to develop future user needs, rather than solely to respond to first-order user needs of the present. It would also seek to convert the user of information into being also a provider of information. This phase then feeds back into the information-gathering phase.
- **Integration with ongoing processes** as part of the core business of the principal project partners. Fulfilling this objective would mean that the product is less subject to the political and commercial whims which govern the production cycles, content, coverage and updating of other information sources.

1.1.6 Policy relevance

A distinction may be made between information relevant to the considered articulation of policy options and information relevant to suddenly emergent crises (requiring immediate response). However, this may be an artificial distinction in that the information required is often the same, the main difference is in the urgency of the requirement.

In both cases an unpredictable range of factors will determine the scope of what is considered relevant. These may include, for example, tolerance for complexity versus need for simplicity (political, institutional, cultural, and personal). Together these

then lead to a particular focus which excludes ‘external’ factors labelled by the user as ‘secondary’ or ‘low-priority’—although advocates of opposing policies, who may also wish to use the product, may question this judgement.

1.1.7 Preference for available technology

A primary objective was not to develop new software, but rather to adapt available packages, which would tend to be easily accessible to potential users.

Roles of consortium partners

The project consortium was composed of five European non-governmental organisations (NGOs): [Union of International Associations \(UIA\)](#), [World Conservation Monitoring Centre \(WCMC, now UNEP-WCMC\)](#), [Norwegian School of Management \(NSM\)](#) through its Nordic Innovation Centre, [Institute of European Environmental Policy \(IEEP\)](#) and [AIDEnvironment](#). IEEP and AIDEnvironment traded places between the Definition Phase and Implementation Phase, respectively.

Specifically, environmental consultants IEEP and AIDEnvironment provided advice on environmental policy and legal instruments for biodiversity conservation (particularly from a European perspective), and on product design from the viewpoint of professional users. Staff of AIDEnvironment tested the product in its early form.

NMS provided advice on electronic publishing, product design and marketing. Marketing students of the school tested the product in its early form.

WCMC provided its substantial experience, developed over 30 years, in collating and managing major databases on the conservation of species, ecosystems and protected areas, and in providing information services based on this information. In collaboration with its other organisational partners and co-funders of this project, it extended the scope of this information, its interlinkages and accessibility, and developed significant new Web information tools and services, including Geographic Information Systems (GIS) (described in Section 17: Mapping national information).

UIA has for over two decades integrated and managed information, provided by international organisations of all concerns and colours, on global problems and the actions society is taking to alleviate these problems. Its wider competence is as a clearinghouse for information on international associations, their perceived concerns and activities. UIA contributed these data, enhanced in the fields relevant to biodiversity conservation. It also provided *Java* mapping and CD-ROM capability, and experimented with virtual reality structures for complex networks.

Description of product

The product is a multimedia knowledge base. It draws on a wide range of different organisations and sources to provide interlinked and globally comprehensive information on:

- key issues concerning biodiversity conservation, and their interactions;
- the actions being taken by society in response to these issues; and
- the species, ecosystems, habitats, resources and sites affected.

This content is integrally linked to:

- associated information on relevant international organisations;
- associated information on relevant publications and other reference sources;
and
- other appropriate information services, particularly those on the Web.

Information content accumulated over many years was made available to the project. A considerable amount of the information content for the product was already in digitised form. It is owned by, or made freely available to, two of the partners: WCMC and UIA. Both bodies have extensive websites (respectively <http://www.unep-wcmc.org/> and <http://www.uia.org/>). The datasets in question are managed and maintained in-house, on a more or less continual basis, by the respective partners. A major aspect of the project was, therefore, to *integrate* the existing datasets (at least the parts of the relevant to biological conservation).

The project incorporates elements from the following databases and products developed and managed by project partners:

- UIA databases on World Problems (ca 15,000 profiles⁶), Strategies, Actions and Solutions (ca 32,000 profiles), Human Values (ca 3,250 profiles), and Human Development (ca 5,000 profiles). These databases have been developed over the past 25 years, as resources have permitted, under the umbrella project called *Encyclopedia of World Problems and Human Potential*. Prior to this project, these resources were not online.
- UIA database on International Organizations (ca 40,000 profiles), maintained on a continuing basis and published annually as the *Yearbook of International Organizations* (now in its 37th edition) in both hardcopy and CD-ROM forms. Prior to this project, this resource was not online.
- WCMC manages the [Red List of Threatened Animals](#) (ca 5,000 profiles) and the [Red List of Threatened Plants](#) (ca 40,000 profiles) on behalf of a range of organisations. Both datasets are regularly reviewed, published and made available as interactive databases on the Web.
- WCMC manages the [United Nations List of National Parks and Protected Areas](#) (ca 10,000 profiles) in collaboration with the World Commission on Protected Areas. The UN List is regularly reviewed, published and made available as an interactive database on the Web.
- WCMC's computer-based Biodiversity Map Library and Internet Map Server, which supports the development of a range of products including maps and atlases of [tropical forests](#), a range of products and services on coral reefs and [mangroves](#) and other resources (several developed under this project) and various other publications and Web information service.
- Other WCMC databases on (for example) [Species Protected by CITES](#) (millions of records of trade transactions), [Descriptions of Natural World Heritage Properties](#), [marine turtles](#) and other datasets which WCMC manages to provide information services that support the implementation of several international conventions and programmes (some of which were developed under this project).

⁶ Not counting around 30,000 new profiles added during this project which correspond to threatened species on the *Red Lists*. Only a small proportion of these profiles yet have text, and many may never. Their main function is as information loci, displaying taxonomic information through their hierarchical relationship structures, and enabling users to link directly to WCMC information and information on the Web.

- Other WCMC Web-based information services, ranging from the UNESCO sponsored [World Heritage Information Network](#) to the [Protected Areas Virtual Library](#) developed in collaboration with the World Commission on Protected Areas.
- Bibliographic references held by the UIA and WCMC, which together exceed 25,000 profiles. Prior to this project, neither resource was online.

The datasets, web services and competence in data handling and delivery of the project partners are fundamental to this project. These databases of WCMC and the UIA are unique in the world and regarded as "industry-standards" for their category of information content. The clearing-house functions of both organisations are of long-standing and include well-established procedures for the management of their datasets.

It must be acknowledged, however, that the work of both organisations relies on extensive links with other organisations working in their respective fields. The information is largely compiled using expert networks or from official sources; in many cases it is managed using methods advised by those experts. Through the collaborative networks of UIA and WCMC, thousands of organisations and individuals are effective partners and beneficiaries of the project; a number of these were drawn into the project, both as contributors and to test and evaluate the product.

1.1.8 Innovative features

Few of the software features used in the development and delivery of the information product and its services are new. What *is* new is the application of these techniques to the integrated management of information of this kind.

In particular we would draw attention to the following features of this project:

- Incorporation into text databases of extensive information on ***both*** development pressures and responses, these being integrally linked to databases which describe the state of species, habitats and ecosystems;
- Extensive use of ***hyperlinked text*** in normally unrelated datasets, and links to appropriate graphics and other information such as ***clickable maps***;
- "***Soft links***" enabling query-searches into certain datasets and/or list servers, or the entire Web.
- ***Sophisticated interlinkage*** enabling interrelationship of data normally considered incommensurable and interrelationship of information across different platforms and data formats and between different datasets and objects. The objective is to produce an information domain with multiple entry points and "journey" options in order to suit different user needs, styles and enquiries.
- Identification of "***vicious cycles***" of Problems and "***serendipitous cycles***" of Strategies in the areas of environment and development;
- Use of user-generated ***Java spring maps*** and ***3D displays*** (VRML) to present both Problem, Strategy and Organization complexes. This aims to improve comprehension and access to the relational data characteristic of environmental information and policy options and institutional networks;
- Development of mechanisms which allow ***user modification and annotation*** of data supplied, both within their own systems, and by returning information to the data custodians and owners;
- ***Active involvement of users*** in the further development of both the information available and the functionality of the information services;

- Development of *interfaces between non-automated and automated communications media*.
- Through a *wide network of collaborative partners* (who are supplying information to us and interacting with the data in a manner which does not impact on the accounts), the project partners are effectively working with hundreds of organisations.
- *Pragmatic approach to data handling* for both the acquisition and processing of information into the databases. Absence of information or lack of resources to process it is, and will remain, a reality. Priorities and practical approaches for selection and processing are therefore important, as well as increased reliance on an extensive network of dedicated end-users capable of compensating for information deficiencies on issues of interest to them.

1.2 Administration

Workpackage 1-1 Deliverables 5052-1/2/3

Final delivery 31-07-00

Background to the workpackage

The project responded to a call for proposals for a definition phase project issued by DG Information Society (then DG XIII) in the spring of 1996. The objectives of the INFO2000 programme were:

- facilitating the development of the European content industry
- optimising the contribution of new information services to growth, competitiveness and employment in Europe
- maximising the contribution of advanced information services to the professional, social and cultural development of the citizens of Europe.

There were three action lines:

- stimulating demand and raising awareness
- exploiting Europe's public sector information
- triggering European multimedia potential

Specific sub-actions (of around 12 in total) that encouraged a response in the partners to form a project consortium were:

- Encouraging skills development at European level
- Developing and exchanging best business practice
- Catalysing high quality European multimedia content
- Making use of content resources in the public sector
- Linking directories of European public sector information
- Encouraging clusters of pan-European users.

Activities of the project

1.2.1 Coordination

The objectives of this workpackage were to ensure that all the required work was planned, and the activities of the four partners in different locations are coordinated to run smoothly and in a timely fashion throughout the project. This workpackage started with the initiation of the Definition Phase and finished with the presentation of the report and review of the Definition Phase. The Coordinator extended activities to cover any outstanding or consequent arrangements with the Commission.

The bulk of the communication amongst the group has been by electronic mail. This has proved satisfactory. Each partner has facilities for very rapid email delivery and receipt. Early problems with the format of email file attaches appear to have been solved with upgrades in software. This enabled partners to work largely independently, other than for 19 meetings and working sessions of between 1 and 5 days (Section 2.2.4: Team meetings). There were some difficulties experienced in scheduling certain meetings because of the inevitable conflict with previously scheduled projects and deadlines.

Partner Union of International Associations (UIA) undertook coordination. It comprised the:

- management of contracts (for the Definition Phase and Implementation Phase);
- financial management and preparation of cost statements for the project;
- frequent briefings and reviews of work being undertaken by the various partners, including deliverables under the contract, scheduling and organising necessary project meetings,
- liaison with the DG XIII (now Information Society and Technology); and
- coordination of reporting.

1.2.2 Definition and Implementation Phases

The project was undertaken in two phases, each under separate contract with the European Commission. The purpose of the Definition Phase was to *define* the product. This was to be followed by an Implementation Phase project that would *produce* the final product for market.

This report is Deliverable 5052-3 of the Implementation Phase (Section 2.2.5.2: Deliverables from the Implementation Phase). It is a summary of activities for the entire contract period of the project (1 Jan 1997 to 30 Apr 2000, Definition and Implementation Phases). The sources are the progress reports and final reports deliverable under the contracts.

This report is also available online at http://www.uia.org/projects/summary_report.doc or via the *Ecolynx* website (Project Information > Reports). Earlier progress reports of the Implementation Phase are also available at the above web location.

The report of the Definition Phase is available online at http://www.uia.org/projects/i2000_report.doc or via the *Ecolynx* website (Project Information > Reports).

1.2.3 Prolongation of contract

On 30 September 1999, an application was made for a prolongation of the contract until 31 April 2000. This was ratified by an *Addendum to the Contract* dated 3 February 2000. The prolongation by four months was necessary because of the delay in completing the final stages in certain of the more complex workpackages. As a result of the prolongation, the final delivery dates for several of the workpackages were extended.

1.2.4 Team meetings

The partners met together, in various configurations, on the following occasions during 1997 - 2000 (Definition Phase, Implementation Phase and outside the contract periods). Staff within each partner organisation also held (numerous working sessions.)

- 6 January 1997, Cambridge. *Introductory planning meeting*: Jeremy Harrison (WCMC), Tim Johnson (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA)
- 17 January 1997, Oslo. *Briefing meeting*: Ken Friedman (NSM) and Nadia McLaren (UIA)
- 9 April 1997, Cambridge. *Project review and planning meeting*: Ian Barnes (WCMC), Jeremy Harrison (WCMC), Nadia McLaren (UIA), Martin Sneary (WCMC)
- 15 April 1997, Oslo. *Task planning meeting*: Ken Friedman (NSM) and Nadia McLaren (UIA)

- 23-24 April 1997, Brussels. **Technical issues working meeting:** Ian Barnes (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA), Martin Sneary (WCMC). This working meeting of the consortium's 'content providers' (UIA/WCMC) was very useful in speeding up outstanding 'data integration' areas.
- 8 May 1997, Brussels. **Full partner meeting:** Graham Bennett (IEEP), Ken Friedman (NSM), Joel Fischer (UIA), Jeremy Harrison (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA). This meeting of the full project team reviewed progress, considered outstanding data integration issues, discussed user requirements, and developed a strategy for the prototype development
- 16-17 June 1997, Brussels. **Partner meeting:** Ken Friedman (NSM), Joel Fischer (UIA), Jeremy Harrison (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA). This meeting reviewed progress, discussed information ownership questions, produced the draft proposal for the Implementation Phase, a distribution strategy for the product and planned the final report of the Definition Phase.
- 9 October 1997, Cambridge. **Strategy meeting:** Nadia McLaren (UIA) and Jeremy Harrison (WCMC). This meeting concerned reporting issues.
- 17 July 1997, Luxembourg. **Prototype presentation and review:** Anthony Judge and Nadia McLaren (UIA) and DGXIII staff and experts
- 2 March 1998, Oslo. **Briefing meeting:** Nadia McLaren (UIA) and Ken Friedman (NSM).
- 23-24 April 1998, Brussels. **Full partner meeting:** Graham Bennett (IEEP), Ken Friedman (NSM), Jeremy Harrison (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA). The entire Project Team met with Mr Michel Brochard, Project Officer for INFO2000. The meeting was primarily for the purpose of reintroducing the project partners to the work which UIA and WCMC, the content development partners, have been doing since the end of the Definition Phase. It also planned for the scaling up of involvement of the NSM and AIDEnvironment in the marketing and testing of the product and when this would commence. Much of the morning was spent on administrative matters.
- 19 June 1998, Oslo. **Task planning meeting:** Ken Friedman (NSM) and Nadia McLaren (UIA)
- 9-13 February 1999, Cambridge. **Joint working session:** Jeremy Harrison (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA), Mary Cordiner (WCMC), Simon Blyth (WCMC), Jake Reynolds (WCMC), Jonathan Rhind (WCMC), Javier Beltran (WCMC), Sam Kanyamibwa (WCMC). A week of intensive technical collaboration.
- 5 July 1999, Amsterdam. **Technical workshop:** Graham Bennett (AIDE), Rolf Kleff (AIDE), Miranda Boland (AIDE), Jan Maarten Dros (AIDE), Nadia McLaren (UIA), Anthony Judge (UIA). Early briefing on product features.
- 14-23 August 1999, Cambridge. **Joint working session:** Jeremy Harrison (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA), Mary Cordiner (WCMC) and Phill Fox (WCMC). A week of intensive technical collaboration.
- 31 October 1999, Amsterdam. **Technical workshop:** Allan Howard (UIA), Graham Bennett (AIDE), Jan Maarten Dros (AIDE) and Miranda Boland (AIDE). Pre-test briefing.
- 17 November 1999, Brussels. **Project review and planning meeting:** Jeremy Harrison (WCMC), Nadia McLaren (UIA), Anthony Judge (UIA).
- 12 April 2000, Brussels. **Project review and planning meeting:** Jeremy Harrison

(WCMC), Nadia McLaren (UIA), Anthony Judge (UIA).

- 13-14 July 2000, Cambridge. **Joint working session:** Jeremy Harrison (WCMC), Anthony Judge (UIA), Nadia McLaren (UIA), Mary Cordiner (WCMC) Will Rogowski and Phill Fox (WCMC). Intensive technical collaboration.
- 8 September 2000, DG IST Luxembourg. **EC project review meeting:** Anthony Judge (UIA), Nadia McLaren (UIA), Jeremy Harrison (WCMC), Ken Friedman (NSM), DGXIII staff and experts.

1.2.5 Deliverables

1.2.5.1 Deliverables from the Definition Phase

Deliverables from the Definition Phase took the form of reports and web products.

- **Workpackage No 1** Integrated data-sets of endangered European species (birds) protected by treaty was completed by WCMC in April 1997 and delivered on the Web in June 1997 as the Integrated Animal Species Database <http://www.unep-wcmc.org/species/data/species.html>. This new prototype of an integrated species database identifies whether the animal is on the Red List, and what its geographic distribution is, and whether it is listed on CITES, CMS, Bern Convention, and EC Regulation No.338/97. It also has the details of why each bird species is threatened. This was largely built as part of the INFO2000 funded project.
- **Workpackage No 2** *Integrated data-sets of (European) conservation issues, strategies and agencies* was completed by UIA in May 1997 and is delivered on the prototype of the CD. Selected portions of these data are being made available on the Web.
- **Workpackage No 3** Prototype of integrated multimedia resource package entitled: Contextual information for European action on biological conservation was completed as a CD/Web product in June 1997 and 'delivered' to the Commission as a demonstration on 17 July 1997. The prototype was ultimately entitled *Information Context for Biodiversity Conservation* and this became the name for the Implementation Phase project.
- **Workpackage No 4** *Preliminary Market Assessment* was completed in May under the title *Biodiversity Project: Information and Marketing Strategy* and delivered to the Commission together with Progress Report 2.
- **Workpackage No 5** *Progress reports 1 and 2* were faxed to Gerhard Heine at the INFO2000 project office on 20 April and 4 July respectively. A draft version of the *Final report* was delivered on 4 July, together with the proposal for the Implementation Phase. This final version of the *Final Report* is dated 31 August 1997.
- The **prototype** was delivered on 17 July at the demonstration organised in the INFO2000 office in Luxembourg. The *PowerPoint* presentation was also used at this time and subsequently uploaded onto the Web for a limited period.

Prior to the development of the prototype, several of the products benefiting from work during the Definition Phase work were delivered experimentally on the Web, specifically:

3-D VRML experimental structures:

<http://www.uia.org/uiademo/vrml/vrmldemo.htm>

Techniques were developed to convert clusters of hyperlinked entities from the UIA databases into various 3-D structural configurations, which can be explored, using the facilities of virtual reality (VRML) environments on the Web. The networked

relationship structures displayed include problem loops and multiple loop interlocks, as well as clusters of interrelated organisations.

CITES-listed Species Database:

<http://www.wcmc.org.uk/CITES/common/dbase/fauna/index.shtml>

This was a searchable database of CITES listed species, identifying when the species was listed, where it is found, whether any countries have taken out reservations over the listing, etc. This database was a significant development and demonstrated an interactive tool that could be developed during the Implementation Phase for other conventions.

Protected Areas Database: http://www.unep-wcmc.org/protected_areas/data/nat.htm

This database included a much wider range of information on both nationally and internationally designated sites, including links to descriptions of many of the sites, relationships between internationally designated sites and the national sites they are based on, etc. Future development of this information will include improved ability to link directly to the information on each of the international agreements and programmes (building on the World Heritage example below).

Descriptions of natural sites: http://www.unep-wcmc.org/protected_areas/data/wh/

These are the more detailed descriptions of each of the natural World Heritage sites, initially developed for UNESCO by WCMC. They have been formatted for and placed on the Web as part of the work for the INFO2000 project, demonstrating the good descriptive information available for key protected areas. In future, links could be added to maps and images. This is also a demonstration of what could be done for other internationally designated sites.

1.2.5.2 Deliverables from the Implementation Phase

The Implementation Phase of the project was to build on the proof of concept shown in the Definition Phase and to develop the product, as outlined in Section 1: Introduction. A schedule of the activities is provided in the accompanying Excel sheet. <http://www.uia.org/projects/finarept/ganttfinal.xls>.

The table of deliverables is given below. The deliverables take the form of reports and web modules, which are provided in the following sections of this report.

Identification of future activities

1.2.6 Continuing development

The consortium is agreed that the product is of relatively little use as a one-off, data compilation / publication exercise. It was never intended as this. The principal partners have very long-term commitments to the maintenance of their databases. The kind of data made available through this project can only be accumulated and refined over extended periods of time.

Unique ID No.	WP No.	Description	Status	Expected Delivery	Revised Date of Delivery	Actual Date of Delivery
5052-1	I	Progress Report No 1	Restricted	31-08-98		30-06-98
5052-2	I	Progress Report No 2	Restricted	30-04-99		28-02-99
	I	Progress Report No 3	Restricted			30-09-99
	I	Progress Report No 4	Restricted			30-04-00
	I	Progress Report No 5	Restricted			30-06-00
5052-3	I	Final Report on Project	Public		31-07-00	21-08-00
5052-4	II(i)	Review of User Needs	Public	31-02-99	28-02-00	30-06-00
	II(ii)	Recommendations for design: interactivity on the Internet	Internal	31-01-99		28-02-99
	II(iii)	Recommendations for design: user searches	Internal	31-01-99		28-02-99
	II(iv)	Recommendations for design: language-related issues	Internal	31-01-99		28-02-99
5052-5	II(v)	Draft Report: Product Design and Development Plan	Restricted	30-06-98		30-06-98
5052-6	III(i)	Web module: species of conservation concern	Public	30-11-98	Final delivery 30-06-99	Partial 30-11-98 Full 30-06-99
5052-7	III(ii)	Web module: national parks and reserves	Public	30-11-98	Final delivery 20-12-99	Partial 30-11-98 Full 20-12-99
5052-8	III(iii)	Web module: implementation of international agreements	Public	30-11-98	Final delivery 28-02-00	Beta test mode 30-12-98 Final version 28-02-00
5052-9	IV(i)	Web module: conservation issues, actions, treaties and feedback loops	Public	30-11-98	Final version 31-12-99	Beta version 31-01-99 Final version 31-12-99
	V(i)	Draft Report on integration of information	Internal	30-11-98		30-09-99
5052-10	V(i)	Final Report on integration of information	Public	30-11-99	31-07-00 (31-03-00)	31-07-00
	V(ii)	Draft Report on feedback loops	Internal	31-12-98		30-09-99
5052-11	V(ii)	Final Report on feedback loops	Public	30-11-99	31-07-00 (31-03-00)	31-07-00
	V(iii)	Draft Report on information on habitats	Internal	31-01-99		30-09-99
5052-12	V(iii)	Final Report on information on habitats	Public	30-11-99	31-07-00 (31-01-00)	31-07-00
5052-13	IV(ii)	Final Report on integration of biographies	Public	30-09-98	29-02-00 (30-06-99)	29-02-00 Beta test mode
5052-14	V(iv)	Final Report on interactive generation of indicators and summaries	Public	30-11-99	31-07-00 (31-03-00)	31-07-00
	V(v)	Draft Report on links to other information services	Internal	30-04-99		30-09-99
5052-15	V(v)	Final Report on links to other information services	Public	30-11-99	31-07-00 (31-03-00)	31-07-00
	VI(I)	Draft Report on multimedia visualization	Internal	29-02-98	Draft 23-04-98	30-06-98
5052-16	VI(I)	Final Report on multimedia visualization	Public	30-06-99	31-07-00 (31-03-00)	31-07-00
5052-17	VI(ii)	Report on mapping national (country) information	Public	30-06-99	30-11-99	30-11-99
	VI(iii)	Draft Report on virtual reality (VRML) 3-D displays	Internal	29-02-98	Draft 23-04-98	30-06-98
5052-18	VI(iii)	Final Report on virtual reality (VRML) and 3-D displays	Public	30-06-99	31-07-00 (29-02-00) (31-10-99)	31-07-00
5052-19	VII(ii)	Report on upgrading CD-ROM	Public	31-03-98	Draft	30-06-98

Unique ID No.	WP No.	Description	Status	Expected Delivery	Revised Date of Delivery	Actual Date of Delivery
5052-20	VIII(i)	software Guided tour of product/service using HTML facilities	Public	Renewed periodically	23-04-98	Last revised 15-05-99
	VIII(ii)	Report on subsidy and sponsorship options	Public	30-06-99	31-07-00 (31-03-00) (30-12-99)	31-07-00
5052-21	VIII(iii)	Report on on-line charging options	Public	30-06-99	31-07-00 (31-03-00) (30-10-99)	31-07-00
5052-22	VIII(iv)	Revised draft marketing plan	Internal	30-05-98		25-03-98
	VIII(iv)	Revised draft marketing plan	Restricted	31-12-98		28-02-99
	VIII(iv)	Marketing and launch plan	Restricted	31-10-99	31-07-00 (31-03-00)	31-07-00

UIA has found this project pivotal in the development of its Web-based information strategy and its long-standing aspirations for participative and interactive online editing of information by international organisations and others. WCMC has found this project an excellent “test bed” for working on development of new and more interactive means for delivering data and information to users in meaningful ways.

Indeed, this project has provided a “jumping off point” for future information services, for review and update of the information, and for developing collaborative work with other organisations. There is considerable potential for increasing the availability of this information further, and for increasing its integration with other datasets and with the information available on the strategies and agreements and their implementation. There is also considerable addition scope for increasing linkages with other relevant information sites on the Web.

As the consortium has worked to develop proposals for future funding of the project, reported on in Section 20: Subsidy, sponsorship and online charging, opportunities to draw in a wide range of collaborators have become apparent, as has also the potential for co-financing of certain components. These opportunities will be explored in the coming months.

It is already clear that this project is a major springboard for future technical developments. Within the past two years, the Consortium has had a significant numbers of exploratory meetings, many producing collaboration. These include direct relations with following software manufacturers: Koan by SSEYO (UK), Decision Explorer by Banxia (UK), NetMap by NetMap (Australia and UK), Flatland and Fluidiom by Beautiful Code (Netherlands), Google search engine by Google (USA), Amazon search engine by Amazon (USA), Revelation and OpenInsight by Revelation (USA), ArcView IMS and MapObjects IMS by ESRI (UK), TheBrain by TheBrain Technologies Corporation (USA).

Real and potential collaborations with other partners are described in Sections 20.2.1. Commercial sponsorship and 20.2.2: Discussions with potential partners.

Other prospective future activities are described in the specific reports of the workpackage reports that follow.

1.3 User needs and product design

Workpackages 2-1 and 2-5 Deliverable 5052-4

Expected (original delivery) 31-02-99
Interim delivery 30-10-99
Final delivery 30-06-00

Background to the workpackages

These workpackages focused on the needs of users. The goals were to identify user groups and draw them into the process of product development. The methods would seek participation as “user-partners” -- an *interactive process* of continuing communication between providers of the information in the database, passive users of that information, and active users concerned to improve / query / debate that information in an interactive mode. To assist with this, a variety of user support facilities were planned, including: feedback facilities offered through the Web; extending user search capacity and improving filters for information; increasing the 'Europeanization' of search engine facilities with respect to language features; and enhancing multi-lingual access to the data. Technical development of these features is reported elsewhere (Section 5: Thesaurus- and language-related issues).

The intended end result would be a product with a high degree of user interactivity and also incorporating ‘good design features’. The latter objective, to optimise design and ergonomic features for the user, was intended to be much more than just how the product looked. Good design was taken to mean functionality -- beginning with the design of the information datasets, their structure, the way they are logically interrelated, simplification of complexity for the user using interfaces and other means, attractiveness of the product, its ease of use, its flexibility for modification, its responsiveness to users, its ability to accommodate new and different forms of information, its capacity for growth, its ability to give the user what they want with relative ease, its cultural sensitivity, etc.

As a general approach to this work activity, we also recognised that web users have become highly active and continue to develop new behaviours and needs in response to new facilities. In particular, those accessing information are often overloaded and the overload is growing exponentially. We assumed therefore that there is a backlash against information *per se* and a rapid call for meaningful patterning of such information over which users have some interactive control in the light of cultural and other preferences (eg for complexity, colour, sound, etc). The emphasis in other parts of this project on "information visualisation" tools, may also be understood as the need for knowledge, as opposed to information (or data) (Section 16: Multimedia visualization).

Activities of the workpackages

1.3.1 Pre-assessment of user needs

1.3.1.1 Stakeholders

In the evolving information society, provision of information on any topic is necessarily of great interest to a range of bodies. These include:

- intergovernmental organisations with specific mandates: a number of such bodies, whether international, regional or nationally-oriented, will necessarily develop information strategies, more or less independently of each other but possibly in direct competition with one another;
- international professional and scientific bodies concerned with the conceptual treatment of particular categories of information;
- advocacy and activist bodies of various forms, who may be impatient with certain criteria and procedures;
- commercial bodies seeking to provide or exploit information, whether for profit or as a public relations exercise in support of other profit-making initiatives; these may include high tech companies seeking to add content to their competitive advantage in information technology.

1.3.1.2 Profile of user groups

As part of the Definition Phase work, all the partners in the consortium collaborated in working sessions to discuss and develop a user profile. IEEP (a Definition Phase partner) developed a user profile for the professional sector, particularly those working with environmental policy. NSM produced a marketing strategy structured around product recognition, sales and marketing within the Internet environment. The potential user groups of the envisaged product were thus categorised in various ways.

An obvious and basic distinction fell between professional and non-professional users. In general, professional users will require the information in order to fulfil their corporate tasks (including in some cases for commercial purposes). They will place high demands on the quality of the information acquired. They will place a premium on the time needed to collect the information. They will usually have access to relatively sophisticated technical resources and their information-handling skills will be of a relatively high level. They will be more used to work in English, even if this is not their language of daily use. In principle, they will be willing to pay for useful information. Non-professional users will tend to the opposite in all these respects.

It was also seen as important to take into account that:

- Both partners providing content to this product, WCMC and UIA, are developing their individual websites as “educational” resources rather than “information” resources;
- Datasets for this product are largely in English and currently written in a style which may be termed ‘professional/academic’;
- All the project partners aspire to create a product that responds to users with second- and third-order inquiries, rather than solely the first-order needs of the present, *ie* by developing future user needs and user skills for inquiry.

These considerations, together with the fundamental differences between the needs and capabilities of professional and non-professional user groups, argued for the consortium to design its product for professional users.

However, professional users themselves fall into different groups, each with its own particular needs and capabilities. The design of the product databases would have to take into account such differences. Two important distinctions between different professional users were made.

First was the distinction between those working in the field of biodiversity and those who require information on some aspect of biodiversity relevant to their work in a different field. In general, biodiversity professionals are more familiar with the kind of

information made available through this project, the organisation of this kind of information and the various sources of relevant data on biodiversity than those active in other areas. They are also likely to use environmental databases more frequently and may require more detailed and specialised information.

Second were other professionals who would be potentially interested in accessing the databases and who are distinguished according to work/occupation. The major groups identified⁷ were:

Policy-makers: Policy-makers who are likely to make most use the databases are somewhat low in the organisational hierarchy. They have the task of consolidating policy-relevant information and identifying and elaborating policy options as the basis for the higher-level tasks leading to decision-making. Depending on the particular circumstances, either summarised or detailed information will be required.

Researchers: Many researchers require high quality, detailed information, often of a scientific nature. They will in most cases also possess high information-handling skills and relatively sophisticated technical resources.

Consultants: Given the nature of their work, consultants will generally require project-specific information. Information-gathering activities will often be strongly influenced by commercial constraints concerning time and financial investment and the usability of the information acquired.

NGOs: Environmental NGOs range from small, highly specialised and poorly resourced groups to large international organisations such as WWF. Despite such differences, their staffs are as a rule highly expert and capable.

Media: Both the audio-visual and the written media can be expected to access the databases. Of all the potential user groups, the media are the most skilled at information gathering, but will generally require easy-to-understand, readily digestible data together with named sources where additional inquiries can be made. It can be expected that specialised scientific media will make regular use of the database and will require information that is detailed.

Educators: Like the media, educators require easy-to-understand, readily digestible data. However, language may be more of an issue with educators in their ability to

⁷ This preliminary analysis was borne out by an independent user profile made of WCMC, which became available to the project team towards the end of this project period. (Environmental Resources Management (1998). *Review of the Future of the World Conservation Monitoring Centre*. Commissioned by Department of the Environment, Transport and the Regions, UK). The report also provides valuable insights into market sectors and target audiences, as follows:

User Profile: Private Sector; Governments; Official Bodies; NGOs; Environmental Organisations; Secretariats of International Treaties and other Intergovernmental Initiatives; United Nations Agencies; Education – Universities, Colleges and Schools.

Private Sector Markets: All national and international organisations with key interests in the environment which virtually includes everyone but priority might be given to the following market sectors: Petrochemical; Automotive; Pharmaceutical; Mining; Construction; Timber/Loggers; Manufacturing; Tourism; Utilities – water, gas, electricity; High Technology; Financial Institutions; Environmental and Management Consultants; Retailers such as Ikea, Tesco and B&Q.

Private Sector Target Audience: Decision makers and influencers such as Chairman/CEO/Directors/Senior Managers; Health, Environment & Safety Officers; Planners, Scientists/Biologists; Engineers; Environmental Specialists; Marketing Departments – Marketing, PR, Community Affairs, Sponsorship.

understand the information provided. It should also be noted that both the media and educators are vehicles for the redistribution of the information in the databases.

1.3.1.3 Nature and Scope of Product in relation to User Needs

It was clear during the Definition Phase that the scope of the envisaged product was a source of particular challenge. On the one hand, within the "professional conservation community" there is clearly a need for data that meets scientific standards of evidence. This is the strength of WCMC-type data, as described on the following and related pages: <http://www.unep-wcmc.org/reception/whoare.htm>. At the same time, and in the absence of high quality data, there is a need for indicative information that can trigger warning signals and further inquiry, as appropriate. This is the strength of UIA-type data, as elaborated in the following background texts on uses of the Encyclopedia <http://www.uia.org/encyclop/16intent.htm>; <http://www.uia.org/encyclop/17usage.htm>). Integrating these two types of data is an essential value of the project. The challenge is to do so without confusing the user.

Additionally, both UIA and WCMC consider their stand-alone services to be educational sites first and foremost. Naturally, both cater for users who see them as providing "answers" to "questions". But more importantly, the integrated service was intended to place the user in a learning mode that ensures that the question can be explored in a context which may lead to its being totally reframed. In fact the project's prime purpose is enabling users, notably policy-makers, to refine the questions to which they seek answers.

Concerning multiple aims, criticism was also received that simultaneously directing the product to many potential end-users (government, NGOs, and private sector) subtracts from its value. It was argued that, for any product, the more it aims to please everybody, the less value it has to any individual user⁸. In this case, each user group would require differing content on biodiversity issues. The response to this challenge was to ensure varied entry points and surface layers to access the information. This has called for site and interface design and knowledge structuring to allow for differing tolerances of complexity. The aim was to allow users, to the extent possible, to quickly identify themselves in terms of their data needs, search style etc. Such preferences could be recorded in their user profile to enable more satisfactory future searches. We believe that the period of development with volunteer users should help clarify such aspects.

1.3.1.4 Developing Country Users

The team also did some research on user needs in developing country needs, using India as an example⁹. Though endemic restrictions will limit most from having direct access to full Internet, many have, or will soon have, the benefits of a lower-

⁸ It is of course correct that governance and policy-making aimed at pleasing a particular sector is no great challenge. Information systems in support of such policies would of course be of great value to the sector or constituency so favoured. This is one classical option for policy-makers -- whether in governance or the corporate world. Such projects would indeed be viable in response to the needs of that constituency. Unfortunately governance is increasingly challenged precisely by its democratic mandate to "please everybody". Increasingly it is "everybody" that is also a prime source of information which a single sector finds it too costly to extract or purchase in a timely manner by conventional means. A degree of cross-sectoral, multi-level cooperation is therefore required involving the active cooperation of a wide range of stakeholders for this service to be of use to anybody.

⁹ This work was done with the assistance of an Indian based NGO partner, Development Alternatives, which is working to increase access and exposure to networked communication services in India and build capacity for its use by NGO groups.

bandwidth facilitated interface with the Internet and/or email interrogation of the Internet¹⁰.

It was clear that the need for this type of information service in India is undeniable. Most Indian independent sector organisations are starved of information that could support their sustainable development. They have little access to development innovations and project results in their own country, much less from outside it. There is a lack of timely, reliable and user friendly information on environment and development issues in India. What is available is not automated and thereby not accessible in the time required. Indian organisations are often dumped with foreign information because it is easily available. The information is either not inherently useful or not converted into a format in whereby it can be used effectively by most organisations in India. Substantive query response and customised information services on environment and development themes are very few in India. Here again, they operate through conventional means of communication with virtually no use of electronic communication systems¹¹.

1.3.1.5 Inferences from Website Usage

One of the project partners, WCMC, had been using the Internet to disseminate information for several years before the project started. In 1997, WCMC had extensively reviewed the usage made of its website, and as part of this review looked carefully at frequency of access to each of the different pages. As a result of this review the way that the WCMC website was arranged was changed considerably.

The principal lessons learnt from usage and the actions taken were as follows:

¹⁰ India holds a unique position amongst developing countries with respect to information technology. It is highly competent, with an unusually large domestic production and consumption of computing products and services. Nonetheless, it has many of the features characteristic of developing countries, notably cultural and language diversity, general poverty, undeveloped telecommunications infrastructure, etc.

An entry level PC is now not much more than \$200. This brings the potential for electronic communications within the economic access of millions and no more financially demanding than a television. Even though "reception" (bandwidth) may be less than ideal and language issues will initially limit access, people will still aspire to enjoying the benefits of a computer. (It is now easy to forget that most "western" offices did not have Internet access or CD-ROM drives five, even three, years ago.)

¹¹ India has between 30,000 and 100,000 independent-sector organisations (ISO or NGO-type organisations). Electronic connectivity is the lowest among ISOs when compared to other constituencies of society. Even those with connections are unable to use it to its potential. Currently 100 to 500 such organizations can use full Internet services (including multimedia), the minority using it frequently and fully; the remainder incompletely or infrequently. A further 1,000 use text-only Internet or email. Greater than 95% of NGO organisations still use postal services, hand delivery and word of mouth as their primary means of means of information recovery. Full Internet service delivery for most ISOs is infeasible for at least ten years¹¹. Limiting factors are national infrastructure policy and costs (notably government as monopoly service provider), incomplete geographic access, bandwidth, and user charges.

However, telephone services are already adequate for considerable expansion of email and fax services and, for those already using such basic automatic services, for a progressive increase in frequency of use and their facilitated interface with more automated systems such as the Internet. There are probably about 5,000 ISOs with computer and telephone connections, but not electronically connected due to non-availability of modems and other support services customised to meet their requirements. There are about 30,000 to 100,000 ISOs who are non-automated, who also require more systematic information support for their environment and development activities. Of these at least 5,000 have adequate working knowledge of English.

- *Usage of information is far higher than of pages describing programmes and activities.* As a result, the second iteration of the WCMC website contained far more information, and access to information was made much easier.
- *Different user groups were trying to access particular parts of the WCMC website.* As a result, a series of themes were identified and focal pages established so that users could “bookmark” these pages and thence move more quickly to the information they required.
- *Users wanted to make feedback on specific issues.* As a result, certain parts of the WCMC website were provided with theme-specific feedback opportunities, in addition to the general feedback pages.

1.3.2 Design and ergonomic considerations

The following guidelines were used in structuring the user interface¹².

1.3.2.1 Navigation

- Are there a variety of information preferences: text, image, map, table, language, experimental?
- Are there a variety of entry points; *eg* multiple "home" pages?
- Is the navigation bar content consistent different points in the site?
- Is site mapping facilities available?
- Is the dialogue that is aimed at the user clear and unambiguous?
- Is the interface language understandable to the user?
- Is the type of user tasks the site offers clearly outlined on the site's index page?
- Are the steps for each user task available throughout the task the user is completing?
- If the user enters the site on a non-index page, is a clear marker provided to the site tasks?
- Is there a clear entry to the sequence of events the user needs to perform to complete a task?
- Is there a clear exit route for users during their execution of the sequence of events?
- Are their shortcuts? Are these shortcuts marked?

1.3.2.2 Errors and feedback

- Are user errors possible?
- If user errors are possible, are informative error messages provided?
- Is feedback provided for users who are making errors in the task?
- Are users allowed to retrace their route if they have made an error?
- Are users offered a clear exit if they make an error?
- Are users offered a chance to start over if they make an error?
- Have ways been evaluated to prevent user errors?

1.3.2.3 Comprehensibility

- Challenge of understanding the whole without confusing the specific information required
- Is each task visually and functionally discrete?
- What function does each task "module" perform?
- Is there a visual cue indicating to the reader when they have left or completed one task module and entered another?

¹² Lisa Schmeiser, 1998. *The Complete Website Upgrade and Maintenance Guide*. SYBEX, San Francisco.

- Is there a way to limit the number of options to a user in order to prevent cognitive overload or distraction from task completion?
- Are the functions available on the website functions people really do use, or functions the site builders could build?
- Are the available user functions readily apparent in the interface?
- Does the user always have a sense of being in control of their site interaction experience? Do they feel as though they are completing the tasks of their own volition?

1.3.2.4 Help facilities

- Is a direct route to help available on every page of the website?
- Does the supporting documentation address specific user problems?
- Does the supporting documentation group possible problems by task?
- Does the supporting documentation describe the factors that led to a task failure for user recognition?
- Does the supporting documentation provide step-by-step tasks to address any user difficulties?
- Does the supporting documentation provide the user with a means of querying the site?
- Are resources set aside to provide users with direct responses?
- Is there specific topical help available while the user is executing a complex task?
- Does the supporting documentation provide a period for users to anticipate feedback?
- Is there an instructional angle to the supporting documentation?
- Is the supporting documentation linear, or can users answer specific queries on demand?

1.3.2.5 Design, layout and aesthetics

- Neutral vs Original?
- Hand crafted vs Automated?
- Complex vs Simple?
- Is there consistency of design? General vs Specific exceptions; use of templates etc.
- Has the design been optimised? In relation to over-design or under-design.
- Is ample white space provided?
- Does the color scheme accommodate color-blind people and other preferences?
- Does the HTML degrade for stripped-down, non-visual browsers?
- Is all positioning and formatting separated from the text elements they affect?
- Are keyboard shortcuts provided for links and image maps?
- Are alternatives provided to drop-box style forms for mobility-impaired users?
- Are alternatives provided to layouts that are strictly dependent on tables?
- Does the navigation scheme allow for clear and functional use by audio browsers?
- Is an equally functional site provided for users with non-applet supporting browsers?

1.3.2.6 Expertise and accessibility

- Are transcripts and descriptions of any audio and video files provided on the site?
- If standard accessibility measures compromise the functional integrity and

presentation of the site, is a link to an alternate, access-abled analogue provided?

- What level of experience will a user have to have before using the new product?
- What level of technical expertise will the user have to have before using the new product?
- Are the technical requirements for optimal product use made clear to the user at the beginning of the product?
- Does the website provide users with advice/means to upgrade to optimal product performance?
- Is there a clear exit route for users who elect not to use the product?
- Does the interface contain a visual point of reference that calls on a user's prior knowledge and experience?
- Is the user offered a means of returning to a familiar product from the cutting-edge one?

1.3.2.7 Maintenance and development

- Can the site and the technologies used be understood by more than one person, especially if there are overlapping responsibilities for updating portions of the site? Complex and sophisticated techniques may pose maintenance problems. This may affect any decision to have portions of the site developed externally, when it subsequently has to be maintained internally.
- Is careful consideration being given to prioritising new development in relation to maintenance? Where development can be undertaken such as to avoid impact on the global design and large numbers of pages, this is to be preferred, provided it is not creating precedents and design obligations for other pages which may have different constraints.
- Is attention being given to the challenges of a multi-faceted site? Proposed changes are seldom of isolated significance; problem of partial application of design changes
- Is careful consideration being given to the costs of development and any subsequent maintenance in the light of the site as a whole?
- Is consideration being given to the respective strengths and limitations of editing tools?
- Are experiments in development contained appropriately, offering (or phasing in) access?

1.3.2.8 Legacy issues

- Is there a redirection policy after page displacement?
- Are old pages phased out?
- Are changes sensitive to inertia in search engine indexing?
- Are changes sensitive to user bookmarking?
- Are changes sensitive to site caching by third parties?

1.3.2.9 Website testing issues

- What is the speed of connectivity for average users? Page-loading speed can be a major discouraging factor if the user has a low-level line. This should influence the way images, movies, templates, and table nesting is used.
- Is browser friendliness maintained across generations and variants? Issues relating to *Java*-capacity, *Cookie*-capacity, *DHTML*, *Frames*, browser-friendly colours. It is important for *UIA* to recognise that some users do not have the latest browsers (even if they are free), and do not choose to download them. This includes users in developing countries and users behind institutional firewalls.

- What is the testing policy?
- How and when are link checks to be performed?
- How is access to be tested?

1.3.2.10 Technical constraints

- Is there a server-side way of serving a different site to people who do not meet the technical parameters for the new site?
- Is time built into the development cycle for recursive scheduling?
- Have persistent interface elements that will not change over iterations and updates been built into the product?
- Is a separate troubleshooting area provided for advanced or cutting-edge technologies?

1.3.2.11 Security and abuse issues

- Backup server facilities and failover
- Vulnerability to hacking?
- Vulnerability to plagiarism?
- Vulnerability to being framed within another portal?
- Transparency: dis-enabling directory listing and statistics?

1.3.2.12 Revenue generation issues

- How is banner advertising used: necessity, appropriateness, alienating potential, and revenue?
- Is “click through” by users facilitated: to Amazon, etc?
- What facilities are available for E-commerce transactions (purchases, donations towards editorial support etc)?

1.3.2.13 Website promotion issues

- What are design implications for direct promotion campaigns?
- What are design implications for indirect promotion campaigns, notably via search engines, exploiting the advantage of the wide range of keywords?
- How are multiple entry points used to enhance user access? *eg* various “home pages” according to user needs

1.3.2.14 Website decision-making issues

- How are design choices made?
- Who has responsibility for development and maintenance?

1.3.3 Interactive assessment of user needs

An essential part of the workpackage was the work directly with users. User needs for the online product were assessed interactively in several ways.

1.3.3.1 Serendipitous user feedback

Components of the project were delivered online in beta mode or final form from around the sixth month of commencement of the project. This has enabled the project team to receive several months of feedback from web users. Feedback facilities are provided on the websites of both UIA and WCMC and user feedback has been received mostly in the form of emails. More recently feedback has been coming via online comment facilities, made possible because the feedback system is built into user interaction with the system.

1.3.3.2 Feedback from conference gatherings

The project team attended some 20 conferences or meetings during the project period. The conferences were related either to (1) biodiversity conservation or (2) knowledge management (Section 21.2.2: Professional outreach). At some meetings, the project team had a display area; at some meetings, aspects of the project was presented to specialist workshops or in plenary sessions; at other meetings, information about the

project was broadly disseminated and the project objectives discussed with participants whenever the opportunity presented. The insights gained from these interactions and discussions were a valuable source of user input and variously incorporated into the project design.

1.3.3.3 Focused user feedback

These activities were designed to provide specific feedback on the design and content of specific databases and information services and their delivery. They stressed active interaction with the data systems as user-partners rather than a passive user role.

Feedback from conservation professionals: The project partner AIDEnvironment is an environmental consultancy, with particular competence in European environmental policy and management. A delegated group of five of its staff was briefed on the databases in a demonstration early in 1999 and again later in that year. They then proceeded to rigorously interrogate the databases over several months and endeavoured to use them as research tools for their current project work (including:

- Netherlands Future Environmental Problems Study (2020)
- International Instruments and Conventions Study for Council of Europe
- Inventory of Econet Models
- Asian Palm Oil Industry Study
- Partners for Wetlands Programme and
- Biodiversity Awareness Raising Studies.

Some tested the interactive comment facility by inserting specialist material in areas that were deficient or would benefit from additional perspectives (in the process information on a total of 45 additional Strategies was included in that database).

Recommendations were made for improvements in various respects:

- the main structure of the database;
- key international environmental problems which could be addressed by the database;
- specific information on selected themes, such as environmental education and wetlands; and
- the appropriateness of the indexing of existing Strategies related to biodiversity conservation. (Section 23, Annex A: Contribution of AIDEnvironment)

Feedback on specific databases and services: WCMC works on a collaborative basis with a number of expert networks, and with the secretariats of a number of international agreements on biodiversity. On a number of occasions the assistance of these groups was sought in reviewing databases and information services on the Internet, and in providing feedback. WCMC has also been investigating the use of interactive update and comment facilities on its more recent web-based services, and is beginning to see not only valuable feedback, but also new information coming in via this route.

Student feedback: The project partner Norwegian School of Management and Marketing (NSM) is a business school and university. Prof. Ken Friedman assigned his first-year students of management the task of visiting the databases and testing out the features. The text of the student assignment is provided in Section 24, Annex B: NSM student assignment. Twenty-six students responded. The principal value of this exercise was that a significant number of remote users, of varying competencies, tested design aspects of the system using a variety of different computer systems. The feedback assisted in identifying unsuspected technical faults and inconsistencies in displays and feature accessibility arising in different operating systems and browsers.

Feedback from collegial cooperation partners: “User friends” also worked with the team on an *ad hoc* basis. These were professional colleagues, family members and friends interested in the project. They included people in the following categories: “environmental professional”, “educated unemployed”, “volunteer”, “information consultant”, “business consultant” and trainer. Such partners were especially helpful in being “guinea pigs” for newly designed interfaces, instructions, explanations and so on.

1.3.3.4 Feedback from other sources

The project team took the opportunity to talk about their work in the course of doing other projects and at other suitable opportunities.

An example of resulting feedback was from an international NGO development office based in Amman, Jordan. This office runs a country programme dealing with agriculture, rural development, environment, education and training, women's issues, food security and poverty. The prototype UIA databases were made accessible on the internal network system and senior management staff was given a demonstration of its application for local project planning. The INGO management staff was sufficiently impressed with the contextual planning applications of the system to convene a number of spontaneous staff training workshops where local and foreign staff were given demonstrations of the system¹³.

This simple informal field test highlighted of the main challenges for practical use of information which the project aims to address; how development work most often operates in single, separated, project-specific and issue-specific actions, often overlooking opportunities to include environmental components in otherwise non-environmentally focussed activities. Enhancement of in-country development comes in some measure from access to more meaningful presentations of information offering a context for strategic choice. The focus of this project is on the provision of context for development-related information (rather than data) that may be available from a variety of sources. Context is the key to strategic responses to questions that can then be more appropriately formulated. The project uses extensive hyperlinking (horizontal and vertical relationships, vicious loops, fixed destination and open-ended search queries) as a basis for creating patterns of meaning.

Another example concerns internationally recognised and designated protected areas. At the start of the project it was recognised that there was a confusing array of international agreements and programmes that designate or otherwise recognise protected areas internationally. WCMC began to put together a series of webpages that explained these in a standard way. As a result WCMC also decided to approach the preparation of the next UN List of Protected Areas in a different manner, focusing on international protection (see Section 8.2.2.5: Harmonisation of information management and reporting). This new approach has received substantial endorsement

¹³ Local management staff were most impressed by the problem analysis of the system; notably (1) how sustainable development could be presented to local staff in integrated planning approaches where single issue project development - *ie* women's development - could be expanded to consider environmental aspects; also (2) how issues not previously considered relevant to local problems and project development (eg water or trees) could be highlighted within a more holistic approach. The opinion was that the databases offered a unique planning tool, enabling trained local project staff to substantially broaden their project appraisal and project planning perspectives, identifying ancillary problems relevant to main theme project objectives and additional opportunities to cross link initiatives and programmes in more community orientated and environmentally relevant packages.

from UN agencies and other international agencies involved in biodiversity conservation.

1.3.3.5 Feedback recommendations

Feedback was received in the following major areas:

Standard of content: Feedback on databases content related almost entirely to quantity or deficiencies, rather than quality. Where it was possible to remedy, this was done. Other content issues have been noted for future work.

It is pertinent here to note that the information managed by WCMC and its collaborators is largely compiled using expert networks or from official sources and in many cases is managed using methods advised by those experts. Information managed by UIA on World Problems and Strategies managed is largely derived in response to regular mailings to the international organisations it profiles. Both partner organisations are increasing the use of Web sources and “data mining” techniques to supplement other sources. Generally, the quality of the data is considered of a very high standard, both by internal and external opinion.

Features: Specific feedback was received from AIDEnvironment on the features considered to offer the greatest added value to the site: These are:

- the provision of summary information on biodiversity conservation;
- the provision of a portal to a large number of specialised sites;
- the provision of continuously updated information and sources.

At the same time, it was noted that the website must match the attractiveness and accessibility of comparable sites in an environment that is developing at a remarkable rate.

With regard to specific priorities for the further development of the database, AIDEnvironment recommended that the following points be taken into consideration.

- The interactive capability of the database as a means to respond to user needs – which may be unique to this product -- has considerable potential, providing that users can be encouraged to make full use of this facility. This requires primarily a number of technical improvements that would make it simpler and quicker for a user to provide input.
- The number of hyperlinks to specialised sites related to biodiversity conservation should be increased. This may go hand-in-hand with the expansion of the number of profiles in the database. Conversely, it is equally important for hyperlinks to the product databases to be included in other relevant sites.
- The indexing feature should be further refined to ensure that more keywords are recognised. For example, many users will search for information on specific Problems or Strategies, which should be immediately accessible.
- The mapping function is an interesting feature and may well have considerable potential for certain kinds of searches. We would certainly like to see this facility further developed.
- Although considerable progress has been made in improving the user-friendliness of the database, we believe that a greater number of users would be encouraged to access the database if further improvements were made, mainly with the aim of ensuring that new users immediately understand the structure of the database, the kind of information available and how to access the required information. Practice in this area has developed considerably since the start of the project and many newer

websites are more "state-of-the-art" in this respect.

Much improvement was made along these lines during the latter half of the project period. However, since the points are goals, the project team realises that much remains that could be done in the future.

1.3.4 Development of access policy

In the case of the UIA, it is expected that "access" to the dynamic pages will continue to evolve with respect to the following:

- **Procedures:** A more stable logon procedure was implemented in July 1999. Further changes have continued to be made since then, notably in the light of user feedback. It is expected that these changes will be transparent to the user and to any bookmarking of profile pages in any database.
- **Facilities:** The range of facilities associated with any database continues to evolve. Users may expect to get more facilities, notably with respect to the visualization software. Some of the more advanced search facilities are already limited to Registered Users.
- **Comment facility:** This feedback facility is currently open to Registered Users and is expected to lead to an increasingly valuable supplement to profile data.
- **Databases:** Users, whether as Guests or Registered Users will continue to have full and free access to the databases on World Problems, Strategies, Human Values and Human Development. Access to some other databases may be made available freely in the same manner. Access to databases on international organisation profiles and international meeting profiles will be subject to restrictions, which are under continual review. With respect to the international organisation database, both Guests and Registered Users do however have minimal access in order to obtain the URL of the organisation, if available.

Users are invited to specify their needs for wider access than that automatically accorded through registration.

Registered Users do not normally acquire access to a greater range of databases. They do however acquire the ability to make on-line comments on specific profiles within databases. These are then accessible to other users.

Requests for access to other databases will be noted and users will be contacted when it becomes possible to respond creatively to their specific need.

It is expected that access to some databases will only be possible in the future against some form of payment. This possibility is being studied.

Unforeseen developments during the project

The start of this work package was delayed due to delays in full online access to the databases. As a result, certain functions, such as full online editing of Problems and Strategies, are still in beta test mode.

Identification of future activities

In the light of more specific and detailed guidelines mentioned above, the project team would continue to regularly review user needs and adjust the product accordingly.

1.3.5 Moderation and maintenance of information

The information provided through *Ecolynx* can only be maintained effectively by the partners acting as moderators on proposed inputs from a multitude of sources. For the product to be viable over the longer term, this moderation function needs to be organised as a buffer between raw input and widely disseminated output. As with any moderated electronic mailing list, provision needs to be made for filtering input. One approach would be to channel feedback into one of a range of buffers pertaining to each database record. These would range from “authorised” to “unknown”, whilst excluding eccentric and abusive feedback. Users would then be free to limit or extend their perusal of these categories of comment. Beyond the moderation function would be the effort to process such feedback into the relevant core database records, as resources permitted.

1.4 Interactivity: search and feedback facilities

Workpackages 2-2, 2-3 Deliverable 5052-5

Expected (original delivery) 31-01-99
Interim delivery 28-02-99
Revised delivery 30-06-00

Background to the workpackage

This project is predicated on the importance of widespread information *dissemination* to those who can make effective use of it—according to their own criteria. This objective features in the statutory mandates of the principal partners. It is in fact essential as one part of the cycle through which the information is maintained, renewed and expanded.

Another part of the cycle is the actual *feedback from end-users* and interested parties capable of correcting and improving the information.

The weakness of any product based purely on dissemination is that the costs of updating the information can become prohibitively high, although allowing longer periods between updates may reduce these. The weakness of any product based on data capture alone is that as a research project this runs the risk of being incapable of widely disseminating the results of that research in an effective manner.

Both principal partners already operate as processors of information supplied to them, whether deliberately or incidentally, by extensive networks. The information can only be maintained effectively by the partners acting as moderators on proposed inputs from a multitude of sources.

Equally, in a policy-sensitive environment, the information also needs to be seen to reflect opinions of significant constituencies, especially where the issues are controversial and the subject of diverse interpretations. Failure to reflect such views, and the dynamics of any controversy, can only undermine the credibility of the product to wider constituencies and would then reinforce competing information projects. This is one outstanding merit of the complementary emphases of the two principal partners in this project. It is also a reason why the project places increased reliance on an extensive network of dedicated end-users capable of compensating for such deficiencies.

Both partners are making the transition between non-electronic and electronic input from such supplier networks. For the product to be viable over the longer term, this moderation function needs to be organised as a buffer between raw input and widely disseminated output. As with any moderated electronic mailing list, provision needs to be made for filtering input. One approach would be to channel feedback into one of a range of buffers pertaining to each database record. These would range from “authorised” to “unknown”, whilst excluding eccentric and abusive feedback. Users would then be free to limit or extend their perusal of these categories of comment.

Beyond the moderation function would be the effort to process such feedback into the relevant core database records, as resources permitted. In this area, the principal partners have a strategic advantage, demonstrated over many years, through the priority they give to “adding value” to data rather than simply repackaging and

redistributing them. Note that this approach ensures access to feedback information, even when resources are not available to process it in detail.

The concerns of this workpackage, therefore, were to facilitate both the ease with which users could access material on the partner websites as well as extend facilities for them to contribute materials to the website. Naturally, this raises questions about information and site security and, to a lesser extent, quality and quantity issues.

Activities of the workpackage

Work required at UIA has been substantially greater than at WCMC, as the latter was already delivering dynamic databases and had far more sophisticated server and web design competence when this project started. Work at the two locations is discussed separately.

1.4.1 WCMC

1.4.1.1 Security and Passwords

During the project period, WCMC has developed facilities for secure password protected access to allow direct editing of three datasets online, as part of three current projects: the UK Clearing-House Mechanism, funded by the UK Government, the "Biodiversity in Development" facility for DG Development, and the development of a metadatabase for the Biodiversity Conservation Information System (see also Section 4.3.2: Metadata). In each case there is an identified series of potential inputters who are allowed access through password control.

It was intended that similar mechanisms would be used to ensure secure update of other datasets on the WCMC website developed as part of the INFO2000 project. However, at present it has been decided not to follow this route but to allow any user to submit information that is then reviewed by staff at WCMC before incorporation. It is anticipated that we will move away from this in the future, but that we should follow this route first to see the type of information received.

1.4.1.2 WCMC interfaces

During the last year the WCMC website has been altered significantly in order to improve accessibility for a wider range of users. This has included the following:

- New frames and *Java* applet menus to allow users to more rapidly access the parts of the website that they require, and to move around between different parts of site.
- New search tools to facilitate the location of information within the website, using Muscat Empower.
- Increased opportunity for feedback on the website and the information contained within it.
- More graphical and map-based tools for presentation of information and to provide access to it.
- More searchable databases and a wider range of data presentation formats (including more pictures and in some cases sounds).

1.4.1.3 Update of WCMC databases and information services by users

Several WCMC information services on the Internet now specifically encourage feedback and comment by users in order to update the information available. In some cases this is intended to broaden ownership of the information available, in others it is mainly to check and add to the information.

Examples of information modules where this is being done are:

- WCMC has established a prototype website on protected areas information for the South Pacific with the aim of having the information updated by protected areas managers in the region during the period between now and the next South Pacific Congress on Protected Areas (2001). This facility has been set up in collaboration with the South Pacific Regional Environment Programme (SPREP), although its full implementation has been delayed because of a change of staff at SPREP.
- WCMC is also experimenting with allowing users of the online threatened plants databases to directly submit comments on the database by email, giving users the opportunity to add comments on any taxon or conservation assessment as part of the continual process of updating this service.

The WCMC Global Coral Disease Database (<http://www.unep-wcmc.org/marine/coraldis/>) is populated almost entirely by observations taken from the scientific literature. There is an important bias inherent in this approach, principally that scientific journals do not function as a monitoring mechanism. The next stage therefore is to begin incorporating unpublished field observations of coral disease in the database. The web pages and the Global Coral Disease Database are being updated on a monthly basis so that the new observations may be plotted in the mapping tool.

1.4.2 UIA

1.4.2.1 Security

In the early phase of the project a simple logon system was implemented with minimal security. Subsequently a *Java*-based logon facility using cookies was developed to replace the simpler experimental system. This also increased security facilities.

This system gave rise to a series of compatibility problems with users entering from different platforms leading to further revisions of the system. The adaptation of the system to the e-commerce requirements of a complementary database subsequently necessitated further refinements.

The UIA has been exploring a balance between use of “guest”, “registered” (non-paying) and “subscription” access to different databases – including a “trial” facility on subscription databases. At this stage the latter are restricted to access under an agreement with the commercial publisher of the corresponding hardcopy and CD formats, but requires an interface acceptable to the publisher (who is responsible for invoicing such subscriptions). The UIA is also exploring techniques to allow privileged access from certain categories of user, notably those supplying information to improve the quality of the databases.

An urgent concern has been the construction of security features to inhibit abusive use of system made freely available.

1.4.2.2 Interfaces

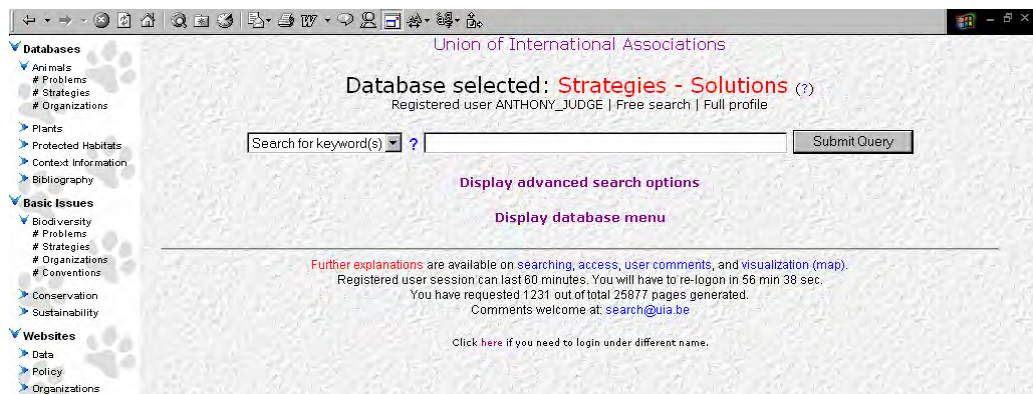
Initial tests covering use of HTML forms in relation to CGI scripts demonstrated that users could identify Problems and Strategies of interest to them and feedback via e-mail (as with the static page variant). The UIA made considerable progress in implementing the user interaction facility with its databases during the reporting period (see implementation via <http://www.uia.org/data.htm>). Interactivity may be understood in five distinct ways:

Logon interfaces:

A single *dynamically* generated interface was developed. Several *static* introductory interfaces were developed to meet the needs of different clusters of users. These provided access to distinct dynamically generated search interfaces to carry through

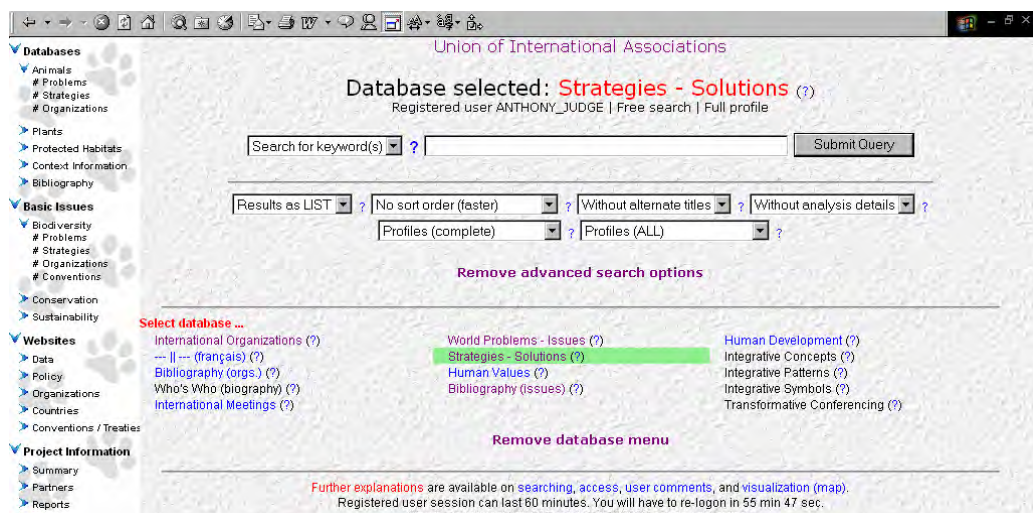
the identity of the interface through which the user entered. Many more static introductory pages can be envisaged to respond to different user needs and languages. Any static introductory page may also provide a location from which individual user preferences may be set for the dynamic interface and subsequent pages, although the system was developed to the point that user preferences are saved.

The dynamic interface offers or excludes users from certain facilities. It is notably designed to allow for a range of users from “Guests” to “Editors”. Many opportunities for the further development of these pages are envisaged (Section 28: Annex F: Further challenges on UIA server). These could include *third party* interfaces whereby other bodies design interfaces for their own users to interact with the data. Educational bodies have already made initial steps in this direction with UIA data.



Simple search window

<http://www.uia.org/projects/finarept/image9.htm>



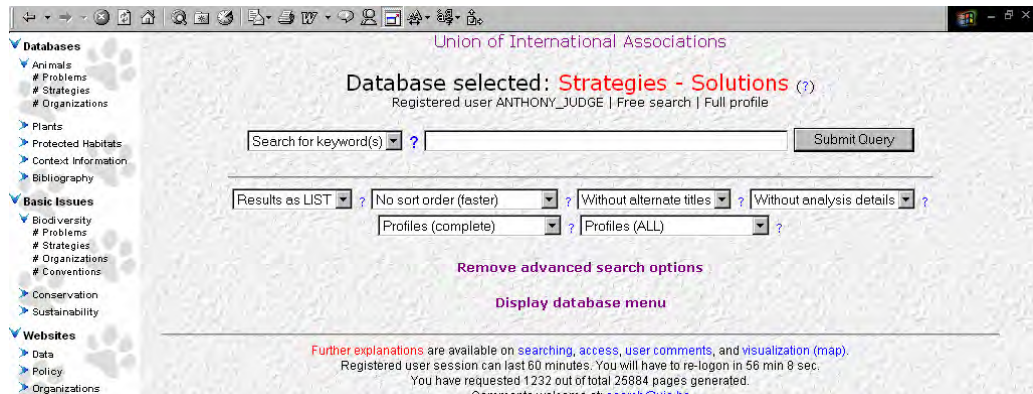
Search window with advanced search options

<http://www.uia.org/projects/finarept/image10.htm>

User search interface and inspection of data:

This facility now allows web users in a test mode to explore a range of databases of which the cores ones are the Problems and Strategies databases. The search interface can be configured by the user into three modes (exposing or hiding options). The databases are extensively hyperlinked both internally and between each other, and now increasingly to third party web sites (see Section 10: Integration of information). Links from UIA data have been made to WCMC data as part of the integration process. Wherever possible, extensive use has been made of query links generated

dynamically. The features associated with this facility continue to be developed (see Section 28: Annex F: Further challenges on UIA server). Technically the consulted databases are now maintained on a dedicated server separate from the LAN on which the UIA maintains the originals. The originals are copied over periodically.



Search query form with select / display options

<http://www.uia.org/projects/finarept/image13.htm>

User commentary interface on specific profiles:

User interaction is offered at the paragraph level, at the profile level, and more generally. User feedback is also designed to enable interaction between users providing such feedback in response to each other's comments.

This facility now allows qualified web users in a test mode to comment on profiles and parts of profiles. Users can choose to inspect comments made on a Problem or Strategy profile in isolation or have the comments integrated into the display of the profile. By registering their email address, users can also choose to interact with each other. The features associated with this facility continue to be developed (see Section 28: Annex F: Further challenges on UIA server). The ability to provide commentary is seen as fundamental to the interaction process through which users provide new material to develop the system and themselves develop into interactive editors (see below). Technically the comments are maintained in files parallel to the databases. This process functions somewhat like a topic focussed listserver.

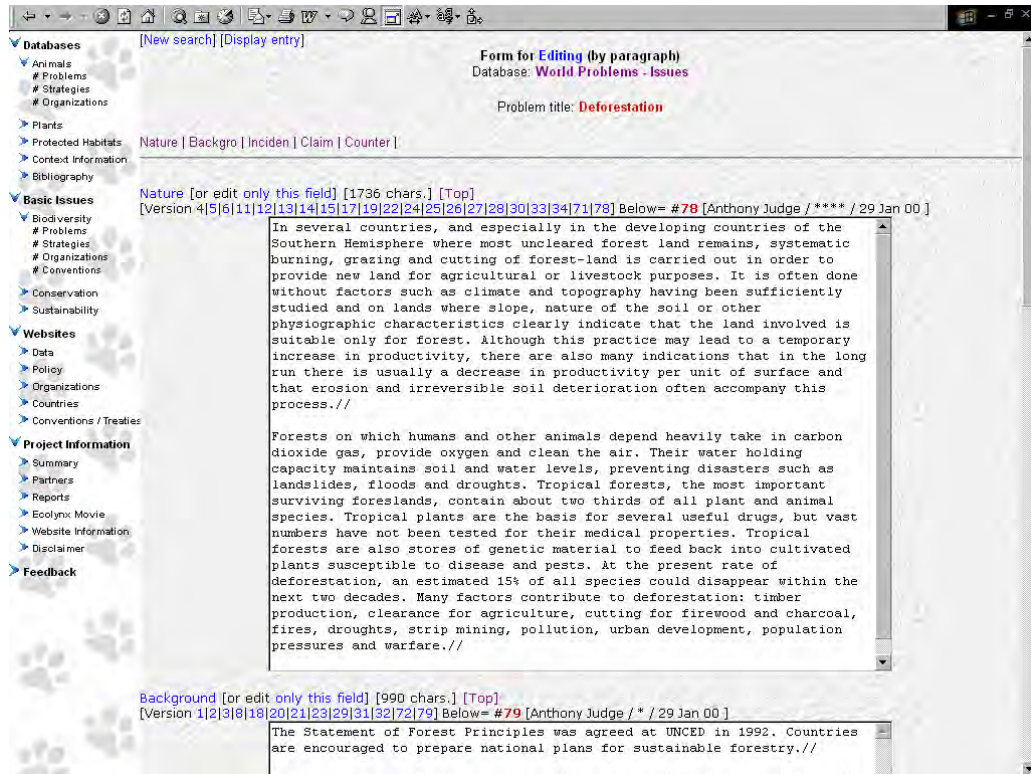
User editing interface of specific profiles:

This facility is now operational in a test mode; effective use awaits a more robust use of the comment facility. It enables qualified editors, operating via the web at a distance, to improve the quality of profiles (and potentially their hyperlinks), whether by adding in new material or processing the material supplied in the form of commentary (see above). Technically the edited items (paragraph fields) are maintained in files parallel to the databases. If present, they are called in to substitute for corresponding paragraph fields from the database when items are displayed from that database. Users may opt to have the original displayed. Editors can explore previously edited versions back to the original. The issues of reconciling updates made on the LAN version as against the dynamically served version remained to be implemented.

User interaction interface via non-text displays:

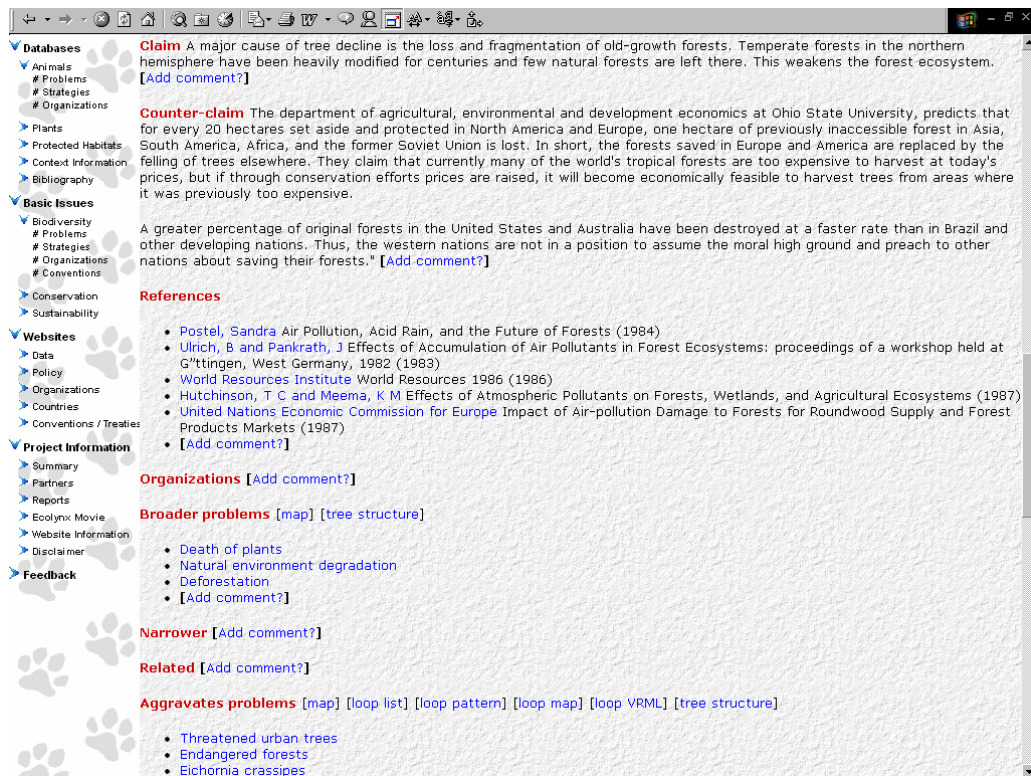
The virtual reality opportunities were presented in the original proposal in a test mode but have been partially superseded by spring map techniques. Considerable progress has been made with the *Java* spring mapping applet generated on the fly from the databases under user control. In addition to an alternative view of the hyperlinked

data, these offer users an alternative mode of access to text profiles. For further details, refer to Section 16.2: Multimedia visualization, Activities of the workpackage.



Editing window (showing version numbers)

<http://www.uia.org/projects/finarept/image11.htm>



Part of profile display showing Claim, Counterclaim and cross reference fields; also clickable links to visual displays and comment facility

<http://www.uia.org/projects/finarept/image12.htm>

1.4.2.3 User searches

Considerable progress on enabling user searches was made by the UIA. The UIA's LAN DOS-based search facility was adapted successfully to a *Windows-Web* environment. Users now have access to the following features in test mode (<http://www.uia.org/data.htm>):

Keyword searches:

The keywords are those in the title fields of profiles (Organizations, Problems, Strategies, etc). These include non-English words in the case of Organisations. Simple Boolean logic may be used to combine searches. This facility has been extended in the case of the Problems and Strategies databases to include marked keywords in the body of the text.

Subject searches:

Using the UIA 150,000 word thesaurus, subjects under which a given keyword is grouped may be searched. This may also be used to formulate queries in languages other than English, even though the responses are only available in English. Simple Boolean logic may be used to combine searches.

Phrase search:

This feature has been implemented.

Browsing titles alphabetically:

This feature has been implemented by using the index to static pages, notably in the case of the Problems and Strategies databases.

Special features:

Additional tools have been developed for "Registered" users to enable them to detect Problems and Strategies at top of hierarchies, or as functional source or sink. Mapping features are now accessible from the search screen as an alternative to conventional listing of hits.

1.4.2.4 Results display

The system has been designed to list hits in a variety of forms, and further possibilities are envisaged, notably switching to alternative language titles in the case of International Organizations. These include:

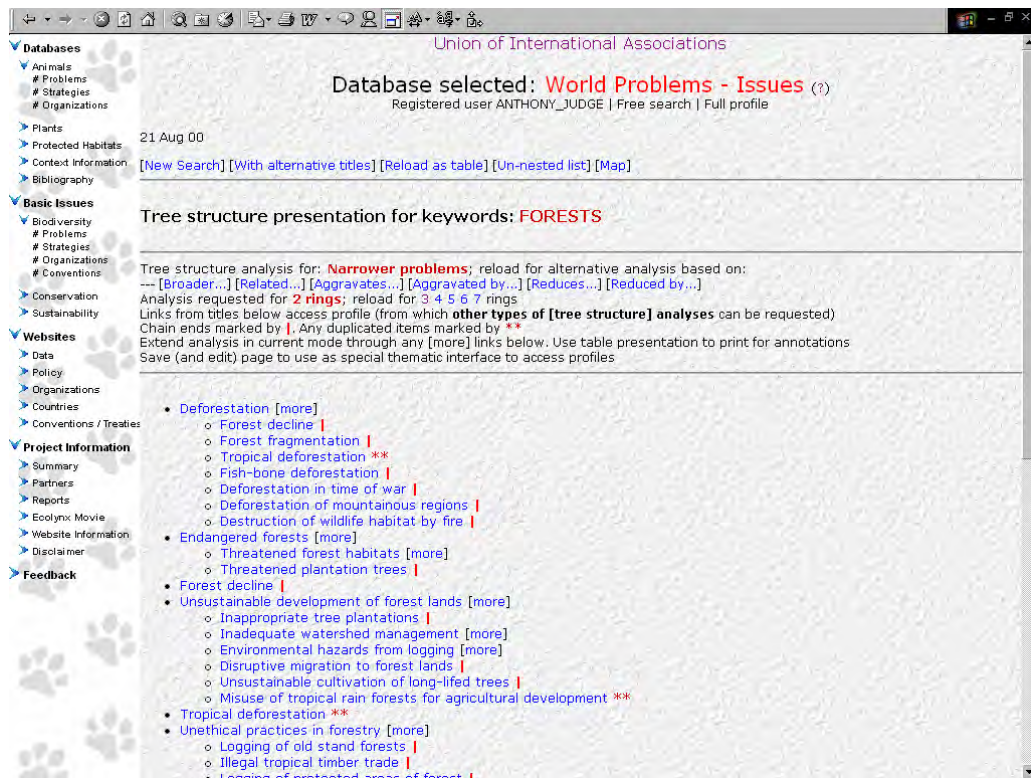
- Main title of profile:
- Alternative titles: Main plus alternative titles of profile (many profiles have a plurality of titles)
- Analytical information:
- Titles: (main or with alternative) plus analytical information giving summary information on the profile (number of cross-references, links to websites, position in networks of linkages)
- Network display: Web users can now request the display of entry profiles (with or without alternative titles) in hierarchies (up to 7 levels) or in functional networks. This provides a powerful overview of the context of any Problem or Strategy profile (see figure).

1.4.2.5 User participation philosophy

User interaction is solicited and guided with the following statements:

- **The Encyclopedia is a work in progress:** It is the product of a project that commenced in 1972. Major refinements have been made, and will continue

to be made, to the descriptive text and to the pattern of cross-references, especially in response to feedback on inadequacies. In this sense the Encyclopedia is an unfinished product.



Network / Hierarchy display

<http://www.uia.org/projects/finarept/image14.htm>

1.4.2.6 Web query links

Work accomplished during the Definition Phase demonstrated the feasibility of generating a multiplicity of specific search queries to locate potentially relevant websites. The concern was to provide users with access to a range of current and emergent websites rather than to restrict them to specific URLs that might become bad links. Links can thus be generated for web documents on a problem, for books, maps, or other kinds of information resource, including organisation links to relevant “.org” (“dot org”) websites. Of particular interest was the possibility of focusing such queries on distinct multimedia material (images and maps, sound, video). The results were very satisfactory in HTML test files.

These techniques have now been successfully implemented for a range of options, including direct search query into WCMC conservation information. These are generated dynamically on the basis of information in the profile titles. Other features are envisaged. For example, it is planned to offer users a choice of common search engines, or to specify a little known preference.



Search index display

<http://www.uia.org/projects/finarept/image15.htm>



Search index display with additional information

<http://www.uia.org/projects/finarept/image16.htm>

- **A wide variety of disparate sources has been used:** These include: international organisation documents, academic papers and conference

proceedings, periodicals and reviews, newspapers, journals, books and book lists. In this sense the information may be viewed as factual. However, such disparate sources reflect many levels of insight and expertise, as well as many cultures, ideologies, beliefs, priorities and biases. No attempt has been made to eliminate inconsistencies, although incompatible items have been treated as separate profiles where appropriate. This is a deliberate editorial policy.

- **International bodies and other constituencies around the world effectively function as editorial partners:** The Encyclopedia's "neutral" information gathering function means that international bodies and other constituencies around the world effectively function as editorial partners in progressively refining information relating to their concerns in every field of activity. The databases are at no time considered complete, rather they reflect "work in progress" to clarify the complexity of the international community and its actions. A good deal of the material in the Encyclopedia has come directly from information provided by international organisations, particularly extracts from documents of the United Nations and other intergovernmental agencies. One of the great merits of working with such sources is that the material is either in the public domain or that the organisations are pleased to authorise wider use of it. It is hoped that the new avenues of access to the Encyclopedia made possible by electronic publication will initiate an even more comprehensive feedback of information from its users.
- **Editorial policy and practice:** The preparation of Encyclopedia profiles is a true editorial process, ideally accomplished with minimal intervention. The editorial intent is not to provide a final "judgement" or "definition" of a world problem, strategy or path of human development; it is to provide a "description" which allows the arguments of diverse constituencies, as advocates for a particular initiative, problem, or approach, to speak for themselves. This involves gleaning material from different documents and combining elements in a suitable manner.
- **The editors are not attempting to present "the objective truth", by making editorial judgements on what is factual and what is not:** The aim is to present phenomena as they are perceived, from the framework or "mindset" within which each is experienced as significant, using whatever "facts" are considered most appropriate by those working within that framework. This is especially the case with the Claim and Counter-claim paragraphs. These paragraphs provide a means of reflecting, most explicitly, the contrast between advocates and detractors of particular concerns. The existence of such dynamics with the international community is, of course, implicit in the juxtaposition of strategies and problems, human values and human awareness; profiles which appear at first glance to be mutually exclusive or irrelevant to each other, may on closer examination reveal interrelationships which can deepen understandings of the world "problematique" and "resolutique".
- **Limitation of existing information:** The production of this ambitious CD-ROM publication has been feasible only because of an extremely pragmatic approach to the collection and processing of information. The editors have deliberately set out to "open up" (through hyperlinks) and to highlight neglected categories of information. The intention has been to provide as broad a coverage as feasible, fleshing out the content to the extent possible.

By deliberately sacrificing content to structure at this stage, it is hoped that even where the information supplied is inadequate, users will still be oriented to new features of the global system which others stress as meriting their attention -- and be more stimulated to contribute their own information to remedy deficiencies in the content of profiles.

- **Inclusion of information in this publication implies only that the editors considered the source reflecting the views of an international constituency:** Such logistical restrictions on the comprehensiveness of research mean that the amount of information given for any entry does not reflect an editorial evaluation of its importance. Issues commonly accepted as important may be documented only briefly. This may be because of resource limitations, because of a profusion of relatively diffuse material available on them, because they are extremely well documented elsewhere, or because they can be more effectively described through their "narrower" expressions. Little-known Problems may be given relatively extensive coverage precisely because their existence is not well recognised. Inclusion of information in this publication implies only that the editors considered the source from which it derived sensitive to and capable of reflecting the views of an international constituency, and therefore as being of significance to a wider audience.
- **The quality of descriptions also varies:** Some profiles reflect an understanding carefully articulated by an international organisation. Others are based on information assembled from a variety of sources. However, still others are based on what in intelligence circles is described as "low grade information". This is because the editorial bias is towards inclusion (rather than exclusion) of dubious or poor quality profiles in order at least to acknowledge the sensitivity of some constituency to that issue. Once established in this way, and appropriately indexed, higher quality information may become available to improve the description.

The editors welcome users of these databases to assist in the provision of information which can improve both the quantity and quality of existing individual profiles and their relationships, or describe new profiles.

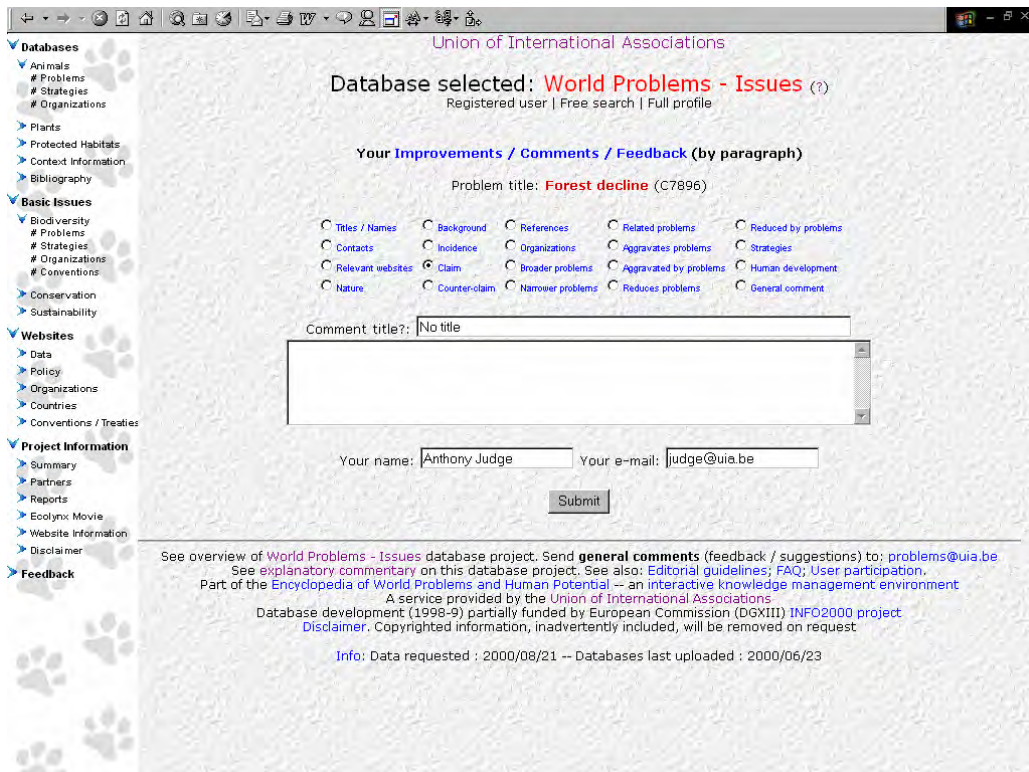
1.4.2.7 User feedback options

Users can respond interactively to the profiles in the various databases in the following ways:

- send general comments on all databases to databases@uia.be;
- send specific comments about individual profiles (as indicated on any profile page);
- registered users can supply on-line feedback on any profile entry through the comment facility (enabling another users to view those comments immediately from the relevant profile):
 - comments may be specific to any *part of a profile*
 - comments may be about the *entry as a whole*
- qualified user-editors can edit profiles on-line (resulting in modified texts that overlay earlier versions when other users access a given profile)

Clearly the current and future challenge is to find ways to work with this flow of information, bearing in mind the difficulties of editorial style, quality of content,

quantity, and the constraints on ability to process whatever is received¹⁴. Obviously the less intervention required to put text into shape, the easier it is to transfer it from "comment" form into the database profile. On the other hand the comment facility does allow users to express views about a text (for other users to see), even if resources are not available to integrate it into the database. How the facility is opened up to on-line editing remains to be explored experimentally. It depends a great deal on the editorial discipline of those who choose to collaborate in this more constrained mode and how their capacity is demonstrated and assessed.



Comment window

<http://www.uia.org/projects/finarept/image17.htm>

Unforeseen developments during the project

1.4.3 Search string limits and stability

A procedure was developed to enable generation of search queries for all Problems and Strategies placed on the prototype CD. The only constraint encountered was an unforeseen restriction in *Folio* 3.1 (the CD-ROM software) limiting search strings to 124 characters. This inhibits some of the searches that are more complex and use of advanced facilities (including language variants). *Folio* 4.1, recently released, increases the length to 194. The string length constraint is not present on a Web version of the product. A significant point for further investigation is the "stability" of the generated search string syntax with respect to selected search engines that are naturally free to change the syntax to offer new possibilities.

¹⁴ A summary of editorial methods and guidelines is presented elsewhere (<http://www.uia.org/dyna/guides.htm>), as well as a warning to users. An extensive commentary on the scope of each database is available from any profile page or via the Encyclopedia Home Page (<http://www.uia.org/homeency.htm>).

1.4.4 Metadata¹⁵

During the project period, WCMC became involved with development of a set of "controlled terms" for biodiversity issues for two related projects: the UK Clearing House Mechanism website and the metadatabase for the *Biodiversity Conservation Information System* to ensure that it is (a) fully compliant with international protocols such as Z39.50 and (b) accessible to all common types of browser. This is essential experience in ensuring capability to deliver information and access to information to the widest possible range of users.

Through the same projects, it also became acquainted with the Global Information Locator Service (GILS) and GELOS, a metadata server being developed as part of the G8 Environmental and Natural Resources Monitoring Programme. Both systems share the goal to make it easy for people to find information, of all kinds, in all media, in all languages, and over time, by evolving international standards for information searching. These international efforts on information standards have been discussed by the partners and will contribute to the data integration process.

The consortium had discussions with the European Environment Agency (EEA) on the possibility making the content of this project available to the EIONET system based on the Z39.50 metadata protocol. Issues were discussed in position papers developed by both WCMC and UIA. Following these discussions, the UIA has initiated development of a Linux server as a basis for further work on Z39.50. The advantage for the UIA is that data in all its databases effectively has a common, normalised meta-structure. The disadvantage at this time is that it uses a proprietary file structure, which may require significant investment to adapt to delivery through a UNIX-based server. These issues are discussed in position papers developed by both WCMC and UIA (Sections 25 and 26: Annex C: WCMC and the Z39.50 protocol and Annex D: UIA and the Z39.50 protocol).

The Internet is providing another type of popular "meta-information" structure, which this project has chosen to benefit from in the use of hard and soft links at the data element level.

1.4.5 Concerns relating to feedback

Opening the databases to user feedback and comment has brought with it new concerns. The following outline some of the issues arising. Some have been dealt with using procedural techniques; others remain either unresolved or under observation.

- **Copyright and copyleft** (for received and published materials): To the extent possible, the UIA profiles are based on public domain information, especially that received from international organisations. Such information has often been very carefully prepared to filter out particular biases. Extensive use is made of other sources in weaving new phrases, sentences, or larger amounts of text into existing Problem and Strategy profiles. Since no profile is considered static or definitive,

¹⁵ It is perhaps useful to comment on the concept of "metadata" in relation to the needs of sustainable development. The concept was first developed in response to the need to reconcile data sets of different agencies or derived from different scientific surveys using different methodologies, or the challenge of bibliographic searches across (library) information systems based on different classification philosophies. Technical solutions have been developed to bridge across data sets. In this sense, metadata has an important role to play in facilitating searches for data in support of development processes.

material from many sources will be combined in the continuing process of developing profiles. This raises the question of whether acknowledgement of sources is reasonable under such circumstances, and the larger issues concerning (1) ownership rights and (2) citation requirements to materials uploaded onto the web (and often freely copied by others onto different locations). This is part of a wider social discussion that is being monitored. Refer to Section 22: Information ownership and copyright for more discussion on copyright and ownership.

- **Interactive editorial participation:** An important emphasis of the editorial process is to transform users in user editors, wherever this is consistent with improvement of the scope and quality of the material. This calls for innovation both on the software side as well as in the management of information flows in relation to resource constraints. Much is being learned from the earliest participants in this activity, and adaptations are being made continually in response to their requests and idiosyncratic methods.
- **User access and accreditation:** These issues have been subject to constant review and experimentation during the course of the project, and will continue to be refined.
- **Editorial delays:** The on-line comment facility is one way to reduce the backlog in making comments. Use of on-line editors will hopefully offer means of integrating comments into database profiles. The development of a network of online editors will be a gradual process. It is already clear that procedures and guidelines will need to be developed to ensure the maintenance of quality standards.
- **Excluded materials:** The question of deliberate or inadvertent exclusion of information remains a matter of continuing review and experimentation. Material may have to be deliberately excluded for copyright or licensing reasons, but it is also the case that some materials have to be excluded to avoid attracting legal harassment that the UIA does not have the resources to deal with.
- **Errors of omission and commission:** Some users comment on the presence or absence of information. There is a disclaimer and [warning to users](#), but perhaps ways must be found to get across these messages.
- **Controversial and defamatory material:** This concern will remain one of continuing review and experimentation. It is to be expected that most "problem" profiles will be experienced by some as questioning the validity of the "strategies" they favour. One group's strategy will always tend to be another constituency's problem. The "counter-claim" paragraph will continue to be developed to hold such challenges. (See also: [Warning to users](#)).
- **Experimental development:** Occasional user comments point to incompleteness or inconsistencies in the databases. More ways need to be found to inform the user that the whole project is a developing process rather than a static finished product.
- **Selective display of user comments:** The quantity of comments on some profiles may necessitate more a selective approach to displaying comment (eg taking account of accreditation of user, date, length, *etc*).

Identification of future activities

It is expected that focus in the future will include:

- Increasing user response and user-involvement in reviewing and updating data and information

- Distributing ownership of parts of the data and information to others, either in terms of updating what is already in databases, or moving to a more distributed approach.
- Adding tools that information registered users of additions to, or improvements, in partner websites

For both the UIA and WCMC, the feedback facilities developed for web users enable them to point out both deficiencies in the data and new sources of information. Methods of accrediting suppliers of feedback can now be explored to ensure that such comments are available, duly flagged, to other online users.

1.4.6 Outgoing feedback

The challenge beyond this is to consider how the data can be fed back through HTML forms into the DOS-based database. The *OpenInsight* software makes provision for this. The more interesting challenges have to do with security issues in general and data adulteration in particular.

One promising approach to be tested in the future would be to channel feedback into a range of buffers labelled “authorised” to “unknown”. Users would then have the possibility of immediately accessing additional information flagged to the level of credibility they require. Such feedback would eventually be processed, according to priorities and resources, to integrate the new with pre-existing information. It is possible that external editors, who are gradually brought into partnership with the project through their personal and professional interest in its services, could do some of this editing and integration.

User interaction over the web with a server brings with it challenges.

1.4.7 Dynamic server response time

The quality of user interaction over the web is strongly related to the response time. Despite installing a well-rated server based on professional advice, the response time has been unsatisfactory. Because the response time is determined by a range of factors, it has take several months of testing to determine what was slowing down responses. This particular combination had built in incompatibilities. Following substitution and/or reconfiguration of these items, a much more satisfactory response has been achieved. This is consistent with the aim of encouraging participative editing over the web. The remaining concern is how the system will respond to multiple sessions, and at what point this becomes a problem.

1.4.8 Security issues

It is to be expected that the data, and the participative approach, will invite the attention of hackers. Further work has been done on the security aspects to safeguard the integrity of the system. However it remains a concern what level of security is appropriate and whether this can be achieved.

1.4.9 E-commerce issues

These have not yet been addressed. It is however clear that the simplest level can already be initiated by issuing passwords and invoicing.

The challenge beyond this is to work out the logistics of integrating such information back into the core database. The more interesting challenges have to do with security issues in general and data adulteration in particular.

1.5 Thesaurus- and language-related issues

Workpackage 2-4 Deliverable 5052-5

Expected (original delivery) 31-01-99
Final delivery 28-02-99

Background to the workpackage

Sensitivity to language issues is no simple challenge for a project with large amounts of text data. Traditional text translation is impossibly expensive, and inappropriate where the intention is for the text to be updated frequently through user feedback. Computer-assisted translation packages are deficient in specialist vocabulary; they also have yet to become sophisticated enough in handling grammar and syntax complexities to achieve more than a crude rendering of English texts into other languages; however, for certain purposes this may be enough.

The UIA has been endeavouring to deal with such challenges over many years and, over the past decade, exploring different computer and software possibilities. For example, it has created a multi-lingual thesaurus (over 103,000 terms), so that users of any UIA datasets are able to employ non-English subject categories to access data only available in English. Different language interfaces have been created for users of its CD-ROM products. Currently English, French and German interfaces are used. Spanish, Dutch and Italian interfaces have also been tested. The information is also organised such that hyperlinks in one language are valid in another.

In the case of international organisations, official titles are held by the UIA in any languages (with the use of transliteration where necessary). Currently this work has resulted in: English (over 20,000), French (8,229), Spanish (2,662), German (1,861), Italian (1,027), "Nordic" (497), Dutch (445), Latin (307), Portuguese (298), Russian transliterated (174), and Esperanto (71). This means that users can access these data using non-English keywords.

The data on international organisations have been extensively translated into French using a combination of traditional and semi-automatic methods (through funding supplied by francophone governments in 1995/96). As part of this work, portions of the data also were translated into Spanish and German. This work arose from sensitivity to language biases in electronic information. It has created considerable in-house capability in creative application of machine translation. It is intended that further developmental work on computer assisted-translation be undertaken in other languages, as dedicated funding becomes available. It is anticipated that this experience and awareness can be transferred in whatever ways are practicable to the proposed INFO2000 project to enable multi-language user access to the information.

Software packages to provide crude on-the-fly translations of web documents are seen as one means of rapidly providing some degree of access from a variety of languages. These should be examined and incorporated as appropriate. Provision of 'one-stop' access to online translation services, *e.g.* Globalink, should also be explored and enabled if appropriate. It also seems to be the case that using advanced search engine query techniques, access to documents in select languages can be provided.

Activities of the workpackage

The prototype produced at the end of the Definition Phase demonstrated possibilities for several innovative user features including language-related tools and data assistant which would considerably increase access possibilities via other European languages. These were adapted to the online web access facility.

Work continued at the UIA on refinement of its 100,000-word thesaurus. New terms arising from Problems and Strategies have been integrated into the thesaurus structure, notably those arising from the creation of several thousand new profiles concerned with species and habitats. It is estimated that around 5,000 new terms were added, coded according to subject area. In this way, user search capacity was extended to enable queries via a wide range of European languages.

With the objective of enhancing multi-lingual access to the data, reasonably successful experiments were undertaken with online translation facilities and software. Since these facilities have become widely available as add-ons to websites and search engines, final implementation of such facilities was postponed.

The UIA has been able to adapt the language facilities of its LAN based system and indexes to the *Windows*-Web environment. Specific progress was made on the following:

Search facilities: As noted above, Web users can already access profiles via a variety of languages commonly used by international organisations. Such searches work at the keyword level in the case of Organisations with non-English titles. They work at the subject level for all databases, using languages such as English, French, German, Spanish, Italian, Dutch, Nordic, Portuguese, and some transliterated Cyrillic.

Interfaces: The possibility of designing non-English interfaces is envisaged but has not been treated as a priority in this reporting period. It does not constitute a problem.

Hits: The possibility of displaying the results of title searches with non-English titles is envisaged for International Organizations but has not been treated as a priority in this reporting period. It does not constitute a problem.

Contextual explanations: The possibility of generating dynamic pages on which the contextual and explanatory comments are provided in non-English text is envisaged but has not been treated as a priority in this reporting period. It does not constitute a problem but does make already complex programs cumbersome.

Commentary explanations: The possibility of providing static pages with commentary explanations (criteria, methodology, etc) in non-English versions is envisaged but has not been treated as a priority in this reporting period.

Unforeseen developments during the project

The online translation facility offered by AltaVista/Babel Fish was implemented for the UIA for its static pages during the Definition Phase. Early in the Implementation Phase, AltaVista removed the service. UIA then disabled the link. The service is available again in improved form. This feature has not been tested for compatibility with cgi script since the progression to dynamic delivery of its databases and the revamping of its user access. It is intended to reactivate this facility in the foreseeable future.

Identification of future activities

1.5.1 Integration of specialist thesauri

Consideration was given to integrating two significant environmental thesauri:

- the European Environment Agency's *General European Multilingual Environment Thesaurus* (GEMET), and
- the ENVOC (environmental vocabulary) of around 2000 terms produced by UNEP's Infoterra programme and updated in 1997.

The task is important but routine and was not given priority during the project period. It will be considered for a student or stagiaire assignment in the future.

1.5.2 Implementation of online translation facility

As noted above, it is intended that the online translation facility offered by AltaVista/Babel Fish be reactivated in the near future. Without intending to detract from its utility, there are limits to its benefit, particularly with specialised texts as the translation may be more garbled than helpful; also there is a page limit. UIA is considering paying for the software which would obviate the latter limitation.

1.5.3 Species common names

Consideration was given to incorporation of common names of species in European and other languages. This was done (through indexing) where names were available in the sources used. There is considerable scope for extending this.

1.6 Web module: Species of conservation concern

Workpackage 3-1 Deliverable 5052-6

Expected (original) delivery 30-11-98
Partial delivery 30-11-98
Final Delivery 31-12-99

Background to the workpackage

One of the main objectives of this project is to make the links between information on Problems and human solutions developed and managed by UIA, and biodiversity information managed by WCMC in order to provide background information and context for biodiversity conservation action.

WCMC has compiled and managed information on threatened species for many years, working in collaboration with the IUCN Species Survival Commission, BirdLife International and others. Some six years ago WCMC put the IUCN *Red List of Threatened Animals* on the Internet site in an interactive format, but prior to the commencement of this project had not done further work on delivering species information over the Internet.

WCMC has also worked for many years with the CITES Secretariat, and with the European Commission on issues to do with implementation of CITES within Europe. WCMC manages extensive CITES datasets, but again before the project this was not managed on the Internet or made available through this medium.

Activities of the workpackage

As part of the Definition Phase of the project, WCMC developed improved mechanisms to provide wider access to the data as prototypes for demonstration purposes, and to test concepts. In particular, WCMC has developed the following tools and services, each of which relates directly to information being incorporated into the UIA Problems and Strategies files.

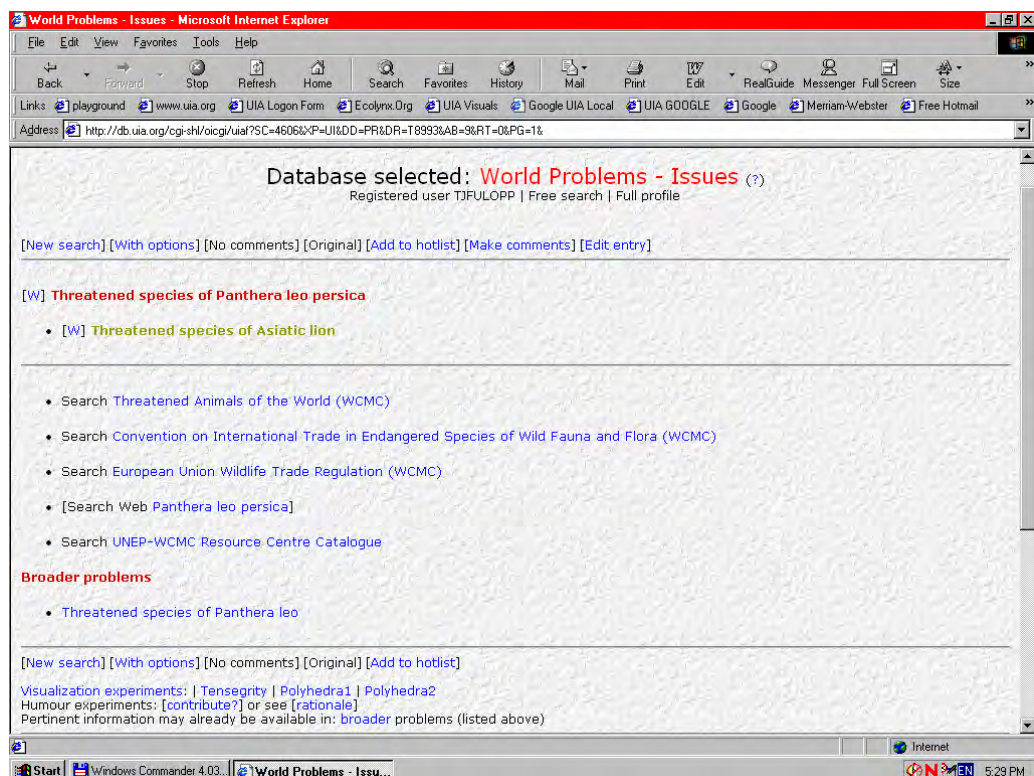
- Development of a prototype Web-based species database which links *Red List* information with details of the conventions and programs that protect or list the species concerned. The prototype, searchable by country and/or species group, delivers information on the status of each species, its distribution (by country), and whether it is listed on the appendices or annexes of CITES, the Convention on Migratory Species, the Bern Convention and the EU Council Regulation implementing CITES. This forms the basis for future convention-based information tools such as that described below for CITES.
- Incorporation into the species database information on why each of the bird species is regarded as threatened (working in collaboration with BirdLife International). This anticipates the intended work during the Implementation Phase to link more closely threatened species, threatened habitats and other threats to their conservation.
- Development of a new Web-based information tool to deliver information on species included in each of the CITES Appendices. This allows users to select

particular groups of species and/or particular countries, and find what species are listed. The facility includes the opportunity to search the species listed by common name, aiding standardisation of search capabilities in the final product. The output, which is a valuable new service for the Secretariat and States Party, identifies for each species its distribution (by country), its *Red List* status, when it was added to the CITES appendices, and so on.

- Summary information sheets on 140 of the more threatened species, prepared in collaboration with WWF and with additional funding from Chevron.

The intention was to build on this experience in the implementation phase of the project.

1.6.1 Direct links between UIA and WCMC components



Part of a UIA Problem profile entry showing soft query links into WCMC databases and the web

<http://www.uia.org/projects/finarept/image33.htm>

In development of databases and other information services delivering information on species on the WCMC website, attention was paid to the need to be able to access entries in the databases or information services *directly* without going through the interface pages. For example, if a page on the UIA webservice was dealing with issues relating to marine turtles, it was important to be able to generate a query string that would return information on marine turtles from the WCMC databases directly and relatively seamlessly (see Section 10.2.2: Integration between partner databases (between WCMC and UIA)).

1.6.2 Integrated species database

Following review of the WCMC species databases, a technical specification was drafted for developing an integrated species database that would be accessible over the Internet, and deliver information in much the same way as the existing prototype. As

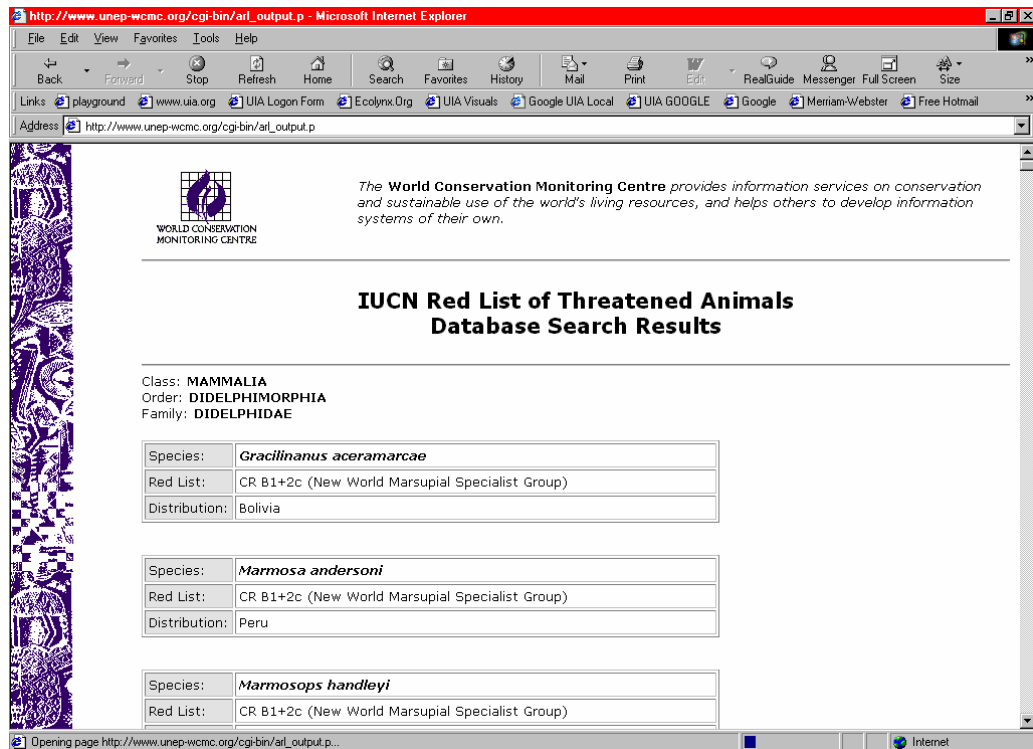
WCMC lacked the in-house expertise to implement this specification in full, much of the work of implementation was contracted out.

The development work on the so-called Species Conservation Database (SCD) was completed by Cardinal Consultants to the specification drawn up WCMC. The principal aim of the work was to develop a database to allow the effective management and delivery over the Internet of species data and particularly animals data (the available tools for plants were already more advanced).

The work extended the data schema allowing the inclusion of all the *animals* data with that developed for the world trees database (see below). The reporting mechanism was extended to include a number of new reports specifically to allow the continued generation of suitable text outputs to update the existing web pages including the EU Trade database, the *Red List* and to allow the combination of the Animals and Trees Red lists. After discussion with IUCN/SSC, a new export routine was developed to deliver the relevant fields from the database relating to *Red List* for 1999.

The majority of the animals data was moved into the new SCD in 1999, but there was outstanding work to be done on the data to standardise it and make the necessary corrections, and to add further information on other international agreements and programmes. The data for the Red List 99 was also entered.

Certain parts of the animal's database have now been reviewed systematically in preparation for integration of the species databases and their incorporation in the new integrated database. Specifically information was reviewed to remove anomalies, and more information was added on the listing of species on certain annexes and annexes of international agreements.



Part of WCMC display for a search in the *Red List of Threatened Animals*
<http://www.uia.org/projects/finarept/image34.htm>

1.6.3 Other species components of the WCMC website

1.6.3.1 Red List of Threatened Animals

A revised red list of threatened animals was released on the Internet, containing additional information and using the new red list categories developed by IUCN. This was made available on the Internet interactively, and includes for birds the information from *Birds to Watch 2* on why the species is listed.

http://www.unep-wcmc.org/species/animals/animal_redlist.html

1.6.3.2 Red List of Threatened Plants

Working collaboration with the Royal Botanic Garden in Edinburgh, the 1997 IUCN Red List of Threatened Plants was made available over the Internet interactively in much the same manner as the animals red list. An additional feature is the opportunity to comment on the records displayed.

<http://www.unep-wcmc.org/species/plants/overview.htm>

It should be noted that the data that is delivered using this interface was contributed by a number of organisations internationally, including the Nature Conservancy (US), the Australian Nature Conservation Authority and the National Botanical Institute (South Africa). As a result of restrictions placed on data release by one of these organisations, it is not possible to deliver a complete listing but only ten records at one time.

1.6.3.3 World List of Threatened Trees

During this period the *World Database of Threatened Trees* has also been completed and placed on the WCMC website. The database itself was developed in collaboration with the IUCN Species Survival Commission, and with the support of the Dutch Government. The INFO2000 project has helped to ensure that availability of the resulting database on the web.

<http://www.wcmc.org.uk/cgi-bin/SaCGI.cgi/trees.exe>

1.6.3.4 EU Wildlife Trade Reference Database

This site has been developed by UNEP-WCMC with a financial contribution from the European Commission. The information presented is produced from databases maintained by UNEP-WCMC on behalf of CITES and the EC. Information is provided interactively on taxonomy, common name, synonyms, IUCN threat category, trade decisions, listing on CITES and EC regulation No. 338/97.

<http://www.unep-wcmc.org/species/trade/eu/index.html>

The overall objectives of the site are:

- To support within the European Union the implementation of CITES and the EU Regulations on wildlife trade through the provision to national authorities of a comprehensive and up-to-date reference database covering all relevant species and EU decisions affecting their trade.
- To make available to a wider audience via Internet services the information on species covered by CITES and the EU wildlife trade Regulations, including details of Community import suspensions and other matters relating to the implementation of CITES.

1.6.3.5 CITES-listed Species Database

The Checklist of CITES Species and the Annotated CITES Appendices are produced from databases maintained by WCMC, this information is available on the WCMC website in an interactive format. This information resource is a result of collaboration between the CITES Secretariat, the Joint Nature Conservation Committee (UK), the European Commission and WCMC. There are separate databases for animals and plants.

<http://www.wcmc.org.uk/CITES/common/dbase/fauna/index.shtml>

<http://www.wcmc.org.uk/CITES/common/dbase/flora/index.shtml>

Unforeseen developments during the project

For reasons that are not entirely clear, the development, testing and implementation of the Species Conservation Database has taken far longer to implement than was at first expected. It is believed that the principle reasons are the departure of a key staff member to work for another organisation, and the different approaches to management of information on animals and plants that were inherent in the Centre's history.

Identification of future activities

1.6.4 Services to international agreements

It is intended to use the species databases far more in the future to service the information needs of international agreements, in the way that is already done for CITES. Information has now been entered on a range of other agreements, and the intention is to have a tool that can hopefully be used to harmonise and facilitate access to the information that these agreements have and need.

For example the database could focus on dealing with the following issues:

- Different agreements use different taxonomies, and recognise different distributions of species, despite the fact that they are dealing with the same commodities.
- Different agreements do not necessarily share information even if it is in similar formats, and do not usually make it widely available.

1.7 Web module: National parks and reserves

Workpackage 3-2 Deliverable 5052-7

Expected (original) delivery 30-11-98
Partial delivery 30-11-98
Full delivery 20-12-99

Background to the workpackage

One of the main objectives of this project is to make the links between information on Problems and human solutions developed and managed by UIA, and biodiversity information managed by WCMC in order to provide background information and context for biodiversity conservation action.

WCMC has compiled and managed information on protected areas – national parks and reserves - for many years, working in collaboration with the IUCN World Commission on Protected Areas and others. Some six years ago WCMC put the United Nations List of Protected Areas on the Internet site in an interactive format, but prior to the commencement of this project had not done further work on delivering protected areas information over the Internet.

Activities of the workpackage

1.7.1 Definition Phase activities

During the Definition Phase of the project, WCMC was able to develop databases and information tools sufficient for demonstration purposes, and to test concepts. In particular, WCMC developed the following tools and services, each of which relates directly to information being incorporated into the UIA Problems and Strategies files.

- Modification of the programmes managing *United Nations List of National Parks* to allow direct querying without going through the WCMC query forms. This allows for direct access to protected areas for a given country from the UIA Web site (or from any other site, providing the format is known).
- Development of a prototype Web-based protected areas database which delivers information on both nationally designated sites, and those sites protected by the World Heritage and Ramsar (wetlands) conventions and which participate in the UNESCO-MAB Biosphere Reserve program. Information provided includes summary descriptions of many sites, and information on the relationship between the nationally designated sites and those recognised internationally. This forms the basis for the development of significantly improved information services on protected areas, and facilitates development of information tools relevant to a wide range of international conventions and programs.
- Provision on the Internet of standard format descriptions of all natural World Heritage sites, both linked to the protected areas database described above, and accessible through an new interface specifically designed for access to this information. This provides IUCN, UNESCO and other users of such information better access.

1.7.2 Direct links between UIA and WCMC components

In development of databases and other information services delivering information on protected areas on the WCMC website, attention was paid to the need to be able to access entries in the databases or information services *directly* without going through the interface pages. For example, if a page on the UIA webserver was dealing with issues relating to national parks in Yugoslavia, it was important to be able to generate a query string that would return information on Yugoslavia from the WCMC databases directly and relatively seamlessly (as had been achieved for the species cross-references (see Section 10.2.2: Integration between partner databases (between WCMC and UIA))).

Unfortunately, this ambition fell short of final success for geographic place references. One reason is that UIA databases for Problems and Strategies are organised by issue rather than place. Where they occur, place references are in text fields (rather than title fields, as in the case of species). The extra procedures for capture of place names, flagging of entries and generation of valid search strings was beyond the current resources of the project. Further work is planned, in part dependent upon the success of another unfulfilled goal -- the generation of flood-fill maps from basic country data (Section 17.4.2: Specification for a simple "on the fly" mapping applet).

1.7.3 World Database on Protected Areas

During the Implementation Phase, the existing database has been thoroughly reviewed, designed and built. Working with two independent consultants, the WCMC protected areas database has been redeveloped for implementation in a *Windows* environment, using mechanisms that allow the same dataset to also be queried across the Internet using a browser.

Discussion with protected area professionals during redevelopment has allowed WCMC staff to explain what is being done. Feedback has been very positive, in particular on the following issues. 1) The ability to access all protected areas data held by WCMC on line is seen as a major step forward, increasing the ability of those providing data to also access information. 2) The ability to comment on the data on line, and potentially to update it in the future is also seen as a very positive step in moving towards a distributed database.

Discussion with an expert group on protected areas and tourism has led to the development of a module within the database on visitation and visitor statistics, which will be implemented and data incorporated over the next two years.

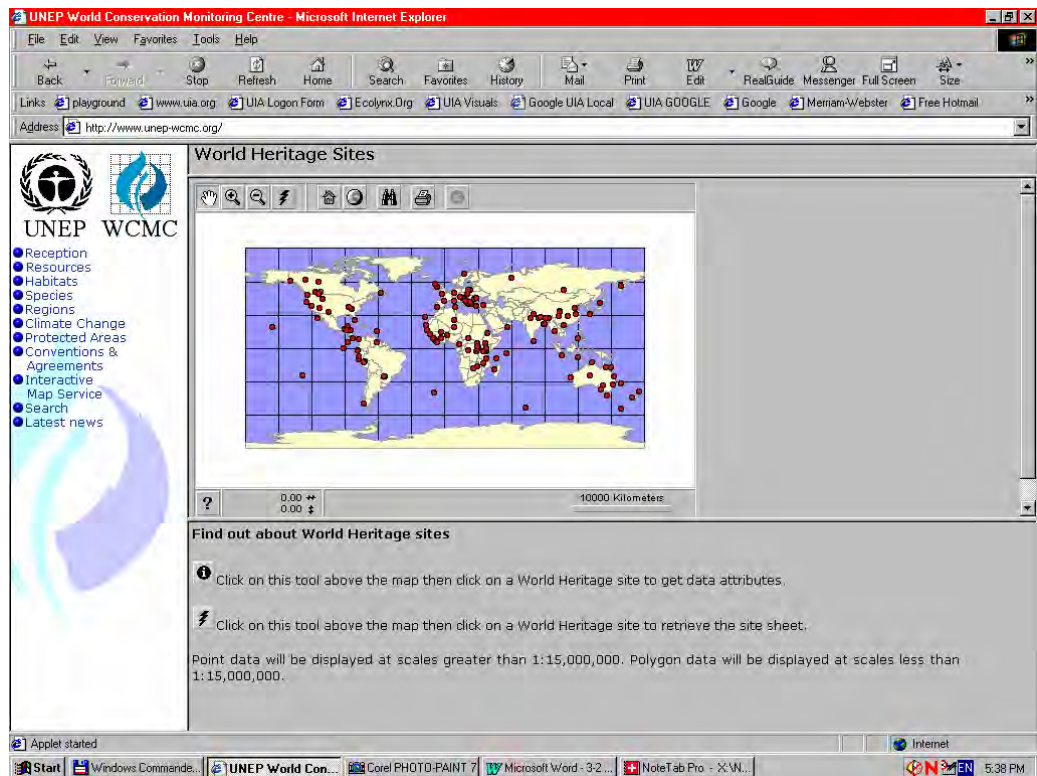
Discussion with an expert group on management effectiveness of protected areas, and collaboration with the WWF/World Bank Forest Alliance is leading to incorporation of more information on the effectiveness of the management of each protected area. Again this information will be compiled and incorporated over the next two years, although some trial datasets are already available.

During redevelopment, consideration has also been given to better integration with the maps of protected areas already held within the WCMC Biodiversity Map Library, and with the WCMC Internet Map Server. The capability for integration and linkage now exists, although this will not be fully implemented during the life of the project.

The database has been exhaustively tested with data for eight countries, and all of the data has been transferred to the new database. Testing of web access to this database was begun earlier this year, and full access is expected shortly.

1.7.4 Protected Areas Virtual Library

There is significant information on the world's protected areas to be found on the Internet, ranging from a number of excellent sites managed by national authorities, to the information services provided by international conventions and programmes. However, locating valuable information is not always easy unless users know what they are looking for, and are familiar with the use of Internet search engines, much time can be wasted in trying to locate the information required; and content and quality of Internet sites can vary widely.



WCMC Internet Map Server display of World Heritage Sites

<http://www.uia.org/projects/finarept/image35.htm>

The moderated *Protected Areas Virtual Library* provides a series of links to relevant websites in a structured manner from a single interface, thus facilitating access and ensures that these websites contain appropriate information, and are managed by competent authorities. The list of URLs on the Protected Areas Virtual Library was thoroughly reviewed and modifications made.

http://www.wcmc.org.uk/protected_areas/pavl/

This project is mentioned here because of the ideas listed in Section 7.4: Identification of future activities, below.

1.7.4.1 International PAs

A significant number of international agreements and programmes designate or recognise specific protected areas or other sites. WCMC has developed a prototype information service on those international agreements and programmes (Section 8.2.2.5: Harmonisation of information management and reporting), and the sites that they designate or recognise site, with information and links organised in standard format. The purpose here is to provide access to information in a straightforward manner, wherever that information may actually lie.

To support this WCMC is to develop further the data that the World Database on Protected Areas holds, and has reviewed the data held in both this and the WCMC

Biodiversity Map Library. Again this project is mentioned here because of ideas listed in Section 7.4:

Identification of future activities, below.

1.7.5 Other related protected areas projects

WCMC is currently carrying out several projects that use and build on the protected areas database, and has other projects in initial stages that require additional data fields and outputs. WCMC is in the process of reviewing all of these requirements, and discussing a programme for upgrade of the database with the consultants who developed the previous version.

WWF/World Bank Forest Alliance

The aim of this project is to support the work of WWF and the World Bank in assessing progress towards targets for forest protection. This has involved adding certain fields to the database, and testing implementation with a number of countries.

FAO (in the context of their Forest Resources Assessment)

This project has supported the compilation of protected areas maps from many sources, and this will support future work on linking the World Database on Protected Areas to the Internet Map Server. The aim of the project was to support the work of FAO and the UNECE in their forest resources assessment by providing information on forests set aside for conservation purposes.

European forests and protected areas: gap analysis

This gap analysis of forest protected areas in Europe was designed to provide information on the distribution and conservation status of European temperate forests, in support of the *Pan-European Biological and Landscape Diversity Strategy* and in particular WWF's *Forest Strategy for Europe*. Digital pan-European forest cover maps of potential and current forest cover were compiled together with a digital map of Europe's protected areas. Digital overlays of these data were undertaken and statistics produced indicating the current state of protection of differing forest types, in respect to the location of these forests within legally gazetted areas. Information arising from the project can be found on the WCMC website at: http://www.unep-wcmc.org/forest/eu_gap/

World Heritage Information Network

Following the critical review of this information service, WCMC has now installed new Internet search software *Muscat* with substantial discount from the supplier. This was tested alongside the previous service, and once it proved to be reliable the previous service was replaced. There have been various initial problems, largely arising from configuration issues. UNESCO has agreed to fund further work during 2000. This will include further outreach to national agencies in those countries with World Heritage sites to try to improve the information available.

<http://www.wcmc.org.uk/whin>

Unforeseen developments during the project

It had been intended to develop the WCMC protected areas database earlier in the project, working in collaboration with a leading computer software company. Unfortunately this collaboration did not come about. This is disappointing, as we hoped for significant “in kind” support. The key problem was their unrealistic expectation of what was achievable in a given time frame.

Identification of future activities

1.7.6 United Nations List of Protected Areas

The overall aims of this approved project are to report on the current status of the world's protected areas in response to a UN mandate, and to promote the harmonisation of information management and reporting for those international agreements and programmes concerned with protected areas. This will be achieved through the preparation of a new-format *United Nations List of Protected Areas* which not only lists the world's protected areas and presents synthesis and analysis of the information, but also seeks to meet the related information needs of a range of international agreements and programmes concerned with protected areas.

1.7.7 International protected areas

The intention is to further develop the database of international sites and the associated maps, and link this into the webpages that describe these international networks of sites. There is a potential here to assist convention and programme secretariats by providing the ability to look for areas of overlap and potential synergy.

1.7.8 Protected Areas *NET*work

The aim of the project is to increase access to information on the World's protected areas systems by: 1) promoting the increased use of the Web and other Internet tools by managers of protected areas in order to deliver information on their systems; and 2) fostering a coordinated approach to delivery of these services that naturally leads to a distributed information system on the world's protected area systems.

This project would be implemented by WCMC working closely with the WCPA Steering Committee. It is to be hoped that a Protected Areas *NET*work committee might be established, comprising those responsible for development of national protected areas Web sites.

Future implementation of the project will almost certainly involve the building of capacity within some agencies, and potentially development of partnerships between agencies in different countries where one country can be persuaded to support another. It will also involve the identification of potential assistance, including potential for partnership with industry.

1.7.9 Generated search strings and maps

As noted in 2.1 above, concerning conservation areas, the development of *direct* search query links from UIA data into WCMC data was not achieved during this project period. This technique had been successfully applied to species and bibliographic data during the project, but the project budget fell short of providing for the extra work to do the same for geographical entities. There is interesting potential for this activity to combine with another proposed future activity that would generate flood-fill maps from basic country data (Section 17.4.2: Specification for a simple "on the fly" mapping applet).

1.8 Web module: International agreements

Workpackage 3-3 Deliverable 5052-8

Expected (original) delivery 30-11-98
Beta test mode 30-12-98
Final delivery 28-02-00

Background to the workpackage

Three partners in the project have expertise and documentation on international treaties and accompanying measures concerning biodiversity. UIA has 2133 international agreements as database profiles in its Organisations file. This is a comprehensive global list of all treaties involving three or more countries but excluding European agreements at the level of directives, programmes and action plans. AIDEnvironment is expert in the field of European-level instruments and larger international instruments to which the EU is party. WCMC manages data relating to several international agreements on biodiversity, notably concerned with threatened species and protected areas.

This workpackage would develop interfaces for each of the major international agreements and programmes, allowing for more integrated linkage of information on strategies and biodiversity status. This would be done in collaboration with convention secretariats, which would provide opportunities for co-financing and for synergistic support (see Section 20: Subsidy, sponsorship and online charging). WCMC would also work closely with a number of agreement and programme secretariats on issues relating to information management and reporting, and especially on harmonisation of the work of the different agreements and programmes so as to increase synergy and reduce duplication of effort.

Activities of the workpackage

Documentation of international treaties and membership held in UIA databases, and that available on the WCMC website, has been integrated into the project website. This work has proceeded along several fronts.

1.8.1 Identification of international strategies and agreements

WCMC used its experience of global and regional conservation issues to identify strategies and agreements that are essential instruments in biodiversity conservation, and would therefore be key to the current project. The project team drew up diagrams illustrating the major conventions and programmes that should be covered by the project, and the information links between these conventions and programmes and other components of the project:

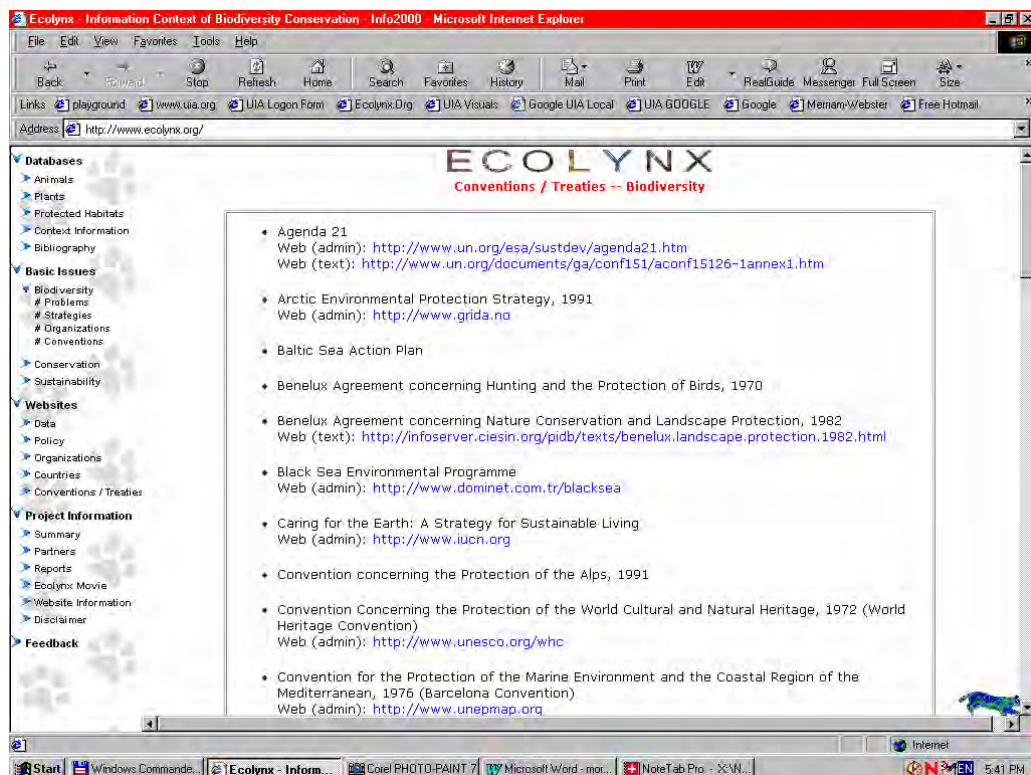
- **International strategies:** Global Biodiversity Strategy; Caring for the Earth; Caracas Action Plan; World Conservation Strategy.
- **Regional strategies:** Pan-European Biological and Landscape Diversity Strategy; Parks for Life: Action Plan for Protected Areas in Europe.
- **International Agreements:** CITES; World Heritage Convention; Ramsar (Wetlands) Convention; Convention on Biological Diversity; Convention on Migratory Species.
- **Regional Agreements:** EC Birds Directive; EC Habitats Directive; Bern Convention.

WCMC worked with UIA to locate electronic copies of the texts of these strategies and agreements, and to identify other documents and information sources that clarify the intent and implementation of these agreements.

AIDEnvironment provided a summary of the international conventions, treaties, agreements and non-legal instruments in place for environmental conservation¹⁶.

1.8.2 Integration of treaty material

UIA then integrated this material into the *Ecolynx* site. UIA incorporated this text and other appropriate information into the Strategies database and enabled these texts for keyword searching. It ensured that all the relevant documents were accessible and built the necessary links between documents. This provided a significant part of the framework for the *Ecolynx* website index option for international legal instruments on biodiversity.



Display of page showing links to international instruments concerning biodiversity conservation

<http://www.uia.org/projects/finarept/image36.htm>

1.8.3 Development of related services by WCMC

While the following activity is relevant to a greater or lesser extent to the work of this project, it is not necessarily an integral part of the project.

1.8.3.1 CITES and the EC Wildlife Trade Regulation

¹⁶ The fact that a substantial proportion of the agreements is European is not simply a consequence of the location of this project. There are far more international European agreements related to biodiversity conservation than for other parts of the world, mainly because of the pressing need for international cooperation on a continent made up of over 50 countries.

A website has been developed for the European Commission on the EC Wildlife Trade Regulation. There is significant information on the regulation itself, and its implementation, and then a database to support this. The overall objective of the site is to support within the European Union the implementation of CITES and the EC Regulation, through the provision to national authorities of a comprehensive and up-to-date reference database covering all relevant species and EU decisions affecting their trade. The information presented is produced from databases maintained by UNEP-WCMC on behalf of CITES and the EC. Information is provided interactively on taxonomy, common name, synonyms, IUCN threat category, trade decisions, listing on CITES and EC regulation No. 338/97.

<http://www.unep-wcmc.org/species/trade/eu/index.html>

WCMC also manages the CITES website on behalf of the CITES Secretariat, and this also includes a wide range of data. The *Checklist of CITES Species* and the *Annotated CITES Appendices* are produced from databases maintained by WCMC, this information is available on the WCMC website in an interactive format. This information resource is a result of collaboration between the CITES Secretariat, the Joint Nature Conservation Committee (UK), the European Commission and WCMC. There are separate databases for animals and plants.

<http://www.wcmc.org.uk/CITES/common/dbase/fauna/index.shtml>

<http://www.wcmc.org.uk/CITES/common/dbase/flora/index.shtml>

WCMC will be working with the CITES Secretariat during 2000 on the further implementation of their information strategy, which include harmonisation issues, and development of further information services for contracting parties.

1.8.3.2 Convention on Biological Diversity

During the Implementation Phase, WCMC completed work with the Secretariat of the Convention on Biological Diversity, which will lead to simplified and more complete reporting of national implementation of this Convention, and the ability to provide more comparative analysis of implementation of the Convention on the Internet in the future. This work was not done using resources from INFO 2000, but contributes directly to the aims of the project. More details can be found at:

<http://www.wcmc.org.uk/cbd/assessment/>.

WCMC is also working with a number of contracting parties to assist them in compiling information at the national level to review implementation. The aim is to collect information in a manner that will both support national requirements and provide input to the reporting process. More details can be found on the website mentioned above.

1.8.3.3 Convention on Migratory Species

During the Implementation Phase WCMC was contracted by the CMS Secretariat to prepare an information management plan for the convention and its agreements. This included a range of recommendations on information services and the harmonisation of approaches to the management of information and reporting, including the sharing of information between agreement secretariats. Further work will be carried out on this during the coming year.

WCMC also manages the website for the convention secretariat, and for the Africa Eurasia Waterbirds Agreement.

1.8.3.4 International agreements and programmes on protected areas

A significant number of international agreements and programmes designate or recognise specific protected areas or other sites. During the course of this project, WCMC developed a prototype information service on those international agreements

and programmes and the sites that they designate or recognise site, with information and links organised in standard format. The purpose here is to provide access to information in a straightforward manner, wherever that information may actually lie. To support this WCMC is to developing further the data that the World Database on Protected Areas holds, and has reviewed the data held in both this and the WCMC Biodiversity Map Library.

1.8.3.5 Harmonisation of information management and reporting

During the Implementation Phase, WCMC worked with international agreement secretariats on various information management projects including efforts to harmonise information management and reporting across the five global biodiversity-related treaties. This led to the development of common approaches to web sites, development of a metadatabase of reports and publications, ideas for development of common approaches to national reporting, and development of mechanisms for exchange of experience.

WCMC has also done significant work on the reporting requirements for international agreements, and there is potential for linking information on these requirements to the strategies and agreements within the UIA databases (see below), to the reports themselves on the different agreement websites, and to information in the WCMC databases (see web pages following):

<http://www.biodiv.org/sbstta3/sbstta3-i16.html>

<http://www.ecnc.nl/doc/projects/desisite.html>

<http://www.wcmc.org.uk/convent/treaties.htm>

http://www.grida.no/prog/cee/enrin/htmls/ukraina/kiev_rep.htm

WCMC is working with UNEP to organise a workshop later this to identify options for modular and streamlined national reporting, and is working with the UK Joint Nature Conservation Committee on a project to identify reporting obligations of biodiversity-related agreements and questionnaires.

Identification of future activities

1.8.4 UN List of National Parks and Protected Areas

As previously reported, WCMC has a mandate to develop the *UN List of National Parks and Protected Areas*, and it is WCMC's intention to use its next cycle of information collection and management to collaborate more closely with the secretariats of international agreements and programmes that recognise individual sites, and to make available information on these networks of sites from a single focal point on the web. During recent months WCMC has had discussions with several UN agencies about this new proposal on the UN List, and has received very positive feedback. The UN List project will be carried out over the next two years, and will contribute substantially to the information available on national protected area systems and how they relate to international agreements and programmes. Information on this project will shortly be available on: http://www.unep-wcmc.org/protected_areas/UNList/.

WCMC is just completing the process of drafting webpages to integrate access to information on these networks of sites, and this will be available shortly. It is then intended that WCMC will work further on these pages with the different secretariats, in order to foster the sort of collaboration described above. The draft webpages will be made available shortly at: http://www.unep-wcmc.org/protected_areas/international/

1.8.5 Harmonisation of species agreements

WCMC is considering carrying out similar work on species agreements and in particular harmonising the lists of species on the appendices of the various agreements. This would be heavily based on the work done during the INFO2000 project, and would provide a valuable service to the agreement secretariats and contracting parties. Proposals for this work are currently being drafted.

WCMC will continue to work with agreement secretariats to find ways to harmonise information management and reporting, and to identify information services that will support national action and reporting.

1.9 Web module: Issues, actions, treaties and organizations

Workpackage 4-1 Deliverable 5052-9

Expected (original delivery) 30-11-98
Delivered in beta test mode 31-01-99
With renewed feedback loops 04-04-99
Final delivery 31-12-99

Background to the workpackage

The UIA databases on *World Problems* and *Strategies, Actions and Solutions* have been developed since 1975 (see statistics Section 9.2.3: Quantitative database achievements); since 1997 they have been freely available on the web. The database on *International Organizations* is continually maintained and updated annually as the *Yearbook of International Organizations* (ca 40,000 profiles in its 37th edition). It is now available in subscription format on the web. In addition, the UIA has other related databases, such as international meetings; notable in the context of this project are constructive and destructive *Human Values* (ca 5,000) and understandings of *Human Development* (ca 4,000).

The UIA has made a heavy investment in the (hyper)linkages between "concepts" in a process of building up a network of interrelated concepts -- and the networks of organisations associated with them. This process is seen as a concrete step, beyond data and information, to knowledge building -- to the extent that this is associated with patterns of information. All UIA databases are hyperlinked intensively (within the database) and extensively (between the databases and beyond into the web).

International organisations are the principal source of UIA's information. The UIA acts as an information clearinghouse for over 40,000 international organisations. Iterative editing of this information over decades has created a rich and comprehensive knowledge resource, which when interfaced with the focused and detailed data of WCMC, provides an information context for biodiversity issues. Exploration of the UIA databases indicate that biodiversity issues are, directly or indirectly, implicated in some 60 percent of recognised Problems.

This *information context for biodiversity conservation* is often subjective and non-scientific. It accommodates value biases, and treats equally the priorities that different constituencies perceive as the most important and to which they would prefer to allocate resources. It holds and encourages debate. It is intended to address a policy challenge of the times: that it is relatively easy to design specific information systems and policies addressed to specific issues but, in information terms, there is little capacity to deal with "broad" issues, "shared" territory and the manner in which sectoral policies undermine each other.¹⁷ This challenge cannot be effectively met by

¹⁷As typified by the costs of the well-known problem of successively excavating and repairing the same road to lay gas, electricity, sewage, telephone and optical lines because of an incapacity to coordinate across agencies. A distinction may be also usefully made between information relevant to suddenly emergent crises (requiring immediate response) and information relevant to the considered articulation of policy options. In both cases, however, an unpredictable range of factors will determine the scope of what is considered relevant. These may include, for example, tolerance for complexity versus need for simplicity (political,

reliance on overly specific information systems, nor on information systems that deliver old information rather than integrate new insights.

For reference, a structured presentation of the UIA initiative in processing information on Problems and Strategies is available on the web in the following documents.

1.9.1 Processing problem / issue information

1.9.1.1 Significance

[Acknowledgement of the universe of problems](#)

[Constraints on a problem-focused approach](#)

[Framework for interrelating incompatible perspectives](#)

[Unique features](#)

[Precedents and parallels](#)

[Precedents in history and tradition](#)

1.9.1.2 Criteria

[Assumptions](#)

[Problem disguises and problem evasion](#)

[Definitions](#)

[Problem inclusion](#)

[Problem exclusion](#)

[Problem importance](#)

1.9.1.3 Method

[Identification procedure](#)

[Problem naming](#)

[Document control and problem description](#)

[Inter-problem relationships](#)

[Conceptual processes summarized](#)

1.9.1.4 Patterning problems

[Concept refinement process](#)

[Classification and section attribution](#)

[Language games](#)

[Patterning the problematique](#)

[Computer representation of problem networks](#)

1.9.1.5 Comments

[General](#)

[Approaches to problems](#)

[Beyond the problem-lobby mindset](#)

[Problem metaphors](#)

[Problem perception and deception](#)

[Problem perception and levels of awareness](#)

[Integration of perceived problems](#)

[Phases of human development through challenging problems](#)

[Future possibilities](#)

1.9.2 Processing strategy / action / solution information

The UIA concern with environmental and development strategy was brought to a focus through a contract to analyse the many specific proposals fed into the Earth

institutional, cultural, and personal). Together these then lead to a particular focus which excludes 'external' factors labelled by the user as 'secondary' or 'low-priority'—although advocates of opposing policies, who may also wish to use the product, may question this judgement.

Summit (Rio de Janeiro, 1992) by a variety of international bodies. The approach taken is outlined in Section 26, Annex E: Configuring intersectoral strategic dilemmas.

1.9.2.1 Significance

Approach

Intended uses

Background and acknowledgements

1.9.2.2 Method

Definition

"Positive" vs "Negative" strategies

Document control and strategy description

Identification procedure

Strategy naming

Relationships between strategies

Relationships to other sections

Computer-assisted generation of strategies

Conceptual processes summarized

1.9.2.3 Patterning strategies

Classification and section attribution

Concept refinement process

Language games

Patterning the resolutique

1.9.2.4 Strategic ecosystem

Configuring strategic trajectories

Beyond "The Plan"

Feedback loops and dependent co-arising

Network strategy

Integrating constraint and opposition

Configuring strategic dilemmas in intersectoral dialogue

Computer representation of strategy networks

1.9.3 Governance and policy implications

1.9.3.1 Governance

Resolutique

Providing a strategic framework

Capacity to govern

Uncommon strategic opportunities

Public management

Spiritual challenge¹⁸

1.9.3.2 Strategic denial

Misappropriation of words of power

Reframing the unknown

Unmentionable realities

Unwritten rules and wishful thinking

Action inhibition

1.9.3.3 Post-crisis opportunities

Range of strategies

Strategies in chaos

¹⁸ See also Posey, D A et al, 1999. *Cultural and Spiritual Values of Biodiversity: A complementary contribution to the Global Biodiversity Assessment*. Intermediate Technology Publications, London for and on behalf of UNEP.

Strategies in meetings
Paradoxical merit of negative strategies
In quest of the socio-economics of non-action
Global strategy and the game of go
Strategic metaphors for thriving
In quest of radical coherence

1.9.3.4 Collective strategy-making: designing a strategic array

1.9.3.5 Strategic appropriateness

Questionable answers
Accumulation of significance
Integrating opposition
Beyond method
Constraints on a meta-answer

1.9.3.6 Embodying discontinuity

Containing the incommensurable
Order through chaos

1.9.3.7 Action implications

Consensus, uncertainty and action formulation

1.9.3.8 Tables and typologies of strategies

Strategy "action qualifiers" organised in the light of strategy clusters
Inter-sectoral strategic dilemmas of sustainable development
Typology of 12 complementary strategies essential to sustainable development
Table of stratagems (Chinese)
Table of confidence ploys

Activities of the workpackage

1.9.4 Substantive activities

The range of UIA database profiles concerning actions for sustainable development, strategies for biological conservation, and proposals and initiatives for environmental protection was substantially expanded during project period. Approximately 3,197 new strategy profiles were added. Text improvements were made in existing profiles relating to environmental treaties concerning species and habitat conservation and their links to relevant organisations and websites. The logical structure of hierarchies within the databases was strengthened. Using materials provided by international organisations and others, various subject and issue areas were also specifically developed; the following are indicative:

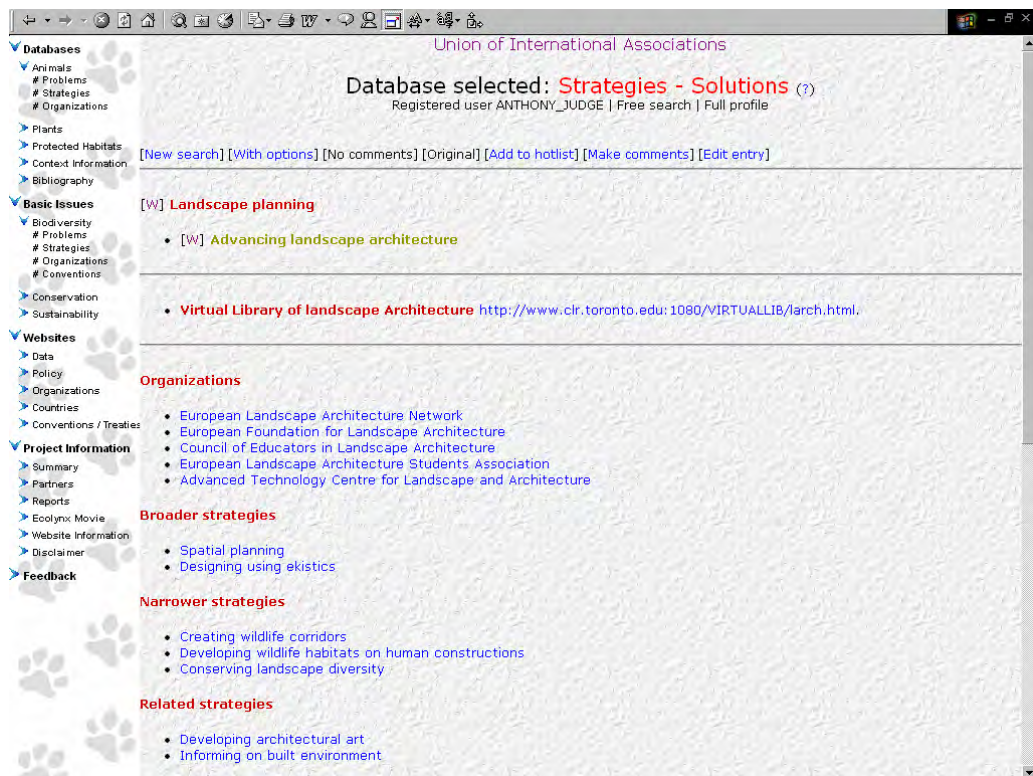
- Individual threatened species and habitats
- Relationships between human settlements, environmental impacts and conservation;
- Social forestry and reforestation;
- Traditional ecosystem management and indigenous conservation practices;
- Biodiversity conservation concerning wild types and indigenous landraces of commercially significant plants and animals;
- Biodiversity conservation and medicinal plants and other socially valuable species;
- Technology transfer relevant to biodiversity conservation
- Biodiversity and economics
- Biodiversity and trade
- Monitoring and reporting of biodiversity-related activities

- Outcomes of the CSD process (Rio+5 and related activities), including international conventions associated with *Agenda 21* and other major environmental plans, strategies and actions.
- Review of the latest materials from relevant international organisations, particularly from the Council of Europe and other European institutions, and from IUCN, WWF and other NGOs concerned with species and habitat conservation.

There was a 30% increase in descriptive text in the Strategies database during the project period, and 34% increase in that for Problems. (These figures do not include either title characters or cross-reference information. Over 90% relate to the Problems or Strategies of types A to F.)

During the Definition Phase, the UIA focused on identification of organisations to be included in the prototype. Organisations were identified both from UIA files (*Yearbook of International Organizations*) and from the Web (other organisations and Web pages, news groups etc). This work continued throughout the Implementation Phase with the result that there are now 23,792 hyperlinks between the profiles Problems and Strategies and those of Organizations. Especial attention was paid to profiles of international treaties and agreements (see also Section 8.2.2: Integration of treaty material).

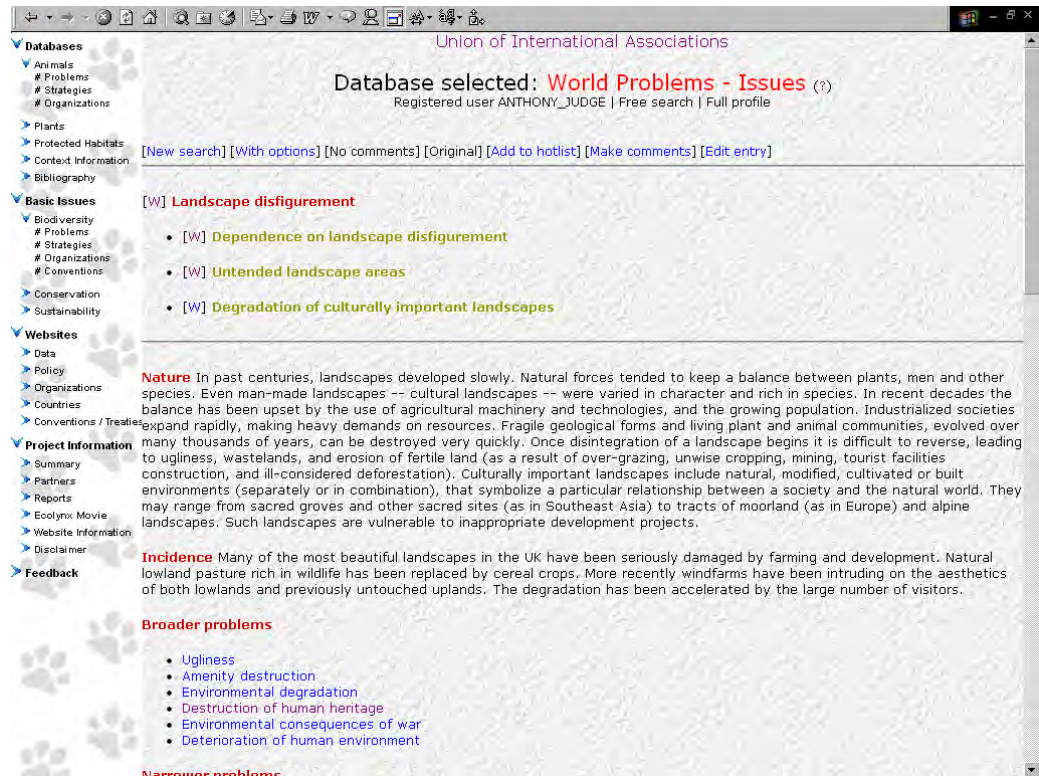
Bibliographic references were also added. There are now 9,890 references hyperlinked to Problems and Strategies (see also Section 13: Integration of bibliographies)



Part of a UIA Strategy profile showink hyperlinks to Organisations and other strategies.

<http://www.uia.org/projects/finarept/image18.htm>

In the case of the Problems database, 46,662 profiles were added during the project period. A major proportion of these was of the form “Threatened species of []”, referring to animal and plants species in the *Red Lists* arranged within their higher taxa (see also Section 6.2: Other species components of the WCMC website).



Part of a UIA Problem profile showing user options, web search options against alternative titles, text fields and cross-relationship fields
<http://www.uia.org/projects/finarept/image19.htm>

External links to web pages from Problems and Strategies now total 3,989. This does not include query links associated with the Problem and Strategy titles (total 140,509).

This web module was delivered in beta mode at <http://www.uia.org/data.htm> and is now available through the *Ecolynx* website.

1.9.5 Methodological initiatives in data handling

1.9.5.1 Comprehensive but partially opened hierarchies

To ensure the product's relevance to unforeseeable conservation concerns, it must endeavour to provide a *context* for information on the range of animal and plant species variously estimated at from 5 to 30 million in number—any one of which may emerge as a nexus of environmental concerns. However, comprehensive information at this level of detail is either unavailable or represents an excessive input investment impossible to justify at this time for this project. Especially in the course of UIA's work, it was therefore essential to investigate and develop data-handling techniques to avoid the immediate need to handle detail on the universe of biological species whilst maintaining the coherence and inclusiveness of the overall data structure.

The approach taken in the case of the Problems file was to use taxonomic clusters of species wherever the cost of encoding detail proved inappropriate. Taxonomic branches were therefore opened to those levels of detail necessary to capture individual species or species groups currently considered endangered—or to the level

of family, order or class in other apparently non-critical cases. In this way, the comprehensive nature of the database is ensured without expanding taxonomic structures to their fullest detail. Hyperlinks are made to the lowest level of detail possible. (The technique is common in outliner functions in word-processors and in zooming features in many graphics packages.) As resources and collaborators become available, higher levels of detail can be documented.

Using this logic, the range of UIA database profiles on threatened biological species as World Problems has been considerably extended to explore possibilities of providing entry points to WCMC data (described in 10.2.2). This involved the generation of over 40,000 new Problem profiles of the form "Threatened species of [taxon]". Profiles have been hierarchically arranged according to the taxonomy of species. Profiles opened at species level were for those species on the *Red List of Animals* (12,062 profiles) and *Red List of European Plants* (1,057 profiles); profiles opened at the genus level were for those plant genera containing species on the *Red List of Plants* (around 28,000 profiles of the genera containing the 140,000 species on the List). The raw data was provided by WCMC¹⁹.

Similar work was undertaken for habitats. During the Definition Phase, an experimental hierarchical framework was created for 303 threatened habitats/ecosystems and biomes. Initially this was to explore the feasibility of interlinking individual species and protected areas through data on habitats. The habitat types were arranged in interlacing hierarchies corresponding to the classification parameters of the information source. Subsequently, other hierarchies were added (see also Section 12: Information on habitats).

1.9.5.2 Interactive commenting and editing

Perhaps the greatest problem in developing functional information networks is the reluctance of data providers to provide data. There are various reasons that "data providers" may be unwilling to release the information, and we have been trying to address all of these. Firstly we recognised the need to move towards a true network approach, where the data provider can provide access to his data without it being sent elsewhere. Secondly we needed to ensure better information within the database on source and quality of information. Thirdly we needed better accountability of how the information is being used. The partners have been working on all these fronts during the course of the project.

It was recognised that the promotion of consistent, two-ways flows of information / knowledge was essential if data quality was to be maintained and improve. An interactive feature for commenting (and editing for authorised people) has been built into the online systems of both partners and applies to those databases accessed through *Ecolynx*. The UIA comment facility has been in test mode for a number of months (see Section 4.2.2.7: User feedback options). Guidelines and technical protocols have been gradually improved (eg see Section 28: Annex F: Further challenges on UIA server). Still in some flux are the editorial logistics of managing user comments and facilitating access at appropriate levels of accreditation -- without alienating those whose views whom some may consider irrelevant or out-dated.

1.9.6 Quantitative database achievements

Two sets of databases are maintained on-line by the UIA:

¹⁹ Sources of additional data and taxonomy were the *Zoological Record* (Biosis website) and *Five Kingdoms* (ETI, World Biodiversity Database CD-ROM), the Germplasm Resources Information Network (GRIN), various academic library, museum and herbarium registers and the Global Plant Checklist of the International Organization for Plant Information (provisional database with 300,000 vascular plant species and 1,000,000 names).

- **Static:** Since 1997, when this project began, the UIA has maintained on-line very *extensive demos* and *comprehensive lists* relating to profile data on international organisations, World Problems, Strategies, Human Development, Human Values, etc. These have been freely accessible via the UIA homepage (<http://www.uia.org/>), specifically via an introductory page (<http://www.uia.org/uiademo/demohome.htm>). These pages have not been updated very frequently.
- **Dynamic:** Since January 1999, as a consequence of this project, the UIA has been progressively providing full access to an *extensive range of its databases*, especially World Problems, Strategies, Human Development, and Human Values. Access to these has been provided freely via the UIA homepage (<http://www.uia.org/>), specifically via an introductory page (<http://www.uia.org/data.htm>). Access to other databases identified there has only been provided to a limited number of users for test purposes. The on-line versions of these databases have been updated on a monthly basis.

Since June 1999, users accessing many static older database pages or lists have been (automatically) redirected into the updated dynamic pages. This process will continue.

Content development has continued throughout this project and is expected to continue to the final date of the project (and beyond). Quantitative progress regarding content has been progressively calculated at approximate three-month intervals and shown online at:

“Statistics on Organization Strategies” <http://www.uia.org/strategy/stratcon.htm#stats> and “Statistics on World Problems” <http://www.uia.org/problems/probcom.htm#stats>.

Summary statistics comparing before and after the project are shown in the table below.

	Problems – Issues						Strategies—Solutions					
	Profiles			Links			Profiles			Links		
	1996	2000	%	1996	2000	%	1996	2000	%	1996	2000	%
A	0	196	n.a.	0	3,507	n.a.	0	1,518	n.a.	0	16,767	n.a.
B	170	187	10%	5,300	7,090	34%	158	154	-3%	3,697	4,253	15%
C	575	722	26%	13,816	19,347	40%	1,100	1,089	-1%	17,096	25,206	47%
D	2,162	2,740	27%	30,613	52,451	71%	3,315	3,452	4%	19,374	43,329	124%
E	3,857	5,378	39%	29,626	52,587	78%	3,008	5,298	76%	11,092	50,677	357%
F	3,072	3,917	28%	38,625	61,604	59%	1,382	1,972	43%	7,015	19,580	179%
G	2,153	30,279	1306%	5,979	47,112	688%	7,685	13,107	71%	3,604	69,059	1,816%
Other	214	12,716	5,842%	905	26,255	2,801%	12,850	6,105	-52%	61,129	34,070	-44%
Total	12,203	56,135	360%	124,864	269,953	116%	29,498	32,695	11%	123,007	262,941	114%

Unforeseen developments during the project

Progress on this deliverable was steady throughout the project but was delayed on occasion by server and software difficulties and work on prior features, notably for feedback loops (Section 11: Feedback loops) and treaties (Section 8: Web module: International agreements).

Identification of future activities

1.9.7 Continuing development of UIA databases

The UIA has every intention of continuing work on its databases. The work on Organisations has been self-sustaining for many years. Progress on the Problems and

Strategies databases usually depends on project funds, which are being sought in various ways. UIA also hopes that surplus revenue for further development may be created by the new online subscription service of the Organisations databases and the soon to be enabled subscription to the International Meetings database.

1.9.8 Supporting development of the policy agenda

We would seek opportunities to work with the tools we have developed to inform and drive the policy debate and provide a planning context for priority issues. For example, the Convention on Biological Diversity Conference of the Parties in 2002 will discuss “alien species” amongst other things (and there is also a big conference on Alien Species at the end of this year). Another big issue is “coral bleaching”.

Another example is Rio+10. In preparation for the upcoming World Conference on Environment and Development in 2002, the UIA would build on its structuring work for the earlier event in 1992 (analysing agendas and action plans), as articulated in Section 27, Annex E: Configuring intersectoral strategic dilemmas. While the agenda for the first Rio Conference was “what should we do?”, Rio+10 is addressing the question of “what is not being done (and why)?” The large amounts of new content and hyperlinkage in the databases, and the newly developed modes of visualising these (see Section 16.2: Multimedia visualization, Activities of the workpackage), has the ability to raise scope this question and raise the analysis to a new level. UIA is seeking funds for this exercise.

1.9.9 Integration with legal databases

The past few years have seen the development of some excellent web resources on international environmental agreements, such as the Joint Environmental Law Information Service (IUCN and UNEP). We would seek closer integration with these by: 1) offering features which they do not have, such as flood-fill maps of membership and web addresses of responsible organisations, and 2) direct search query linkage, rather than hard linking, into their databases.

1.10 Integration of information

Workpackage 5-1 Deliverable 5052-10

Expected (original delivery) 31-11-99
Draft delivery 28-02-99
Final delivery 31-13-00

Background to the workpackage

UIA and WCMC are the data providers for this project. The data is either held on site or integrated and delivered by various means from other sources. Both organisations have extensive digitised holdings and websites on which increasing amounts of this material are being made available (respectively <http://www.uia.org/> and <http://www.unep-wcmc.org/>). The datasets held by the organisations have been generated, and are maintained on a more or less continual basis, by the respective partners.

One notable feature of the project was the essential difference between the nature and scope of the database activities of the principal partners. Improving the interlinkages between these datasets would increase their value in policy analysis, issue identification and public comprehension. This highlights a major value of the project but also was the source of a continuing challenge in achieving any viable integration to honour this complementarity.

Leading into the Definition Phase, a major concern therefore was to explore the feasibility of linkage between UIA data, WCMC data and relevant external websites. At the same time, given the large quantities of data involved, another concern was to develop estimates of additional work required to integrate, by hyperlinking, the text information held by UIA and WCMC.

Activities of the workpackage

During the Definition Phase, and for purposes of demonstrating and testing the integration between UIA and WCMC data, effort was devoted to further articulating the UIA content with respect to environmental issues. This provided a pattern of links (including query links) into WCMC data and relevant external websites. It also developed estimates of additional work required to develop more effective linkages between the databases managed by the two organisations, so as to be able to deliver integrated policy-relevant information products and services.

After this early work, the original idea of physically “integrating” the WCMC and UIA data was quickly replaced by “integration” using the web. This approach avoided the complications of harmonising source data and is also highly consistent with the current evolution of web organisation.

During the Implementation Phase, WCMC and UIA periodically reviewed the possibilities of integration between their two sets of databases as their respective information systems evolved during the period of the project. The following work was done.

1.10.1 Integration within websites (WCMC or UIA)

During the project, both UIA and WCMC have engaged actively in increasing the degree of integration between the various databases and information services within their own websites.

1.10.1.1 UIA

Within databases

In case of UIA, the number of internal hyperlinks within its databases is shown in the Table in Section 9.2.3: Quantitative database achievements.

In the case of the many profiles in the UIA databases, great importance was attached to grouping them into multi-level hierarchies, refining these hierarchies progressively – if necessary by splitting or combining profiles. This process was vital to enable the functional links to be usefully positioned. The loop analysis procedure (Section 11.2.1: Loop analysis) was very helpful in focusing editorial attention on profiles that called for extra work. Information on new Problems or Strategies, for example, was very helpful in testing the robustness of such hierarchies and consolidating profiles (eliminating duplicates, detecting gaps and inconsistencies). Formation of appropriate hierarchies was a key technique to enable the UIA to hold information on millions of species for which individual profiles could not necessarily be provided at the species level.

These links identify the reported causal relationships between Problems or between Strategies. They are the basis for any loop analysis. They are also vital to any understanding of the inter-sectoral (or interdisciplinary) relationships between Problems or Strategies, notably the manner in which Problems are aggravated by other Problems.

Between databases

The UIA was able to convert its integrated in-house DOS-level database structure into an equivalent *Windows*-based form based on a web in order to generate pages dynamically in response to user queries. This process involved the intermediary step of moving data provisionally held on a static page server (for demo purposes, during the Definition Phase) onto a dynamic page server, whilst building up pages on the static server (indexed by search engines) to facilitate access into generated pages from the dynamic server. This integration between the two distinct servers works very satisfactorily

The UIA was able to develop a common search interface for its Problems, Strategies, Values, References, and Organizations database (see also [Ecolynx](#) interface, 10.2.2 below).

The UIA explored several alternatives to the conventional text entry points (*Java* spring maps, virtual reality – see Section 16.2: Multimedia visualization, Activities of the workpackage) and was able to ensure that these could be used in conjunction with the text entry points.

1.10.1.2 WCMC

In the case of WCMC, three approaches have been tested further.

- The first is using a map-based interface to access all information relevant to a particular region, which has been tested for data on the Mediterranean region and will be expanded to other marine regions shortly.
- The second is a new test interface for accessing all databases on the WCMC website which have information relating to a particular country from a single point.
- The third is the integration of information on species, so that data of the status and distribution of species is linked to information on the inclusion of the species within

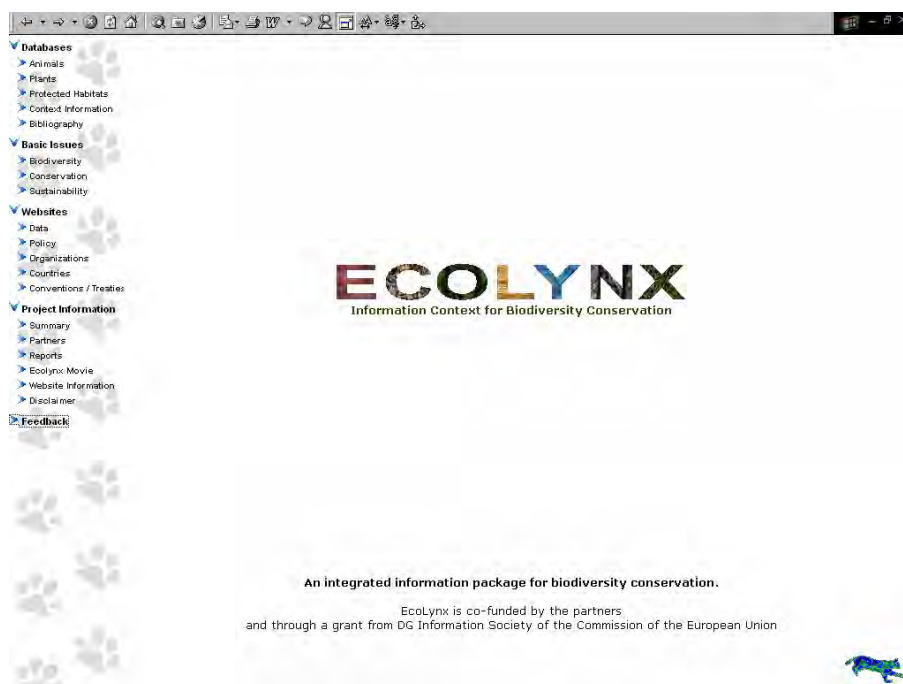
international legislation.

Another issue tackled by WCMC was the redevelopment of the library catalogue, which allowed improved linkage of bibliographic information to different parts of the WCMC website (see also Section 13: Integration of bibliographies).

1.10.2 Integration between partner databases (between WCMC and UIA)

1.10.2.1 *Ecolynx* entry page

The project website domain was registered in January 2000. The URL is <http://www.ecolynx.org/>.



Ecolynx front page

<http://www.uia.org/projects/finarept/image7.htm>

The website is a principal vehicle through which data integration is achieved. To date, the website is structured as a portal into the UIA and WCMC sites and other websites. There is a frame index with selected subject groups, which should represent the first concerns of most users. Later efforts may improve upon aesthetics and design, in response to user feedback.

1.10.2.2 Generated query links

A prime focus for work was on the development of query links from relevant profiles in UIA database profiles into WCMC database profiles. Users of UIA databases can now be passed from a large number of UIA profiles directly into the relevant part of the WCMC databases. These links are generated automatically. To achieve this, UIA had to build up sets of entries on species (plants (including fungi), animals and other living organisms) with relevant names to seed such searches appropriately.

1.10.2.3 Bibliographic links

Automatically generated bibliographic searches were enabled from relevant UIA profiles into the new WCMC bibliographical database (Section 13: Integration of bibliographies).

1.10.2.4 Hardlinks

Where appropriate, hardlinks were inserted into UIA data entries, notably in the Strategies database, to provide access to sets of pages on the WCMC site. These now number over 100.

1.10.3 Integrating users

As described with regard to the user feedback facilities (Section 4: Interactivity: search and feedback facilities and Section 9.2.2.2: Interactive commenting and editing), steps were taken to offer users the opportunity of actively participating in the evolution of the UIA database entries (rather than just reading them as passive users).

1.10.4 Integration from partner databases to other websites

Here the concern was to enable linkages into other relevant information services, especially to biodiversity sites). Again a combination of generated query links to search engines and hardlinks to relevant sites was used.

1.10.4.1 Hard links

During the course of the project, 3,989 links were inserted from Problems and Strategies profiles of the UIA databases to websites of other organisations, in addition to made from these databases into the Organisations database (with its own hard links to their websites). None were present before the project commenced.

WCMC has concentrated on development of links in four specific areas, both to test working practice, and to develop the potential for future work. These are as follows:

Protected Areas Virtual Library. There is significant information on the world's protected areas to be found on the Internet, ranging from a number of excellent sites managed by national authorities, to the information services provided by international conventions and programmes. However, locating valuable information is not always easy unless users know what they are looking for, and are familiar with the use of Internet search engines, much time can be wasted in trying to locate the information required; and content and quality of Internet sites can vary widely. The moderated *Protected Areas Virtual Library* provides a series of links to relevant websites in a structured manner from a single interface, thus facilitating access and ensures that these websites contain appropriate information, and are managed by competent authorities.

Country Knowledge Server. This service is a preliminary attempt at identifying links to websites that provide biodiversity information organised by country. This includes those sites delivering national reports for international agreements, the country profiles produced by bilateral and multilateral aid agencies, and so on. This is a preliminary effort at promoting avoidance of duplication of effort at national and international levels.

International protected areas. A significant number of international agreements and programmes designate or recognise specific protected areas or other sites. This is a prototype information service on those international agreements and programmes, and the sites that they designate or recognise site, with information and links organised in standard format. The purpose here is to provide access to information in a straightforward manner, wherever that information may actually lie.

Africa-Eurasia Waterbirds Agreement website. WCMC is developing this website in collaboration with the secretariat of the agreement (based in the Netherlands) and Wetlands International. The website is on the WCMC server, but the maps are being prepared by Wetlands International and placed on their server.

1.10.4.2 Generated query links (web generally /web for books / web for images)

In the case of UIA profiles, query links are generated on the basis of each of the alternative titles for Problems or Strategies. This enables the user to employ a search engine to query the web for further sources of information based on the title as a phrase. The search engine currently used is Google (rated number 1) which also provides a modest income stream to the UIA for maintenance of the *Ecolynx* website (Section 20.4.1.5: Achieving sustainability).

The UIA continues to experiment with generated links into the amazon.com book search facility. It is also intended as a modest source of revenue. A particular difficulty encountered in testing this facility has been to determine what keywords to use in the search string in the case of Problems or Strategies with more complex titles, or many alternative titles. Further testing of this was beyond the current means of the project. (WCMC did have, and intends to reinstate, direct search links from bibliographic records to amazon.com, and intends similar links to distributors of partners' publications. This was not possible for a time because of VAT implications.)

1.10.5 Collaborative links

As a result of contacts with the European Environmental Agency (EEA), UIA was encouraged by representatives of the Agency to explore the possibility of adapting its data to query via servers using the Z39.50 protocol. UIA discussed this with WCMC and the situation of the two bodies with respect to this possibility was transmitted to the Agency with a view to special funding to adapt the two sets of databases to such querying (Sections 25 and 26, Annex C: WCMC and the Z39.50 protocol and Annex D: UIA and the Z39.50 protocol). On 25 August 1998, an EEA information officer who was enthusiastic about the prospect visited UIA; the matter was also referred to others in the EEA by WCMC. Unfortunately, none of the parties could commit the necessary resources to the activity during the project period, and so it remains a future possibility. This collaboration is likely to cover information on internationally designated sites and species covered by international legislation, and may also cover nationally designated protected areas.

WCMC met with representatives of the EEA and the ETC/NC on several occasions to discuss future collaboration in delivery of information services on the Internet. The only programme where this is currently happening is on protected areas. WCMC works with the EEA and the Council of Europe on the *Common Database on Designated Areas*. The aim of this work is to ensure that each country is only approached for information once, not once by each international organisation.

Unforeseen developments during the project

Possible use of the Z39.50 metadata protocol arose during the course the project and is discussed in 2.5 above.

Identification of future activities

1.10.6 Intelli-Work

The UIA is exploring the possibility of "Intelli-work" – a Procedural Framework for the Interoperability of Decentralised Knowledge Management Processes Based on Diversity of Partners, Commitments and Competencies. For the UIA as project coordinator, the prime concern of this telework proposal would be to develop the

template provided by its existing software facilities and editorial practices as a means of interacting with a growing network of distant editorial and user partners of different categories and competencies. The motivation is to seek practical ways of involving editorial and research partners, notably in economically-challenged and rural areas, developing countries and other regions (such as Eastern Europe) as part of a self-organising knowledge-base network. This form of telework goes beyond the simpler models of packaged, prescribed and self-contained tasks, with bilateral communication between a remote "tele-agent" and a central "tele-agency". It seeks to develop a distributed editorial team, which participates in the management and evolution of knowledge bases, and is fully capable of interacting with others in the network (outside of central switching) and works flexibly and responsively within a framework of guidelines (rather than fixed rules).

The key issues for investigation are seen to be:

- **Editorial decentralisation:** Determining how best to decentralise different levels of editorial work on complex databases
- **Quality management issues:** Integrating contributors of different motivations and competencies
- **Infrastructure management**
- **Reward and remuneration procedures:** Their reconciliation (both in practice and in perception) so as to sustain rather than undermine enthusiasm of a variety of collaborators with different motivations
- **Transforming tele-users into tele-workers:** Integrating the role of on-line user with that of on-line contributor
- **System security:** Developing fail-safe mechanisms
- **Tools and techniques:** Provision of a variety of interfaces to support the telework process
- **Self-organisation:** Developing techniques of self-organisation and a sense of their limitations

1.10.7 Improvement of generated query links

As indicated above (Section 10.2.4.2: Generated query links (web generally /web for books / web for images)), the UIA seeks to improve its techniques for generating query links into web search engines, either for documents, multimedia files or other resources (eg *Amazon*).

1.10.7.1 Protected Areas Virtual Library

The intention is to facilitate improved access to quality information on protected areas on the Web, and possibly in the future to use this as a vehicle both for capacity building at the national level and as the basis for a distributed protected areas database and information service. The next steps are:

Improving content by:

- Regularly search the web for relevant material, and add it to the virtual library.
- Using protected area professionals to assist in locating relevant web sources.
- Improving opportunities for users to recommend the addition of other web sources.
- Considering the addition of new services in collaboration with protected area professionals.

Improving structure and functionality by:

- Reviewing the existing functionality with users and potential users.
- Developing improved functionality based on the advice received.
- Developing a database to hold web addresses and information about web sites, to simplify the process of adding new web sources.

Improving use by:

- Advertising the *Protected Areas Virtual Library* more widely.
- Improving opportunities for users to comment on the services provided.
- Using protected areas meetings to promote the *Protected Areas Virtual Library*.
- Reviewing options for establishing a search facility across all sites in the *Protected Areas Virtual Library*.

1.10.7.2 Country Knowledge Server

The intention is to add tools that allow the choice of country to be made at the top level, and then all of the subsequent links to information on that country to be identified and tabulated. This will require either the careful configuring of the WCMC search tools, or the development of specific search and retrieval tools.

1.10.7.3 International protected areas

The intention is to add more data to this information service so that comparative analysis can be made of the sites covered by the 20 or so different international agreements and programmes, and the further 15 regional agreements and programmes.

1.10.7.4 AEWA website

Future work is already planned, and it is expected to be funded later this year (2000). This will extend the prototype, which only covers certain species to include all of the species covered by the agreement.

1.11 Feedback loops

Workpackage 5.2 Deliverable 5052-11

Expected (original delivery) 30-11-99
Delivered in beta test mode 04-04-99
Final delivery (amended) 31-02-00

Background to the workpackage

In parallel with the work on individual data elements in the Strategies and Problems files (Section 9.2: Web module: Issues, actions, treaties and organisations, Activities of the workpackage), UIA undertook to advance its explorations of feedback loops (both self-reinforcing and self-damping), specifically for this project in the fields of environment and conservation. The specifications for this work were to:

Develop, refine and seek to dynamically display the self-sustaining, interlocking loops of conservation issues and solutions. In the event that on-the-fly generation and visualisation of loops is feasible during web server access, such dynamic displays would be developed as a means of shifting the level of analysis beyond seemingly isolated environmental Problems and Strategies. The visualization tools would then be adapted to assist editorial and error detection processes. The key issue here is speed of detection and generation of loops. This will be explored as a combination of machine capacity, algorithm logic and display design.

The significance of this work is that there has long been recognition of how one problem can aggravate another and of how several Problems can reinforce each other. The UIA data register many relationships between Problems in complex networks. Clearly such relationships may form chains or pathways linking many Problems. But hidden in the data as presented is also the existence of chains that loop back on themselves. The UIA data offer a unique opportunity to identify such feedback relationship loops or cycles through which several Problems constantly reinforce one another.

The notion of “loops”, and its relevance to this project, requires some further explanation. As defined by the authors of *Making Strategy*²⁰, in describing the value of *Decision Explorer* (Section 16.2.4: Decision Explorer): a loop represents a description of a chain of consequences that produces a dynamic outcome by feeding off itself (positive feedback = “vicious” or “virtuous” loops), or by controlling itself (negative feedback). Typically a feedback loop will be an important strategic issue in its own right. The purpose of detecting feedback loops is to raise the level of analysis of individual issues to a higher, systematic level. It is a technique which has the potential to add extra meaning to basic data, particularly relevant for policy makers (one significant user group for this product) and others concerned with understanding the interrelationships and root causes of environmental problems, notably those relevant to biological conservation. This is one perspective on the title of this project: *Information Context for Biodiversity Conservation*.

²⁰ Colin Eden and Fran Ackermann, 1998. *Making Strategy: The journey of strategic management*. Sage Publications, London.

A self-reinforcing (“vicious”) problem loop, then, is a chain of Problems, each aggravating the next, and with the last looping back to aggravate the first in the chain. An example is:

Man-made disasters → Vulnerability of ecosystem niches → Natural environment degradation → Shortage of natural resources → Unbridled competition for scarce resources → Man-made disasters.

Such cycles are “vicious” because they are self-sustaining problem cycles. organisational strategies and programmes that focus on only one problem in a chain may fail because the cycle has the capacity to regenerate itself. Individual “vicious problem cycles” also tend to interlock, forming tangled skeins of interlinked global Problems which implicate single environmental problems in chains and complexes of multi-sectoral issues²¹. Without the means to untangle the relationships, the response to a conservation challenge may be ineffective, self-defeating or, even, harmful.

Before commenting on the project work in detecting vicious cycles, it is important to recognise that it is precisely through the detection of such loops that attention can be drawn to defects in the pattern of relationships in the data. It is possible for some loops to be the result of incorrect relationships rather than being representative of genuine feedback, and so “accidental” loops appear. Detection of loops is therefore in the first place an editorial tool for hyperlinkage within a relational database. It raises questions as to the appropriateness of certain links which otherwise may go unquestioned. It also sharpens the discussion on how distinctions are made, using verbal categories and definitions, and how system boundaries are drawn grouping what is represented in this way. The results indicate this is a very interesting area for further exploration.

Activities of the workpackage

1.11.1 Loop analysis

Prior to the Definition Phase of this project, experiments in 1995 gave rise to the results in Column 1 of Table 1 (below). It was concluded that the procedure had promise but needed refinement, notably to detect Problems erroneously excluded from loops, as well as loops excessively connected to a single problem.

Progressive Refinements of Problem Loops					
	Prior to Project	INFO2000 Project			
Date	1995	1999	1999	2000	2000
	Column 1	Column 2	Column 3	Column 4	Column 5
Machine	386/486	486	Pentium III	Pentium III	Pentium III
Processing Time	many weeks	Some days	37 hours	12.5 hours	500 hours
Chains tested	9,519,722	15,000,000	46,474,882	16,091,877	1,239,769,768
Profiles			6,891	1,217	12,397
2-Loop	-				5
3-Loop	35				173
4-Loop	115				230
5-Loop	527				473
6-Loop	3,058				1,163
7-Loop	3,568				3,473
8-Loop	excluded	excluded	excluded	excluded	10,600
9-Loop	excluded	excluded	excluded	excluded	35,438
Total	7,303	6,000	15,958	8,253	51,555

²¹ In some cases the relationship may be a feedback loop in its own right where A influences B and B influences A -- creating a nested negative feedback loop within a positive feedback loop.

Deforestation

[New Search](#) | [\[Loop list\]](#) | [\[Alt loop list\]](#) | [\[Alt loop pattern\]](#) | [\[Loop map\]](#)

Overview of loop patterns for problems that Deforestation **aggravates**.
 Table 1 shows chain of impacts (presented elsewhere as a nested loop list). Max. number of loops currently listed= 15 (of 49).

- Each row of table is a loop (starting from left-most coloured column).
- First (left-most) coloured column items impact second column items (2nd column items impact 3rd, etc).
- Last column items loop back to impact on those in first column.
- The pattern is helpful in highlighting questionable links and errors.

Table 2 gives names of problems in cells of Table 1. Click on any links in Table 2 to access profile (from which other types of information can be requested). Switch to the [alternative presentation](#) to get an overview for problems that Deforestation is **aggravated by**.

Table 1	▶	▶	▶	▶	▶	▶	▶	▶	▶
Loop 1	A	AV	AC	AB	AE	Q	P	K	M
Loop 2	A	AC	AB	AE	Q	P	K	M	
Loop 3	A	AC	AB	AK	AE	Q	P	K	M
Loop 4	A	AC	AB	AK	Y	Q	P	K	M
Loop 5	A	C	L	AJ	J	H	F	B	
Loop 6	A	C	L	AA	J	H	F	B	
Loop 7	A	C	L	J	H	F	B		
Loop 8	A	C	L	J	H	AU	AT	N	D
Loop 9	A	C	L		W	T	S	R	
Loop 10	A	C	L		W	T	AI	S	R
Loop 11	A	C	L		W	T	X	V	B
Loop 12	A	C	O	Z	AH	AS	AR	E	B
Loop 13	A	C	O	Z	AH	AQ	AP	AD	I
Loop 14	A	C	O	Z	AG	AO	AN	AF	U
Loop 15	A	C	O	Z	AG	AM	AL	G	B

Loop display for the Problem “Deforestation”. Each cell is a Problem profile.
<http://www.uia.org/projects/finarept/image21.htm>

Table 2: Codes used in Table 1 (above) for problems in loops associated with **Deforestation**.
 Items listed below in decreasing order of frequency of occurrence in Table 1.
 Click names of problems to view the profile. Click on **pattern** to see equivalent Table 1, or **loops** to see corresponding list.

A	379	Deforestation	pattern	loops
B	241	Environmental pollution	pattern	loops
C	128	Global warming	pattern	loops
D	25	Forest decline	pattern	loops
F	24	Urban shams	pattern	loops
F	21	Toxic metal pollutants	pattern	loops
G	20	Indiscriminate economic development	pattern	loops
H	18	Marine dumping of wastes	pattern	loops
I	17	Unsustainable population levels	pattern	loops
J	13	Marine accidents	pattern	loops
K	13	Failure of green politics	pattern	loops
L	12	Bad weather	pattern	loops
M	12	Insufficient environmental legislation	pattern	loops
N	11	Acidic precipitation	pattern	loops
O	9	Inhospitable climate	pattern	loops
P	9	Restrictive environmental policies	pattern	loops
Q	9	Doom-mongering	pattern	loops
R	8	Environmental hazards from logging	pattern	loops
S	8	Foreign exchange reserve shortages	pattern	loops
T	8	Burden of servicing foreign public debt	pattern	loops
U	7	Environmental warfare	pattern	loops
V	7	Criminal offences against the environment	pattern	loops
W	7	Instability of the commodities trade	pattern	loops
X	6	Social hardships of economic reform	pattern	loops
Y	6	Risk of ecoaccidents	pattern	loops
Z	4	Deficiencies of developing countries	pattern	loops

Display of all Problems involved in loops concerning “Deforestation”.
<http://www.uia.org/projects/finarept/image20.htm>

During the Definition Phase for the project, the data file on loops in the Problems data was critically reviewed. The programme previously written to detect aggravating pathways in the data and identify loops was re-run. Loops were identified for selected types of problems only and for a maximum of 7 problems per loop (since chain searching requires many days of computing time, even with 133 MHz PCs available to us at that time). Two weeks of judicious source editing of aggravating links between Problem profiles reduced the size of the file from 19,000 problem loops to around 7,000. A preliminary detection analysis was also made of cycles of facilitating strategies in the Strategies database. At the completion of the Definition Phase, there were 200 loops recognised to contain environmental issues relevant to biodiversity conservation. They were presented on the prototype CD. Work was also done in improving the display of loops, using popups, from single data records on the prototype CD.

It was anticipated that the number of loops detected in the data would increase significantly following the editing work on content and hyperlinks during the Implementation Phase of the project (Section 9.2.1: Substantive activities). One need for this work was to acquire a faster computer (to avoid having to segment the data). This was done with project funds.

However, loops are relatively rare in chains of problems. It was anticipated that the technique to detect loops (to this point explored in a DOS environment in batch mode and delivered online in a static mode) would need to be improved to make it easier for an online user to explore them dynamically. The algorithm through which such loops are detected was referred to a mathematician, but with no breakthrough. However, our objectives were achieved in other ways.

The next step in this work was enabling the contextual listing of Problems and Strategies on user request relating to a selected node. The list was provided “on the fly” at the request of the visitor to the UIA website. This facility provided a rich pattern of information in which loops were indicated if detected in the data.

During 1999, some 15 million chains of Problems were searched to detect those that looped back on themselves within 7 links maximum. Some 6,000 loops were detected and were scanned for potential errors and hyperlink redundancy. The results of this work were integrated into the facilities offered to web users via the UIA website. Loops were flagged in the hit index and so became available to webusers for the first time in beta test mode in October 1999. This web module was delivered in beta mode at <http://www.uia.org/data.htm> in early 1999 and has been continuously upgraded on numerous occasions since that time. Later in the year, as a result of third-party contribution to *Java* graphics capability, loops were visualised as an integral feature of the bespoke *Java* spring mapping facility (Section 16.2.2: Spring maps (*Java* applet)). This was a major step in the online graphic presentation of feedback loops in the data and is described below in Section 11.2.2: Loop patterns.

The non-web standard editing software was augmented to detect local link redundancies and errors in the cross-relationships of Problems and Strategies. This meant that the daily work of editing database profiles was also directly contributing to the refinement of loops. Of particular interest in any loop analysis were Problem profiles indicated as being the most highly connected to loops, namely members of the largest numbers of loops. These were treated as indicative of inappropriate hierarchical clustering and encouraged redistribution of functional relationships to broader or narrower Problems.

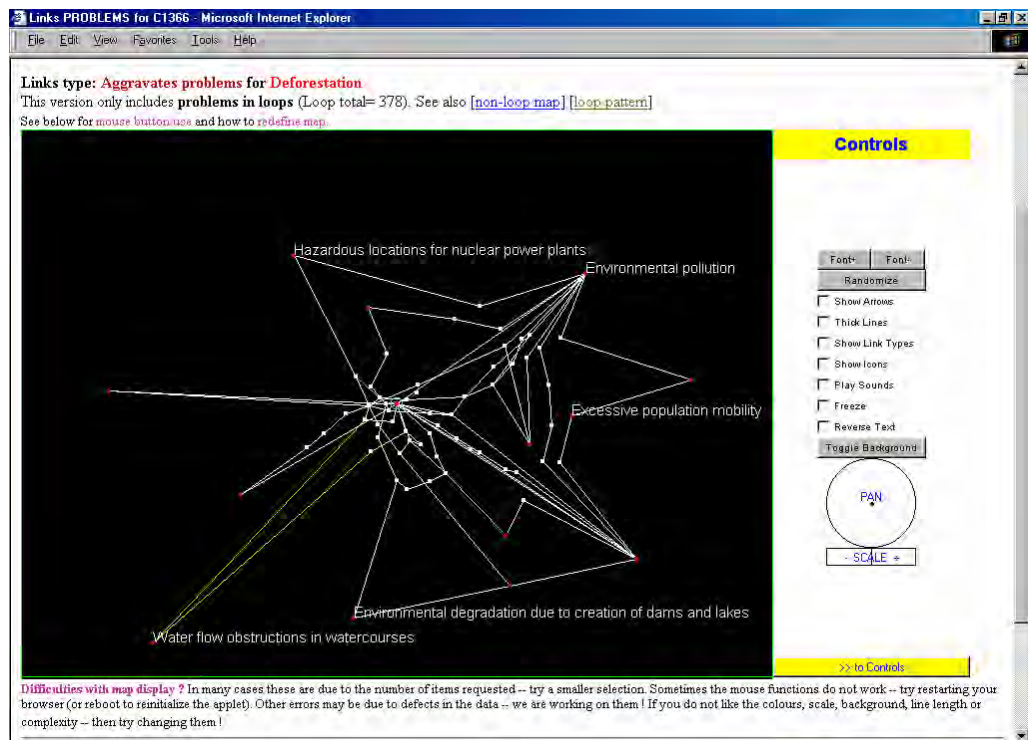
The final stages of the loop detection and visualization activity were completed towards the end of 1999. First, the loop detection program was run in batch mode for all Problems (except the most detailed and minor). The result was 15,958 feedback loops. Loops that involved the more detailed and minor Problems were edited at source to correct anomalous linkages²². This activity reduced the number of loops to 5,873. To further eliminate errors, entries involved in more than 80 loops were carefully edited; redundant and anomalous links were corrected. This activity reduced the number of loops to 2,675. It is believed that this list effectively represents “keystone” biodiversity issues -- problems that are implicated in many negative feedback systems concerning the natural environment.

Finally, the loop detection program was run again for the entire Problems database. The resulting 51,555 loops were subjected to the error tests developed in previous iterations. A total of 9,315 Problem loops were uploaded onto the website.

A similar procedure undertaken on the Strategies database produced over 2,000 loops, but of inconsistent quality. No project time remained to invest in refinement of these links and the loops were not uploaded at this time.

It is expected that procedures developed in this project for working with loops will become the standard for future reiterations as the databases evolve in the future.

1.11.2 Loop patterns



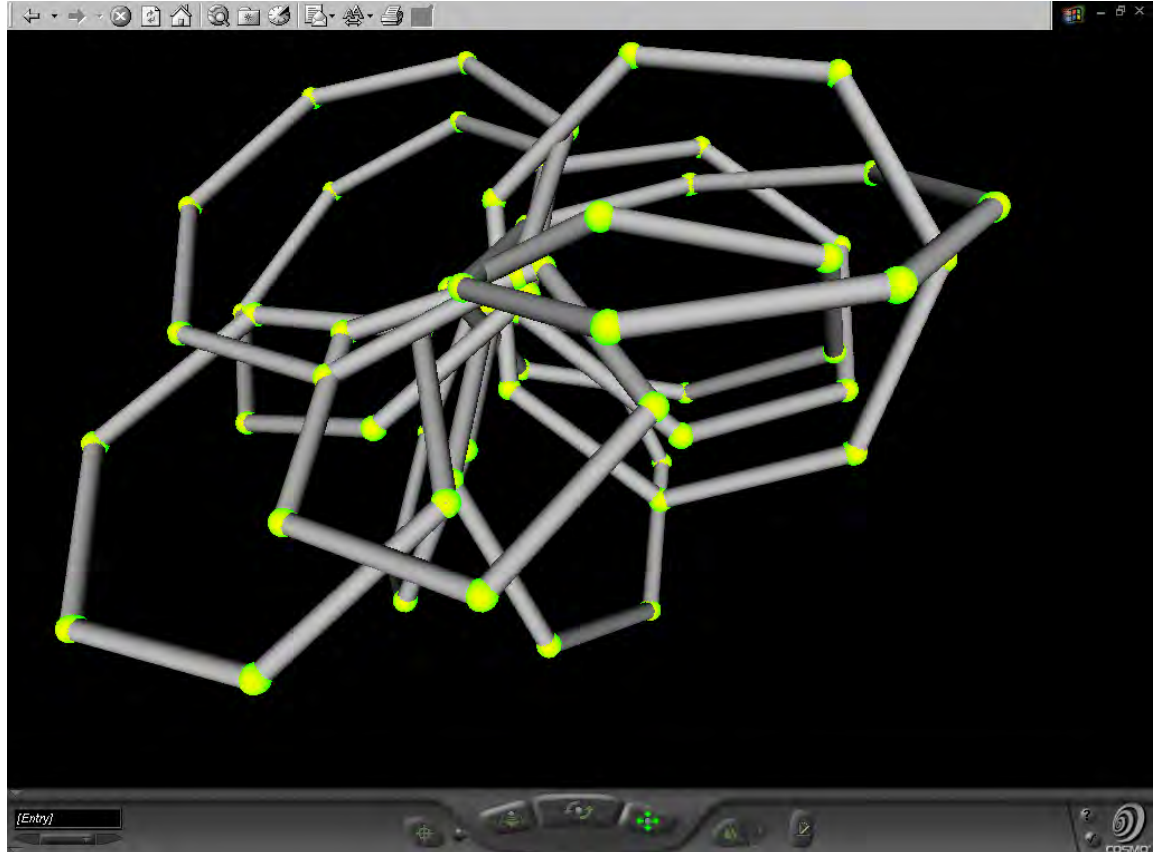
Java spring map display of loops for the Problem “Deforestation”
<http://www.uia.org/projects/finarept/image22.htm>

²² The logic behind this is that it is inappropriate for broad and detailed Problems to be *directly* aggravating narrow and minor Problems, and *vice versa*; this connection is best shown through hierarchical relationships where “suites” of problems are so aggravating. The most common remedy was to remake the link higher up the hierarchy of the detailed or minor Problem.

In order to give users a sense of the pattern that multiple loops formed, a colour-coded tabular presentation is generated on-the-fly from database entries with loops. An example for “deforestation” is shown.

1.11.3 Loop display

Users are able to manipulate both of the above displays. The elements of the *Java* spring map can be dragged to redistribute them. The same is true of the three-dimensional virtual reality display, which in this case is dynamic. Clicking on the nodes in either display will open a window with the corresponding profile text from the database.



3-D display of loops for the Problem "Deforestation". Each node is a Problem in the loop. Clicking on a node opens the Problem profile.

<http://www.uia.org/projects/finarept/image23.htm>

Unforeseen developments during the project

At the close of this project work, the loop detection program successfully explored 1,239,769,768 chains of relationships in the Problems file to detect 51,555 loops (of up to 9 elements) in 12,397 Problem profiles (types B,C,D,E,F -- the more general categories). This took only 500 hours of computer time. The results were as indicated in Column 4 of the table above.

Having proved the possibility of identifying such cycles, the question raised was how this information could be best portrayed through various mapping techniques. One attractive option is to map the circles around the surface of a sphere with whatever interlocking the data implies.

In anticipation of such expertise, during the final phase of the project, several approaches were taken to facilitate user visualization of loops from the profile of any selected entry that was part of a loop). This work drew from complementary work in the concerned with “Graphics and Visualization” (Section 16: Multimedia visualization). As presented online at the culmination of this project, users can choose between the following presentations:

Tabular presentation: Users have a choice of two sets of tables:

- **Aggravated problems:** Presents an array of cells in a first table, coloured to give the user a sense of the pattern of links from the selected problem, with a second table as a key to the first. Users can click from there to a similar table focusing on any selected problem in the array. Unfortunately because of technical constraints in the construction of the HTML page, the number of loops presented in this way is currently limited.
- **Aggravating problems:** Since problem relationships are reciprocal, a second set of tables allows users to explore the reverse set of relationships in a similar manner.

Java spring map: Users have the option of selecting a spring map presentation, generated in response to the user request, restricted to problem loops. This can be used as an access interface to other such maps or to individual profiles of problems identified as nodes in the display.

Virtual reality display: Users have the option of selecting a virtual reality display, generated in response to the user request, restricted to problem loops. This presents a limited number of loops with which the selected problem is associated. The concern here was to demonstrate the viability of allowing users to generate and explore loops in this mode. As with *Java* map, users could then click into a text profile of any problem in a loop. Of special interest is the relative ease with which different display metaphors could be designed. The challenge is effectively switched to the question of which design metaphors provide the most additional meaning.

Identification of future activities

1.11.4 Partnerships and supportive coalitions of organisations

Both functionally and conceptually, such vicious cycles may offer a better way to approach complex networks of problems. Indeed they serve to make clear that any organisation with projects focusing on a single problem needs to be aware of any vicious cycle of which that problem is a part. Unless that organisation coordinates its activities with any bodies focusing on other problems in that cycle, its work may be undermined. Despite apparent success in responding to a particular problem in the short term, this may not affect the sustainability of the vicious cycle of which it is a part. Pressures building up in other parts of the cycle may regenerate the problem.

Ideally a coalition of organisations would form in response to each vicious problem cycle. Information passed between organisations should then match the pattern of impacts between the problems with which they are concerned. The strategic issue may be less one of how to “break” the cycle and more one of how to reverse it, exploiting the fact that problems are functionally linked in this way.

Also, there are not just “vicious problem cycles”. A significant number of problems also alleviate other problems, although this information is less easy to obtain and such links are consequently less frequent in the UIA data. There may therefore be

“beneficent problem cycles” through which problems constrain each other. It could prove strategically advantageous to locate such cycles. Correspondingly, in the Strategies data there would be “facilitative strategy cycles” and “constraining strategy cycles”.

Using the techniques developed through this project, UIA is in a good position to now identify the families of self-reinforcing and self-damping cycles in international activities. From this additional work it could identify both (a) networks of organisations working on the same issues and (b) supportive coalitions of organisations involved with problems and strategy cycles.

1.11.5 Display modes for feedback loops

During the Definition Phase of this project, Nadia McLaren visited the Millennium Institute in Washington DC for a demonstration of their software applications of system modelling and displays, which include feedback loops. Experiments with VRML showed that feedback loops could be represented in 3-D, notably as structures of loop clusters. The bespoke *Java* applet for spring maps, designed for this project, has the capacity to display feedback loops.

1.11.5.1 Decision Explorer

Late in the project, the new features in the software *Decision Explorer* were found to display and analyse feedback loops. It is important to stress that this product is a tool for exploring information in a feedback model, not just a "page layout" tool where the concepts are neatly placed. It is intended to be a dynamic modelling tool working with a database of concepts and links where areas of the model are extracted to focus on using a “map” command to “bring” further concepts onto the display. The producers of the software have suggested to the UIA that it may be preferable to have an initial map layout stored with the model data. If this is appropriate, the UIA could work with them to add a new section to the data with X/Y coordinates for the concepts. This would present people with a neater view of the data initially.

Another possibility suggested by the producers is their development of a "Viewer" version of *Decision Explorer* that will be restricted to displaying only views that have been saved in a model, with no analysis or other capabilities. It would be free. In this way UIA users could distribute "finished" models more widely.

1.11.5.2 Improved algorithms

The interesting possibilities for the development of more sophisticated displays of feedback loops depend on the identification and implementation of algorithms capable of positioning a multiplicity of loops (several hundred) over the surface of a sphere. To be useful, this has to be organised so the more detailed loops are positioned “locally” whereas the intersectoral loops exploit the global properties of the sphere.

As discussed elsewhere²³, it is interesting to hypothesise the existence of major "pathways" formed by elements of different loops. Such pathways can be envisaged as being like rivers from which local loops break off (as whorls). A number of such pathways may intersect. It would then be the interlocking of these pathways which ensured the integrity of the system of problems as a whole.

²³ Anthony Judge, 1994. *Clarification of a Mathematical Challenge for Systems Science*, <http://www.uia.org/uiadocs/mathsys.htm>.

This approach becomes especially interesting if it is hypothesised that such pathways are themselves necessarily circular. The question can then be formulated in terms of the nature of the surface onto which the pattern of loops can be usefully projected or mapped so as best to bring out the systemic integrity.

A flat surface is not especially interesting for such an exercise (although this has been done for metabolic pathways). More interesting in comparison is a sphere or a torus. In the case of a sphere, any such major pathways could emerge as "great circles" in a geometrical sense. It would then be the interlocking of such great circles that provided the integrity of the structure. Lesser circles could encompass portions of the sphere. Local circles could then be positioned appropriately in relationship to them. Graphically displayed on computer, they could be accessible by zooming when detail was required, but the overall pattern would not be lost.

Clearly the projection of the loops onto such a surface constitutes a special challenge. What mathematical operation is necessary to effectively "massage" the loops into the positions on the surface that most effectively bring out the integrity of any great circle-type phenomena? How should this question be formulated in mathematical terms?

Clearly the number of loops of the type detected can be considered very large, or even infinite, when the number of elements in a loop is increased. What then is the mathematical constraint that usefully excludes certain loops, so limiting the number that can be detected? This question would seem to have something to do with maximising the number of tangential relationships between loops, notably by "nesting" the maximum number of loops within other loops -- minimising the number of loops that need to be represented non-tangentially as crossing other loops.

It might be argued that this approach to the analysis of the data is more complex than other more conventional forms available from graph theory. The assumption made here is that the constraint of representation on a surface comprehensible to the human mind is of immediate relevance to the ability to make informed decisions on such matters at a policy level. The existing ability to provide specialised analysis of what amounts to local loops in isolation has been well demonstrated, as has the inability to act on the larger loops to which these may contribute. A more comprehensive approach is required to "thinking globally and acting locally", whether in the geographical or the systemic sense (as suggested here).

As in the case of studies currently supported by computer graphics (CAD, PCB, molecular chemistry, etc), and even dependent on them, it is suspected that this approach might offer an entirely new grasp of global system properties of very large systems.

1.12 Information on habitats

Workpackage 5.3 Deliverable 5052-12

Expected (original) delivery 30-11-99
Delivered in beta test mode 04-04-99
Final delivery 31-07-00

Background to the workpackage

The conservation of natural habitats is a vital component of the protection and conservation of species of wild flora and fauna and of biodiversity in all its forms. Intact habitats are relatively undisturbed areas, which have maintained most of their original ecological processes and have communities with most of their original native species. Although around 5% of the world's natural habitat is formally protected from development, much of this area is threatened by activities that encroach on park borders and/or reduce overall environmental quality. It is universally agreed that levels of protection both in and outside existing protected natural habitats need to be strengthened. Organising available information to support this objective presents a challenge.

One contextual problem is that around the world, and across sectors, the term habitat is used with a multitude of different meanings²⁴. Vernacular usage loosely aligns

²⁴ According to the Convention on Biological Diversity, 'habitat' means the place or type of site where an organism or population naturally occurs. 'Natural habitats' means terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, entirely natural or semi-natural.

According to the EU Habitats Directive the habitat of a species means an environment defined by specific abiotic and biotic factors, in which the species lives at any stage of its biological cycle. The conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. The conservative status of a natural habitat is favourable' when: (i) its natural range and areas it covers within that range are stable or increasing, and (ii) the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and (iii) the conservation status of its typical species is favourable.

The *Convention on the Conservation of European Wildlife and Natural Habitats*, known as the *Bern Convention*, aims to conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co-operation of several States, and to promote such co-operation. Particular emphasis is given to endangered and vulnerable species, including endangered and vulnerable migratory species.

The aim of the *EU Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, 1992* (Habitats Directive) is to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora. The implementing measures are to be designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest. The *Habitats Directive* requires the EU member states to identify, designate and conserve areas that are necessary to maintain or restore habitats and species of Community interest at a favourable conservation status. Annex I lists natural habitat types of Community interest whose conservation requires the designation of Special Areas of Conservation (SACs), and includes priority natural habitat types.

“habitat” with “the place an animal or plant lives”. But the place may be geographic (Mediterranean region) or may be descriptive (high mountain areas). The description may be scientific (lotic) or in simple language (flowing freshwater); it may be generic (wetland) or particular (peat bogs). The scale may be small (forest clearings) or may be vast (Boreal taiga).

Aside from different classification systems, there is also a multitude of existing lists concerning habitats and their larger aggregations. Some are comprehensive reference lists, some are operational lists indicating protection status and priorities for protection; some are appended to regional legal instruments; some apply to global policy objectives; some are for alpine areas, some for coastal; some are produced by botanists, some by zoologists. The variations go on²⁵. Authors of one list rarely point to correspondences in other lists.

Irrespective of special or local nomenclature, the issues concerning conservation and management of seagrass beds, or of alpine meadows or of semi-arid scrublands are much the same across the world, wherever (politically or geographically) they are located. However, it is common that in research reports different authors may use quite different names for what are the same habitat types. Valuable recommendations concerning conservation of a local habitat or a certain species rarely point to their relevance in other parts of the world. So potentially valuable insights within one locality or region are hidden.

All these inconsistencies pose a challenge in organising contextual information for habitat conservation.

Activities of the workpackage

As with the species information, it was first essential to investigate and develop data-management techniques. The immediate need was to avoid handling detail on the universe of habitats whilst maintaining the coherence and inclusiveness of the overall data structure.

The approach taken was to use taxonomic clusters of habitats as identified in the various source lists. Top-level classifications were particularly sought after. Taxonomic branches of habitats were opened to the levels of detail necessary to capture available information. Where information was unavailable, or represented an excessive input investment impossible to justify at this time for this project, it was noted as a potential resource for future work. In this way, the comprehensive nature of the database was ensured without expanding taxonomic structures to their fullest potential. This logistical compromise ensures the product is relevant to unforeseeable developments, since it provides a *context* for information on the global range of habitats -- any one of which may emerge as a nexus of environmental concerns. As

²⁵ At the largest scales there are “biomes”, “biogeographic provinces”, “biotic kingdoms”, “dominant ecosystems” and “ecoregions”. In some parts of the world (notably North and South America), divisions are based on faunistic criteria (sometimes called faunal provinces). The names tend to be tied to geographical places, eg “The Everglades Province”. Elsewhere in the world, floristic provinces (usually called floral regions) have been described and mapped based on dominant or major vegetation types and the regional climate (eg tall sclerophyll woodland), and these are used by zoologists. They are identified according to the climax vegetation type. But some classifications recognise not only of the climax vegetation, but also of associated successional communities, persistent subclimax communities.

resources and collaborators become available, higher levels of detail can be documented.

During the Definition Phase, using this methodological approach and a variety of sources available on the Internet, an experimental hierarchical framework was created within the UIA Problems database containing 303 threatened habitats, ecosystems and biomes. The habitat types were arranged in interlacing hierarchies corresponding to the classification parameters of the information source²⁶. This structure was used to explore the feasibility of interlinking individual species and protected areas through data on habitats.

During the Implementation Phase, a wider review of habitat classifications systems was made, with WCMC providing many of the resources from its global map indexes. Six different systems were entered into the database using the “overlapping hierarchy” method. At the completion of this work was at total of 311 Problem profiles of the form “Threatened habitats of [.....]”, 134 Strategies of the form “Conserving [....] ecoregion²⁷, and hierarchies of smaller numbers covering biogeographical provinces, regions and their subcategories, biomes, floral and faunal provinces²⁸, and forests²⁹. Various other regional and national sources were used for more detailed classifications, such as freshwater wetlands, including those in Annex 1 of the *European Habitats Directive*³⁰. Wherever possible, reasonable correspondences between classification systems were considered alternative expressions, and therefore synonyms, of a single data item³¹.

Unforeseen developments during the project

1.12.1 Corine biotypes

It was baffling that the CORINE habitat types for Europe were so difficult to come by, despite various requests to specialist consultants, the European Commission and the European Environmental Agency (from whom was obtained the CD-ROM *Natural Resources*, but not containing the classification system). Only a French language version was obtainable from the web, and that incomplete. By the time a

²⁶ For example, Holdridge’s set of the world’s major ecosystems is classified by climate (temperature and rainfall). Other sources used classify habitat principally by vegetation structure or geographic factors. Sources included the UNESCO terrestrial cover classification, the US Forest Service vegetation classification system and other North American materials, the Ramsar Convention wetland classification system and the UNEP/GRID world vegetation map.

²⁷ WWF has identified the most outstanding terrestrial, freshwater and marine ecoregions have been identified on which to focus conservation efforts. Using representation as the guiding principle, they identified the Global 200 -- truly outstanding examples of the major habitat types in each of the Earth’s biogeographical realms and ocean basins.

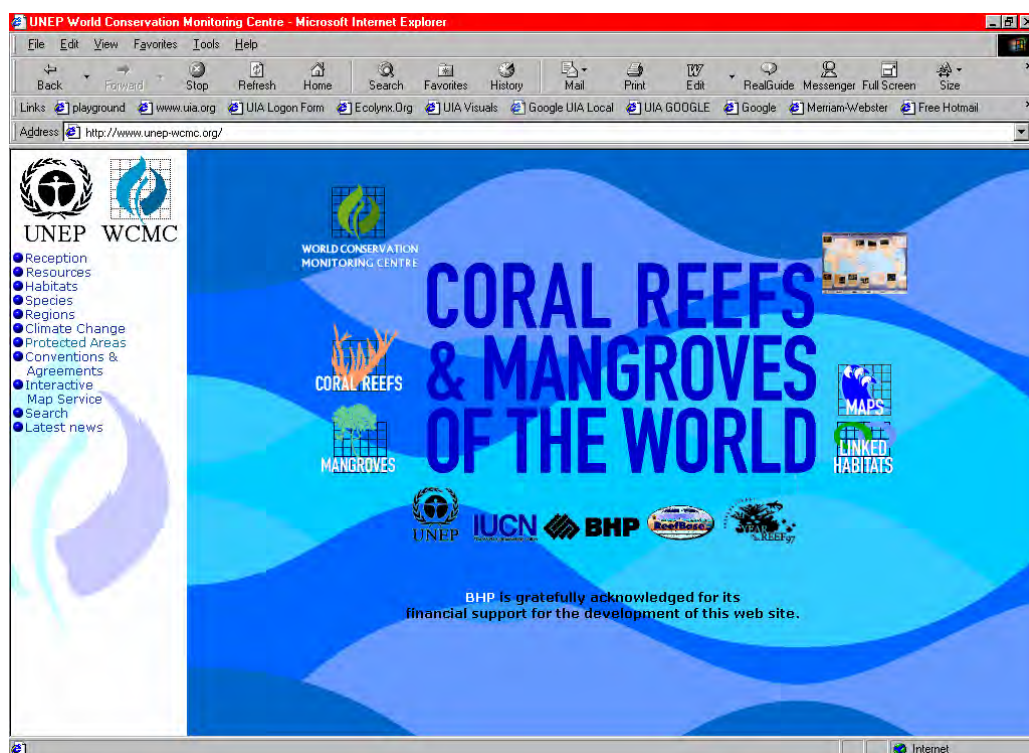
²⁸ Udvardy, Miklos D F, 1975. *A Classification of the Biogeographical Provinces of the World*. IUCN Occasional Paper No 18, Morges, Switzerland .

²⁹ FAO’s Forest Resources Assessment (FRA2000).

³⁰ Natural Habitat Types of Community Interest whose Conservation Requires the Designation of Special Areas of Conservation and which uses the NATURA 2000 code for Europe.

³¹ Examples taken at random show that the following have been taken from two or three different systems and placed into the same entry (“=” indicates equivalence for many conservation purposes): (1) “Threatened temperate broad-leaf forests or woodlands biome” and “Threatened subpolar deciduous thickets biome”; (2) “Threatened temperate grassland habitats” = “Threatened cool grassland/scrub habitats” = “Endangered montane steppe habitats”; (3) “Threatened warm temperate desert scrub habitats” = “Endangered scrub-steppe habitats”.

comprehensive source was located³², it was too late in the project to incorporate the CORINE items in the databases for the end of this project period. It is earmarked as a future activity.



A WCMC website concerned with habitats of coral reefs and mangroves
<http://www.uia.org/projects/finarept/image37.htm>

Identification of future activities

1.12.2 CORINE biotypes

It is planned to progressively incorporate the CORINE biotype classification and other important materials into the database when resources become available.

1.12.3 Tool for harmonisation of global habitat classifications

The experimental methodology developed in this project has addressed one information challenge of conserving habitat diversity: namely to relate information concerning habitats, at any level, with the generic threats and strategies concerning that habitat type. It is likely that further development of this method could provide a new resource for those working with harmonising approaches between regions or agreements. This will be followed up with the relevant organisations concerned with such work.

1.12.4 Relating habitats and species systemically

Directly building from a harmonised system of habitats is a larger challenge, namely to cross-relate species and habitats within a global information system. Then high quality information about well-documented species-habitat relationships could provide indicative or precautionary information for less well-known (or unknown) relationships in another region of the world or concerning a congeneric species. This

³² An out-of-print volume: Commission of the European Communities, 1991. *Corine biotypes manual. Data specifications - Part 2: Habitats of the European Community*. Luxembourg.

would enhance both predictive capability (*e.g.* for predicting the likelihood of species being present for environmental impact assessment of projects and programmes) and enhance knowledge transfer (*e.g.* adaptive transfer of a successful species conservation strategy from one habitat to another of similar structure but in a different biome).

This would first require the building of hyperlink relationships between UIA's Problem profiles on threatened habitats and WCMC's habitat data, to other species-specific data and to any other relevant electronic datasets. Within this framework and to the extent possible, links would be made between particular species or groups of species (*e.g.* communities or higher taxa) with habitat entries, both within and between the respective datasets.

The linking of habitat data to individual species and areas is no simple task. It is one, which most conservation biologists quite understandably shy away from because they recognise the huge data (and personnel) demands, and deficiencies. They are also sensitive to the various nomenclatures, systems and scales used for classifying habitats. Usually only a few field biologists, who are biogeographers and have become personally familiar with entire continents and sub-regions of the world, are capable of providing such insights, and this in a human-brain-as-database mode. We are not aware of any systems, which have used information technology to link field and global data on habitats in a global fashion (other than for the purpose of 'ground-truthing' and verification in the field of remote sensing).

1.13 Integration of bibliographies

Workpackage: 5-4
Deliverable: 5052-13

Partial delivery 30-11-99
Final Delivery 30-06-00

Background to the workpackage

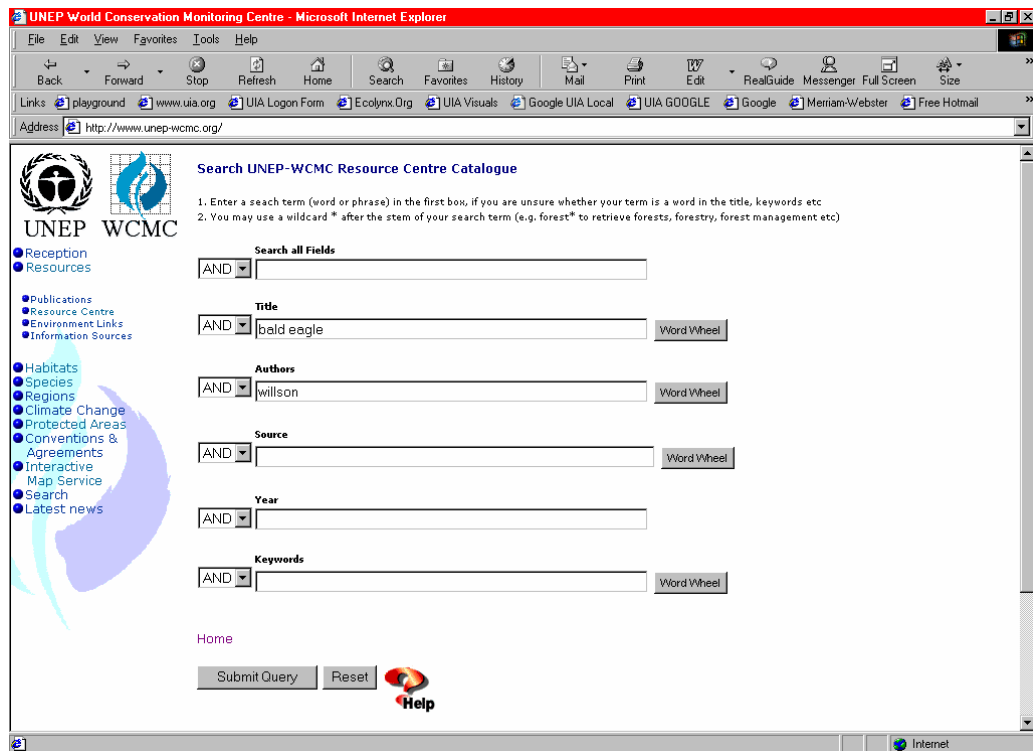
WCMC has a unique collection of formally and informally published information on biodiversity, at national and international levels, comprising around 100,000 bibliographic holdings. One of the strengths of its collection is 'grey literature' about biodiversity. The UIA has no sizeable library holdings but over decades has compiled over 9,890 citations of publications relating directly to global issues and strategies of international organisations and others. At the start of this project, neither resource was available online. Integration of data and online delivery were the principal objectives of the workpackage.

Activities of the workpackage

During the project, the following activities were undertaken.

1. WCMC and UIA had several rounds of discussion about "integrating" their bibliographies.
2. UIA continued to develop its bibliographic data file, notably with recent publications by international organisations concerning biodiversity conservation.
3. The UIA References database of bibliographic references was made available over the Web. This was done late in 1998, at the same time as enable access to the Problems, Strategies and Human Development databases (<http://www.uia.org/data.htm>).
4. During the development phase of the project, WCMC made a copy of its catalogue available online; however, the interface was relatively cumbersome to use, and the database on the Internet was separate from the actual catalogue and required the periodic transfer of files (which with the previous catalogue system was not an easy process).
5. Subsequently WCMC reviewed its library catalogue. WCMC has made a major overhaul of the management of its literature holdings and library reference system with a view to making the information more readily accessible over the Internet. This included review and purchase of new library software, which offers many suitable features, including automatic web publishing capabilities.
6. The old WCMC cataloguing software was replaced with new software, which was then tested in in-house and online mode. Trials of the WCMC software and training were undertaken. This new development has enabled WCMC to offer access to its library catalogue over the Internet (<http://www.unep-wcmc.org/resources/resources.htm>), including improved access and functionality for staff.

- The final step was to make the online integration between the new library catalogue, and between different parts of UIA and WCMC databases and information services. This activity was undertaken in the fifth phase of the project. UIA was able successfully to generate search strings from within relevant profiles, on user request, in order to search the WCMC bibliographic database and present the user with bibliographic record information. This feature is available through the *Ecolynx* website.



Search interface for WCMC bibliographic resources. This is now directly activated from UIA data profiles.

Unforeseen developments during the project

After early discussions, the original idea of physically “integrating” the WCMC and UIA bibliographies was quickly replaced by “integration” using the web. This approach avoided the complications of harmonising source data.

The delay in finalising this work package was necessary because WCMC has considerable literature holdings that needed special attention. A number of limitations of the existing cataloguing software had been identified over the years and these have become increasingly serious as information technology advanced. The selection of alternative software, which could also deliver over the web, was delayed for a number of reasons, principally resource constraints, until the beginning of 1999.

Identification of future activities

1.13.1 Extended bibliographic web searches

Using the search string method developed during this project, UIA plans a further step to activate analogous searches of other external databases containing bibliographic

information, including commercial sites like amazon.com. From sites like amazon.com, this would also be a source of continuing revenue for the *Ecolynx* website (Section 20.4.1.5: Achieving sustainability). A particular difficulty encountered in testing this facility has been to determine what keywords to use in the search string in the case of Problems or Strategies with more complex titles, or many alternative titles. Further testing of this was beyond the means of the project.

WCMC did have, and intends to reinstate, direct search links from bibliographic records to amazon.com, and intends similar links to distributors of partners' publications. This was not possible for a time because of VAT implications.

1.13.2 Integration of data from other sources

WCMC is seeking to work with like minded organisations to integrate their bibliographic and catalogue data with that of WCMC, and provide access to a far wider range of literature in an integrated way. Initially we are considering working with BirdLife International, and as also working to include other bibliographic information already held by the Centre on plants. In this way WCMC will build on the resource made available by the project to integrate the work and resources of a far wider range of organisations.

1.13.3 Integrated tabular presentation of citations from various sources

At some point, notably if there is demand, it could be explored whether UIA's reference files and WCMC's Conservation Library data are amenable to combined tabular presentation on user request. For this it would be necessary to: (1) compare data and field structures of WCMC's and UIA's bibliographies; (2) review and harmonise citation duplications; (3) supplement any deficient data using resources such as *Books in Print* and other secondary sources such as *BIOSIS* and *Zoological Record*; and (4) deliver shared datasets jointly in manner not apparent to the user.

As part of a wider activity, this activity also touches on the metadata programmes of the European Environment Agency (EIONET), the United Nations (UNION) and others (Section 4.3.2: Metadata).

1.14 Indicators and summaries

Workpackage 5-5 Deliverable 5052-14

Expected (original) delivery 30-11-99
Final delivery 31-07-00

Background to the workpackage

Although WCMC has managed major datasets relating to biodiversity conservation for many years, it has made relatively little use of this information in the development of indicators, and at the time the project started had few summaries of information available either on line or in the published literature.

The intention was therefore to seek ways to display and interpret data, with the ability for users to perform such analyses themselves (giving consideration of the full range of user from policy-maker to educator) providing the ability to derive simple indicators from the available data, which can be linked to particular environmental pressures.

Activities of the workpackage

During the project WCMC has used counterpart funds from other organisations to review the extent to which summary information from the WCMC databases can be used to illustrate key issues.

1.14.1 Living Planet Report

WCMC has been working with WWF on the *Living Planet Report*. This is an attempt to provide a quantitative answer to questions concerning the loss of biodiversity. The annual reports (so far prepared for 1998 and 1999) present the most reliable data available on forest area and populations of marine and freshwater species world-wide. The report also examines consumption of critical resources in countries around the world.

The central component of the *Living Planet Report* is the *Living Planet Index*, an indicator of the overall state of the earth's natural ecosystems. WCMC carried out a substantial amount of the work on development of the indicators relating to biodiversity, reviewing the information available and its reliability, and trying to identify what was meaningful. The report includes maps, graphs and histograms.

This information is available as published reports, and on the WWF website at: <http://panda.org/livingplanet/lprreport.cfm> with the main biodiversity statistics at: <http://panda.org/livingplanet/lpr/flash.htm> (or at the "lite" webpage: http://panda.org/livingplanet/lpr/lp_index.html).

1.14.2 Global Biodiversity: Earth's living resources in the 21st century

This is a major WCMC publication launched in early 2000, funded by a German foundation are not strictly speaking part of the present project. The aim is to provide a comprehensive review of key global issues in biodiversity, outlining some of the broad ecological relationships between humans and the rest of the biosphere, and summarising information bearing on the health of the biosphere. There is a considerable amount of illustrative material in the book (maps, graphs, diagrams),

based on summarisation of the biodiversity information available to WCMC, but this is not yet available on the Internet and is therefore not yet built into the project's deliverables. This is currently under consideration.

1.14.3 Species and protected areas databases

It had been hoped to develop tools to display summary information on-the-fly from the two major databases that have been developed and placed on the Internet as part of this project. This work has not been completed, for the reasons explained in the next section, but we expect it to be part of the future work programme of WCMC.

Unforeseen developments during the project

There are two reasons why WCMC has not yet implemented the generation of on-the-fly summary statistics and indicators based on its two main databases on the Internet. Firstly the databases have taken longer to implement on the Internet than was originally expected. This is explained in another work package. Secondly, counterpart funding for this work was expected as part of another WCMC project, and this was not achieved. This area of work was therefore developed less than other areas that had more secure counterpart funding.

Identification of future activities

WCMC is actively seeking resources to make its information more accessible to educators and students, and this will involve the preparation and delivery of far more summary information, much of it on-the-fly.

WCMC is also ensuring that its future major projects (such as the UN List described in Section 8.3.1: UN List of National Parks and Protected Areas) have a more substantial "policy influencing" approach, and as such will include more interpretation and summarisation.

1.15 Links to other information services

Workpackage 5-6 Deliverable 5052-15

Expected (original) delivery 30-11-99
Final Delivery 31-07-00

Background to the workpackage

The objectives of this workpackage were to develop linkages to other relevant information sources, and at the same time build links with the organisations involved so that there is an ongoing relationship in the management of mutually supportive datasets. This will involve creating (hyper)linkages between various WCMC and UIA datasets, notably with respect to national organisations, protected areas and systems.

It should be said at the outset that the project partners see partnership and linkages as a natural part of their activities. WCMC, for example, has a wide range of operational links and partnerships with agencies in conservation/biodiversity networks in which it participates. Our strategic approach in this project was not dependent on particular partnerships outside the project frame, however "logical" in principle, but rather on partnership building wherever and whenever it proves possible in practice. We also recognised that the degree of "partnership collaboration" within the project frame could also vary in practice in the light of experience and need.

The Web and email environment proving ideal in that it offers the possibility of rapid partnership formation (and dissolution) in response to changing needs and priorities -- without requiring the administrative overhead traditionally associated with formal partnerships. It is in this sense, for example, that the UIA has a long record of "collaborating" minimally with some 20,000 international organisations by requesting and receiving information on their organisation profiles and on the problems and strategies that engage them³³. WCMC similarly has "collaboration" with thousands of contributors of data to its databases.

Activities of the workpackage

1.15.1 Links to other information services

1.15.1.1 Collaboration with the European Environment Agency

WCMC is continuing to collaborate with the EEA and the ETC/NC in Paris on the *Common Database on Designated Areas*. This helps to ensure the quality of information available on European protected areas and access to it over the Internet.

1.15.1.2 Collaboration with the CBD Clearing-House Mechanism

WCMC has been working on several projects that are concerned with implementation of the Clearing-House Mechanism (CHM), and regularly attends official meetings at

³³ Such "minimalist partnership" is in fact vital to information collection in circumstances in an information society increasingly riven by mutual suspicion (this is not a generalization, but certainly true of some of UIA's more problematic exchanges).

both the global and European levels (WCMC is a contractor on the EC CHM project managed by the EEA).

1.15.1.3 Country profiles

There is a significant number of country profiles available on the Internet, and similarly a number of national reports to international bodies. WCMC has developed a webpage that facilitates location of these reports., and is considering the development of search tools for improving access to content.

http://www.wcmc.org.uk/information_services/other/country.htm

1.15.2 Complementary projects

The following list of projects is not exhaustive but illustrative of the types of projects which UIA and WCMC, in particular, have carried out that are relevant to the aims of the INFO2000 project, and which have contributed to its implementation. Most of these complementary projects contributed skills and/or funds to databases used in this project. Through these collaborations, the web products produced are linked with the *Ecolynx* website.

1.15.2.1 Threatened Plants of the World / 1997 United Nations List of National Parks and Protected Areas

These databases became available over the Internet in 1998, based on publications that WCMC has produced in collaboration with IUCN and others. The plants database is similar to the animals red list database, which is the most frequently accessed part of the WCMC web site. In each case funds from other sources paid for the information to made available initially, although the INFO2000 project contributed funds in 1999/2000.

1.15.2.2 IUCN World Commission on Protected Areas

WCMC has provided support to the IUCN World Commission on Protected Areas in the redevelopment of its website. The US National Oceanographic and Atmospheric Administration is leading this work, and WCMC is serving on the working group directing and reviewing this work. The commission is a network of protected area professionals, and the website is intended to increase the efficiency of this network at global and regional levels.

1.15.2.3 Experience of developing Internet-based metadatabases

WCMC worked on two metadata projects over the initial six months of the Implementation Phase, both with funding from other agencies, which enabled staff to develop skills in the use of the Internet to manage and deliver information in metadatabases. The UK *Clearing-House Mechanism* is a means for UK-based organisations to "advertise" their experience in the context of the *Convention on Biological Diversity* - the products, services, databases and events that they have available. The metadatabase for the *Biodiversity Conservation Information System* is intended to identify the datasets that are managed by the various organisations in the consortium and provide a "shop window" on their services. The experience developed is relevant to the INFO2000 project rather than the metadatabases themselves.

1.15.2.4 Critical review of the World Heritage Information Network

In collaboration with the UNESCO World Heritage Centre, WCMC has made a full review of the current Internet-based information service, and recommendations for future development. This project was funded through the World Heritage Convention, but it is suggested that the collaborative development of certain categories of information service with the INFO2000 project will provide the basis for development of further Internet-based information services for conservation conventions. This particular project could be very good demonstration project, as future plans include the development of a *World Heritage Information Network Partnership* which would actively encourage the development of national web sites presenting information on

World Heritage sites, linked to the international information service and search engine. *Funds for search engine*

1.15.2.5 EU Wildlife Trade Reference Database

WCMC has recently completed the first phase of this project for the European Commission (DGXI), and it is not directly a part of the INFO 2000 project. However the database is built on the development phase of the INFO 2000 project and provides a useful demonstration of how a database can be used to support implementation of an international treaty.

1.15.2.6 AEAW website

WCMC worked with the African-Eurasian Waterbirds Agreement on development of their website on the species covered by the Agreement. This website incorporates text, photographs, maps and sounds for a few species at present, but will be developed further over the next few months. It was reviewed at the first Meeting of Parties to the Agreement, which was held in South Africa in November. (<http://www.wcmc.org.uk/aewa/>). This demonstration site shows the potential to develop similar information services for other agreements based on this experience.

1.15.2.7 EC Clearing-House Mechanism

WCMC has collaborated in the development of this website as one of a consortium of organisations that won an EC Call for Tender in the context of the *Convention on Biological Diversity*. The series of tasks carried out by WCMC in the first phase of the project included the review of options for various web-based activities. The results of these reviews of options are directly relevant to development of information services in the context of the INFO2000 project. The EC Clearing-House Mechanism website was launched during May 2000.

1.15.2.8 infoDev Programme of World Bank

The project proposal for complementary funding had been approved by the World Bank's infoDev (Information for Development) programme. This project is, in effect, an extension of the methodology and data of the INFO2000 project into a developing country context. Due to various reasons, such as the Kosovo crisis, the programme fund has not been replenished. We are informed that it is now unlikely that the project will be able to be funded.

1.15.2.9 IHEAL Europe Interactive Database

The UIA undertook a complementary development of environment and health-related components of its knowledge base as part of the project *Interactive Health Ecology Access Links - Europe* (IHEAL-Europe). The initiators were UNED-UK (coordinator), International Campaign for Responsible Technology (I-CRT), Union of International Associations (UIA), Right to Know Network, and Environmental Partnership of Central and Eastern Europe (EPCE). Initial financial support for IHEAL-Europe was provided by DGXI of the European Commission. Matching funds and resources contributed by the UNED-UK, I-CRT and UIA.

(IHEAL-Europe) was launched at the *Health Planet Forum / Third European Conference on Environment and Health* (London, June 1999). It is an information network that is continually developed through public access to environment and health data and concerns. This is an open process of cooperation among non-governmental organisations working within the context of the Aarhus Convention on Public Participation. IHEAL-Europe notably supports the Pollution Release and Transfer Registry (PRTR) and National Environment and Health Action Plan (NEHAP) pan-European initiatives.

1.15.2.10 IPIECA Internet Map Server

WCMC is working with IPIECA, the International Petroleum Industry Environmental Conservation Association, and ESRI (who make the ARC/INFO GIS software on the

development of an Internet map server. As IPIECA is particularly interested in marine areas because of the importance of rapid information responses in the case of oil spills during transportation, initial work has been on the Mediterranean, and will continue on the Caribbean. This work has provided counterpart funding to the project.

1.15.2.11 Global coral disease database

This database accessible on the Internet allows users to (1) select and access records in the Global Coral Disease Database; (2) map observations of different coral diseases over the UNEP-WCMC coral reef maps; (3) download the selected records to their own computer. The work has resulted from a collaboration between UNEP-WCMC and NOAA. The next stage of the project will expand the Global Coral Disease Database with unpublished records of coral disease. Users are encouraged to submit observations for inclusion in the Global Coral Disease Database. <http://www.unep-wcmc.org/marine/coraldis/>

1.15.2.12 Forest and poverty mapping in South East Asia

The forest and poverty mapping website contains a new Internet map server, which has been designed to give users the ability to produce custom-made maps showing forest cover and indicators of poverty and population pressure in South Asian countries. The site provides the user with an overview of the study area. Linkages between poverty, environment and population are discussed. The method for selecting the indicators and indices used in the IMS is described. The IMS can be used to generate user-defined maps at national and sub-national scales. The strengths and weaknesses of the method are discussed in the conclusions and links to related sites are listed. <http://www.wcmc.org.uk/forest/poverty/>

1.15.2.13 European forests and protected areas: gap analysis

This gap analysis of forest protected areas in Europe was designed to provide information on the distribution and conservation status of European temperate forests, in support of the Pan-European Biological and Landscape Diversity Strategy and in particular WWF's Forest Strategy for Europe. Digital pan-European forest cover maps of potential and current forest cover were compiled together with a digital map of Europe's protected areas. Digital overlays of these data were undertaken and statistics produced indicating the current state of protection of differing forest types, in respect to the location of these forests within legally gazetted areas. Information arising from the project can be found on the WCMC website at: http://www.unep-wcmc.org/forest/eu_gap/

Identification of future activities

1.15.3 Links to commercial data

A situation may well emerge in which information of significance to biodiversity conservation is held by commercial services. *Ecolynx* proposes to address these challenge 1) by referring users on (via hyperlink) to commercial services holding such information, and leaving it to them to follow that path and to negotiate the access transaction; 2) exploring partnership arrangements with certain services to reduce the financial and administrative hassle of this procedure for the user.

At the same time, *Ecolynx* could benefit from "loyalty" association with certain commercial service providers. As mentioned elsewhere, experiments are already in place with the search engine *Goggle*, *amazon.com* and banner sites.

1.15.4 Links to non-commercial organizations

This project, and the integration of databases between UIA and WCMC was designed to be "light" on governance and administration (and their associated costs) and

"heavy" on operational links between data elements that are of value to users. We have taken the route of building on existing partnerships and demonstrating capability. Success to date has been described above and in Section 20: Subsidy, sponsorship and online charging. This philosophy would be extended to future partnerships with other institutions.

Potential partners, especially if they have their own databases, tend to be understandably reluctant to constrain their own data strategies in response to others. However, by the use of hyperlinks (and especially query links between such databases), real "operational partnership" can be achieved without the requirement for extensive "administrative partnership". We envisage such opportunities will emerge in the future.

SAMPLE OF 1,000s of INTERNET SITES LINKED to <i>ECOLYNX</i>	
International Institute for Sustainable Development Information Centre	http://iisd1.iisd.ca/ic/
IISD Linkages – Commission for Sustainable Development (CSD)	http://www.iisd.ca/linkages/csd/
UN Department for Policy Coordination and Sustainable Development	http://www.un.org/DPCSD/
United Nations Division of Sustainable Development	http://www.un.org/DPCSD/dsd/
Commission for Sustainable Development (CSD)	http://www.un.org/DPCSD/dsd/csd.htm gopher://gopher.un.org:70/11/esc/cn17
Search the Sustainability Publications on the WWF Global Network	http://www.panda.org/cgi-bin/wwf/AT-wwf_sustainsearch.cgi
International Development Research Centre	http://www.idrc.ca
The Food and Agriculture Organisation	http://www.fao.org
United Nations Development Programme	http://www.undp.org/undp/comm/index.html
Communication for Development (FAO)	http://www.fao.org/waicent/faoinfo/sustdev/CDdirect/Cdhomepg.htm
International Small Business Consortium	http://www.isbc.com/
TOOL	http://www.tool.nl/
The Earth Charter Consultation Homepage	http://www.earthcharter.org/
Sustainable Development Dimensions	http://www.fao.org/waicent/faoinfo/sustdev/Welcome_.htm
Biodiversity Conservation Information System	http://biodiversity.org/
The African Information Society Initiative (AISI)	http://www.bellanet.org/partners/aisi/
Bellanet	http://www.bellanet.org/index.html
The Acacia Initiative	http://www.idrc.ca/acacia/
International Institute for Environment and Development (IIED)	http://www.oneworld.org/iied/
International Development Network	http://www.idn.org/
Consortium for International Earth Science Information Network (CIESIN)	http://sedac.ciesin.org/
TERRA	http://www.olcommerce.com/terra/
The Online World	http://www.puc-rio.br/parcerias/presno/
The German Federal Environment Ministry (English Pages)	http://195.80.205.111/englisch/index.htm

Environmental Treaties and Resource Indicators (ENTRI)	http://sedac.ciesin.org/pidb/
International Treaties Database	http://sedac.ciesin.org/pidb/IUCN-guide.html
International Year of the Ocean	http://www.yoto98.noaa.gov/oceanl.htm
UNEP-HEM	http://www.gsf.de/UNEP/index.html
European Centre for Nature Conservation	http://www.ecnc.nl/
ERIN: Environmental Information Servers by Region	http://www.erin.gov.au/other_servers/region/server_region.html
ENVIROLINK	http://envirolink.org/
ICONS	http://www.iucn.org/icons/
Global Environmental Information Locator Service (GELOS) – G7 ENRM	http://enrm.ceo.org/
Global Environment Information Centre	http://www.geic.or.jp/
World Resources Institute	http://www.wri.org/wri/
Biodiversity Clearing House Mechanism	http://www.biodiv.org/
START – Global Change System for Analysis Research and Training	http://www.start.org/index/index.html
International Human Dimensions Programme on Global Environmental Change	http://ibm.rhrz.uni-bonn.de:80/ihdp/
International Geosphere and Biosphere Programme IGBP	http://www.igbp.kva.se/
Sustainabledevelopment.org	http://www.sustainabledevelopment.org/

1.16 Multimedia visualization

Workpackage 6-1 Deliverable 5052-16

Expected (original) delivery 29-02-98
Draft delivery 23-04-98
Final delivery 30-06-00

Background to the workpackage

1.16.1 Comprehension and multimedia

“Why do we put so much emphasis on audio-visual means of portraying goal, trend, condition, projection, and alternative? Partly because so many valuable participants in decision-making have dramatizing imaginations. ... They are not enamoured of numbers or of analytic abstraction. They are at their best in deliberations that encourage contextually by a varied repertory of means, and where an immediate sense of time, space, and figure is retained.”³⁴

An important focus of the project was on the development of multimedia facilities through which users could interact with databases. Such use of multimedia is to be strongly contrasted with the predominant concern with decorative preoccupations that are a focus of much web design.

The [Union of International Associations](#) (UIA) is faced with a major challenge of how to provide greater insight into complex networks of relationships amongst international organisations, world problems, strategies in response to them, human development and human values. Extensive databases are maintained on each of these sets of entities. There are (hyper)links between the entities in each set, and between entities in different sets.

To clarify options for visualisation of complex patterns of conservation-related information, during the Definition Phase of the project Anthony Judge attended the CODATA Euro-American Workshop on the Scientific and Technological issues of Data and Information Visualization *Where are we and where do we go from here?*. He discovered that little attention had been given by corporate and academic researchers to generated virtual reality displays of the style explored by the UIA for this project. It was possible that some graph layout and distortion methods (fisheye, etc) could be relevant. It was clear that innovations are being rapidly copyrighted in this area³⁵.

1.16.2 Multimedia potentials

The principal partners in this project have until quite recently presented their data in text form, although numeric data, maps and other display structures may be associated with the texts or calculated from them. The key policy-related issue here is how such textual information can best be rendered more immediately comprehensible. The interest of the partners in multi-media development is therefore intimately related to how such interactive media can improve comprehension of more complex patterns of

³⁴ Harold D Lasswell, 1968. The transition toward more sophisticated procedures In: Davis B. Bobrow and J.L. Schwartz (Ed.), *Computers and the Policy-Making Community: applications to international relations*, Prentice-Hall, pp. 307-314.

³⁵ The USA Central Intelligence Agency (CIA) has articulated its own interest in the field in the report of the P1000 Committee on *Strategic Information Visualisation* (1996).

environmental information than is possible through pure texts, tables or traditional graphics. In this sense, the key to the product's success lies in the development of an interactive learning environment. The challenge is to facilitate the emergence of meaning rather than simply the collection and dissemination of information for its own sake.

The overarching objective was for the product to contain a balance of graphics content, pre-generated or generated on-the-fly that genuinely enhances the value of the product and the comprehensibility of the data for the user. Priority is given to policy-relevant comprehension tools (Section 3: User needs and product design). These might include: species and protected area information distribution maps, photographs and graphics of other kinds (*e.g.* taxonomic relationships of species, vicious cycles of environmental problems and sustainable cycles of conservation strategies).

A feature of WCMC's datasets is identification of the geographic location of biodiversity and the factors that affect it. The UIA records the countries in which each international organisation has members, including signatories to treaties. These data have immediate potential to be converted into maps (some of which may be clickable). These may be pre-made graphics (GIF) files, or 'flood-fill' displays generated on-the-fly, or both. The UIA also has other data that is amenable to mapping, notably (1) hierarchies (2) networks and (3) feedback loops of conservation issues and strategies, while the WCMC may have data relating to the international treaties which a country is party to, or percentage cover of protected areas at the national level.

During the Definition Phase it was shown that images and sound files could be located using generated search strings. This work was to advance to enhance user access to such third-party resources, notably by making arrangements with Web image and sound providers for user access, for free or at cost, as appropriate.

Activities of the workpackage

Several distinct lines of development were explored by UIA, some of which emerged subsequent to the Definition Phase. Initial work focused on tracing valuable software packages, and people, that could in some way assist in presenting the data in new and more meaningful ways. The obvious constraints continued to be the exorbitant prices of commercial packages, many of which offer only marginal cognitive advantages in relation to the data. Proprietary constraints and the obligation for users to acquire software were also a preoccupation.

It became clear that the most striking advances at minimal cost lie in the area of using either VRML or *Java* in relation to HTML pages, since these can be most closely related to planned delivery of data. Such work also has the advantage of being least locked into licensing arrangements and most open to further adaptation.

The project achieved several significant breakthroughs in allowing users to employ visual displays as entry points to text data. As a result of the project, users now have access to several different kinds of on-going experiment, which are described in detail below.

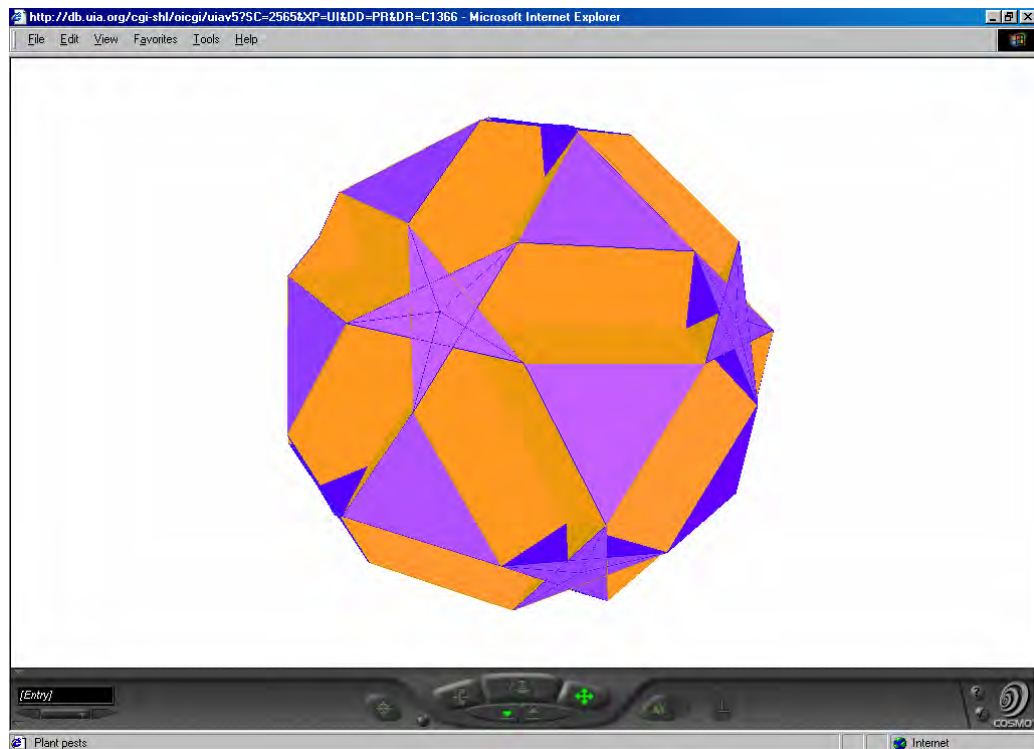
It must be stressed that the following visual experiments are designed to find ways of representing, comprehending and exploring complexity. The purpose is to provide sophisticated techniques which generate structures that are visually interesting in their own right but raise interesting questions about what they are able to represent and how they might be developed. It is a deliberate intention to give the user as much control as

possible in exploring these structures creatively. The intention is also to make this process as interesting to academic researchers, students, the media, and to those concerned with formulating more appropriate policies in a complex society. For further discussion see: *Envisaging the art of navigating conceptual complexity: in search of software combining artistic and conceptual insights* (<http://www.uia.org/uiadocs/artnavig.htm>)

1.16.3 Virtual reality (VRML)

This is the subject of another part of this report (Section 18.2.1: Virtual reality (VRML)). Essentially the UIA web server now generates unique virtual reality displays in response to user queries from individual text profiles of Problems.

The constraints with respect to VRML remain those of acquiring competence in VRML 2.0 beyond that acquired in VRML 1.0, notably in relation to the new browsers. It has been irritating to discover that colour values on work already done, that were very satisfactory in VRML 1.0 have been lost in VRML 2.0. The challenge of generating VRML on-the-fly for web users of the data appears to have been solved.



3-D polyhedron representation of UIA data in VRML. The nodes of the structure are live links into the data.

<http://www.uia.org/projects/finarept/image24.htm>

In the on-line form of these databases (<http://www.uia.org/data.htm>), these are as follows:

- **Tensegrity:** an experiment in mapping a network of relationships onto a tensegrity form as a coherent framework
- **Polyhedra-1:** an experiment in mapping a network of relationships onto a polyhedral form selected from a set of such forms according to the properties of the network
- **Polyhedra-2:** a development of the previous experiment in which the user can endeavour to control the way in which the software selects the polyhedron and projects the network onto it.

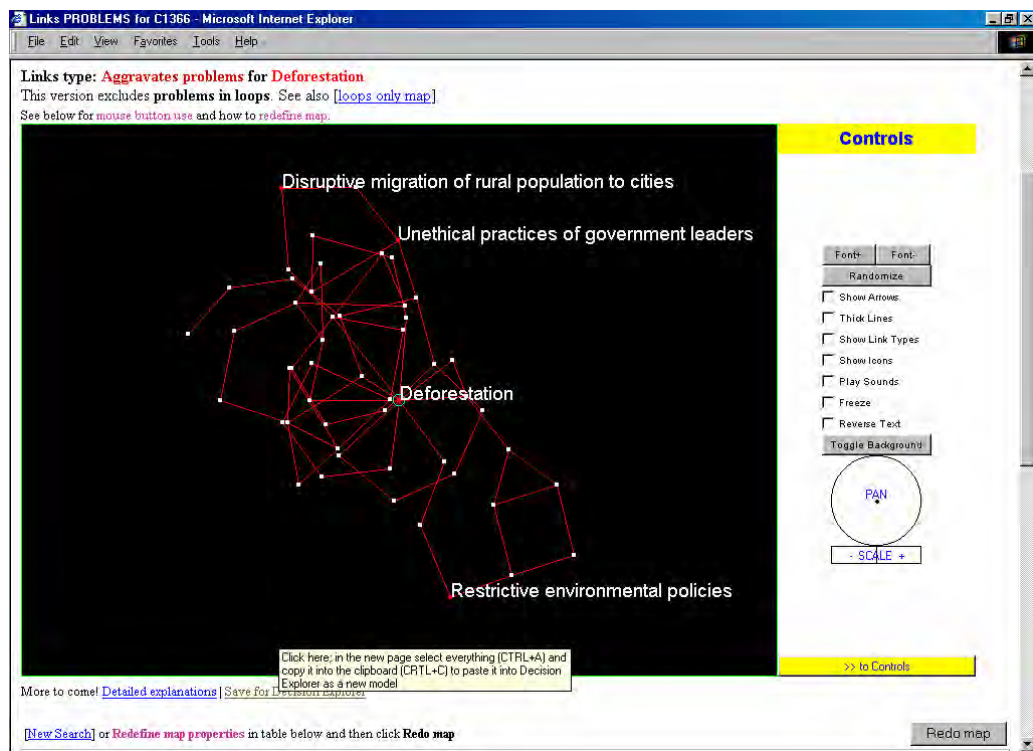
- **Loop display:** use of VRML 2.0 as the basis of a dynamically generated display of problem loops

A selection of earlier experiments using virtual reality to display complexes of problems and organisations is presented elsewhere (<http://www.uia.org/uiademo/vrml/vrmldemo.htm>). These structures were generated in 1997 as *static* pages (in contrast to the *dynamic* generation of structures described above). They were converted to VRML 2.0 in the final phases of the project.

1.16.4 Spring maps (*Java applet*)

Subsequent to the Definition Phase, the possibility emerged of developing a network graph layout facility in *Java* in order to portray information on sets of UIA database entities (Problems, Strategies, Organizations, Values, etc). This involved two areas of development:

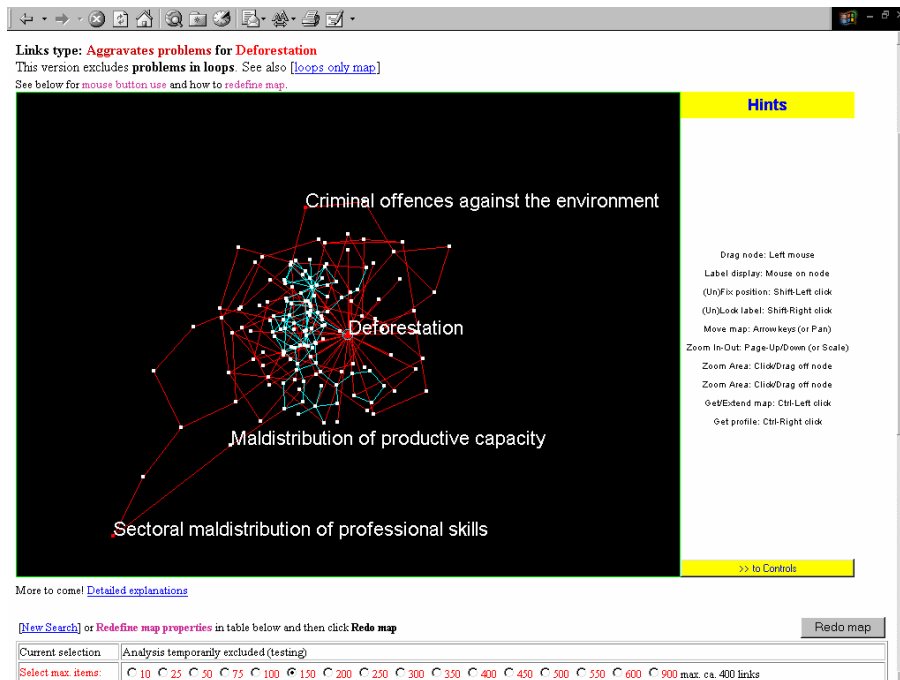
- Progressive development of a spring map applet, was undertaken with third party assistance ([Beautiful Code BV](#), Netherlands), through a series of iterations as new possibilities became evident on testing
- Progressive development by the UIA of the generated web page calling the applet to offer the user a range of additional ways of feeding parameters to the applet to redesign the display.



Java spring map display of UIA data. The nodes on the dynamic map are live. <http://www.uia.org/projects/finarept/image28.htm>

Spring maps are characterised by their dynamic self-organising properties. Instead of having to pre-allocate elements of the map over the screen surface, the network is randomly distributed over the surface and then reorganises itself according to the length (strength) of the relationships between individual nodes (based on spring mechanics). In addition, users are then free to manipulate portions of the map, configuring it according to preferences, colouring its parts, and freezing the result progressively.

Further details on this activity can be found in Section 18.2.2: *Java spring maps*.



Same Java spring map display of UIA data with more nodes displayed.
<http://www.uia.org/projects/finarept/image25.htm>

1.16.5 NetMap

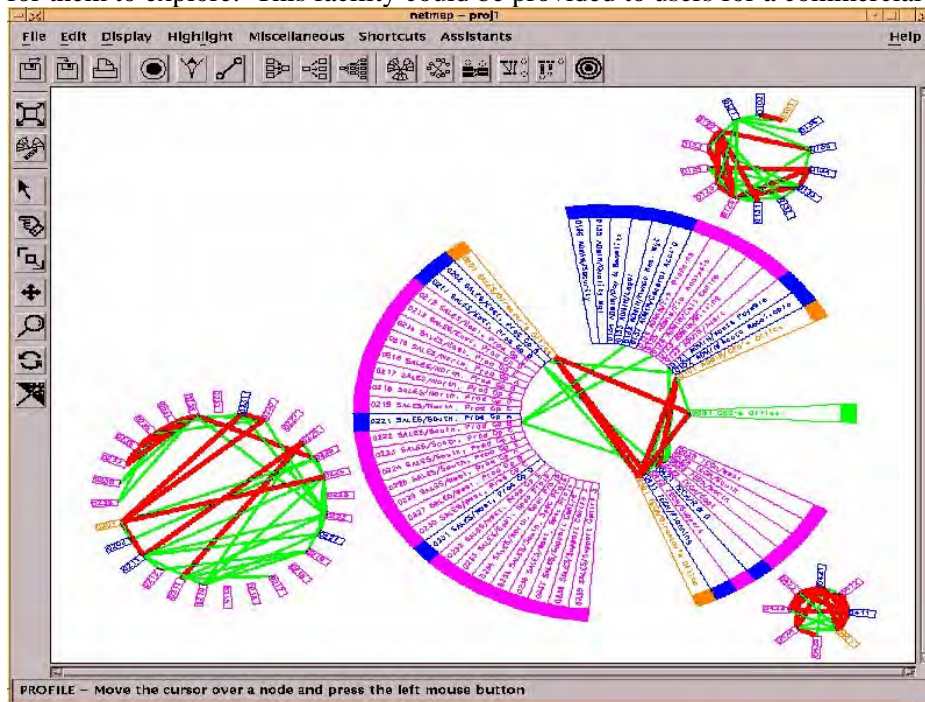
According to the producers of the software, *NetMap* is a relational data visualisation tool, providing visual analysis of multi-related data from both a strategic and tactical view, providing the analyst or user with full train of thought analysis on large data sets to identify areas of interest within the data. *NetMap* can be used in conjunction with data repositories or as a stand alone analysis tool importing flat ASCII files for analysis. The flexibility of *NetMap's* design enables many other tools such as algorithms and neural networks to be included as an integrated tool.

In 1995, the UIA had provided an extensive dataset to NetMap (UK) for a demonstration of the software on an expensive platform beyond the UIA budget. The demonstration was a success and various visualisations of the data were published by the UIA. Of great interest is the possibility of providing *a single overview of hundreds of thousands of links* and drilling down to subsets or details. It is this feature which makes it a powerful tool for tracing fraudulent financial transactions (a major market for the software).

In 1999, a visit was made by Nadia McLaren to the Australian inventor of *NetMap* in order to re-establish contact in relation to the INFO2000 initiative. It became apparent that the constraint on further collaboration was that the development licence for the non-Pacific region had been sold to a US company. The only opportunity for further co-operation lay in use of an Australian server.

In 2000, at the close of the final phase, Anthony Judge followed up this visit and was informed that NetMap (Australia) was currently testing an Application Service Provider (ASP) formula. It was agreed that it would be possible for users of the UIA website to be passed through to the ASP to have *NetMap* analyses performed on the

UIA data (and then passed back to the UIA website). A new set of test data was left for them to explore. This facility could be provided to users for a commercial fee.

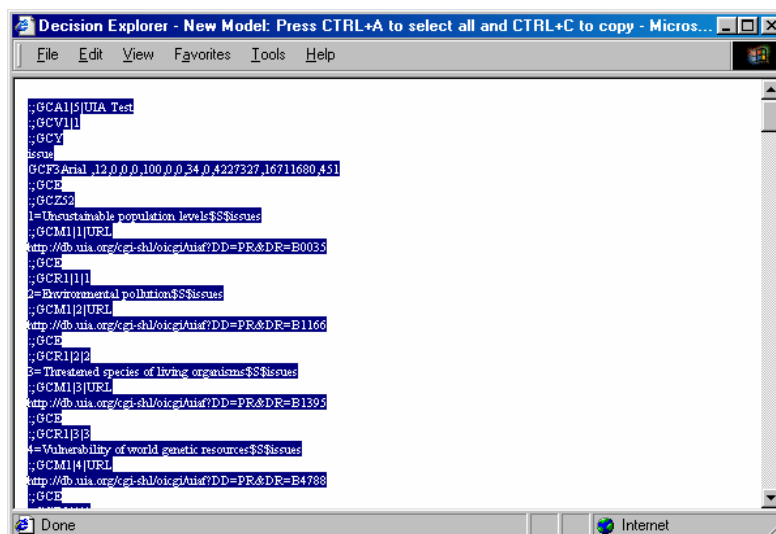


<http://www.uia.org/projects/finarept/image26.htm>

Copyright © 2000 NetMap Solutions, Pty Ltd. (Australia) <http://www.netmap.com.au/>

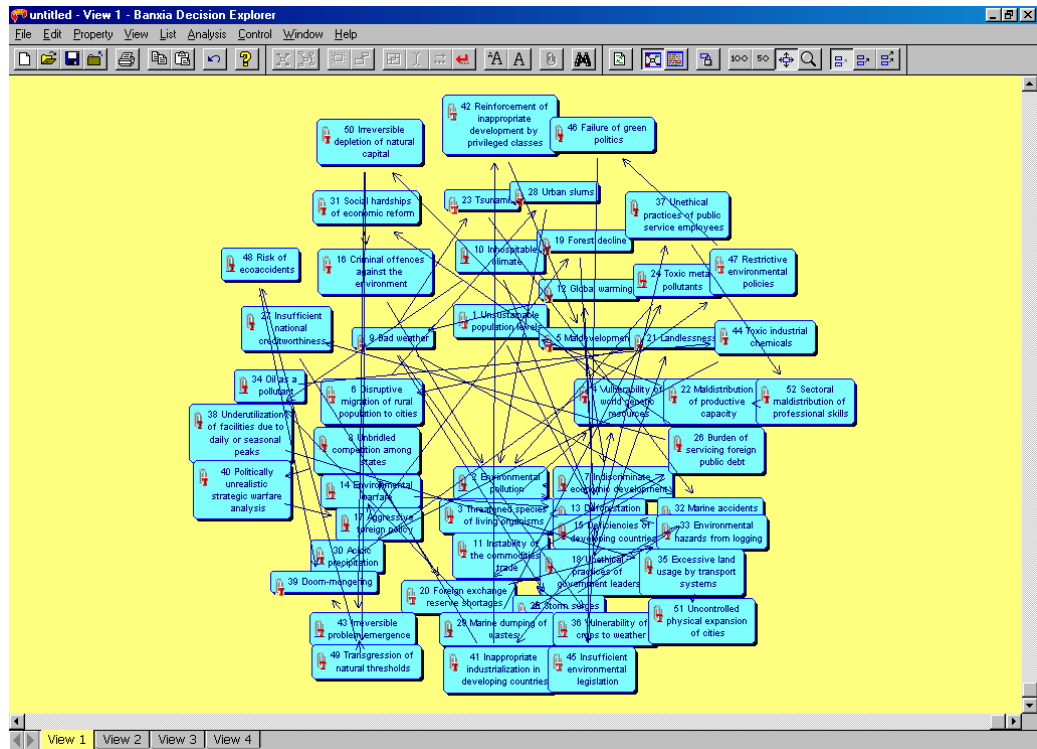
1.16.6 Decision Explorer

According to its producers, *Decision Explorer* is a proven cognitive mapping software package for managing "soft" issues - the qualitative information that surrounds complex or uncertain situations. It allows users to capture in detail thoughts and ideas, to explore them, and gain new understanding and insight. The product was developed by academics at the universities of Bath and Strathclyde and currently by Banxia Software (UK), in conjunction with major organisations. It now has hundreds of major international users.



Code of *Decision Explorer* – incorporating UIA data

<http://www.uia.org/projects/finarept/image27.htm>



Display of UIA profiles using *Decision Explorer*
<http://www.uia.org/projects/finarept/image30.htm>

-

Listing of profile relationships, by type, using *Decision Explorer*
<http://www.uia.org/projects/finarept/image29.htm>

Anthony Judge had explored this package in 1997 but found it lacked a variety of features that would have made it relevant to mapping UIA data online. The most recent release, however, allows importation of data in formats compatible with those

that can be output under user control during the *Java* spring mapping process. In effect the web user can now save the UIA relationship data in a format that allows it to be read by *Decision Explorer* (at the user's location) and formed into a cognitive map. Alternatively the saved data can be converted into such a map at the UIA site (as a fee paying service) and sent to the user.

A considerable advantage of this package, from the policy perspective of this project, is that it has been designed with strategy-making as its main focus. The package therefore has a whole range of analytical and display tools built in. The inventors (Professor Colin Eden and Dr Fran Ackermann of the Strathclyde Business School) provide background argumentation in a recent book, *Making Strategy: The Journey of Strategic Management* (1998), offering an integrated and practical resource for all those concerned with translating strategic theory into management practice using cognitive mapping tools and in the light of a number of case studies, including the Scottish Natural Heritage, the National Health Service, the Northern Ireland Prison Service and Reed Business Publishing.

The package can handle several thousand conceptual entities and relationships, meeting a basic requirement of the complexity of the UIA data.

The UIA has therefore been able to provide users with an alternative way of presenting relationship networks. But, unlike the preoccupation of many *Decision Explorer* users, the UIA has been able to bypass the cognitive mapping phase and allow maps to be directly constructed from the UIA relationship data on the fly by web users, after preliminary exploration using the spring map technique.

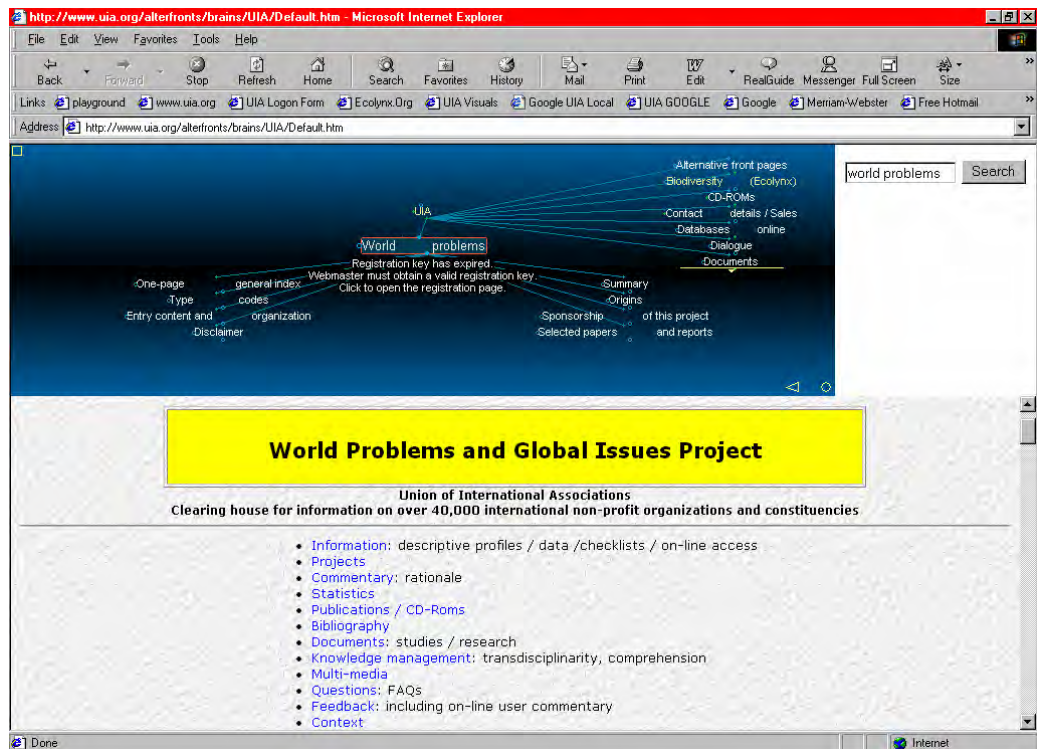
Users can either work with static maps provided on request from users by the UIA, or else with the full facilities of *Decision Explorer* to analyse (with over 40 functions) and restructure a cognitive map. The software allows very large and complex maps, of the kind emerging from UIA data, to be printed as a linked set of individual maps. As with the *Java* spring maps, URLs can be associated with individual maps to link into the full profiles in the UIA databases.

For the UIA this facility also means that it will be able to provide meetings, at any location, with preliminary cognitive maps from its data with the possibility of exploring ways of building on, or correcting, such a map in the light of insights emerging during the meeting. This has the considerable advantage of allowing meetings to optionally access data at a higher level of complexity rather than having to work solely with a weaker overview because of communication challenges during the meeting. In this way a meeting can see an explicit picture of an issue, clearing indicating the inter-relatedness and interdependencies between different aspects so that these can be explored and debated in a controllable setting.

1.16.7 TheBrain

As a knowledge management system, *TheBrain* software provides interface to any complex back-end knowledge system with rich patterns of interconnected information. It is designed to increase accessibility, avoiding the need for clumsy list boxes and tree views. *TheBrain* interface provides the ability to display complex relationships from a database with a consistent and dynamic display.

UIA experimented with demo versions of this software and was impressed its possibilities for organising some of the information in its databases as well as access to them. Unfortunately, despite interaction with the manufacturers, it was decided that the professional version was too expensive (in excess of \$2,000), especially because its licensing arrangements were based on numbers of users.



Display of UIA information using *TheBrain*
<http://www.uia.org/projects/finarept/image39.htm>

1.16.8 Visual products

At the close of the Implementation Phase, and as a marketing and communication experiment in support of the *Ecolynx* website, the UIA invested in a variety of multimedia products based on specially selected and crafted spring maps. These products available for sale and can be ordered from the UIA website (see <http://www.uia.org/visuals/index.html>). It was necessary to develop in online credit charging capability.

1.16.9 Images

The Definition Phase demonstrated the ability to associate images, such as those of endangered species, with the relevant text page. The results were quite satisfactory. The possibility of automatically generating web query searches for such images was also demonstrated. It was decided that, where possible, arrangements will be made with image providers for user access for free or at cost, as appropriate.

UIA intended to spend time during the Implementation Phase in making arrangements with Web image and sound providers for user access for free. However, given that this rather routine activity would have consumed time which could be given to the more exciting developments described above, this facility was treated as low priority and was the subject of no further work during the project.

WCMC carried out similar experiments as part of the prototype website being developed on the Africa Eurasian Waterbirds Agreement (AEWA).

1.16.10 Sound

Much of the challenge for the *networks of strategies* developed by *networks of organisations*, in response to *networks of problems*, based on *networks of values*, lies in how these are to be coordinated or "harmonised" in some way. The well-explored

conventional approach, based on some simplistic consensus, has a relatively poor track record and few prospects for greater efficacy. The dimensions explored by music redefine "consensus" in richer musical terms that offer many more ways to explore relationships between seemingly disparate elements, using both consonant and dissonant features to advantage.

The use of sound is therefore seen as a way of benefiting from insights into harmony that are widely and intuitively understood. Hopefully it will also help to reframe strategic responses to complex issues in ways to which younger generations can resonate more optimistically.

In the Definition Phase, the possibility of attaching sound files to profiles or images was foreseen. This was not considered especially challenging (and could be taken up as a routine task at some later date). Subsequent to the Definition Phase, two possibilities were explored:

- **Attaching sound files to spring map features:** This mapping initiative (described above) initially explored the possibility of attaching simple sound files to each node, allowing the user to trigger them individually by mouse operations. This was seen as the basis for developing an acoustic mnemonic code for structures. Ways of packing sequences of notes into each nodal file were envisaged.
- **Use of generative music:** A more structured approach to the use of sound to enhance comprehension of complex patterns of information emerged as a result of exploration of use of the *Koan* software provided freely over the web as a browser plugin by SSEYO (UK). This focuses on the use of *generative music* seeded by particular (data) patterns and controlled by an extensive array of parameters familiar to musicians. Generative music has the additional advantage of avoiding some of the obvious copyright issues associated with supplying sound over the web; this may not be the case with the seed pattern, but seed patterns can be developed. Of special interest is the fact that the amount of data transferred as a pattern to the plugin is normally less than 30k, since the music is generated by the plugin on the user's computer rather than having to be downloaded in its entirety. The plugin is free of charge.

The prime interest of using sound was to explore ways of offering sound cues to facilitate comprehension and identification of complex data structures, reinforcing visual cues. This is in contrast to conventional uses of sound to associate distinct ambience music with a web page or a web site.

In the fourth quarter of the Implementation Phase, this facility was successfully implemented as an experimental extension of the spring map facility to enable users to explore its possibilities on the basis of a set of seed patterns supplied for demonstration purposes by SSEYO, UK (who were extremely interested in the database application). The technical challenge of enabling the plugin through a cgi script, rather than in relation to static web pages, was partially solved. Difficulties for the user were occasionally encountered in relation to loading or obtaining the plugin.

Phases for further development of use of generative music in relation to the data were envisaged in some detail (Section 16.2.8: Sound). These ranged from simply allowing the spring map data set to modify the seed pattern, through defining a unique seed pattern from the map data, to allowing the user to input music to trigger movement of selected parts of the map or its total reconfiguration.

Unfortunately lack of resources prevented rapid development and exploration of these facilities although new releases of the plugin have continued to be released.

1.16.11 Geographical maps

This aspect is covered in Section 17: Mapping national information.

1.16.11.1 WCMC mapping

During the project WCMC made extensive progress in implementation of an Internet Map Server to allow deliver of a map-based interface to a number of its databases on the web.

A review of two Internet mapping products was carried out. A demonstration version of *MapObjects* IMS was acquired and installed, in addition to *ArcView* IMS, to enable a comparative review of the two systems. ESRI UK was contacted to ensure that a free swap of software was available should that be deemed necessary.

A Mediterranean demonstration was developed including elements from the two Internet mapping tools. In addition to the map display and query functionality of the early demonstration pages based on *ArcView* IMS; the new system based around *MapObjects* IMS also incorporated data download functionality. Experience gained from this exercise is summarised below:

	<i>ArcView</i> IMS	<i>MapObjects</i> IMS
Mapping and querying	Easy and quick to set-up using <i>JAVA</i> based tool. Available to all Internet browsers.	Becoming easier using Active X based tool, but still not quite as straight-forward as <i>ArcView</i> IMS. Available only to Internet Explorer.
Data download	Data must be pre-packaged by WCMC.	User can select region and data sets to download interactively.
Customisation	Limited customisation.	Fully customisable, but using programming languages unfamiliar to WCMC staff.
Future support	Future development plans unknown.	Most new Internet related developments are with <i>MapObjects</i> IMS.

At the annual conference of the Internet mapping software supplier (ESRI) in 1999 it was clear that future developments of their Internet mapping technology would be based on a different product: *MapObjects* IMS. It was decided that the *MapObjects* IMS would provide the better longer-term development environment in which to develop the IMS service. However, the development of the system took longer as new skills needed to be developed.

To ensure that mapped information is delivered to the user at the highest possible quality, the format in which the map server delivers information has been changed. By switching the file format from a JPEG file to GIF file far clearer images are provided. However, the UNISYS Corporation has copyright on the compression technique used in the GIF file format. To enable the GIF functionality within the IMS an agreement was signed with UNISYS. The standard contract issued by UNISYS requires the licensee to pay a percentage of all income from a system using their technology with a minimum annual payment of \$5,000. Through negotiations with UNISYS, these costs have been reduced to \$1,000 per annum.

Following development of the Mediterranean pilot, a number of other applications have been developed, each of which is described in other parts of this report. These include:

- Coral disease database
- Marine turtles database
- World Heritage sites
- European forest gap analysis
- Forest poverty mapping

It should be noted that developments in the field of delivering maps over the Internet are moving very fast, and WCMC is now considering changing the method that is currently being used to one that is more flexible.

1.16.11.2 UIA mapping

The prime focus of “mapping” for the UIA was of the non-geographical variety related to representation of networks of problems or strategies as described in terms of the visualization techniques discussed above.

Throughout the project, the UIA explored the possibilities of low-cost mapping software that might have been used to provide users with a sense of the geographical distribution of problems. The UIA does maintain large datasets on the country location of members of international organisations. Given the links between Problems (or Strategies) and organisations, these data could have been used to colour fill world maps by country to provide users with an indicative sense of where the preoccupations with problems were originating.

Unfortunately no suitable, simple, low-cost software was located, despite the availability of more sophisticated and expensive alternatives. Tentative specifications for what is required have been indicated below.

1.16.12 Promotional Video

In 1999, at the request of DG Information Society the project produced a promotional video together with a series of streaming video interviews intended for release on CD-ROM to illustrate the achievements of the INFO2000 programme. A copy of the video is accessible on the [Ecolynx](#) website at Project Information > *Ecolynx* Movie.

1.16.13 CD-ROM prototype

As part of the completion of the Definition Phase, a comprehensive CD prototype was produced to demonstrate online and offline capabilities of the proposed service. Further work on this medium has not been given priority, for reason outlined in 19.1.

1.16.14 PowerPoint presentation – guided tour

A *PowerPoint* presentation was made for the Definition Phase project. Illustrated were seven scenarios of typical user applications:

- Threats to World Heritage sites;
- Endangered species;
- Trade in endangered species;
- Polar bear *Ursus maritimus*;
- Steller’s eider *Polysticta stelleri*;
- Protected areas for biodiversity conservation;
- Conserving global biodiversity.

This *PowerPoint* presentation provided the basis for a presentation tool for potential users and sponsors. It was updated in April 1999 and shown at various conferences.

The most recent version is also available for download or viewing online at:
<http://www.uia.org/projects/completx.ppt>

Unforeseen developments during the project

The period of the project saw a distinct shift in industry investment towards a new sector defined by the term "visualization of information". The obvious constraints continue to be the exorbitant prices of commercial packages, many of which offer only marginal cognitive advantages in relation to the data.

Throughout the project, evolution in multimedia software packages and facilities was a constant preoccupation and reframed the work that had been outlined by the Definition Phase. In particular, the shift from the focus on virtual reality to *Java* spring maps is described above (Section 16.3: Multimedia visualization, Unforeseen developments during the project). The further possibilities of products such as *Decision Explorer* and *NetMap* had also not been foreseen, as with the *Koan* generative music software applications.

We were disappointed that that the large range of geographic software available did not offer us the simple tools relevant to some of our particular needs especially in the case of geographical display of some UIA data.

Identification of future activities

1.16.15 Use of sound

From November 1999, ways of *integrating sound into the visualization of complex networks* were explored, although resources did not permit them to be enabled. In order of increasing challenge and significance, these possibilities can be tentatively presented as:

1.16.15.1 Music unlinked to data or map movement

In this case, the music is basically generated in parallel with the network as a form of accompaniment (like in the silent movies). The issue here is whether any such accompaniment can usefully enhance comprehension of the map by judicious aesthetic choices or whether it is purely decorative and "for effect" -- especially if the user is free to modify the music at will. Research elsewhere has shown that background music can assist in the absorption/retention of information. *ie* even audio at this simple level, can be of real benefit, assuming it is suitably chosen.

1.16.15.2 Music driven by data (but unlinked to any map movement)

In this mode, data from which the map is generated is also used to affect or determine the "music". The music is therefore generated from the data and thus to some degree encodes the complexity represented visually in the accompanying map. The challenge here is to determine useful ways to translate the map coding into the patterns through which the music is generated. The question is the degree to which this musical encoding is meaningful in new ways, especially since it does not affect visually the dynamics of the map to which the user is exposed. In its more challenging forms, this mode would give rise to "music" unique to each map. How musical or meaningful it would be could be a challenge for the software facility and the user's mastery of its features. Particular patterns of sounds, or musical sequences, could be associated with the nodes of the map to be triggered by mouse operations.

1.16.15.3 Map movement driven by music (through common data)

In this mode, the data from which the map is generated is also used to trigger dynamics in the map, namely movements of particular nodes in response to particular musical notes and/or instruments. The map therefore moves in rhythm to the music. Again the question arises as to the degree to which this is simply an intriguing effect, as opposed to enhancing any form of comprehension of what the map (and the music) then represent.

1.16.15.4 Music driven by map movement (through common data)

In this mode, the user's manipulation of the map has effects on the pattern of sound. This could be merely a trivial effect to accompany normal mouse manipulation of the map. However it is possible that a user might benefit from this effect in unsuspected ways.

1.16.15.5 Map movement driven interactively by music (AND vice versa)

This mode essentially combines the two previous modes. The key here is the centre of gravity of control. Does user movement of the map take greater or lesser precedence over the music driving that movement on the basis of the data.

1.16.15.6 Map movement driven via user (micro) input

This mode explores the use of external user sound input as a means of reconfiguring the map interactively, in effect by playing to it -- "taming the beast". Emphasis in this case is on the musical ability of the user in playing sounds that entrain the map into new patterns or sequences of patterns. Again the question, arises as to the extent this is more than an intriguing toy, and whether it offers new opportunities for comprehending and working with complex patterns.

1.16.15.7 Strategic coordination (possibilities to be explored)

It is at this stage that it becomes possible to explore the use of insights from music to effectively "harmonise" complex patterns of relationships.

At the close of the project, UIA on-line experiments are at *Stage 4.1.1, verging into Stage 4.1.2* in the above schema.

1.16.16 Geographical maps

WCMC Internet Map Server

WCMC is continuing to develop its Internet map server, and will be seeking to implement it increasingly in its information services. This includes development of distributed databases using *OpenGIS*. This is described in detail in Section 17: Mapping national information.

Updating databases via visual interfaces

There is clear value to users to be able to respond to visually displayed data by immediately indicating new concepts or links, or deleting old ones. At present such changes are only possible in conventional text mode. Although it is fairly straightforward to provide the facility allowing a user to modify a graphical display, it is quite another matter to integrate such changes back into the database from which the display is generated. Initial investigation of the *Decision Explorer* interface suggests that this may offer a very interesting option for such data capture.

1.16.17 Adding photographs and other images

The possibility of automatically generating web query searches for images and other multimedia files was demonstrated in the Definition Phase (Section 16.2.7: Images). However, the essentially routine activity of associating texts with images (photographs etc) was forsaken for other priorities. This is seen as a potential for further work. It would certainly enrich the databases in ways that would make them more "popular" in feel.

1.16.18 Guided tour of functional operation

On the UIA website, a draft tour has been designed for organisation-related data in order to get a sense of possible ways of organising information for an exploratory approach by users. This will be developed and extended to other categories of data available through [Ecolynx](#).

1.16.19 Guided tour of conceptual operations

The skills acquired by individual editors working for extended periods of time in a hyperlinked environment – clustering, splitting and relinking conceptual entities – suggest the great value of capturing these operations through video screen capture accompanied by interview commentary. The product would be used to convey an understanding of what is essentially a new knowledge management skill, namely hyperlink editing.

1.17 Mapping national information

Workpackage 6-2 Deliverable 5052-17

Expected (original) delivery 30-11-99
Beta delivery 30-11-99
Additional delivery 31-05-00
Final delivery 31-07-00

Background to the workpackage

Mapping is an essential tool for the presentation of information on the status and distribution of biological diversity, and for presenting information on the actions taken by nations to conserve and sustainably use that biological diversity.

For more than ten years, WCMC has been using computer Geographic Information Systems (GIS) as a means of integrating and presenting information, working in collaboration with ESRI (who is the developer of one of the main GIS suites of software), and the oil industry. However, for most of this time WCMC has only been able to make individual graphics files (GIF or JPEG) available over the Internet, although on a number of occasions these are organised and delivered through a database.

The objective of using multiple media, including maps, in this project is for the product to contain a balance of graphics content, pre-generated or generated on-the-fly that genuinely enhances the value of the product and the comprehensibility of the data for the user. Priority should be given to policy-relevant comprehension tools. These could include: species and protected area information distribution maps, photographs and graphics of other kinds (*e.g.* taxonomic relationships of species, vicious cycles of environmental problems and sustainable cycles of conservation strategies).

A feature of WCMC's datasets is identification of the geographic location of the species or protected area in question. The UIA records the countries in which each international organisation has members, including signatories to treaties. These data have immediate potential to be converted into maps (some of which may be clickable). The maps may be pre-made graphics (GIF) files, or 'flood-fill' displays generated on-the-fly, or both. There is in-house expertise to do so and portions of certain datasets have been so developed on a prototype basis.

Activities of the workpackage

1.17.1 Internet map server

During the development phase of the project, WCMC provided copies of geographic material for use within the CD-based prototype. This material included maps of tropical forest and coral reefs for a range of countries and the database that supports location and delivery of the correct maps (these materials are also available on the WCMC website).

A major gap in the prototype product was the ability to deliver maps, and to develop and use maps interactively or "on the fly" - only pre-packaged graphics files were available. WCMC has been working on development of an Internet Map Server, in

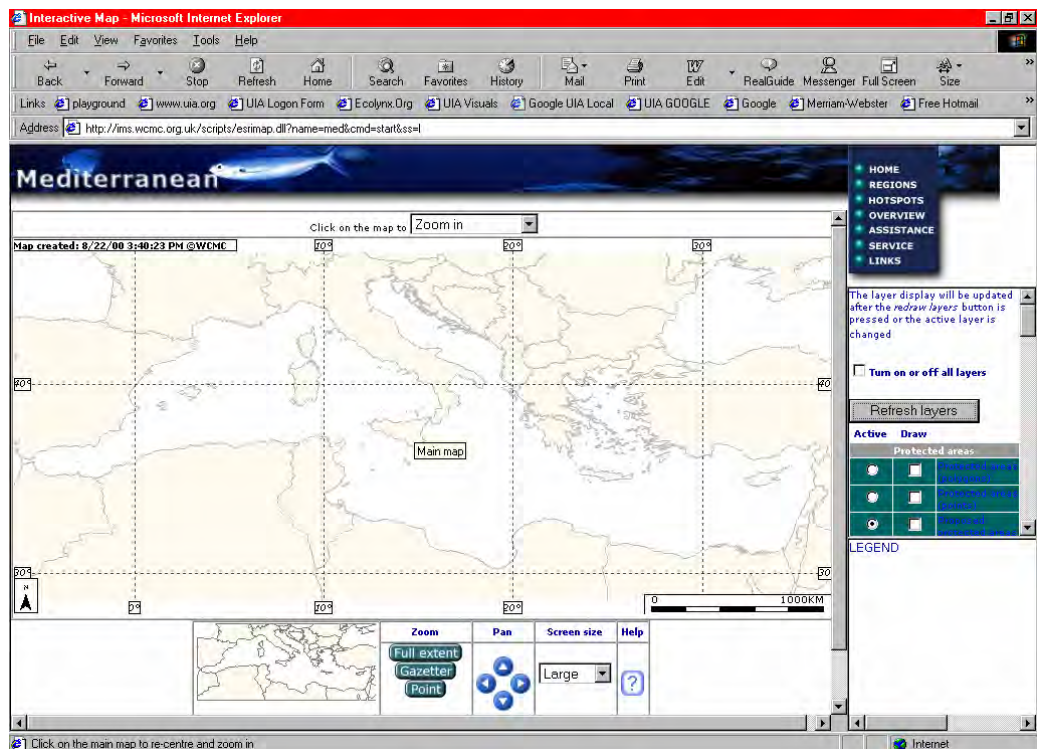
collaboration with ESRI (the developers of Arc/Info GIS software) and the World Bank, and with additional funding from the International Petroleum Industry Environmental Conservation Association (IPIECA).

1.17.1.1 Technical issues

A review of two Internet mapping products was carried out. A demonstration version of *MapObjects* IMS was acquired and installed, in addition to *ArcView* IMS, to enable a comparative review of the two systems. ESRI UK was contacted to ensure that a free swap of software was available should that be deemed necessary.

A Mediterranean demonstration was developed (17.2.1.2 below), which included elements from the two Internet mapping tools. In addition to the map display and query functionality of the early demonstration pages based on *ArcView* IMS; the new system based around *MapObjects* IMS also incorporated data download functionality. Experience gained from this exercise is summarised below:

	<i>ArcView</i> IMS	<i>MapObjects</i> IMS
Mapping and querying	Easy and quick to set-up using <i>JAVA</i> based tool. Available to all Internet browsers.	Becoming easier using Active X based tool, but still not quite as straightforward as <i>ArcView</i> IMS. Available only to Internet Explorer.
Data download	Data must be pre-packaged by WCMC.	User can select region and data sets to download interactively.
Customisation	Limited customisation.	Fully customisable, but using programming languages unfamiliar to WCMC staff.
Future support	Future development plans unknown.	Most new Internet related developments are with <i>MapObjects</i> IMS.



Internet Map Server: Mediterranean sea
<http://www.uia.org/projects/finarept/image40.htm>

At the annual conference of the Internet mapping software supplier (ESRI) in 1999, it was clear that future developments of their Internet mapping technology would be based on a different product: *MapObjects* IMS. It was decided that the *MapObjects* IMS would provide the better longer-term development environment in which to develop the IMS service. However, the development of the system took longer as new skills needed to be developed.

To ensure that mapped information was delivered to the user at the highest possible quality, the format in which the map server delivers information was changed. By switching the file format from a JPEG file to GIF file far clearer images are provided. However, the UNISYS Corporation has copyright on the compression technique used in the GIF file format. To enable the GIF functionality within the IMS an agreement was signed with UNISYS. The standard contract issued by UNISYS requires the licensee to pay a percentage of all income from a system using their technology with a minimum annual payment of \$5000. Through negotiations with UNISYS, these costs have been reduced to \$1000 per annum.

It should be noted that developments in the field of delivering maps over the Internet are moving very fast, and WCMC is now considering changing the method that is currently being used to one that is more flexible.

1.17.1.2 Mediterranean prototype

Significant testing and prototyping work has been undertaken on development of the Internet Map Server. WCMC is working with IPIECA on marine and coastal information, and the prototype site on the Mediterranean region (<http://ims.wcmc.org.uk/ipieca/>) has been well accepted.

This site provides the following:

- An interactive map with features such as zooming and panning
- Ability to overlay one or many map layers
- Overlays of species and habitat distribution
- Overlays of information on national protected areas
- Overlays of information relating to international agreements and programmes
- Supporting and descriptive information on each of the above
- Attribute information for mapped features

The global overview provides facilities to view the data sets through an interactive mapping service. Data can also be downloaded for use in local systems. Additionally this section provides a gateway to the metadatabase and contacts system of the web site.

Information on the source of the data is provided by a metadatabase. Further information on quality control, data attribution and processing history can be retrieved from a datasets 'Maintenance guide'. Links to the relevant maintenance guide can be found within the metadata. The metadatabases system also manages contact information.

1.17.1.3 Other IMS implementations

Now that the IMS tools are available to WCMC they are being applied to a number of other projects. These include:

Marine turtle mapping: Working in collaboration with the Convention on Migratory Species, WCMC has developed a website that delivers mapped information on the distribution of marine turtles in the Indian Ocean region. It is hoped to extend this work to other regions in collaboration with the CMS Secretariat.

<http://www.wcmc.org.uk/marine/mturtle/>

World Heritage site prototype: WCMC has maps available locating sites in a number of international networks, including, for example, World Heritage sites and wetlands of international importance. Information on world heritage sites have been made available over the Internet through a prototype Internet Map Server, with links to other information on each of the sites that can be accessed through clicking on the map.

<http://ims.wcmc.org.uk/wh/wh2.html>

Coral disease database: This database allows you to select and access records in the WCMC Global Coral Disease Database, to map observations of different coral diseases over the WCMC coral reef maps, and to download the selected records. This work has resulted from a collaboration between WCMC and NOAA NMFS. The next stage of the project will expand the *Global Coral Disease Database* with unpublished records of coral disease. Observations of coral diseases from users are actively encouraged. <http://www.wcmc.org.uk/marine/coraldis/>

Forest poverty mapping: The forest and poverty mapping website contains a new Internet map server, which has been designed to give users the ability to produce custom-made maps showing forest cover and indicators of poverty and population pressure in South Asian countries. This work is the result of collaboration between WCMC and the United Nations Environment Programme.

<http://www.wcmc.org.uk/forest/poverty/>

1.17.1.4 Other WCMC mapping work

Some of the other mapping work carried out at WCMC over this period (relevant to the project but independently funded) is listed below. This is not a complete list, nor even a list of all the relevant work available on the Internet.

Protected areas database: The new WCMC protected areas database incorporates the ability to deliver maps “on the fly” locating each of the areas in the database based on the latitude and longitude held in the database.

Protected areas maps: WCMC has continued to digitize maps of protected areas at a nominal scale of one to a million as part of a number of projects (particularly funded by WWF and FAO). These are incorporated into the WCMC Biodiversity Map Library, and in future will be available in a generalised form over the WCMC Internet Map Server.

European Forest Gap Analysis: This gap analysis of forest protected areas in Europe provides relevant information on the distribution and conservation status of European temperate forests. The project was a collaboration between UNEP-WCMC and WWF. At the completion of this project the resulting maps were made available on the Internet as static graphics files. (http://www.unep-wcmc.org/forest/eu_gap/)

Certified Forest Sites: This is a world forest map (developed at WCMC) showing sites that have been certified by the Forest Stewardship Council. (http://www.unep-wcmc.org/forest/ffl/fsc_maps/world2.htm)

Unforeseen developments during the project

1.17.2 Internet map server

In implementing the Internet Map Server during a time when changes in the field were rapid was both a challenge and a risk. WCMC has gained significant experience

during the process, but now finds itself in a position where it needs to change direction and implement a new set of tools. This will take time, but will ultimately deliver more useful tools to the Internet user.

1.17.3 UIA mapping

The prime focus of “mapping” for the UIA was of the non-geographical variety related to representation of networks of Problems or Strategies as described in terms of the visualization techniques discussed above. WCMC could also make use of this approach for certain applications.

Throughout the project, the UIA explored the possibilities of low-cost mapping software that might have provided users with a sense of the geographical distribution of problems. The UIA does maintain large datasets on the country location of members of international organisations. Examples of Problems and Strategies may also refer to specific locations. Given the links between Problems (or Strategies) and Organizations, these data could have been used to colour fill world maps by country to provide users with an indicative sense of where the preoccupations with problems were originating.

Unfortunately no suitable, simple, low-cost software was located, despite the availability of more sophisticated and expensive alternatives. Tentative specifications for what is required have been indicated in the following section.

Identification of future activities

1.17.4 Internet map server

WCMC is continuing to develop its Internet map server, and will be seeking to implement it increasingly in its information services. This includes development of distributed databases with partners and collaborators using *OpenGIS*. Specific areas of future development include:

1.17.4.1 International protected areas networks

WCMC has a prototype service with information on World Heritage sites, and has also included several international networks of sites within the Mediterranean prototype. As part of work over the next two years leading up to the World Parks Congress, WCMC will seek to develop this information further working in collaboration with the IUCN World Commission on Protected Areas and the various international convention and programme secretariats.

1.17.4.2 Migratory species

WCMC anticipates developing its collaboration with the CMS Secretariat and the secretariats of the various CMS agreements, and working more closely with the German-funded *Global Register of Migratory Species* on developing information services on migratory species.

1.17.4.3 International development projects

WCMC is working with the Global Environment Facility (GEF) and UNEP *Global Resources Inventory Database* in the United States to develop a tool for displaying information on the location of GEF projects and potential projects with respect to various other mapped features. There is a real opportunity to extend this work further as a service to a wider range of development aid agencies.

1.17.5 Specification for a simple “on the fly” mapping applet

The following specification was written for the in-house development of a software tool to present global information “on the fly”.

Objective

For users of UIA and UNEP-WCMC websites to be able to generate simple maps “on the fly” which illustrate whether or not countries meet certain criteria defined by the user.

For example:

- which countries are members of a given international organisation
- which countries have signed a certain treaty.

It is hoped that this facility could be implemented quickly on UIA and UNEP-WCMC pages, notably for the 8th September presentation to the Information Society Directorate-General.

Implementation

The user would see a flat world map projection with country borders outlined. According to the webpage to which the map applet was attached, the countries would be variously colour filled, and some additional functions might be available according to resources (see below).

Multiple GIFs would be impractical to implement because of the number required and the greater cost in update. The intention is to avoid dependency on more sophisticated, proprietary mapping software in order to achieve a very simple end result. This should lead to more rapid response and avoids the necessity of the user having mapping software on his own machine.

Operation

A programme is required to function as an applet that can generate a map using:

- a) a dataset of attribute data which defines what to do with which polygon
- b) polygon definitions of the country borders

The data used to generate the dataset could be extracted from a larger database by the cgi script that calls the applet.

The cgi script would provide as parameters to the applet a set of countries to be colour filled. Options for definition of these parameters include:

- c) using standard names
- d) using standard ISO three-letter codes to define the country parameters, leaving any name text to be optionally defined

The cgi script would generate with each country as part of the country parameter field (delimited into sub-values):

- e) a selected colour code to determine how the country would be colour filled
- f) possibly a brief text/statistics to accompany the country
- g) possibly a URL to link to a country-specific search

Possible additional functions:

- h) country names on mouse-over
- i) zooming
- j) legend
- k) feature to focus in on very small countries, with possibilities such as placing a larger circle around the country (eg for Nauru) to know where to zoom (if this feature is possible)
- l) click function to bring up some brief text/statistics relating to country in addition to mouse-over info
- m) click function to activate hotlink to a URL specified as part of the country parameter by the cgi script (eg to trigger a search by country of a database)

Unresolved Issues

- n) regions, or clusters of countries, unless these are defined by the cgi script
- o) alternative language versions of country names (unless these are defined by the cgi script -- one advantage of using the ISO codes)
- p) changing country boundaries (names) that may render the presentation obsolete, unless the applet can be easily updated.
- q) other (non-political) boundaries
- r) sub-national boundaries of occasional legal/political significance (Scotland, etc).

1.18 Virtual reality (VRML) and *Java* spring mapping

Workpackage 6-3 Deliverable 5052-18

Expected (original) delivery 30-06-99
Final delivery 31-07-00

Background to the workpackage

The original proposal presented a series of individual prototype VRML displays (generated off-line from the UIA databases using the VRML 1.0 standard). The intention of the project was to build on this facility and to incorporate it into the databases served dynamically as web pages.

The purpose of using virtual reality (via VRML) displays was:

- to offer users a way of grasping more complex patterns of relationships between problems or between strategies, as well as allowing them to explore complex institutional networks in new and potentially more powerful ways.
- to offer access to people who have not been habituated to classic database output but have acquired familiarity and preference for multi-media style presentations. This is especially the case with younger people and is consistent with some of the predicted developments of knowledge visualization.

Activities of the workpackage

As indicated in the discussion below on virtual reality, the opportunities of developing *Java* spring maps during the project led to higher priority being given to that mapping approach early in 1999, with a view to continuing work on virtual reality later in the project. For this reason this final report is split into two parts. The two mapping approaches were seen as complementary features of value to users in different ways.

1.18.1 Virtual reality (VRML)

At issue at the start of the project was whether 3-D displays could be generated from UIA databases to produce files readable virtual reality (VRML) environments through standard browser plug-ins (such as Live-3D on *Netscape*). During the Definition Phase, techniques were developed to convert clusters of hyperlinked entities from the UIA databases into 3-D structural configurations via Web browsers. The networked relationship structures able to be displayed include problem loops and multiple loop interlocks, and clusters of interrelated organisations. These experimental structures have been placed on the UIA website to evoke comment from potential users (<http://www.uia.org/uiademo/vrml/vrmldemo.htm>).

Over 50 displays were originally generated using VRML 1.0. The experiments explored several display metaphors: intersecting polygons, networks, tagging polygons forming a sphere, and a solar system. Techniques demonstrated include: colour tagging diverse elements, multiple complexes in the same display (different relative coordinate systems), insertion of lines linking common elements in different complexes of a display (between different relative coordinate systems), representation

of complex networks, use of parameters to regulate size of display elements according to measures of importance, hyperlinking to explanatory local HTML text and to external websites. The results suggested interesting new ways of looking at environmental problems and institutional complexes (including the UN, the World Bank and the European Union institutions).

Constraints originally encountered were the labelling facilities within VRML 1.0, the size of files relative to the complexity to be displayed, and browser speed on lower capacity machines.

The intention of the project was to build on this facility and to incorporate it into the databases served dynamically as web pages.

The purpose of using virtual reality (via VRML) displays was:

- to offer users a way of grasping more complex patterns of relationships between problems or between strategies, as well as allowing them to explore complex institutional networks in new and potentially more powerful ways.
- to offer access to people who have not been habituated to classic database output but have acquired familiarity and preference for multi-media style presentations. This is especially the case with younger people and is consistent with some of the predicted developments of knowledge visualization.

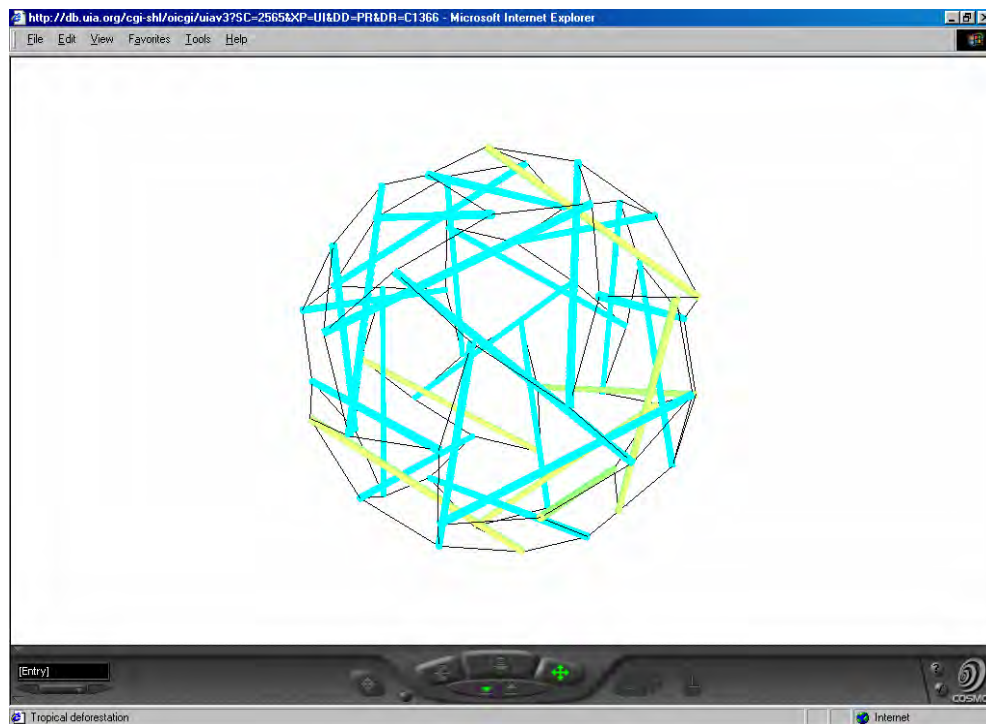
During the early course of the project, this development was retarded by the following factors:

- the industry switch from the VRML 1.0 standard to the VRML 2.0 standard and development of UIA capacity to handle the dynamics of VRML 2.0 (partially dependent on availability of error checking software, more recently built into relevant plugins)
- the industry transition period for browser plugins to stabilise and adapt to the VRML 2.0 standard through the recent succession of browser generations
- the priority given to the unforeseen opportunity of the *Java* spring mapping visualization (developed by the UIA during 1999 with third party assistance); the final report on virtual reality was deferred for a second time because of the significant continuing progress being made on the parallel initiative involving development and testing of a *Java* applet to provide mapping facilities which may affect the way in which any VRML work is completed.
- the UIA challenge in switching to dynamic serving of database pages (successfully completed only in November 1999)
- the clarification of loop analysis and the presentation of such loops as part of the data offered to users (completed in the Fifth Phase)

During the early phase of the project, the experiments with virtual reality took the following forms:

- ***Tensegrity***: This experiment is an effort to make use of a somewhat unique tensegrity structure displayed through virtual reality (viewable through freely available browser plug-ins). Individual entities (eg Problems or Strategies) are associated with the struts in such a structure. The aim being to produce a coherent configuration that a user can rotate and explore using the virtual reality plug-in navigational tools. So the structure can be turned, zoomed into, etc. In principle clicking on an active strut with which a problem (say) is associated will bring up the

corresponding text profile. A commentary on the value of this technique is given elsewhere under the title *Configuring strategic dilemmas in inter-sectoral dialogue* (<http://www.uia.org/transfor/a11.htm>)



Relationships between Problems displayed on a tensigrity framework

<http://www.uia.org/projects/finarept/image41.htm>

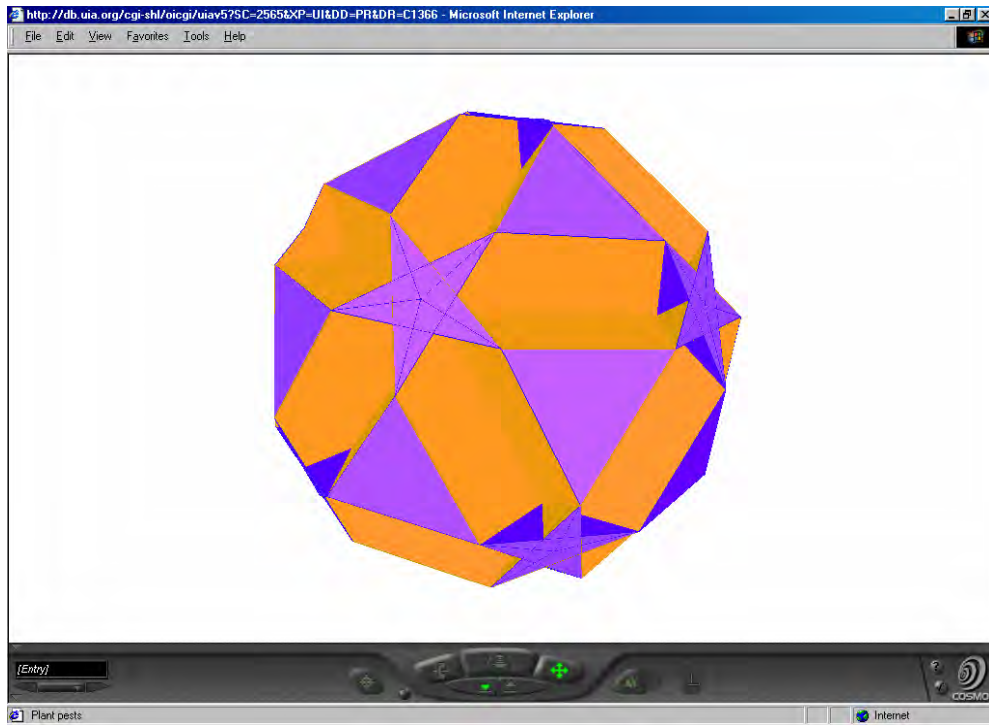
- **Polyhedra-1:** Through this experiment, software selects a polyhedron onto which relationships from a problem (say) are projected. Each facet thus becomes the interface to another problem. The polyhedron as a whole is thus a configuration of facets representing the problem as it interfaces with related problems. Clicking on the facets should bring up the corresponding text profile. This experiment is based on a similar justification to that based on tensegrity. In the current version, the selection of polyhedron is crude and the colouring is random. The virtual reality browser enables the user to manipulate and explore the structure.

- **Polyhedra-2:** This is a development of the previous experiment in which the user can endeavour to control the way in which the software selects and designs the polyhedron. The user is free to include or exclude particular types of relationship and to colour the corresponding facets differently, as well as selecting a preferred shape. Again clicking on a facet should bring up the text profile. The virtual reality browser enables the user to manipulate and explore the structure.

The work on the logic of dynamically generating *Java* spring maps however facilitated virtual reality visualisations using VRML 2.0, which were made available to users during the Fifth Phase (Jan-Apr 2000) as an alternative to the *Java* map mode of display.

The approach taken to the virtual reality displays, as with the spring maps, has been experimental but with an emphasis on enabling users to explore the experimental displays as they were developed.

The final priority for the displays was to increase capacity to present information on problem loops and to ensure a hyperlink from nodes on these displays into the corresponding text data. The displays can therefore be used a front-end interface.



Relationships between Problems displayed on a polyhedral framework
<http://www.uia.org/projects/finarept/image24.htm>

Link type	Total	Priority	Shape	Colour
Broader problems	4	Low (Any)	Any	Random
Narrower problems	7	Low (Any)	Any	Random
Related problems	2	Low (Any)	Any	Random
Aggravates problems	22	Low (Any)	Any	Random
Aggravated by problems	13	Low (Any)	Any	Random
Reduces problems	0			
Reduced by problems	0			
All links	48	Low (Any)	Any	Random
No link	-	Low (Any)	Any	Random

User facility to redefine polyhedral framework for relationship display (no link)

The project enabled some specific technical challenges to be resolved in ensuring dynamic adaptation of loop data into a visual display of loops in virtual reality from

any problem in the database (provided it was part of a loop) and delivery through a cgi interaction. This successfully sets the stage for further developments that are primarily constrained by determination of meaningful design metaphors through which data from UIA databases can be displayed. It is now possible to make use of the full range of VRML 2.0 facilities (including those requiring dynamics within the structures of the display) to generate visual structures focused on any part of the UIA database as determined by a user.

Several interesting design challenges are still to be resolved to enable even more powerful access (see 4.1 below). For some of these reasons, and the fluid nature and exotic status of VRML software, users may experience some difficulty and frustration in getting virtual reality browser plug-ins to work correctly.

1.18.2 Java spring maps

As noted above, the UIA took advantage from early 1999 of the unforeseen possibility of collaborating with a Netherlands-based software company to develop *Java*-based spring mapping visualization. Essentially the UIA paid them for third-party assistance in developing software that related closely to a software initiative that they had been undertaking on a non-commercial basis for several years.

The product, which they developed in the light of UIA specifications and their own experience, was an applet that allowed a network of entities to self-organise on a web page. Through several iterations, additional functions were added to the applet. The applet is controlled via a web page offering the user a range of possibilities. The web page (with a unique map) is itself generated on-the-fly in response to user request from many UIA database profiles.

This facility has been developed to the point that unique maps are now generated from any database entry in response to user queries. Users are able to increase or decrease the complexity of a map. Nodes on the map serve as clickable entry points -- either to the relevant text profile in the database, or to a new map centred on the selected node. In effect the map may be used as a front-end entry point to the database.

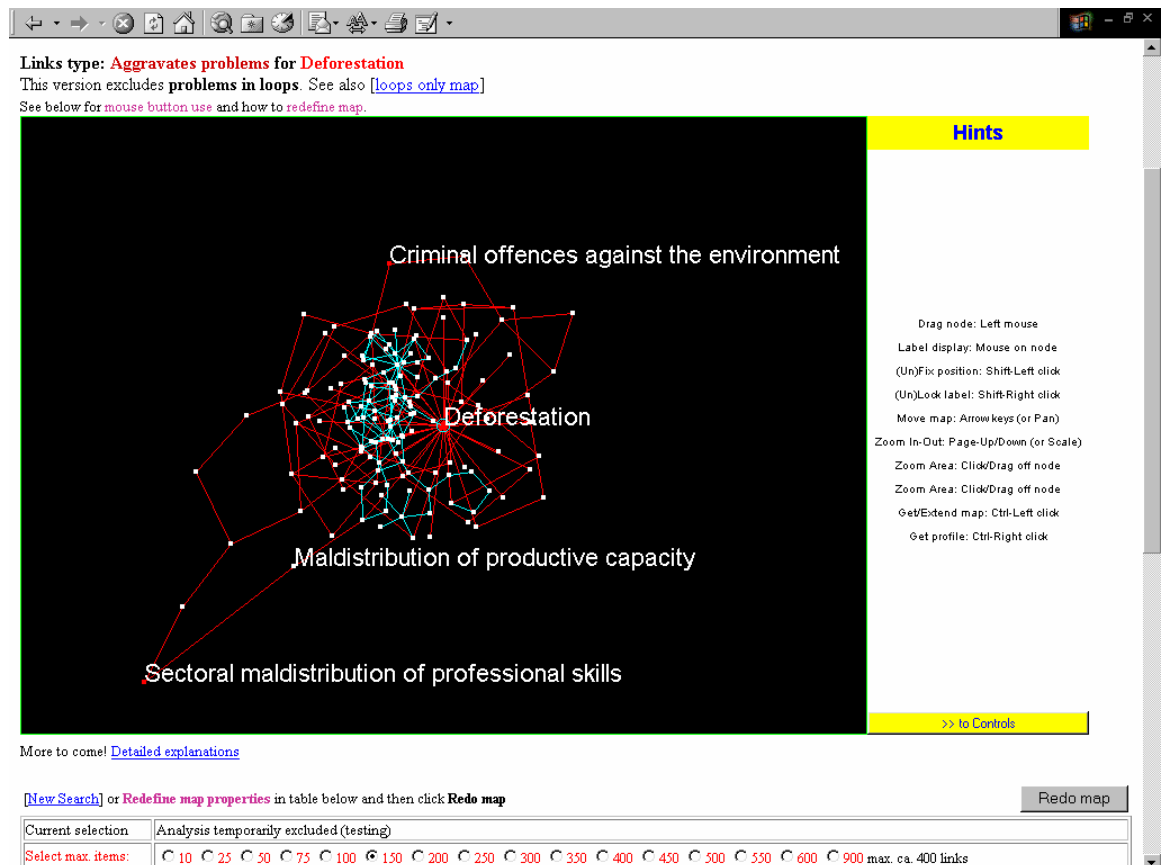
A series of desirable further developments to this 2-dimensional mapping facility have been identified. Unfortunately resources did not permit these to be undertaken within the framework of the project. The applet has now been registered as "open source", avoiding difficulties in the creative relationship between UIA and Beautiful Code.

The constraints with respect to *Java* are due to the fact that *Java* compatibility across browsers and platforms is far from satisfactory. Steps have been taken to acquire some facility with *Java* or the adaptation of *Java* packages. However the challenge of ensuring predictable safe delivery of applet-based maps across all platforms remains. Such work also has the advantage of being least locked into licensing arrangements and most open to further adaptation. The planned release of a *Java*-oriented version of *OpenInsight*, announced for 1999, has been postponed and, according to the latest information, may be abandoned.

Subsequent discussions with Beautiful Code have focused on the development of the 3-D variant of the underlying algorithms (to be eventually marketed as *Fluidiom* by Beautiful Code). In the further development of the 3-D variant, Beautiful Code has sought UIA collaboration to enable it to use UIA databases to populate a 3-D universe for demonstration purposes. This is being done in conjunction with an adaptation of the database structure to XML to enable further testing to be done within an XML database (under development by a Netherlands-based company) using *Fluidiom* as a

front end. Both partners need a rich dataset to demonstrate the viability of the unusual applications envisaged.

For explanations concerning the other visualization experiments, see elsewhere (<http://www.uia.org/dyna/vizexp.htm>).



Java spring map display of relationships

<http://www.uia.org/projects/finarept/image25.htm>

The maps are generated under user control via <http://www.uia.org/data.htm>. There are several pages from which a map may be (re)generated:

- From the **search screen**, after specifying a keyword (for example "forests" for the database World Problems), and clicking on Map against display choice.
- From an **index listing**, after running a search (for example "forests" for the database World Problems), and clicking on "Map" at the top of the listing
- From a **text profile**, after running a search and selecting a profile for display (for example "forests" for the database World Problems, then click on "deforestation"), and then click on "[map]" against any of the lists of cross-references of different types

The purposes of these self-organising displays are to create a visual index to show the complexity of relationships between (data) profiles and reveal the data rich domains. The maps are generated directly from the data in response to user requests. Each display is dynamic and continues to organise itself in response to user constraints applied via the mouse. Further improvements to the display are under development in order to offer new insights into the data.

User instructions and commentary on the maps can be found at <http://www.uia.org/dyna/mapexp.htm>.

Unforeseen developments during the project

During the early course of the project, this development was retarded by the following factors:

- the industry switch from the VRML 1.0 standard to the VRML 2.0 standard and development of UIA capacity to handle the dynamics of VRML 2.0 (partially dependent on availability of error checking software, more recently built into relevant plugins)
- the industry transition period for browser plugins to stabilise and adapt to the VRML 2.0 standard through the recent succession of browser generations
- the priority given to the unforeseen opportunity of the *Java* spring mapping visualization (developed by the UIA during 1999 with third party assistance)
- the UIA challenge in switching to dynamic serving of database pages (successfully completed only in November 1999)
- the clarification of loop analysis and the presentation of such loops as part of the data offered to users (completed in the Fifth Phase)

Identification of future activities

1.18.3 VRML

Several interesting design challenges still remain to be resolved to enable even more powerful access. These include:

- use of standard techniques to reduce the polygon count for distant objects within the display in order to increase the complexity of navigable displays,
- distinguishing parts of objects by visual cues without losing the possibility of reusing such objects in the display (in order to reduce the size of the VRML document -- a constraint for cgi processing within the *OpenInsight* webserver used)
- developing further CGI scripts, based on the early UIA experiments in VRML 1.0, using other design metaphors
- attaching sound files to a display to offer commentary.

1.18.4 Java maps

Planned modifications to the *Java* spring map applet are indicated in the following table, but could not be implemented during the project period for lack of further resources.

Java Spring Map Applet-related Operations (current and envisaged)						
	Feature	Node	"Group"			All
				"Type"		
		Selected node (mouse on node)	Proximate nodes (to mouse over mode, and including it)	Node group (node is in first joint group with which it is associated in map build)	Link group (a node may be linked through several different link-type groups)	
Labels	Node label	Current	Current			(discussed)
	(Un)lock display	Current				(discussed)
	Size (font)					Current (+/-)
	Link types					Current (tick)
	Reverse label text					Current (toggle)
Nodes	(Un)fix position	Current				Current ("Freeze")
	Icons			(Current: by specified group)		Current (by group specif.)
	Colour					Default
	Size (node or icon)					Default
	New (from user)	Current (*) (via form)	n/a	n/a	n/a	n/a
Links	Length (rest)				(via form)	
	Colour				(via form)	
	Arrows					Current (tick)
	Direction					(discussed)
	Highlight	(**)				
	New (from user)	Current (*) (via form)	n/a	n/a	n/a	n/a
Branches	Zap-out	Proposed				(via Form)
	Add-back	Proposed				
	Add-call	Proposed	n/a	n/a	n/a	(via Form)
Background	Bk/Wh	n/a	n/a	n/a	n/a	Current (toggle)
	Image	n/a	n/a	n/a	n/a	(discussed)
Sound	Node	Current				n/a ?
URL Calls	Profile	Current	n/a	n/a	n/a	n/a
	Map	Current	n/a	n/a	n/a	n/a
	Query	Current (*) (UIA variant)	n/a	n/a	n/a	n/a

(*) Implemented by UIA via a form using a previous generation of the applet. To be reinstated when modifications to the current version are stable

(**) Highlight: Use to highlight a succession of nodes which, if linked, form a path that could be highlighted. The nodes on the path could be posted back to the server to generate a page client-side with clickable names for text profiles along the path

1.19 Upgrading CD-ROM software and UIA webserver

Workpackage 7-1/2 Deliverable 5052-19

Expected (original delivery) 31-03-98
Draft delivery 30-06-98
Final delivery 31-07-00

Background to the workpackage

The rate of evolution of information technology is such that any longer-term product can only be based on the ability to shift continually between technologies and combinations of technologies, as proves appropriate. At this particular time, one or more combinations of CD-ROM and Web technologies are the obvious focus of attention.

A hybrid "CD-ROM with Web links" therefore offered interesting possibilities. These could be summarised as follows:

- CD-ROM product with data from the two principal partners, cross-linking to each other on the disk;
- as above, with the addition of Web access either to the partner's databases or to third parties, or both;
- direct user Web access to the partners' databases, selectively cross-referencing each other and third party databases; and/or
- queries of Internet resources either directly from the CD-ROM or partners' websites.

To demonstrate these possibilities, a CD-ROM was produced as part of the Definition Phase. This was particularly useful experience in the case of formatting WCMC's data and the newly developed search query functions.

Activities of the workpackage

1.19.1 Software evaluation

1.19.1.1 *OpenInsight* (Revelation)

At the commencement of the project, both UIA and WCMC were using Revelation databases, although both (especially WCMC) were questioning whether they represented a viable future strategy. In the case of the UIA, it was clear that the Windows-based variant, *OpenInsight*, required evaluation because of its potential for web delivery of the content in the DOS-based Revelation file structure through which the data was maintained. UIA also continued to use Revelation to generate flat files for the CD software produced by Folio. This was the facility used to prepare the prototype during the Definition Phase.

1.19.1.2 FolioViews and siteDirector (Folio)

These topics were explored by attendance at the European Folio Conference (London, 3 February 1997) to assess the applicability of the new Folio release and the compatible webserver products.

At the commencement of the project, the release of *FolioViews* successfully employed for the prototype CD was 3.1a. Since that time, the company Folio has been sold and has repackaged their software offerings in relation to the products of their new owners. However Folio does continue to be a leading industry standard. The product *siteDirector* was the dedicated web server variant.

Development of the CD-ROM beyond use of *FolioViews* 3.x (in the prototype and in the UIA commercial product) envisaged use of *FolioViews* 4.x (available from the beginning of 1998). The upgrade was purchased to take advantage of new features, notably a supposedly multilingual platform in contrast to previous requirements for separate language versions (of which the UIA used English and French).

It turned out, however, that the ability of developers to develop their own thesaurus, which was characteristic of release 3.x, had been disallowed. The UIA had adapted its own 100,000-word thesaurus in the prototype and in its own CD products to allow users to request information by subject in any of a range of languages and obtain hits in English. This also applied to geographic names and names of organisations.

Extensive correspondence with Folio and its agents resulted in the information that achieving such functionality was now only possible with further software development in which the UIA would be expected to invest. The cost, if the work was subcontracted back to Folio, was estimated at \$10,000. The UIA therefore decided to abandon planned use of the 4.x release for the present (and its own scheduled non-project CD product for September 1998) and to consider the possibility of using an alternative product in 1999. These intentions were communicated to Folio whose European resellers are very concerned at the retrograde design options taken by the upgrade. A proposal was put forward by them to share such development costs between European resellers -- since it is a problem that affected other multilingual products.

Given the importance as an industry standard of *FolioViews*, the relevance of the new release (Version 4.x) was explored in comparison with the version used by UIA (version 3.1, which has several language versions). It turned out that version 3.11a enabled hyperlinks from a CD to external Web sites -- a facility used for the prototype.

These factors determined UIA's subsequent decision not to upgrade to *FolioViews* 4.x. UIA continues to use 3.11a for its annual CD containing the international organisations database (outside the project). An additional factor was the cost and delays associated with support relating to software bugs (experienced with the 3.x product) and likely to be present in the 4.x product.

In considering alternatives to *OpenInsight*, given the possibility of a CD product, it was logical to consider the relevance of the compatible Folio webserver (*siteDirector*). However, although this is a very powerful product, permitting full text search, further consideration was not given to this product. Reasons include: cost, licensing arrangement (including transaction charges), dependence on a US product, unsatisfactory support experience with the *FolioViews* product, complexity and cost of any customisation.

1.19.1.3 Alternative products

Consideration was given to alternative CD products (especially if associated with webserver applications). However in the case of the UIA these investigations were heavily influenced by the concerns of its main publisher (K G Saur Verlag, ü). Although it was clear that other products were available, the Folio product in its early

release was considered reasonably satisfactory and the value of any change was marginal.

With respect to the web publishing aspect, the UIA was actively exploring a range of alternatives independent of the CD issue. These are described below. Major considerations were cost, licensing, cost of conversion, compatibility of existing databases, long term stability as a platform.

1.19.2 Development of UIA web server facility

The planned implementation of web-based operations beyond those demonstrated during the Definition Phase was achieved during the second reporting period in a test mode. The UIA already had a considerable web presence with some 11,000 *static pages* currently accessible. This information is now held on the UIA's commercial service provider.

In June 1998, the UIA purchased its own NT web server and necessary web serving software (*O'Reilly Website Professional*). This server is directly linked (outside the UIA's own firewall) to the ISP. A series of databases were initially made accessible from the web in a test mode.

During the course of the project, work continued on security, search and presentation issues. In the final phase, work commenced on the commercial features, although these were to a large degree anticipated by the design of the security features.

1.19.2.1 Dynamic page generation (software requirements)

In order to enable dynamic page generation from the UIA data several software components were required:

- ***OpenInsight*** (Windows-based version of the UIA's *Advanced Revelation* database software): The 3.5 release of this product was obtained (and subsequently upgrade through to the current 3.7.3 release). This software allows access to copies of the databases maintained by the DOS-based users on the UIA's LAN as well. It also allows for web delivery through CGI script processing. The merit of this technique is that the script can be written in the programming language that extensively overlaps the older DOS-based product, which has been used by UIA for its databases for over a decade. In fact a number of index look-up routines could be ported across with relatively little modification, permitting extensive exploitation of the investment in the DOS-based indexing.
- ***O'Reilly Website 2.0*** which offers a professional range of facilities for web delivery, including appropriate security and commercial features. This was obtained and successfully installed in a test mode on a standalone machine to interface with the *OpenInsight* software.

With these elements, it proved possible to develop an HTML form through which dynamic generation of pages could be requested directly from the UIA DOS-based data (copied over from the intranet for security reasons). The design has been gradually improved, the object being to ensure that functionality could be built in for a range of databases with adequate performance. This was achieved.

1.19.2.2 Dynamic page generation (licensing requirements)

During the project period, the *OpenInsight* software provider imposed a licensing requirement for web delivery of UIA data that contradicted statements in previous correspondence on this matter dating back over a year. These exchanges had established that this, as yet rarely used, feature of the *OpenInsight* software would NOT be subject to additional licensing costs. The company developed a change of heart, notably in the light of the UIA interest in this feature, and imposed this

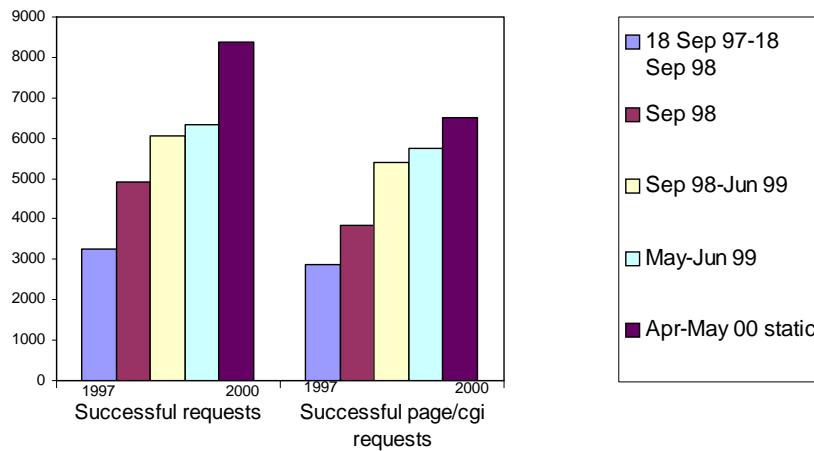
requirement as a matter of general policy, and was unwilling to make an exception in the light of the UIA's pioneering work in this area. Although this decision could have been disputed in the courts, it was clear that it would be cheaper to incur the one-time licensing cost rather than pursue legal possibilities. Whilst this has been clarified for the *OpenInsight* releases, it has been impossible to obtain clarification on the licensing constraints with respect to the planned *Java*-oriented versions to be released in 2000. Discussions on these matters were a source of some delay in implementing the test version on the web during 1999.

1.19.2.3 Dynamic page generation (hardware requirements)

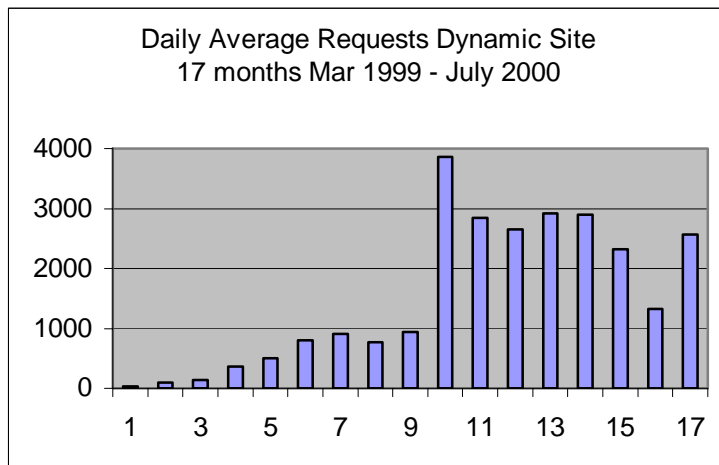
Since the UIA's initial in-house service provider operated in a UNIX environment, it was considered necessary for the UIA to invest in a dedicated NT server appropriate to the *O'Reilly* and *OpenInsight* software. Through the course of extensive testing, instabilities in the *NT/OpenInsight* environment eventually forced a decision to install a brand name server (Dell Poweredge 2400), initially running NT. Some problems persisted and it was decided to upgrade to *Windows 2000* in the final period. The system is now stable.

Copies of the full range of databases were made accessible over the web in test mode (to restricted users) during 1999. The process of clarifying the security and commercial issues continued to clarify the marketing options and product design opportunities.

Static Site: Daily Averages



**Daily Average Requests Dynamic Site
17 months Mar 1999 - July 2000**



1.19.3 Relationship between static and dynamic servers

During the fourth period of the Implementation Phase, appropriate links between the static pages (open to web search engine indexing) and the dynamic pages were established. This allowed comprehensive lists of problems and strategies to continue to be made available as indexes, but ensured that they offer access to profiles via the dynamic pages.

The static page indexes to Problems and Strategies are therefore used as hyperlink entry points to pages generated through the dynamic server. This means that users find the dynamic page site through regular web search engines – a considerable marketing advantage given the large subject range of keywords through which users can locate the site.

1.19.4 Consideration of alternative platforms

Throughout the project, alternatives to the *Windows/OpenInsight* formula were considered. These included:

- **Windows/jRev:** *OpenInsight* has a *Java* successor named *jRev* partially released in 2000. Although attractive in some respects, the licensing problems with supplier discouraged further investigation.
- **Windows/Access:** Rejected because of the UIA investment in *OpenInsight* and the instability of successive versions of *Access*
- **Windows/Apache:** Rejected in preference to a *Linux/Apache* formula
- **Linux/Apache:** Different web serving variants were considered, including *MySQL*, *PHP3* and *Postgresql*. Although some serious testing of *Linux* possibilities was undertaken, the implications of the conversion of the UIA databases, and the questionable value of doing so, meant that these possibilities were not considered a priority
- **AREV/Web:** The UK-based consultants used for some of *Revelation/OpenInsight* issues that occurred, started to develop late in 1999 an alternative to the *Windows/OpenInsight* formula which could run on DOS or *Linux*. This was partially in response to clients in a similar position to the UIA. This platform was under test at the close of the project and will be actively considered because of its potential for both intranet and Internet webserving, and the possibility of editing in and HTML environment.
- **XML:** The file format used for the creation for the UIA's CDs, is a variant of SGML that has many of the tagging features of the emerging XML standard. At the close of the project, the UIA was under discussion with its Netherlands-based consultants regarding the transformation of the UIA file formats into an XML format. An agreement was concluded for demonstration purposes to explore a 3D interface into the UIA data that would also allow for XML editing. The value of this approach remains to be determined, although clearly the merit of this route is the opening to WAP and other new Internet access devices.

1.19.5 Compatibility issues

A major issue in considering alternative platforms was the known, unknown and unforeseeable compatibility problems between browsers, generations of browsers, and platforms.

Despite testing, such problems tended to subsist until reported by annoyed users. A prime difficulty related to the use of *Java* for the authentication facility and its relative

instability with some browser generations and on Mac machines. Some generations of Opera were variously reported to work or not work with *Java*.

A further consideration related to some of the multimedia software. The applet software for the spring maps was subject to the same difficulties as the authentication software (which also used applets). The virtual reality browser plugins progressed towards greater stability during the closing phases of the project, but the challenge of their operation in Mac or other environments could only be partially determined. The sound plugin, supposedly operational on both *Netscape* and *Internet Explorer*, had its own instabilities that led to its development being deprioritized.

These issues could only be progressively eliminated.

1.19.6 E-commerce related software and hardware issues

The period of the project saw the emergence of many approaches to e-commerce solutions and the associated security and financial transaction problems. Initially these solutions appeared costly and insecure. It was only in the final period that it seemed appropriate to explore concrete options.

The approach to e-commerce was further stimulated by an agreement reached in early 2000 with the Germany-based publisher of the UIA's International Organizations' database to go ahead with online access in addition to the existing hardcopy and CD formats. However the publisher stressed that all financial transactions for that database be off-line and via their offices, consistent with the other formats. The UIA would however allocate passwords and manage the databases.

In the final reporting period the UIA was exploring the interface between the different degrees of commercialisation of databases that were hyperlinked together at the most detailed level. It has been agreed with the publisher that the UIA can explore alternative pricing arrangements for access by the profiled international organisations supplying information on themselves or on the content of other UIA databases.

Unforeseen developments during the project

1.19.7 Postponement of CD-ROM version

The prototype produced for the Definition Phase had demonstrated the capacity to produce a satisfactory CD-ROM³⁶. The period of the project saw a dramatic evolution in web-oriented databases at the expense of CD-ROM databases. The planned production of a CD-ROM was discussed at length with the UIA CD publisher. They expressed great interest in distributing the product, with two unsatisfactory conditions however:

- Relatively modest advance payment with a relatively low subsequent royalty
- Obligation to limit access to any web variant in order not to prejudice CD sales

³⁶ The only constraint encountered was an unforeseen restriction in *FolioViews* 3.1 (the CD-ROM software) limiting search strings to 124 characters. This inhibits some of the searches that are more complex and use of advanced facilities (including language variants). *FolioViews* 4.1, recently released, increases the length to 194.

In addition, to the extent that WCMC databases were placed on the same CD, this would have raised considerable complications for WCMC in determining their relations to collaborating bodies who supplied data voluntarily in the expectation that it be made freely available.

The possibility of including only UIA databases on the CD was considered, with hyperlinks to the WCMC server, but this hybrid solution was excluded in favour of more intense work on the web interfaces

1.19.8 Modification of flatfile generation for CD-ROM

The workpackage task to modify the flatfile generation programs for CD-ROM creation was therefore postponed, together with the associated interface redesign (and adaptation to other languages).

Outside the project framework, the flatfile for the Organizations CD (2000 edition) is being modified to permit links from an Organization entry into the corresponding profile on the webserver.

Identification of future activities

1.19.9 CD-ROM

The value of producing a CD version of the product continues to be actively considered by the speed of evolution of web-related products, and the cost of adapting any CD software, tend to discourage immediate production of a CD product expect for special purposes.

In considering the CD-ROM option, issues currently untested but considered unlikely to present significant problems, are how end-users:

- acquire updated information more recent than on the CD -- clearly Web access is an attractive option; the objective would be to enable the delivery of the UIA databases from an in-house Web server and to upgrade current CD-ROM capability.
- supply feedback updating information on the CD-ROM or on the Website—again “mail to” facilities via the CD or directly on the Web are an attractive option.

1.19.10 UIA webserver

Early in the Implementation Phase, an activity checklist was prepared for guiding the development of the UIA in-house webserver and its facilities (Section 28: Annex F: Further challenges on UIA server).

1.20 Subsidy, sponsorship and online charging

Workpackage 8-2/3 Deliverable 5052-20

Expected (original delivery) 31-06-99
Interim report 09-10-99
Final delivery 31-07-00

Background to the workpackage

The product has been developed in a “not-for-profit”, “public interest” environment. As non-profit organisations, the partners are primarily interested in “financial sustainability” (cost recovery), namely the long-term maintenance of the product and its services with minimal call on fresh funds, rather than “commercial viability”, namely making profit. In practice, however, the business model is much the same and is one that the project partners have used to finessed the art of not-for-profit business practices over many decades.

The main difference is that “profits” are redistributed by (1) charging at different rates (discounted, standard, commercial) and being rather more flexible over services to those who are not in a position to pay anything and (2) ploughing surplus income back into service management and development. The ‘commercial’ strength of both principal partners is that the project builds on their ongoing and developing information systems, whose development strategies are having to confront these realities anyway and have already demonstrated success in doing so.

In much the same way as equivalent private sector organisations, the partners gain their income by the sale of products and services in their various fields of publishing, environmental consulting, information development, knowledge management and education. In the case of UIA and WCMC, this income derives in large part from the value placed on their databases, which are being continually improved and updated using the proceeds of their work. Over the past 30 years, these partners have proved that the long-term development of their data activities is viable, although at times the level of resources has been of concern because of its potential to affect the currency of the information available.

At the broad level, UIA and WCMC do not distinguish between the financial sustainability of this project and that of their ongoing concerns. This is because the work is essentially on their development paths. They have been prepared to contribute considerable amounts of matching funds and bring in other funds and partners to accelerate this process. This is likely to build into the project a considerable amount of shared risk with other “non-project partners” because it is designed to be (1) modular and additive (adding content to long managed databases; adding new coverage to already funded initiatives) and (2) interwoven with information developments funded by other parties in other domains (eg Internet and e-commerce initiatives).

Both “content partners” in this project (UIA and WCMC) rely heavily on the contributions of what might appropriately be termed “hidden” partners. These are the providers of information and, at the same time, are often the prime users of that information. As such, they are motivated to ensure its accuracy and improvement and may be sensitive to the manner in which it is used. Such partners may be private sector organisations (including corporate sponsors), non-profit organisations,

academics and scientists³⁷. With each relationship, there is a set of understandings, usually implicit, about ownership, care and use of the data. This raises rather complicated issues about the redistribution of aggregated data, particularly if it is to be sold in digitised formats (not books or CDs). Although cost recovery is essential, especially in an increasingly competitive information environment, means must nevertheless be found to ensure the involvement of the constituencies identified above, notably through differential pricing schemes so that they do not experience themselves being charged unreasonably for information that they have freely provided.

At the start of the project, charging for information services on the Web was still in its infancy. Appropriate security/authentication/billing software started to become available in 1996-7. One expected outcome of this workpackage was to demonstrate the feasibility, or otherwise, of using online-charging for the Web delivery of some or the entire product. This would involve experiments with: suitable packages and formulae using a mix of zero cost and billed access to Web information; billing for selected portions of the data; and offering facilities to sponsors to subsidise access to data in particular domains.

It was also clear that the business plan for the post-Implementation Phase of the project would itself be a matter of trial and development during the Implementation Phase.

Activities of the workpackage

As the project has developed, the future sustainable financing of the activity was clearly as a web-based product. It was proposed in the *Third Report of Implementation Phase* that final reporting on the workpackages for “Subsidy and sponsorship options” (WP 5052-20) and for “On-line charging options” (WP 5052-21) be combined as this single report on funding options.

1.20.1 Commercial sponsorship

Commercial sponsors potentially benefit from a range of activities including:

- Access to information and services in a preferential manner
- Opportunities to help set priorities
- Training sessions and seminars in use of information and services
- Sponsor brand included in selected literature and on website
- Hot links between project websites and sponsor sites where appropriate
- Joint PR activity.

Plus other tailor made activities to help sponsors achieve their set objectives.

Sponsors would improve and enhance brand and corporate images within the environmental arena whilst communicating clearly defined messages for all those striving towards self-management and environmental stewardship. As a result, sponsors would benefit from increasing prosperity whilst being seen to conserve the natural world and its resources.

³⁷ In the case of the UIA, much of its information is obtained from international non-profit bodies, whether intergovernmental or non-governmental. In the case of WCMC, much of its information is obtained from networks of “volunteers”, whether professional scientists or dedicated amateurs. As noted below, updating and improvement of the information is primarily dependent on the involvement of these constituencies as partners/users.

WCMC has had meetings and discussions with a range of commercial sponsors, including:

1.20.1.1 Discussions with corporate IT sponsors

WCMC has had a number of discussions with leading international companies, one working in software development, the other in development of Internet search engines (June/July 1998).

Discussion with the software developer concerned potential support from them in the development of web-accessible databases and other Internet-based information services. Unfortunately this fell through because of the unreasonable expectations of the software company. In WCMC's experience non-experts always consider that database related to biodiversity are non-complex and easy to implement, whereas the reverse is the case.

Discussion with the company developing Internet search capability concerned future development of search engines that can target specific information subsets on other web sites. In this case the company provided its Internet search tools (*Muscat Empower*) at a significantly reduced price.

WCMC has also had numerous discussions with other hardware and software suppliers outside the context of this project. Our usual experience is that the companies are prepared to provide more equipment for a given price rather than to donate equipment. WCMC has in the past benefited in this way from both *Sun Microsystems* and *ESRI* (who make ARC/Info and the related GIS products).

1.20.1.2 International Petroleum Industries Environmental Conservation Association

During the project WCMC has also been working closely with IPIECA, which is supported by a number of oil companies. In a number of areas the projects have been working synergistically. Initially it had been intended that IPIECA members would sponsor a part of the WCMC website that was only available to members, but this is not now the case and IPIECA is interested in sponsoring development work that is available to whoever wants it.

1.20.1.3 ECOSearch

During the last few months WCMC has been working with three major multinational companies to develop an approach to making the biodiversity-related information that these countries hold more widely available. While this is still under development as a concept, the signs are good, and it seems likely that a feasibility study will be funded in 2000. The industries concerned will then be making funds available in order to increase access to information that they hold.

1.20.2 Discussions with potential partners

The project partners had numerous meetings during the course of the project where the purpose was to discuss potential partnerships, funding or sponsorship. Most of these have produced genuine involvement, which in several cases is still in the process of being appraised. Examples of such meetings and discussions are:

1.20.2.1 Discussion with the South Pacific Regional Environment Programme (SPREP)

In 1991, WCMC published with IUCN and SPREP the *Directory of Protected Areas in Oceania*. In a meeting of 20 May 1998, WCMC proposed to the biodiversity focal point for SPREP the development of pilot project on the Internet for update of protected area descriptions between now and the next South Pacific nature conservation conference in 2000.

WCMC is now making information sheets on individual protected areas for the whole region available on the Internet in such a manner that direct update by appropriate individuals in management authorities using the Internet is encouraged.

This region is good for a pilot project that can then be applied to other regions because of the need for better information sharing, the distances involved which preclude frequent meetings, and the need for regional organisations to promote increased use of the Internet. At present this does not have a sponsorship or charging option, but as a service to a regional environmental programme this is clearly a possibility.

1.20.2.2 Discussions with IUCN Protected Areas Programme and IUCN World Commission on Protected Areas (WCPA)

WCMC works very closely with both the IUCN World Commission on Protected Areas and the IUCN Protected Areas Programme in compiling information on protected areas and disseminating it in a variety of formats. At the WCPA Steering Committee (8-12 June 1998), the INFO 2000 project was briefly introduced to Steering Committee members, and discussed in more detail with the Commission Chair and the senior staff officer from the IUCN Protected Areas Programme. All were delighted that the INFO2000 project is able to contribute to increased access to protected areas information and are willing to collaborate in making the information available. The contract that WCMC has with WCPA (worth about £45,000 a year) was amended to take this collaboration into account.

1.20.2.3 Discussions with European Environment Agency (EEA)

WCMC and the EEA have a mutual interest in making more information available on the Internet concerning both the compliance of European states with international legislation, and national efforts to meet international conservation objectives. Preliminary discussions on how this can be done in the context of the INFO2000 project have been held with the biodiversity focal point of the *European Environment Agency* and staff of the *EEA European Topic Centre/Nature Conservation* (various correspondence and meeting of 25 June 1998). This collaboration is likely to cover information on internationally designated sites and species covered by international legislation, and may also cover nationally designated protected areas. A result of this collaboration is a joint approach to collecting information on protected areas in Europe, which reduces duplication of effort, and ensures that the use of available resources is efficient.

1.20.2.4 Discussion with Centre "Leo Apostel" (Brussels, 4 May 1998 and subsequent)

This meeting with Dr Francis Heylighen covered the possible presentation of the project by UIA to a seminar of the Centre "Leo Apostel" (Free University of Brussels, Belgium). This is in connection with the Centre's work on *Principia Cybernetica* and their possible interest in cybernetic feedback studies. Their initiative has recently (2000) achieved scientific publicity in relationship to the notion of a "global brain", with which the project data is compatible. Discussion on potentials for future collation continues.

1.20.2.5 infoDev and Development Alternatives (New Delhi and Bangalore, 19-30 October)

Development Alternatives (DA) is an Indian-based organisation, which designs appropriate technologies and institutions for the creation of sustainable livelihoods. It also has an extensive information network under development. Within the project requirement to secure matching funding for the EU funds provided under the INFO2000 programme, the UIA made a joint application with DA for funding by the World Bank under its *infoDev* (Information for Development) programme. The *infoDev* activity aimed to accelerate the transition of a significant market segment of telephone, fax and basic email users towards fully automated information services

during a decade when most would not have this opportunity. It would have increased access and exposure to networked communication services in India and build capacity for its use by NGO groups. Unfortunately, after a 24-month application process, the project was recommended for funding but remains unfunded.

1.20.2.6 EU-India Economic Cross-Cultural Programme

Meetings were held with Roberto Carpano, Director of the Programme (Brussels, 8 September 1998) and with Domenico Nicoletti, Enterprise Project Officer (New Delhi, 29 October). Project concepts complementary to INFO2000 activities were discussed. It was intended to submit a proposal, in the first half of 1999 under the second call of this programme, for activities relating to water. The call never eventuated and the programme is back with DGI under review.

1.20.2.7 Discussions with Monsanto (Brussels, 7 September 1998)

UIA has had discussions with the coordinator of Environmental Services, Monsanto Europe, concerning possible sponsorship of the product. The discussions and possible collaboration are seen as a model for approaches to other companies.

1.20.2.8 Discussion with members of Contact Consortium (Rotterdam, 5 July 1998 and subsequent)

Anthony Judge and Nadia McLaren had discussions with members of the Contact Consortium, notably Gerald de Jong, Beautiful Code B.V. (Rotterdam) with regard to use of *Active Worlds* and *Struct* virtual reality technologies. These discussions continue to evolve between a variety of potential partners, one configuration of which is currently (August 2000) using a UIA database to test a new kind of software.

1.20.2.9 MyTown (Sydney, 30 December 1998)

Nadia McLaren initiated discussions with the *MyTown* consortium, based in Melbourne, Australia. *MyTown* is an online empowerment resource for local community development. It is currently in pilot planning phase, under the support of major corporate sponsors. The integrated knowledge system being developed under this project could become part of a disseminated and participative knowledge structure serving sustainable community development. These discussions continued in 1999. The UIA databases are now available through the *MyTown* portal, as soon may be [Ecolynx](#).

1.20.2.10 Discussions with Danyal Sattar, INAISE (Brussels, 26 February 1999)

The International Association of Investors in the Social Economy (INAISE) is a global network of socially and environmentally oriented financial institutions. The Brussels office is exploring the use of web databases for the promotion of sustainable development and the social economy through case studies. We discussed possible collaboration but nothing further has developed.

1.20.2.11 Meeting with John Galloway, NetMap (Sydney, 5 May 1999 and subsequent)

NetMap Solutions Pty Ltd is the owner of very sophisticated data mapping software. John Galloway was its creator. The meeting was to follow-up on previous email contacts and an experiment several years previously, which imported UIA data into the NetMap software. Friendly and fruitful discussions were had, with an understanding to explore closer collaboration. NetMap currently has a set of UIA data to test access to it via an application service provider (ASP), which would reduce the cost to users of accessing this facility via the UIA website.

1.20.2.12 Meetings with Convention on Biological Diversity and Biodiversity Clearing House Mechanism (Montreal, 7 May 1999)

Nadia McLaren had a series of courtesy and research meetings with people in the Convention on Biodiversity office in Montreal. Of special significance were discussions with Marc Auer, the Programme Officer at the Clearing-House

Mechanism. Under the Convention, the Clearing-House Mechanism is the official place for inter-national information exchange on biodiversity conservation. It was important that it be made aware of our project and we begin consideration how the two resources might work together. Jerry Harrison of WCMC has done the task of informing in the past, when he has met with officers of various agencies concerned with biodiversity conservation. No specific ongoing relationship with the CHM has been defined as yet, but this is an area for future review with both the global CHM and national CHMs.

1.20.2.13 Malcolm McCafee, Paideia

On his initiative, several discussions took place during 1997-2000 regarding the creation of an educational front-end to UIA databases in order to provide a set of courses for a virtual university. A prototype version was implemented on his website.

1.20.2.14 George Pór, Community Intelligence Labs, Santa Cruz

There have been two meetings, one in 1998 and one in 2000, to discuss the implications of visualization of UIA data for current initiatives on knowledge ecology in relationship to knowledge management. Mr Pór is currently presenting this aspect of our work for potential sponsorship by an industry consortium in the USA.

Unforeseen developments during the project

The reason for deferring this report was because of significant changes in the organisation of information services within one of the partner organisations (WCMC), and the appointment of a staff member with a specific marketing mandate. Also, as discussions with potential sponsors were ongoing until late in the project and are still ongoing.

Identification of future activities

The business plan is an indication of the constraints and opportunities with respect to which the data is already being marketed, and the guidelines for continuing development and future development of marketing and revenue generating initiatives.

As pointed out above, the two partners have already built up considerable momentum towards cost recovery and reinvestment along the lines developed in more detail.

1.20.3 Business plan: Cost recovery and reinvestment

1.20.3.1 Statement of purpose

Achieving sustainable development is a knowledge based imperative, requiring provision of *non-campaigning, unbiased and comprehensive information* services to government, non-government and the private sector.

1.20.3.2 Background

The partners in this product are non-profit research groups. WCMC and UIA both sell a variety of information products and services, including CD-ROMs and reference books. The sustainability of their operations is ensured by appropriate contractual arrangements with publishers, custodians of data, or other parties. The UIA obtains a high proportion of its income from its publishing activities; WCMC a considerable portion of its income from information development and management contracts.

The proposed project is designed to mesh with, and enhance, existing income generating initiatives whose viability has been demonstrated over the years. It should

be stressed at the outset that the project was conceived as integrated within ongoing business plans of both principal partners. In practice this means that the future development of the project databases is guaranteed by the way in which they reinforce and are reinforced by a set of ongoing, longer-term initiatives.

The following “Business Plan” is therefore best understood in terms of ensuring cost recovery and reinvestment of future surplus income in continual improvement of the product, for any combination of Web, CD-ROM, or Web-CD hybrid as the market dictates or permits in the next years.

1.20.3.3 Business challenges

A major difficulty in presenting a Business Plan for this product lies in the unpredictability of the information market, technology and emerging services over the coming years, *if not months*. This has been widely acknowledged in the financial and publishing press, notably in terms of the rate of business failures of CD-ROM and Web initiatives, even by the largest corporations. Any new undertaking is faced with the rapid and unpredictable evolution of the information society—especially when such enterprises must generate income from quality information services in a highly competitive environment. From a strategic perspective, there are few dependable “givens” in this context, other than change itself.

Product evolution: The product/service is designed to evolve with emerging software, notably in relation to the Web and to a Web/CD hybrid product/service. It must necessarily also evolve in response to competing products and services and to the increasing availability of information on the Web, notably in specialised areas which may be an incidental focus of the product. It must also evolve in response to new opportunities for cost recovery.

Information brokering

We have found that donors of data generally feel much easier about “giving it away” in an environment where they get something back which they value. This can be information provided by others in the same or related fields; it can be wider dissemination of their organisational information. The interactive “stakeholder-as-partner” model caters for this. This project will increase delivery back to NGOs of material that they themselves in large part have provided over several decades.

This said, there is a dilemma for any information provider adding value to public domain materials and concerned to maximise access. Our response is not to co-opt or resell others’ data; rather we significantly reformat it, if appropriate, and where not take full advantage of a hyperlinked and interactive environment.

It is not intended to charge for any information in a form currently in the public domain and available for free (putting aside for now that it always costs the user something to access even free information). Charges would apply only to provision of requested services that are additional to those already provided for free or required to be freely given by their organisational mandate and collaborative partner arrangements. The distinction is made between the stockholders and stockbrokers; the stockbroker does not get paid for stocks themselves (that could be freely sold anyway), but for providing a valued facilitation and transfer service as an intermediary between buyer and seller.

The intermediary service in this case is a specialised one of “information broker”, “value adder”, “knowledge switchpoint”, “expert finder” and “meaning creator”. Such information services are increasingly valued. They are the core business of clearing house organisations like UIA and WCMC. This is in part because knowledge bases

of such organisations are analogous to metadata in that they provide comparable references, formats and relationship links. This does not mean that “sale” and “licensing”, or their electronic equivalents, are not there. Just that any transaction is enabled within a framework where participants are responsible for their own information specification and control. One of the intermediary’s arts is in designing the interfaces to enable transactions to be as “automated” and self-designed as possible.

However, in a Web and email environment the need for intermediaries and “local licensing” is reduced since there is no need for acquisition of information by an intermediary -- only transfer from source to end user. The intermediary chain found in conventional marketing processes is much reduced or absent. Ideally, basic information changes hands between the source repository and the user on whatever terms they agree between them. Essentially the art would be to ensure that, in the event of any sale, it should be negotiated between user and data source or the user and a specialist service provider, not with any intermediary.

Determining prices and income: The greatest difficulty lies in fixing appropriate prices for services and predicting income. In the case of WCMC and UIA, this is further complicated by their need to respond creatively to a category of “user-partners” who are suppliers of their information as well as users of it. WCMC and UIA may also need to respond differently to their respective contacts in the case of particular categories of information.

On top of that are the trends in the dissemination of electronic information, in particular the contrasting tendencies to produce “information for free for everyone” and “information of high value for those who can pay”. In assessing possibilities for cost recovery in a volatile commercial environment, there are no clear answers to how much a user should pay for online access, or what they should get for what they pay. Libraries often host CD-ROM databases that are available to any passing searcher, like their print collections. But use of commercial services like Dialog or Lexis-Nexis may involve contracting with a separate Internet provider, since most of these do not offer direct Internet access. Even data that are free to the end user are liable to be costing somebody something.

The challenge for the proposed product is to position its access costs within this range as it evolves over time, possibly offering a variety of formulae according to the type of the user.

Determining investments: Further difficulty lies in the variety of investments, which it may, or may not, be necessary to make with respect to Web hardware and software, and, in the latter case, with respect to transaction licensing. The level of investment for “industry standard” webserver software (*e.g. Folio*, \$15,000), and billing systems (*e.g. Folio* \$10,000 per year) encourages exploration of alternatives. The CD-ROM case is less extreme, but also involves licensing/transaction royalties, which may increase the product cost beyond an affordable price for many.

Unpredictability of market: A major difficulty in presenting a Business Plan for this information package lies in the unpredictability of the information market, technology and emerging services over the coming years, *if not months*. This has been widely acknowledged in the financial and publishing press, notably in terms of the rate of business failures of CD-ROM and Web initiatives, even by the largest corporations. Any new undertaking is faced with the rapid and unpredictable evolution of the information society—especially when such enterprises must generate income from quality information services in a highly competitive environment. From a strategic

perspective, there are few dependable “givens” in this context, other than change itself.

Willingness to pay: The project is designed to navigate the essentially uncharted transition between conventional information products, desired by known markets, to unconventional information services responding to the changing needs of emerging markets. In this context the "willingness-to-pay" of any particular, possibly as yet undefined, niche cannot be effectively determined in an economically uncertain environment. What degree of confidence it is possible to place in estimates of usage and payment five years hence for a service defined today?

We believe an adaptive project or service would respond like an amoeba to marketing opportunities, pulling back from unsustainable interaction as appropriate. Our strategy relies on the demonstrated sustainability of a continuing core business, through established information publishing and delivery services within more stable economies, venturing wherever possible into more risky areas (see Section 20.4.1.5: Achieving sustainability). Given the nature of Web and email marketing, charges for the service could vary from zero to "what the market niche will bear" at the time. Charges may be varied also as a consequence of sectoral subsidies, introductory offers, scaled rates and other time or volume dependent devices (see Section 20.4.1.4: Business objectives).

The process of payment, and "willingness to pay", will also be partially determined by continuing experiments to be undertaken with the use of "information credits" in the exchange between "users" who may also be "suppliers" of information. For developing country NGOs, credits may be provided for a bridging period by collaborating organisations or sponsors in other parts of the world. Another example would be where credits for use were given for information was gathered by one organisation but compiled or distributed by another. These experiments may reflect aspects of current investigations into LETS systems and their electronic equivalents. Information has itself become a new unit of currency and the challenge is to integrate its exchange into determinations of system viability.

1.20.3.4 Business objectives

Commercial success in a competitive environment: This project is committed to exploring the full range of income earning potentials within its general objective to promote contextual information services for biodiversity conservation. This project is based upon a realistic study of economic support factors in each of the target sectors, also accounting for growth in the expanding field of environmental services and for the major impact the Internet information revolution is having upon this new field.

The strength of this project rests upon the experience and expertise of the project partners in the management and provision of reliable, accurate and relevant information services over many years. The emergence of the *Ecolynx* initiative from the existing partner activities recognises the market niche for organised contextual information (“managed knowledge bases”), which combines and crosses between disciplinary fields relevant to biodiversity, between science and policy, and between direct relationships and more indirect and subtle influences etc.

We note that most “dot coms” fail because they are purely based on a concept – without any thought to delivery of product and services or infrastructure behind the idea. UIA and WCMC, on the other hand have both substance and great experience in identifying and addressing the needs of the audiences.

Doing business within a not-for-profit context: The project partners in this project are non-profit research and service organisations, who at the same time are very much involved with commercial activities through contracts in the information services industry. The *Ecolynx* project is intended to span this threshold between commercial and non-commercial activity and to develop the market that exists there for environmental information services.

The 'commercial' strength of the partners providing information content is that the *Ecolynx* project builds upon their existing and developing information systems. Each partner organisation has demonstrated success in the evolution of their own particular organisation development strategy over a number of years, successfully confronting the realities of today's fast changing commercial environment, adapting to change and maintaining the market relevance of their own particular regimes.

Cost of data: In general terms, the data used in this project comes from publicly available sources and hence have no attached cost. However, access to much of that data requires the specialist knowledge and organisational arrangements built up over years by the project partners. These organisational arrangements, networks of resource provision; relations with technical experts and general organisational establishment, are what equip the project partners uniquely for undertaking this project task.

Professional data handling: Organisation and collection of source data into meaningful, precise and relevant formats (of international standard) for the target end users in each of the identified sectors is the core aim of *Ecolynx*. In instances where data is recovered from commercial sources the project partners will ensure the correct legal and proprietary pathways are created through *Ecolynx* to the end users, protecting copyright and authorship of material, establishing these pathways into each of the developing countries involved with the project.

Cost recovery and reinvestment: The Business Plan is designed in terms of ensuring cost recovery and providing reinvestment in the continued improvement of the products and services of *Ecolynx*, for the development of any further combination of Web, CD-ROM or Web-CD hybrid as the market dictates or permits in the next years. In this respect the Business Plan refers largely to continuing activity by the project partners beyond the project period.

Building on established viability: The proposed project is designed to mesh with, and enhance the existing income generating initiatives of the project partner organisations whose viability has been demonstrated over the years. For UIA and WCMC, this type of work is their "core business" and they will clearly benefit in the longer term from the "commercial success" of the product. Each of the project partners is therefore prepared to provide a considerable contribution of their own research and development investment collateral, in the form of personnel, facilities and resources, into the continuing development of the databases that underlie *Ecolynx*.

Multi-tier charging strategy: A multi-tier charging strategy would be based on a combination of willingness to pay and ability to pay (as indicated in the following table) -- further modified by the amount of information supplied in response to the query of a particular category of user.

Those deemed "able to pay" would be designated as Category A users and charged "what the market would bear". Typically Category A would include corporations, governments and universities of industrialised countries. The requirement for payment may be accompanied by an explanation that this not only supports work to

maintain the quality of the information content but supports access of financially disadvantaged users.

Indicative user groups	Category A “Able to pay”	Category B “Subsidised”	Category C “Info-barter”	Category C “Unable to pay”
Corporations				
Governments				
Universities / academics				
NGOs / CBOs				
Students / schools				
Individuals				
Journalists / media				

Nonetheless, it is expected that even Category A users would get some level information for free, notably “data”, *eg* names, addresses, URLs, raw statistics and the like; essentially any simple, unprocessed materials that would be considered by their “owners” as public information. Factors certainly likely to trigger user charges are access to multiple records, formatted records, or lengthy texts of professionally edited documentation, extensive searches, analyses or downloads that heavily consume server time, and the like.

Those deemed “unable to pay”, or to engage in any kind of LETS-type exchange, would be designated at Category D and would be allowed some form of free use of the system. This might include a range of users from developing countries (or their equivalent in industrialised countries). Note, however, that guest users of all types might be initially accorded this freedom as part of the marketing strategy. A strong encouragement would be given to all such users that contribution of information in return for use would be valued.

Those willing to engage in some LETS-type non-financial exchange in return for information supply would be allocated to Category C. Typically this would include certain kinds of advocacy groups and other non-commercial “power users”. Certain academics have expressed a desire to work in this way. Other organisations in this category would be current collaborating partners in information banking of UIA, DA and WCMC.

Category B would be for users that it was considered appropriate to support to some degree in the interests of development objectives, notably those of the World Bank. This would include some bodies with limited ability to pay, whether in developing or industrialised countries. It would include some important development NGOs, for example.

In working with the above scheme, the intention would be to shift users into a progressively higher category, Category A where possible, but without denying them the service if it was possible to include them in one of the other categories. Users could, for example, be allocated to Category B if some sectoral services were subsidised by interested third parties.

The details of the multi-tier economic and marketing strategy would be a matter for continuing review and innovation in the light of the development of e-commerce possibilities, loss-leader marketing opportunities, exercises in LETS-type interaction with user-suppliers, as well as sectoral subsidies or sponsorship.

1.20.3.5 Achieving sustainability

The key question in the future will be whether the formula chosen for relating to users and “user-partners” generates sufficient income to sustain in-house editing and system maintenance. In addition the partners would continue to support the initiative in the following ways:

Seeking counterfunding: The partners have successfully counter-funded the EC contribution to this project over a period of three years. Co-sponsors and new funders, interested in financially supporting future developments outlined in this report, will be invited into the project, hopefully ensuring a constant non-commercial support to the central R & D of the project.

Subsidies and sponsorship for projects is an established method of financing used by all the project partners. Whilst such support may be quite general (significant non-EU funding partners of WCMC during the project being IUCN and the Dutch Government), it may also be focused on quite specific portions of the data -- an example being the sponsorship by various petroleum companies of specific portions of WCMC's *Biodiversity Map Library*.

Again, in the case of the UIA, there is an interest in exploring a formula of “*user-owner*” of portions of the data, where particular users may take both financial and editorial responsibility for portions of the data. This is of course entirely consistent with the philosophy of the Web. The viability in practice in terms of data quality and economics will be a matter of continuing experimentation and evaluation.

Financing partners: There is considerable scope for attracting funds that support further development of this project through direct financial payments -- because *Ecolynx* serves their organisational objectives and they would have to pay anyway to create a similar service. Presentations of the project to a variety of potential “partners” (who could provide financial or in-kind support) could include the European Environment Agency, WHO, UNICEF, UNESCO and OECD Environment Division. These will be made with a particular view to integrating the project with new and existing (complementary) initiatives, building joint project arrangements and having the *Ecolynx* system integrated into the programme R & D activities of existing international organisations.

“Loyalty” income from web services

The UIA has recently opened an account with the search engine company *Google*. *Google* pays a fraction of a cent for every search made through the UIA interface. *Google* was tested along with other search engines for many months prior to this decision. The UIA customer code is inserted into each automatically generated search string from the UIA or *Ecolynx* website. This means that every click-enabled search from an *Ecolynx* page will earn money for the project. Both WCMC and UIA intend to enable a similar loyalty customer system offered by Amazon.com for books.

“Advertising” / banner accounts:

The UIA researched a number of company offers for online advertisements, using banners. A six-month trial was carried out on *Ecolynx* of Advertising.com, the one that appeared the most promising. The results were disappointing and the experiment discontinued. The main concern was that, while the company said it would gradually match the advertisements to the content and user preferences of the website, this did not occur.

Non-monetary exchanges: It is also expected that the *Ecolynx* partners will build on their established system of non-monetary information transactions to produce long term sustainability. Even services for which there is normally a charge may be made

available without cost or at a discount by use of an “information exchange and barter currency” with user/partners otherwise unable to afford mainstream development information.

Charge for services: Neither UIA nor WCMC has charged for their web-delivered information either before or during the course of this project. In August 2000, UIA introduced a web subscription service for its *Yearbook of International Organizations* and with a few months do the same for its *Calendar of International Meetings*. Both these products have been sold for many years in printed form and, in the case of the past five years for the *Yearbook*, in CD-ROM format. This is intended to be a pilot for potential sale of the other databases of UIA, using a multi-tier system as described above. This may be offered by various forms of subscription, use against a deposit payment or microcharging to established accounts.

For a couple of years, WCMC has been considering future options along the same lines.

1.20.3.6 Risk assessment

The mixture of commercial and non-commercial goals in this project affords a flexibility which is of advantage to “risky” and “enduring” ventures alike -- *ie* any project whose survival is subject to the whims of fashion and the marketplace, as information projects currently are.

The UIA has long demonstrated its capacity to mix the commercial objectives of its publisher with its own non-commercial objectives -- to the considerable satisfaction of both parties. WCMC has relied on contracted project work and core funding to achieve financial sustainability. Whilst it may be “complicated” to marry such contrasting philosophies in a Web environment, the proponents believe they have a credible strategy for doing so -- as well as a variety of credible fall-back positions if any particular tactic proves unsuccessful.

In carrying out this work, the partners have deliberately developed information tools and services that can stand independently, as the opportunities to develop collaborative relationships with other organisations interested in these datasets is thereby improved, and hence the opportunities for co-financing.

As explained in above, through synergistic support of related projects, the financial risk of this project has already been spread. Any new partnerships must be a *quid pro quo* arrangement that makes sense first in terms of service delivery, second in terms of injecting funds. This approach enables us to keep our financial risk low and focus on doing the work rather than raising money.

For this business plan to be viable, it is assumed that the greater part of the costs of this service would be absorbed into the ongoing operational costs/overheads. In this sense the objective is to benefit maximally from the publishing advantages of the Web. Once provision is made for stakeholder access to data, by covering server operation and maintenance costs, the core costs then relate to processing information resulting from user interaction with the information and service providers. This is potentially chargeable personnel time.

Below is a table illustrating the cost recovery implications for two levels of maintenance costing. Given the existing information delivery infrastructures of the partners, from these preliminary figures it appears feasible that a project maintenance system could be designed as financially self-sustaining during a period of growth and development following its launch.

Maintenance cost Monthly transactions	1000 Euro / month	2000 Euro / month
100	10 Euro per transaction	20 Euro per transaction
500	2	4
1,000	1	2
5,000	0.2	0.4
10,000	0.1	0.2
20,000	0.05	0.1

At the very least, the project will reliably make available in the longer term the substantial corpus of information that has been accumulated over a couple of decades. It will deliver back to a range of organisations, material that they themselves in large part have helped to provide. This information will be more or less continually updated by other ongoing projects within the partners' domains and those of other hyperlinked domains. This level of service is essentially passive and costless. The additional cost component increases with increasing interactivity, as shown by the table above.

In a worst case "pull-back" scenario, the person-to-person services can be completely automated or severely cut back (as current experiments have determined). Under optimal conditions (an "expansion" scenario), ongoing costs relate to the continuing editorial/research development of information profiles and linkages -- together with the continuing development of the interfaces through which users interact with that information (including new visualization techniques). We see these being funded by a combination of UIA/WCMC surplus funds, some of which will be user charges and an unknown amount from commercial partners (*Google, Amazon* etc), and complementary new contracts or direct sponsorships.

From this perspective, the success of the project is guaranteed to the extent that valuable data will be assembled, interrelated and made available using in-house personnel and equipment resources of the principal partners. Whether it can be "made available" in a manner consistent with both the needs of potential "zero-cost" "user-partners" and of sustainable cost recovery will be a matter of continuing review. In a worst case scenario, there would be totally inadequate information sales and zero sponsorship/subsidy in the immediate post-Implementation Phase period — however much the "zero cost" aspects of the service were appreciated. However, in this case initiatives would be taken to repackage the information in other ways.

1.21 Outreach, marketing and launch

Deliverable: 5052-22
Workpackage: 8-4

Revision 31-03-98
Partial delivery 30-10-99
Final Delivery 30-06-00

Background to the workpackage

1.21.1 Pre-existing products

The two partners providing content to this project -- UIA and WCMC -- are European-based international NGOs with agendas to enable organisations (governments, official bodies, conservation groups, industry and commerce) around the globe to be informed, plan and make fundamental decisions.

For almost 90 years, UIA has been providing information services about international organisations and their activities, as well as facilitating global networks to be more effective. WCMC has for almost 30 years been providing information services on conservation and the sustainable use of the world's living resources as well as helping others develop information systems of their own. Both organisations have established unique and enviable reputations as data clearing houses and for providing *non-campaigning, unbiased, timely and factual information*. In addition, the UIA is particularly interested in capturing biased and possibly unfounded perspectives from constituencies that seek to influence policy and/or allocate resources in the firm belief that these perspectives are factually based.

Both organisations access data from a wide range of expert sources and have extensive networks of contacts and collaborative links throughout the global community. UNEP-WCMC operates on national, regional and international levels; UIA at regional and global levels. Both organisations are committed to the principle of data exchange and act as clearing houses, allowing data providers and users to share data and information. They also serve as knowledge managers and custodians, aggregating and storing information in knowledge structures.

Wherever possible, data managed by WCMC and UIA is placed in the public domain. In giving open access to data, WCMC is more limited by obligations to its data providers (scientific and commercial), particularly as regards ownership; UIA is limited more by contractual obligations to the commercial agent which markets some of its reference products and provides a major income stream to ensure maintenance of the databases.

1.21.2 Past marketing by UIA and WCMC

Until the advent of the web, neither UIA nor WCMC themselves 'marketed' their information products in any conventional commercial sense.

1.21.2.1 UIA

In the case of UIA, its reference products are marketed globally by the Munich-based academic publisher K G Saur. UIA independently publicises its book and CD products on the Web, in journals (it's own and others) and at international meetings.

UIA began web-based delivery of information in 1997 and the dynamic delivery of databases in 1998 (as enabled by this project). With no deliberate marketing, it now has over 17,000 registered users and around 75,000 hits per month. This is primarily a consequence of web search engine exploration of the UIA static site (pointing into specific materials in the dynamic site initiated by this project).

1.21.2.2 WCMC

In the case of WCMC, books and reports were prepared in response to requests, usually co-operatively produced, and marketed by partner organisations (UNEP, IUCN and others). Rather than developing a broad marketing strategy, WCMC has tended to carefully target organisations and processes that can provide information services to support, and work with the organisations concerned to find the resources for the work.

WCMC was one of the first organisations to deliver such information via the Internet, and made available dynamic databases as early as 1994, and its electronic products are freely accessed, hence 'marketed', through user search and access on the Web. Although little to no marketing efforts have been made to date, WCMC has achieved a world position, which is second only to *panda.org* and *greenpeace.org* amongst conservation-related organisations - at a rate of over 2.5 million hits per month. More specifically there are over 200K individual users of the website each month, from around 80 countries.

Activities of the workpackage

The work entailed by this programme of activity was to progressively (1) test and revise the marketing plan in response to feedback, taking into account user workshops and online feedback; (2) implement the web component of the marketing strategy as components of the product are brought online; (3) as the product develops, add more conventional marketing components of the marketing plan through the usual operations of the partners (mailings, meetings, journals etc) and (4) prepare for a public launch.

These activities were carried out according to plan, except that the plan has been displaced somewhat. Part (1) is fully achieved; parts (2) and (3) have commenced and are planned to conclude in the late half of 2000 and beginning of 2001; and (4) is still to take place.

1.21.3 Review of market trends

In 1998, WCMC undertook a study of market trends for environmental information, in order to provide a basis for review of the Centre's programmes. This study confirmed that the market for the provision of environmental information is in high growth because:

- Global and European legislation continues to have a major impact on industry and commerce.
- Awareness and popular support for biodiversity issues have increased dramatically over the last 3-5 years.
- Over the last 12 months alone the environmental consultancy market has seen an increase of 5% and the environmental training market has seen an increase of 20%.
- Due to the demand for natural products, industry is taking its environmental responsibilities seriously.

This was echoed in the opinions of private sector organisations that are among the customers of WCMC:

“The key area where action is necessary is the environment. Although the science is still provisional, the legitimate concerns about the risk of fundamental change in the earth’s climate are too serious to be ignored. Precautionary action is justified and necessary Those concerns are increased by the growing demand for oil and natural gas, driven by population growth and economic development....” BP Amoco – December 1998

“A healthy and diverse environment is a key goal of sustainable development with nature conservation and partnerships an essential part of our long term environmental strategy...so biodiversity (the variety of life) is one of our 10 key sustainable indicators.” Anglian Water – June 1999

In 1998, as part of an independent review of WCMC, over 52 representatives were interviewed from 42 organisations that provide or use biodiversity/conservation data or information. Approximately 70% expected information/data demands to increase, and most expected this to be reflected in demands on WCMC services.

As a provider of services, the key strengths of WCMC were seen to be the skill and broad ranging experience of the staff and its global data coverage. For private sector users, the independence and objectivity of WCMC was particularly important. There are, for example, organisations more strongly placed to provide biodiversity/conservation data on individual topics *eg* species, wetlands, and the same can be expected to be the case for many single countries. But as a source of global information, WCMC currently appeared pre-eminent, although there were competitors. About half of those interviewed said that they were aware of no substitute to WCMC. These organisations relied on WCMC for their own ability to service the needs of conservation/biodiversity protection.

Users of WCMC’s databases and associated services had the opportunity to fill out a questionnaire on the WCMC website during October 1998. Of the 57 users that responded, 50% were from academic organisations, such as universities, 12% from local government, 7% from national governments and the remainder fairly evenly spread between conservation organisations, NGOs, individuals, consultancies and “other”. 80% of the respondents cited their use of the information as being either academic or teaching / school related. The majority of visitors were expressly seeking biodiversity / conservation information.

Recently WCMC has gone through a period of change as it has moved from being an independent organisation to a part of the United Nations Environment Programme (UNEP). During the various programme meetings that were necessary for this transfer, and during the launch itself, a number of prominent individuals commented on the important role of information management and dissemination in ensuring conservation and sustainable use of biological diversity.

Specifically, each of the following is a comment on WCMC’s role made in the first half of 2000:

“The global community must improve its ability to identify emerging environmental problems and assess appropriate responses. Formulating effective global, regional and national policies on matters vital to our future requires the ability, and the foresight capability to make accurate, long term projections of global trends.” UNEP Deputy Executive Director

“The Centre’s technical experience and expertise place it in exactly the right position to take the best advantage for securing ever more accurate environmental information, guiding decisions of both governments, inter-governmental organisations and NGOs. For this is the cornerstone of biodiversity conservation: accurate, accessible and useful information.” UK Minister of Environment

“The accessibility of your work is vital. The results of monitoring ecosystems and habitats need to be widely available. They help to show whether we are using the Earth’s living resources sustainably. And that in turn is crucial to reducing poverty and improving the quality of life.” UK Minister of Foreign Affairs

In the case of the UIA, the most significant recent indicator of market demand for its information services is that on the occasion of the recent sale of its commercial publisher, K G Saur Verlag, by Reed Elsevier to its major competitor Thompson Publishing Group, the inclusion of the UIA contract was one condition of the sale.

These quotes and indications, coupled with increase in project work, the number of queries coming to WCMC and the increase in usage of the WCMC and UIA websites all serve to confirm importance accorded to information and information services that are delivered through this product.

1.21.4 Professional outreach

1.21.4.1 Meeting with World Bank staff (Washington, 1997-99)

On 8 February 1997, Nadia McLaren made a presentation of the project to people working with biodiversity issues at the World Bank and the Global Environmental Facility. Nadia and Anthony Judge had meetings on 21-22 January 1999 with Rolf Carriere, former head of UNICEF Bangladesh and now UNICEF Liaison at the World Bank and Jose Furtado, a consultant within Economic Development Institute of the Bank. Introductions were made with Linda McGinnes, Co-Manager of the World Links for Development (WorLD) Program, a programme personally established by James Wolfensohn, President of the World Bank. This programme aims to establish a global learning network linking thousands of students and educators around the world. WorLD is seeking to establish partnership with online providers of knowledge bases suitable for education purposes. We are continuing the dialogue.

1.21.4.2 Global Knowledge ‘97 Conference *Knowledge for Development in the Information Age* (Toronto, 22-25 June 1997)

UIA registered interest in providing a learning event at the Global Knowledge ‘97 Conference (Theme: ‘Knowledge for Development in the Information Age’) in Toronto, 22-25 June. It participated in the online discussion preceding the conference. Arrangements were made for a Canadian member of the UIA Council to attend the conference.

1.21.4.3 *Online Exhibition* (London, 8-12 December 1997)

At the invitation of the European Commission, the project was presented as part of the EU stand at the London Online Exhibition. Representatives from UIA and WCMC took turns to be in attendance at the stand throughout the exhibition period. The opportunity to be present was appreciated. The Commission organisation and facilities were excellent. In the event, the benefits to the project were not worthwhile. Such events are probably best suited to marketing finished products or services, although even this was apparent. The main reason for most exhibitors to be present was simply that – to be seen. On the strength of this experience, we declined to be part of another EU contingent at the IT exhibition/conference in Vienna later this year.

We would welcome a similar invitation twelve-months hence when the product is in a near completed form.

1.21.4.4 Bridging the GAP Conference (London, 3-5 June 1998)

The Netherlands, the UK and the European Environment Agency jointly sponsored this event, subtitled *New Needs and Perspectives for Environmental Information*. It addressed the needs and deficiencies in provision of environmental information for environmental policy and planning, and the communication of required information to the general public and industry. Nadia McLaren and Anthony Judge of UIA presented the project to one of the conference workshops entitled "Biodiversity: Making the most of very little"; they also ran a continuous presentation in the foyer of the conference hotel. Another project member, Graham Bennett of AIDEnvironment, was one of the workshop organisers. Several potentially very valuable contacts were made, including IUCN and EEA. We are following up interest expressed by individuals from one academic institute (Germany) and one research institute (Denmark) to assist the project with testing interactive editing of the data.

1.21.4.5 6th World Wilderness Congress (Bangalore, 24-29 October 1998)

Nadia McLaren participated in this congress, the latest in a series convened every four years by the International Conservation Union. It should have been an ideal venue to connect with professionals involved with biodiversity conservation. This congress was less relevant to our European focus than was expected. Attendance was largely South Asian (previous congresses have been more international). Nonetheless very useful perspectives were gained and a variety of valuable contacts made. Travel to this conference was linked to project development work (including securing of matching funds) for application of the work in India as a pilot for developing country applications (see below). Therefore, the full value of this effort should become apparent later in the project period.

1.21.4.6 4.6 World Academy of Art and Science (Vancouver, 25-27 October 1998)

Anthony Judge made a presentation at the assembly of the World Academy of Art and Science referring to the INFO2000 project. The title of the presentation was "Advances in Graphics Technology". It drew upon some of the development work of the UIA funded by the INFO2000 project.

1.21.4.7 NGO Environmental Health Action Group meeting (Soesterberg, 7-8 February 1999)

As a direct consequence of their involvement with this INFO2000 project, Nadia McLaren and Anthony Judge had been invited as members of the Environmental Health Action Group, which met for the second time in Soesterberg, Netherlands. Certain members of the group continued meeting on the subject of a related information project, part EC-funded through UNED-UK, called Interactive Health Ecology Access Links - Europe (IHEAL-Europe) (Section 15.2.2.9: IHEAL Europe Interactive Database).

1.21.4.8 NGO Internet Fiesta (Vienna, 19-20 March 1999)

The World of NGOs organised this event at the UN Centre in Vienna. Nadia McLaren provided an online demonstration of the INFO2000 project. She highlighted that this project has enabled UIA to make its databases available on the Internet (<http://www.uia.org/data.htm>) in an interactive format in beta-test mode. This means that people can comment on the information, suggest improvements and add new material. Their comments are instantly registered and available to other users. She also talked about the procedures now being refined for the online editing of the data. This will enable accredited editors to change the profiles remotely, notably incorporating new materials, updating and building interrelationships between profiles. The objectives are to use the capacities of the Internet to further open the

process of information collection and sharing, enable the widest access to the information, and encourage interaction and debate on issues important to NGOs. Ms McLaren also participated in the workshop "International Resources, Global Co-operation and Networks", focusing on the potential of international information resources and the urgent need of structuring on the Internet.

1.21.4.9 Workshop: Integrated Planning at Different Scales: Policy and Practice (Perth, Scotland, 7-9 April 1999)

Graham Bennett presented information on our project at this workshop, organised by Scottish Natural Heritage. The workshop was concerned with sharing expertise and experience on integrated planning and management of natural resources at national, regional and international levels.

1.21.4.10 Pan-European Eco Conference on Public Participation (Moldova, 17-18 April 1999)

Allan Howard of UIA attended this conference, which addressed the role of NGOs within the UN ECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (the Aarhus Convention 1998).

Besides participating in conference workshops and contributing to the conference's final statement, Mr Howard had meetings with representatives of the US Agency for International Development (Europe & NIS), the Regional Environmental Center for Central and Eastern Europe (REC), the European Environmental Bureau (EEB), the European Union Tacis programme and representatives of environmental projects in Russia, Moldova, Turkey and Africa.

1.21.4.11 4th International Expert Seminar on Environmental Management (Surfers Paradise, 19 -25 April 1999)

Nadia McLaren was invited to present at an international conference in Australia concerned with environmental indicators and local government. The conference was followed by three round-table seminars in Brisbane, Canberra and Batemans Bay. The meeting was funded by the host and enabled further discussions with potential partners in Australia. Return through Canada also enabled meetings in Montreal with the Biodiversity Clearing House Mechanism and Convention on Biological Diversity (see Section 20.2.2.12: Meetings with Convention on Biological Diversity and Biodiversity Clearing House Mechanism (Montreal, 7 May 1999)).

1.21.4.12 Fifth Framework Seminar, East-West Collaboration in Developing Interactive Media Production (Budapest, 8-11 May 1999)

Anthony Judge attended this meeting, sponsored by DG-XIII. Contacts made on this occasion have set the stage for collaboration with potential partners in Prague and Budapest, together with a partner in the UK. These are part of discussions for two separate UIA-initiated consortia based on work related to the Problems and Strategies databases.

1.21.4.13 WHO/NATO Expert Workshop on Environmental Health (Varna, 17-23 May 1999)

Nadia McLaren was invited to present insights on the role of NGOs in local planning of environment and health and on environmental indicators. The INFO2000 project was presented as an example of using interactive technologies for capturing contributions from citizens on matters of community concern.

1.21.4.14 Healthy Planet Forum and 3rd Meeting of European Health and Environment Ministers (London, 14-22 June 1998)

A team of UIA personnel was based in London during the Ministerial Conference and its concurrent NGO Forum. At the Forum, they made available a continuous

presentation of the interactive online facilities developed during the course of this project.

1.21.4.15 Presentation to KPN Research and Training Divisions (Groningen, 1 July 1999)

This invited presentation of the project databases and website, especially the multimedia facilities, was designed to suggest new lines of thinking to KPN, notably with respect to their product and service development. The possibility of a joint project with KPN Research was evoked as a means of further developing the multimedia features.

1.21.4.16 Presentation to Dutch Ministry of Environment (Den Haag, 13 July 1999)

This meeting focused on the main environmental problems that have an international dimension and which are likely to be of relevance to the Netherlands in the first part of the next century. In a general presentation of the Report on International Aspects of Dutch Environmental Policy, Graham Bennett presented our project's index and display features as a comparison of results using conventional research methods.

1.21.4.17 Foundation for the Future *Threats and Opportunities towards the Year 3000* (Seattle, 25-29 September 1999)

This meeting of invited futurists, notably including biotechnologists, endeavoured to scope out the "threats" and "opportunities" towards the Year 3000. It included presentations by Jay Forrester on World Dynamics and by Jeremy Glenn on the United Nations University millennium survey of threats (to which UIA had contributed).

1.21.4.18 Workshop on Information in the Policy Process (San Francisco, 10 December 1999)

The Nautilus Institute organised this workshop for Security and Sustainable Development and the World Affairs Council. The presentation by Anthony Judge provided a context in which the relevance of the kinds of information developed for this INFO2000 project could be demonstrated in relation to security and policy dilemmas of the immediate future.

1.21.5 Marketing strategy

A marketing plan was prepared during the Definition Phase. It was reviewed and revised during the process of preparing the proposal for complementary funding from the *infoDev* programme of the World Bank (Section 15.2.2.8: *infoDev* Programme of World Bank). A copy was handed to the INFO2000 Project Officer at the Team Meeting on 24 April 1998. It is confidential and restricted. A review of the major points is provided below.

1. The ideal information and marketing strategy should be able to reach the target audiences at the lowest cost possible.
2. There are many possibilities for marketing this product, which is transiting through the era of change from authoritative, hardcopy information to dispersed, electronic information. They include opportunities for:
3. Marketing the product through its responsiveness (interactivity) to its potential market;
4. Employing the product as the marketing tool;
5. Employing the medium as a market place.
6. A detailed break down of target markets and audience has been provided in Sections 3.2.1: Pre-assessment of user needs and 21.2.1: Review of market trends.

7. This product will be of greatest interest and value to selected scientists, researchers, policy-makers and professionals, as well as to scholars, educators and students. Libraries, NGOs and special interest organisations also comprise a significant potential audience.
8. It is not simple to create a marketing formula for this product because the “multimedia content stage” is being reset month by month. The project consortium believes it will need to respond by adapting to market trends and the needs and requirements of the audiences over the course of the next few years, whilst at the same time regularly reviewing the existing need for the product and adapting to the feedback from end users.
9. Because the products and services build on ongoing activities, there is a strong case for progressive and segmented marketing through selective communication of the product.
10. This product is designed primarily for a ‘professional user-group’ (although it is expected that others will benefit incidentally and may become a valuable source of information). Marketing to this group can be done to a large extent by direct marketing to the existing UIA/WCMC client and databases.
11. The “launch” would be a hybrid of announcement and publicity of the *Ecolynx* website at one or more major international events and in other formats and media.
12. The Internet provides multiple avenues for dissemination. An Internet marketing strategy is detailed in Section 21.2.4: Internet marketing strategy.
13. The new information products and services will be publicised by the partners and their regular collaborators through usual channels, including publication catalogues, project partners’ journals, press releases, submitting the *Ecolynx* website to review processes of the print and on-line media concerned with conservation and/or technology issues, on-line announcements, meetings, magazines, regular mailings etc).
14. It is likely that an affordable (sponsored) CD-ROM product will be made available in the future and that this would extend the product into a new, non-online, market, probably through a commercial distributor.

1.21.6 Internet marketing strategy

The web marketing outlined below is being progressively implemented. Internet technology makes it possible to reach the target users and media contacts in a simple, effective and direct manner. The primary expense is staff time for completing the various operations.

Note that in implementing this strategy, marketing may be carried out for components of the information services being developed, and not for the whole project. For example, much of the work carried out by WCMC has been modular in nature, targeted to the needs of particular expert and interest groups. Marketing therefore tends to be focused on those specific groups.

Key actions are as follows:

1.21.6.1 Prepare common portal website

Building the interface for the web portal *Ecolynx* commenced in January 2000. The www.ecolynx.org domain was registered in April 2000 and has been functional for beta-testing purposes, since this time.

1.21.6.2 Prepare partner web sites

The partner websites have developed their existing project-related content, most of it at this stage at no-cost access. Relevant details on access to further information and

further information services are included as appropriate, including sales and subscription information.

1.21.6.3 Announce to discussion groups

Announcements concerning the project and the websites (including components of them) have been prepared and will be submitted to relevant e-mail based discussion groups to attract individuals or organisation representatives likely to be interested in the project and the project partners' activities.

1.21.6.4 Register with Internet search engines

Because of the nature of information search and retrieval on the Internet, project partner websites and relevant components of them are being re-registered with the growing number of search engines in order to have the pages relevant to project properly indexed. Each feature or page, where unique from the rest of the site contents, are being registered individually.

1.21.6.5 Provide meta-tags

The project webpages are being developed and delivered with appropriate meta-information so that webcrawlers, spiders and other search engines correctly identify pages of potential interest. This is particularly necessary where information is in databases, because the traditional search engines do not easily locate these.

1.21.6.6 Submit sites for web awards

As with Internet meta-indexes and search engines, it is possible to submit a URL for appraisal by a number of initiatives – essentially more heavily edited guides or meta-indexes – which present awards or certification of a website, based on certain criteria. Appropriate “target” schemes are being identified, for submission to later this year.

1.21.6.7 Establish site links

A special page of hyperlinks to project relevant websites (Internet initiatives, national and international organisations, etc) are being developed and will be maintained. At the same time webpages of other organisations are being identified which might provide a link to the webpages developed by UIA and WCMC.

1.21.6.8 Create email discussion groups

Consideration is still being given to the creation of E-mail discussion groups on specific biodiversity issues and/or world problems, for project users and participants.

1.21.7 Professional outreach

Members of the project team participated in a wide range of international meetings during the life of the project, and at a significant number of these meetings discussions related to the work being carried out by the project. At a total of 18 conferences or workshops during the course of the Implementation Phase, the specific purpose was to publicise the project (Section 21.2.2: Professional outreach).

WCMC also had meetings with a wide range of user-groups in the context of this and other related projects, in the light of its organisational review, primarily to assess user-needs and to ensure that the services being developed would adequately meet those needs. This included meetings with international agreement secretariats, UN bodies (both regional and global), regional organisations, and specialist networks.

Many other meetings were held with professional user groups, potential partners and sponsors (Section 20: Subsidy, sponsorship and online charging). Notable interactions were with *staff of*: the World Bank, World Conservation Union (IUCN), Clearing-House Mechanism, Convention on Biological Diversity (CBD), Development Alternatives, Centre “Leo Apostel” (Free University of Brussels), International Association of Investors in the Social Economy (INAISE), MyTown consortium, Contact Consortium, Monsanto, NetMap Solutions, KPN Research, and involvement

in **conferences organised by**: the Foundation for the Future, European Environment Agency (EEA), Environment Agency for England and Wales, Netherlands Ministry of Housing, Spatial Planning and the Environment (VROM) / Advisory Council for Research on Nature and the Environment (RMNO) / National Institute for Public Health and the Environment (RIVM), Scottish Environmental Protection Agency (SEPA), Scottish Natural Heritage (SNH), NGO Environmental Health Action Group, The World of NGOs, World Health Organisation (WHO)/North Atlantic Treaty Organisation (NATO), International Council for Local Environmental Initiatives (ICLEI), World Academy of Art and Science, Nautilus Institute for Security and Sustainable Development and the World Affairs Council.

1.21.8 Launch

The planned launch has been reframed, as outlined below (see 3.3).

Unforeseen developments during the project

1.21.9 Developments in WCMC marketing policy and practice

The three years of the project period have coincided with a major review and transformation of WCMC's organisational status and structure (but not significantly its activities). In late 1998 there was a review of its future given a decline in guaranteed core funding. Just after the end of this project period, on 3 July 2000, WCMC became an office of the United Nations Environment Programme (UNEP).

These changes have also had some effect on the approach to business development and marketing. For one year WCMC had a Head of Business Development who reviewed sponsorship and marketing of WCMC products and services. Significant advances were made in the development of an information service which it was expected that industry would use through a subscription service. At the last minute this had to be scrapped because of changes in the UK law dealing with VAT, and the approach of the Centre to business had to go through some changes.

Coincident with the final phase of the project, WCMC filled a new position of Head of Marketing. Future marketing strategies are (1) web-based (2) database marketing (3) direct response mailers (4) media relations (5) partnership marketing and (6) through commercial sponsorship (Section 20.2.1: Commercial sponsorship). Two new recent developments are important:

- BP Amoco/Rio Tinto announced recently at the Biodiversity in Business conference that UNEP-WCMC will become keepers and managers all their global environmental information. This consolidates a relationship, developing over several years, between WCMC and a significant private sector data provider.
- There is already an increase apparent in the work that WCMC is being asked to carry out for the global biodiversity-related treaties. Again this consolidates relationships developed over a number of years.

1.21.10 Developments in UIA marketing policy and practice

K.G. Saur Verlag, publisher/distributor agent of UIA's books and CDs was a member of the Reed Elsevier group during the entire project period. It has since been sold to the Thompson Publishing Group (owners of Gale Research, a major competitor on some UIA products). Saur will market UIA's international organisations database on line, by subscription, from August 2000 – linked to the databases funded by this project. This organisation data was previously only available in book or CD form.

UIA is looking into micro-payment arrangements for small amounts of these data and also online subscription to its international meetings database. All other UIA databases online are still provided free of charge.

1.21.11 Major launch

At the commencement of the project, a formal “final launch” of the product was seen as a coherent end point to the marketing plan. The notion of a “final launch” has been reframed for a number of reasons:

- The product is a distributed service for which the *Ecolynx* website interface is the unique organising interface. However the “product” can be entered by many routes and its content is not necessarily identified to a single source;
- The product builds on the proven “raw materials” of UIA and WCMC databases, currently “marketed” as a myriad of products. *Ecolynx* is another “shopfront” but not a completely new product.
- Segments of the work have been “released” throughout the course of the project, usually in beta versions, but in many cases in complete form;
- Experience of marketing stands at conferences and exhibitions leads to the conclusion that there are more effective modes of introducing this product to its users. Self-looping *PowerPoint* presentations and take-away printed information, probably in the form of postcards, would be the preferred way to inform at conferences.
- Being a web product, the *Ecolynx* interface is most effectively launched on the web.

Identification of future activities

Future activities are identified in the marketing strategies dealt with above. A range of other activities continues to be discussed. One example, in the case of WCMC, is the use of public and press relations. Another, in the case of the UIA, is a number of marketing-related possibilities emerging in relation to visual interfaces, whether the *Java* spring map (with Beautiful Code, Netherlands) or *Decision Explorer* (Banxia, UK) (Section 16.2: Multimedia visualization, Activities of the workpackage)

The marketing strategy outlined above has the advantage of opening channels of direct communication between the project partners and organisations or individuals who are likely to be interested in collaborating on this or related projects. Activities undertaken for the purposes of the project will have a secondary benefit of generally improving the project partners’ web sites visibility on the Internet and the sites’ ease of use for their existing (expanding) constituencies.

1.22 Information ownership and copyright

Background to the workpackage

The participants in this project believe in the principle of open access to data, and support the increased mobilisation of policy-relevant environmental information to support the conservation and sustainable use of the world's living resources.

The participants contributing information content to the project (UIA, WCMC) are not-for-profit organisations. They are committed to enabling free exchange of information, only charging for the staff time and other expenses necessary for editing and managing the data, performing services specifically requested, developing the services and products, and maintaining the currency of the information. Their concerns over intellectual property matters do not arise from an inherent commercial, or for-profit, bias. They may, however, need to reflect such concerns of others that provide them with information or commercialise their information.

The information content of the product is owned by, or freely available to, the two content-providing partners. The datasets in question have been generated, and are maintained on a more or less continual basis, by the respective organisation partners. The core creators of the information are research scientists involved in the fields of species, habitat or ecosystem conservation, or they are researchers involved with the study of global networks and associative activity for environmental conservation; they are also the information and policy arms of organisations and institutions working in these fields.

Information held in the partners' databases is not "original" (in the sense that they can unconditionally claim ownership). Parts of the information in the partners' databases are already available in a variety of forms, some in the public domain, much of it as "grey literature". In both cases, the partners add value to the data by standardisation of presentation, quality control, regular updates, and especially by integration into a broader navigable framework. In this sense, the partners do not so much own the data elements as the hypertext structures linking those elements.

As current debates on information on the Web indicate, copyright is liable to severely impede the free flow of information, especially where some element of cost recovery is essential to the viability of the enterprise. This may be compensated by three extreme tendencies:

- evolution of very high cost "quality" information products;
- trivialization of a wide range of, seemingly comprehensive, "popular" information products; and
- proliferation of large, overlapping bodies of public domain information lacking any integrative framework.

It is expected that the following, often contradictory, trends will continue to develop vigorously:

- dissemination of information free of cost, and copyright, via the Web by organisations not needing to recover costs. Typically, this will include intergovernmental organisations and non-governmental organisations with specific sectoral interests.

- dissemination of information free of cost, as above, but with specific copyright constraints
- dissemination of information accessible for a fee, but free of copyright.
- dissemination of information accessible for a fee and with copyright constraints. This category will be the major focus of commercial information development. It will necessarily be designed to exclude or undermine competing services operating at minimal cost and free of copyright.

These trends are expected to become especially marked in the case of non-text information, namely the multimedia content which is a major focus of INFO2000: images (photos, maps, graphs), sound files, video files and virtual reality files

Activities of the workpackage

Where material is incorporated into this project from external sources other than those for which the partners have existing free-use arrangements, data ownership or custodianship has been, or will be, identified.

Discussions have been held, and will continue to be held, at stages of the project where any issues of concern or potential conflict arise for any of the partners. In particular, clarification has been sought (and duly recorded) at an early stage concerning any residual copyright or intellectual property rights matters which could be relevant to the eventual production and dissemination of the product/service (see Section 22.3.3: Draft INFO2000 Consortium Agreement).

1.22.1 Data security and copyright

Corresponding to the copyright and data security constraints of third parties, are those of the principal partners (WCMC and UIA) in seeking to sustain their position as information providers in a complex, highly competitive environment).

Whilst there is no intention to impose copyright on the data, the manner in which it is accessed and used must be restricted to prevent abusive copying of the data onto competing sites. At the same time, since the mandates of both partners are to ensure wide dissemination of information, a degree of openness to external access must be maintained. The methods of achieving these essentially contradictory aims will need to be subject to continuing review.

Identification of future activities

1.22.2 Copyright

The project anticipates that it will naturally become progressively more preoccupied with copyright issues, especially where the information itself is perceived as the key asset, rather than the processes through which it acquires value. It is to be expected that information monopolies will develop, replicating the often-crude economic history of more tangible products.

This project will therefore be faced with several copyright constraints associated with:

- information furnished “freely” by its constituencies who are attentive to what further use is made of it;

- third party databases, which could be usefully associated in any pattern of Web hyperlinks from the product; such third parties may be non-profit or for-profit;
- the partners in this project, both contractual and cooperative, who need to be sensitive to how they use or refer to each other's data.

Further work could clarify which information could be freely available and which subject to access under constraint. Constraint may take the form of filtration through a web server generating pages on-the-fly (as currently practised by WCMC); it may also involve use of passwords and billing systems (currently under investigation by the UIA), or a combination of both. Different methods could be used for different parts of the data, especially where specific sponsorship arrangements reduce the challenge of cost recovery.

The particular challenge of this context derives from the emphasis in databases of both partners on a degree of comprehensiveness. Where information, especially that of higher quality, is only available elsewhere under cost and copyright constraint, more flexible approaches must be envisaged.

1.22.3 Partner relationships

It is crucial for the partners to maintain their relationships of trust with their information partners. It is also highly desirable that such partners continue to be involved with the development of this information product. To this end, WCMC has been in dialogue with certain partners for whom it acts as an information agency. The UIA is also intending to inform the 20,000 or so international organisations with which it has annual contact of this project, seeking to elicit support in-kind – in the form of information materials and linkages, and user feedback.

1.22.4 Draft INFO2000 Consortium Agreement

1.22.4.1 Definition

Project means the INFO2000 (European Commission: DGXIII) project No. 5052, "Contextual Information for Biodiversity Conservation", called **Conservation** for short. The project outcomes are a range of information products and services relating to biodiversity conservation.

Consortium means the consortium of **Partners** in the project, namely Union of International Associations (UIA), World Conservation Monitoring Centre (WCMC), Norwegian School of Management (NSM) and AIDEnvironment (AIDE).

Content Providers means the two partners in the consortium who are contributing data and other information content to the project, namely the Union of International Associations (UIA) and the World Conservation Monitoring Centre (WCMC). Such information may be managed in partnership with and/or with the consent of their respective collaborators.

Collaborators and Collaborating Partners means collaborating and contributing partners not in the Project Consortium.

Non-Content Providers means the two partners in the consortium who are not contributing data or other information content to the project, namely the Norwegian School of Management (NSM) and AIDEnvironment (AIDE).

1.22.4.2 Introduction

This agreement is based on the WCMC Draft Data Release Policy of 7 January 1997. It is adapted at this time to clarify issues of data ownership, rights and responsibilities

among the partners in the Consortium, between the Partners and their Collaborators, and between the Partners and users of the products and services.

The Consortium believes in the principle of free access to data, and supports the increased mobilisation of policy-relevant environmental information to support the conservation and sustainable use of the world's living resources.

As focal points for the compilation, management and dissemination of information, the Content Providers provide information services to a wide range of organisations and individuals. This information comes from networks of collaborators (organisations and individuals, many of who have networks and databases of their own), and a very wide range of publications and reports (including a considerable amount of "grey" literature difficult to obtain elsewhere). A good deal of the source information is in "public domain"; a principal role of the Content Providers is to edit, structure, link and redistribute it in formats which make it accessible to the widest audience.

When datasets are exchanged between collaborating organisations, questions of ownership and copyright arise. Often these may be clarified through memoranda of understanding between the organisations. UIA and WCMC independently have signed such agreements with a number of organisations. Existing agreements may affect the ability of the Content Providers to release certain categories of data that they are holding. Such agreements guide this Consortium Agreement and take precedence over it.

1.22.4.3 Accordance of Rights

1.1 All title rights, property rights, copyright, royalties and all other rights of whatsoever nature are vested in the Content Providers (UIA and WCMC), each with respect to their own datasets, and their Collaborating Partners as specified in extant agreements or those which may be negotiated in the future.

2. The Non-Content Providers (NSM and AIDE) waive all claim to title rights, copyright, royalties and all other rights of whatsoever nature, other than their due mention wherever applicable as partners in the consortium which developed the INFO2000 product.

1.22.4.4 Dataset availability

UIA

- UIA has contractual agreements with its publisher, K.G. Saur Verlag in respect of the current editions of hardcopy and CD-ROM publications published by Saur Verlag. As a result of such contracts, it is bound to consult with Saur concerning the release of data in any other form.
- The data provided to the UIA by its Collaborating Partners (international organisations) are provided freely for use in describing their aims, preoccupations on the understanding that it will be disseminated widely. The disseminated organisation descriptions are submitted periodically to the bodies in question for their approval.

WCMC

Each dataset held by WCMC carries a distribution or release classification based on agreements with data sources:

- Free access: Those datasets that WCMC is able to distribute.
- Source approval: Those datasets which WCMC requires prior approval from the originating body before distribution. WCMC will usually apply to the originating body on behalf of the requester, but the requester may need to provide specific information concerning the intended application and

distribution of those data.

- In-house use only: Usually licensed products from commercial concerns, which WCMC is unable to distribute.

Availability may depend on data holding (see Appendix). For example summary data may be free access while detailed data from the same origin may require source approval.

1.22.4.5 Conditions of release

The following conditions will apply to data provided by UIA and WCMC, unless otherwise specified:

- The copyright of the data rests with the Content Provider and/or its Collaborating Partners.
- The Content Providers reserve the right to restrict use of specific parts of the data by third parties.
- Others will make no copies of the data for commercial purposes, nor will the datasets be placed on any other network or information medium.
- Third parties will not publish or copy the data or any part of it without acknowledging the copyright to the data. The form that this acknowledgement should take will be based on the following:

These data are copyright. The data is made available for specific identified purposes. Any use of the data for other purposes must have permission of the copyright holder.

- UIA, WCMC and their respective partners, as applicable, shall be appropriately acknowledged in any publication relating to the data, along with any other organisations identified by WCMC as being information sources. The form of this acknowledgement will be based on the following:

Source data compiled and provided by the World Conservation Monitoring Centre, from whom further information can be obtained.

Source information compiled and provided by the Union of International Associations, from whom further information can be obtained.

1.22.4.6 Cost recovery and sales

- As service-oriented organisations, the Content Providers (UIA and WCMC) aim to provide the services that users require, while covering the costs of maintaining and further developing the services.
- The Content Providers are not-for-profit organisations. They are committed to the principle of free exchange of information, and only charge for the staff time and other expenses necessary for editing and managing the data, performing the services required, developing the services and products, and maintaining the currency of the information.
- Any Consortium partner or its agent can make CD-ROM sales. The cost price and distribution of revenue shall be agreed between the Partners. The sales agency shall retain a percentage of the sales price at the point of sale to cover the costs of administration, handling, postage etc. Accounts and stocks shall be reconciled at least every year.
- For online data delivered by the Content Providers, where the Partners can reach agreement on billing, the charge would be made at the "front door" entered by an online user; alternatively the billing site of the respective Content Provider. In the case of linked data, where through-billing meets the constraints of the data provider

then that shall be done, otherwise secondary and tertiary billing protocols will be established. The precise nature of this arrangement will be a matter of experiment during the Implementation Phase of the contract.

- In certain circumstances the Content Providers may choose to waive the costs of providing services or products, or allow discounted sales or free data access. This will occur in situations of data exchange, or ongoing collaboration with another organisation.

1.22.4.7 Disclaimer

While the Content Providers makes every effort to ensure the accuracy and currency of data within the limit of available resources, certain disclaimers need to be associated with data provided by UIA or WCMC.

Provision of data by WCMC

Source data compiled and provided by the World Conservation Monitoring Centre, from whom further information can be obtained.

These data are copyright. The data are made available for specific identified purposes. Any use of the data for other purposes must have permission of the copyright holder.

WCMC and its collaborators have obtained data from sources believed to be reliable and have made every reasonable effort to ensure accuracy of the data. WCMC and its collaborators cannot assume responsibility for errors and omissions in the data nor in the documentation accompanying them.

The designations employed and the presentation of material do not imply the expression of any opinion whatsoever by the WCMC and its collaborators concerning the legal or constitutional status of any country, territory, city; the area of its authorities; or the delineation of its frontiers or boundaries.

WCMC and its collaborators will not be held responsible for any consequence from the use or misuse of these data by any organisation or individual.

Provision of data by UIA

Source information compiled, edited and provided by the Union of International Associations, from whom further information can be obtained.

These data are copyright. The data are made available for specific identified purposes. Any use of the data for other purposes must have permission of the copyright holder.

UIA and its collaborators have obtained data from sources believed to be reliable and have made every reasonable effort to ensure accuracy of the data. UIA and its collaborators cannot assume responsibility for errors and omissions in the data nor in the documentation accompanying them.

The designations employed and the presentation of material do not imply the expression of any opinion whatsoever by the UIA and its collaborators

concerning the legal or constitutional status of any country, territory, city; the area of its authorities; or the delineation of its frontiers or boundaries.

UIA and its collaborators will not be held responsible for any consequence from the use or misuse of these data by any organisation or individual.

5 December 1997
Jeremy Harrison / Nadia McLaren

Appendix 1: WCMC Data Holdings

It is helpful to consider a number of different ways in which data from organisations are shared, and how such data are handled and used.

1.1 Custodian: Where WCMC is able to take full responsibility for deciding on use of the data by others (although this may be within guidelines provided by an owner).

1.2 Data manager: Where WCMC manages the data on behalf of the owner, usually under a detailed agreement or memorandum of understanding which may cover data release.

1.3 Collaborator: Where WCMC holds a copy of data being developed with another organisation. Ability to release data will depend on the nature of the collaboration, and the policies and practices of the collaborators.

1.4 Subsidiary data holding: Where WCMC holds a copy of a dataset but does not have a role in developing or enhancing it. This includes commercial products. Usually WCMC will not be able to release these datasets per se.

1.5 Summary data holding: Where WCMC holds summary data from another organisation, but not entire datasets. This can usually be made widely available, and WCMC may be able to obtain the full dataset if required.

1.6 Catalogue holding: Where WCMC holds a description of the data, but not the data itself, which needs to be obtained from the custodian or data manager (either directly or through WCMC).

1.23 Annex A: Contribution of AIDEnvironment

Summary of activities

The contribution of AIDEnvironment to the Implementation Phase of INFO2000 comprised the following activities (1998-2000):

Project planning

A contribution was made to the preparation of a detailed plan for the way in which the partners would implement the project, including attendance at the first team meeting in Brussels on 24 April 1998.

Project presentation

Arranged for a presentation of the INFO2000 biodiversity project at the European conference "Bridging the Gap: Needs and Perspectives for Environmental Information", London, 3-5 June 1998.

Improving the user-friendliness of the biodiversity database

AIDEnvironment periodically reviewed the user-friendliness of the database from the point of view of professional users and made recommendations for improvement. AIDEnvironment staff also participated in two workshops with UIA representatives in Amsterdam to assess the design, the profile and the interactive capability of the database and the needs of professional users with a view to improving its value.

Improving the content of the biodiversity database

Through a rigorous interrogation of the database, recommendations were made for improvements in various respects:

- the main structure of the database
- key international environmental problems which could be addressed by the database
- specific information on selected themes, such as environmental education and wetlands
- existing strategies related to biodiversity conservation: the appropriateness of the indexing of these strategies was reviewed and recommendations for improvements were made; information on a total of 45 additional Strategies was compiled for inclusion in the database.

Impact study of INFO2000

Participated in a review by consultants to the European Commission (BIPE) of the impact of the INFO2000 programme.

Experience and recommendations

Our experience in helping to develop the INFO2000 biodiversity database leads us to conclude that it is a valuable initiative that has considerable potential. The key to its future success is, in our view, to ensure that the features that offer the greatest added value are further developed. These are:

- the provision of summary information on biodiversity conservation
- the provision of a portal to a large number of specialised sites

- the provision of continuously updated information and sources.

At the same time, the website must match the attractiveness and accessibility of comparable sites in an environment that is developing at a remarkable rate.

With regard to specific priorities for the further development of the database, AIDEnvironment recommends that the following points be taken into consideration.

First, we feel that the interactive capability of the database as a means to respond to user needs – which may be unique in the INFO2000 programme -- has considerable potential, providing that users can be encouraged to make full use of this facility. This requires primarily a number of technical improvements that would make it simpler and quicker for a user to provide input.

Second, the number of hyperlinks to specialised sites related to biodiversity conservation should be increased. This may go hand-in-hand with the expansion of the number of profiles in the database. Conversely, it is equally important for hyperlinks to the INFO2000 database to be included in other relevant sites. The number of these hyperlinks seems to be extremely limited at present.

Third, the indexing feature should be further refined to ensure that more keywords are recognised. For example, many users will search for information on specific problems or strategies, which should be immediately accessible.

Fourth, the mapping function is an interesting feature and may well have considerable potential for certain kinds of searches. We would certainly like to see this facility further developed.

Finally, although considerable progress has been made by UIA in improving the user-friendliness of the database, we believe that a greater number of users would be encouraged to access the database if further improvements were made, mainly with the aim of ensuring that new users immediately understand the structure of the database, the kind of information available and how to access the required information. Practice in this area has developed considerably since the start of the project and many newer websites are more "state-of-the-art" in this respect. We are, of course, aware of UIA's continuing efforts to improve the database, and some of these improvements may already be in preparation.

Comments on UIA strategies database

In considering the structure of the INFO2000 strategies database, I am struck by the issue of terminology and its implications for the database. UIA must have enormous experience in dealing with disparities between the terminology used in the sources and the terminology used by users, so I probably can't add anything which you haven't already considered.

I am, however, interested in to what extent the database can cope with these disparities. To give an example, I see various terms used for areas that are identified for some kind of conservation action, such as "protected areas", "conservation zones" or "reserves". Searching the database for information on protected areas does not seem to throw up information on nature reserves or conservation zones. Yet many users will use these terms loosely or will not know which term is used by an unknown source. UIA therefore has to find a way of dealing with these disparities.

I had assumed that you would use your own framework for structuring information on biodiversity, on the basis of which you would establish links between source terminology and user terminology. I don't know whether you have done this. If I were faced with this challenge, I would use the following structure to organise the information relating to strategies:

1. OBJECT

- a. Ecosystems
- b. Habitats
- c. Species
- d. Genes
- e. Regions
 - i. Biogeographical
 - ii. Climatic
 - iii. Physical
 - iv. Political
- f. Landscapes
- g. Natural resources
- h. Sites

2. AIM

- a. Conservation/protection
- b. Management
- c. Natural resource use
- d. Restoration

3. MEANS

- a. Policy
- b. Law
- c. Economic instruments
- d. Spatial planning
- e. Communication
- f. Research
- g. Training
- h. Methodologies
- i. Etc.

This is not a definitive or complete framework (particularly 3), and each heading could be elaborated to any level of detail (I have given one example to one level of detail), but it provides a way of organising the material from the sources so as to guide the establishment of links between topics and terms. For example, "protected areas", "reserves" and "conservation zones" would all be found under 1(h) and each source linked as appropriate to Aim and Means.

To link this information to the problems database, it would be necessary to add Causes, Environmental Changes and Impacts to the framework.

Such a framework could also be included as a search resource in the database to help users frame their query in such a way that it generates information on the appropriate topics.

I would be very interested to learn which approach you have adopted to deal with these issues.

1.24 Annex B: NSM student assignment

The following is the instructions issued for the student assignment.

Dear Student,

Here is assignment four.

As I mentioned in the letter we sent you, I must apologise for sending this assignment out so late, but computer problems and communication problems have delayed us.

Because we are sending it out so late, the deadline on completing this assignment is June 8.

It involves using the Web as a resource, and it involves completing a successful communication interaction with a Web site.

We are involved in a multimedia information research project funded by the European Union. Our major partner is the Union of International Associations in Brussels. UIA is building a web site rich in resources and information development opportunities. One of the major reference tools is an interactive encyclopedia which has been compiled from the materials of international organisations and has tens of thousands of profiles of world problems and strategies.

This Web site has been undergoing extensive change and improvement. We are now in the testing stage for the site.

For this assignment, you must visit the site, register as a user, explore the resources, and offer comments. You may offer as many or as few comments as you wish. You may make comments online, using the interactive "comment" feature or offline by an email report, or both.

This is an example of the kind of information resource you will sometimes discover in the last phases of developing a business plan, a market study, or an academic research project.

Here are a few suggestions for exploring the site.

The encyclopedia and reference materials catalogue large amounts of data and a huge number of articles on different issues, problems, and challenges. Examples might be "leadership," "ethics," "recycling logistics," etc. In the future, this resource will give you valuable information for your research projects.

Your assignment is to visit the site, try to learn something useful, and - before you leave -- report your conclusions back to the site itself using the comment feature.

WHERE TO GO AND WHAT TO DO

The site is located at

URL: <<http://www.uia.org/data.htm>>

When you get to the site, click on [Search Databases].

You will be asked to register. Register as a NEW USER.

Your User Name should be "nsm" followed by your last name.

If your name is Stoltenberg, your user name will be "nsmstoltenberg"

My name is Friedman, so my user name is "nsmfriedman".

Your password can be the same. My password is 'friedman'. The password is case-sensitive, so note use of capital letters.

Registration is important, since it is how we can register your completion of this assignment.

NB: If you visit the site a second time, you enter as a "Registered User" by giving the same name and password.

Surf around a bit. See what you can learn. See if you can find ways to use this tool. See how easy - or difficult - it is to use.

You can start by entering a keyword in the [Search for] window; then [Submit query]. Explore the links. Try the [Tree structure] [Map] and other tools or clickable features.

The default database is World Problems. Make a [New search] in other databases. Try the [Comment?] facility.

See what problems you have, if any, using the site. If you identify problems, please report them. If you know a solution to any problems you find, please report them.

If you discover important issues in the database that you feel should be handled a different way to be more valuable or useful, please report.

If you discover holes in the database or missing issues, please note them in your comments. This can be done by identifying the missing issue with one or two words, and giving a short sentence explaining the problem or the strategic implications of the missing issue.

If you see alternate names or headings for material already included, please report. Remember you can use the online comment facility, or simply report as you would normally.

HOW TO ENTER YOUR REPORT

When you are in the database, you will find that most entries have a box **CLICKABLE LINK** labelled [Comment?]. You may use this tool for your comments.

Please be sure to sign comments with your user name.

NB: If you want to see how a comment appears before you make one, look at one of the following profiles. Just above the title at the top of the page, click the option [With user comments]: Problem called "Chattle slavery" Strategy called "Capturing environmental value" Human Development called "Trances and mental absorptions"

HELP

If you have trouble, you can ask for help by contacting

<nadia@uia.be>

Questions and comments are also welcome there.

DEADLINE

You may complete this assignment any time up through June 8.

Because this Web site is rich with multimedia features that require good web access, I suggest you use a computer at school or in a properly wired office.

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1.25 Annex C: WCMC and the Z39.50 protocol

Background

The use of the Internet to manage and communicate information lies at the heart of WCMC's approach to information service delivery. It also influences the projects we conduct with external clients and partners. Without dominating our approach, we see the Internet as a major asset in bringing environmental information to an ever-growing range of stakeholders and decision-makers.

Over the last two years we have successfully completed a number of 'metadata' projects for external clients, comprising the development of 'catalogues' of datasets and other institutional 'resources'. The end products (see for example <http://www.chm.org.uk/> or <http://www.wcmc.org.uk/biodev/> or http://www3.wcmc.org.uk/cgi-bin/bcis_pub.exe) permit users to search on-line catalogues for resources such as organisations, people, services, products, projects, documents and, of course, datasets.

These projects have enabled WCMC to generate an electronic catalogue of its own datasets and deliver this over the web. However, the catalogue is not accessible other than through the specific web sites where it appears. Of most concern, it is not interoperable with a growing body of databases and catalogues which communicate via a search protocol known as ANSI Z39.50 (ISO 29350).

Z39.50 protocol

Following many years of evolution within the library community, the Z39.50 protocol has evolved to become *the* standard means for conducting interoperable ('federated') search over multiple distributed servers. As Internet communication has grown, the role and importance of Z39.50 have expanded considerably; it now underpins many Internet-based public and scientific information services, and has spawned widely used metadata standards across geographic and sectoral divides (e.g. GILS, GELOS, US FGDC).

There are two key advantages of searches conducted using z.39.50. Firstly, search requests can be issued to any number of Z39.50 servers simultaneously, enabling search to be conducted across agency boundaries in a single operation. Secondly, results from Z39.50 searches tend to be of a much higher quality than those conducted over the Internet in general, since requests can be narrowed down in ways other than simple keywords. For example, the spatial and temporal characteristics of the resource, or its language, can be selected.

Proposal

By placing its metadata onto a Z39.50 server, WCMC would be adding to the growing pool of interoperable metadata catalogues that are accessible over the web. It would be possible to add the information resources of WCMC to search services offered through the GELOS service, EEA and other international environmental initiatives. This would provide more open and transparent access to WCMC's information resources.

No additional hardware costs are anticipated, whilst full-featured Z39.50 software can be obtained commercially from Blue Angel Technologies. Transfer of the existing WCMC metadatabase into a server-readable format would be however, though this been achieved (to a large extent) at a semantic level. To ensure a quality service, some improvements to the underlying metadata content would be valuable, for example

linkage to the latest environmental thesauri and addition of repeatable fields for different languages. A budget for this work is provided below.

Budget

Activity	Person days	Cost in UK pounds ³⁸	Cost in ECU ³⁹
Quality improvements to WCMC metadata	10	3220	4664
Conversion of existing metadatabase into Z39.50 format	5	1610	2332
Installation and testing of Z39.50 hardware and software	10	3220	4664
Project management	5	1610	2332
1 year server maintenance	10	3220	4664
Sub total	40	12880	18654
Hardware and software			
UNIX web server (already in place at WCMC)		0	0
MetaStar product suite from Blue Angel Technologies		7376 (12000 US\$)	10683
Sub total		7376	10683
Contingency		Cost	
		1013	1467
Total		21269	30804

Timescale

Activities would be complete within 3 months of commencement.

³⁸ WCMC staff time appropriate to these tasks is costed at £322 per day.

³⁹ 1 UK pound = 1.4483 ECU

1.26 Annex D: UIA and the Z39.50 protocol

Background

The Union of International Associations (UIA) is in process of beta testing access to many of its databases over the web through pages served dynamically in response to user requests and display parameters. The databases include profiles of: International Organizations (ca 40,000), International Meetings (ca 100,000), bibliographical information (ca 15,000), World Problems (ca 35,000), Strategies and Solutions (ca 40,000), Human Development concepts (ca 4,000), Human Values (ca 3,000). Most of these profiles are extensively hyperlinked within each database, to the other databases, and to external web sources.

The data is maintained using Revelation Technologies' software in linear hash files that are simultaneously compatible with DOS and *Windows*-based access. The *Windows* version is used to write CGI scripts through which the data is served dynamically via a dedicated NT 4.0 server.

Significant portions of the data have traditionally been marketed to the library community in the form of hardcopy reference books published by Saur Verlag (part of the Reed-Elsevier group). CD-ROM versions have also been produced.

Z39.50 protocol

Within the library community electronic data exchange of bibliographic information is now accomplished using the ANSI Z39.50 protocol (ISO 29350). This is designed to facilitate interoperable searches by a single request over multiple distributed servers. This is proving increasingly central to public and scientific information services. It has encouraged the development of widely used metadata standards.

The two advantages for the UIA in adapting access to this protocol are:

- Allowing UIA data to be incorporated into the network of databases that respond to a single research request designed to explore across institutional boundaries
- Featuring UIA data in responses to searches sensitive to the need for higher quality data (rather than the disparate responses of standard Internet searches facing the user with an overwhelming quantity of sources)

A further response might include the possibility of generating such search queries within the profiles generated by the UIA in response to search queries (as is currently being tested in the case of conventional sources).

The Z39.50 protocol is relevant to several projects through which the UIA's data is currently being developed:

- *Information Context for Biodiversity Conservation*, INFO2000 (European Commission DG-XIII) in which the UIA is partnered with the World Conservation Monitoring Centre (Cambridge, UK), there is a clear advantage in ensuring that the web-based integration of UIA-WCMC data in relation to biodiversity conservation is

also reflected in a Z39.50 search option. WCMC is actively considering implementation of this protocol.

- ***International Health Ecology Access Links*** (IHEAL) an NGO-coalition project part funded by DGXI and related to the forthcoming 4th European Health and Environment Ministers Conference and its outcomes for public participation and access to health information.
- ***Interactive Contextual Environmental Planning Tool*** (INTERCEPT), project proposal under final stage consideration by the World Bank's *infoDev* programme. This will focus on the development aspects of UIA's data and is partnered with Development Alternatives in India for the purpose of testing distributed and participative knowledge management in a developing country context.

Implementation

Two levels of implementation can be envisaged:

- Descriptive metadata which essentially makes known the availability of UIA data within the Z39.50 search community, even though the data itself may not be available in that format.
- Adaptation of the UIA data itself to be served via a Z39.50 server

Considerations governing further work towards either or both of these objectives include the following:

- The UIA databases, despite their apparent dissimilarity are all managed through the same application programs and use a virtually identical file structure. This has been the case since 1985. It has been achieved by effectively defining a metadata structure and a system of tags that facilitates data management, updating and queries. Solutions for one database are therefore applicable to others, with some minor exceptions.
- The linear hash file structure of Revelation Technologies continues to be used to maintain databases via DOS applications running through *Windows* (and therefore allowing pasting in of information from the web). They are also used in that form as the source of information served dynamically via CGI scripts (written in the *Windows* flavour of *Revelation's* Basic) in response to external web requests. This file structure is also expected to be compatible with the *Java*-based (cross-platform) versions of the same software (*jRev*) that is currently being tested for full release towards the end of 1999.
- Z39.50 servers run on UNIX rather than *Windows*-based machines. At this point in time the UIA makes no use of UNIX machines and has no expertise in that area, although its static web pages are served on the UNIX machine of the ISP cooperative of which the UIA is a member (and whose offices are provided by the UIA). It is understood that the *jRev* evolution of the Revelation software is likely to run on LINUX machines although this has not yet been tested. The UIA plans to explore use of LINUX software in mid-1999, notably for its firewall.
- It is possible that a Z39.50 server could be operated on the UNIX machine of the ISP, although this may not be satisfactory for other reasons. A dedicated line to the ISP currently connects the UIA's NT server.
- The UIA has considerable expertise in converting its data into other formats, notably flatfiles required for the Folio-based CD-ROMs and HTML pages. Little difficulty is expected in writing conversion software to the Z39.50 standard. It is

questionable whether the conversion templates available commercially would be relevant to the organisation of the UIA's data on Revelation linear hash files.

The possibility of adapting Revelation software to act as a Z39.50 server has already been considered. A very preliminary estimate from Revelation Technologies suggests that their work might cost in the region of 15,000 sterling. Further discussion of this possibility is scheduled for 9th April 1999.

Information received from other sources however, suggests that significant additional costs in implementing a Z39.50 server are associated with imponderables of access to requisite expertise and in-house "hassle" (= additional staff and possible consultant costs). The actual software costs can be minimised, notably through the version (GIST) available from JRC. Further costs would be associated with any subsequent requirements to maintain and develop the application.

Contact:

Anthony Judge (judge@uia.be)

Union of International Associations (<http://www.uia.org/>)

40 rue Washington, B-1050 Brussels. Fax: +32 2 643.61.99

1.27 Annex E: Configuring intersectoral strategic dilemmas

Extract from a UIA report (<http://www.uia.org/transfor/a11.htm>)

"Global bargains" through more complex structure

In preparation for the 1992 United Nations Conference on Environment and Development (UNCED), (as a follow-up report to his involvement as Secretary-General of the World Commission on Environment and Development, responsible for the *Brundtland Report*⁴⁰), Jim MacNeill articulated for the Trilateral Commission the policy options for sustainable development in terms of "*shaping global bargains*". He notes: "*The notion of a 'global bargain' conjures up many images, especially within the broad context of sustainable development...In its simplest terms, a bargain involves at least two parties and two issues. It implies a trade-off between the parties on the issues. The group of nations, developed and developing, that have come together to form a bargain must agree to give up something in order to get something else. As a rule, they would give up a path of development in a given sector that is unsustainable and thus represents a threat to themselves and the other negotiating nations or the global commons.*"⁴¹

In this sense, a global bargain involves at least two parties and two issues, implying a trade-off between the parties on the issues. However according to this perspective, the arenas to be subject to bargaining emerge haphazardly as a result of conventional political processes. There is no systemic sense of how the bargains interweave to ensure the sustainability of development as whole. There is no sensitivity to issues that can be conveniently ignored by powerful majorities. In a real sense this corresponds to the traditional paradigm of ad-hocery which has contributed so much to the emergence and maintenance of the present crisis.

The difficulty is that bargains are typically discussed in the verbal and textual mode. In this mode, notions of "giving up" in order to "get something else" are understood in the simplest terms and therefore readily evoke opposition. This opposition is indeed legitimate in terms of the "two-dimensional" images (of "sides") through which they are currently discussed. It would not however be so necessary in terms of more complex configurations (of "sides") as advocated above.

Beyond isolated bargains

It is unfortunate, as the MacNeill report illustrates, that thinking for the 1992 Earth Summit was focused on the possibility of a series of issue-specific "global bargains". Taken one by one, these may or may not prove negotiable. But on this basis there is every likelihood that the effects of some will undermine the effects of others. What is missing is any image of how issue-specific bargains can be interwoven to constitute a

⁴⁰World Commission on Environment and Development, 1987. *Our Common Future*. Oxford, Oxford University Press.

⁴¹James MacNeill, P. Winsemius, and TI Yakushiji, TI, 1991. *Beyond Interdependence: the meshing of the world's economy and the world's ecology*. New York NY, Oxford University Press.

larger sustainable development bargain --as a set of complementary elements rather than as a series.

As in architecture, it is through balancing the stresses and tensions between a set of complementary construction elements that the integrity of a building is ensured. Richer structured imagery is required to facilitate understanding of how the larger and more encompassing bargains can be achieved. It is through such images of integrity, emerging from more complex structures, that the logic of that integrity gives justification to issue-specific bargains with greater effectiveness. It shows how they "fit". Structured images are required to give precision to the vague notions of "checks and balances" conventionally articulated in textual terms. Such images give precision to the notions of "giving up", and tensional "trade-offs", which readily lend themselves to description in architectural terms, for example.

The overall purpose of the inter-sectoral dialogue is to raise the level of inter-sectoral debate. The challenge is to move beyond simplistic consensus and beyond acrimonious restatement of established positions. The challenge is one of moving towards higher orders of consensus.

Strategic dilemmas

To explore and illustrate new possibilities, an exercise was undertaken, in preparation for an Intersectoral Dialogue on the occasion of the Earth Summit, under the auspices of the International Facilitating Committee for the Independent Sectors in the UNCED Process (chaired by Ashok Khosla). The focus of the exercise described here was on identifying "strategic dilemmas" underlying debates on Earth Summit issues. These are the dilemmas that reflect such seemingly irreconcilable concerns as safeguarding watercourses versus exploiting essential hydroelectric energy reserves. The assumption is that the set of these local (namely issue-specific) long-term dilemmas may offer clues to new patterns of global (namely inter-sectoral) strategies and bargains.

There were two points of departure:

- A brainstorming exercise in the identification of *polarising dilemmas*. This proved to be unsatisfactory because it lacked any systemic ordering.
- *Clustering* of some [450 issues](#) identified in the *Brundtland Report, Agenda 21*, and in sectoral declarations (see [checklist](#)). As a checklist this document had the merit of providing a crude context for specific sectoral concerns. However this was not enough. It failed to respond to the need to raise the level of debate by offering a global (inter-sectoral) context for specific bargains, checks and balances. Such checklists, like *Agenda 21*, are effectively overwhelming. They encourage simplistic attempts to identify "the most important problem" whose solution it is hoped will magically transform all the others. The coding procedure is described [elsewhere](#).

Pattern of strategic dilemmas

[Figure 1](#) is one attempt to respond to this situation by showing how different social functions, understood as strategic opportunities, interfere with each other to engender a pattern of strategic dilemmas. In that pattern each strategy may take a privileged role or may in turn be constrained by other strategies. For example, when "environment" is a privileged function, "well-being (+jobs)" may be sacrificed, whereas, when "well-

being (+jobs)" is the privileged function, sacrificing "environment" is the alternative option. Neither option is satisfactory, but both appear to have their place.

Any such dilemma may of course be "resolved" by short-term measures, but the nature of the dilemma renders such solutions unsustainable in the longer-term. *Sustainable development is a function of the pattern as a whole rather than of its components.*

The choice of six principal functions as the basis for the pattern in [Figure 1](#) is of course arbitrary -- but it is certainly more systemic than the chapter organisation of the *Brundtland Report* or of *Agenda 21*. A different number of clusters could have been used, bearing in mind the constraints of over-simplification and excessive complexity. A tentative interpretation of the significance of the 2-letter codes in [Figure 1](#) is given in [Figure 2](#).

Network of bargain arenas

The traditional tabular presentation of [Figure 1](#) is itself a conceptual trap. It encourages a very mechanistic approach to the pattern of dilemmas, reinforcing tendencies to much-contested forms of "linear thinking". The linearity may be deliberately challenged by allowing the information to be encoded or projected onto a network. In the light of the earlier arguments concerning polyhedral nets, in this exercise *the network has been deliberately chosen to facilitate comprehension of global properties of the pattern of strategic dilemmas* by mapping the information in [Figure 1](#) onto an icosidodecahedral net (see [Figures 3A](#) and [3B](#), redrawn for web presentation by David Stevenson). As noted below the global significance of the pattern, and the basis for its sustainability, only emerges when its form in three-dimensions become apparent.

In the network the principal lines traversing the pattern are used to represent the six selected strategic preoccupations of [Figure 1](#). The same letters code them. Most of the lines can only appear as broken in two dimensions, although in three they are seen to form unbroken interlocking circles around a sphere as is seen when the original polyhedron is reconstructed in 3 dimensions (see [Figure 5](#)). In this exercise, the interlocking of these circles creates a pattern of triangles and pentagons. These may be understood as simpler (3-valent) and more complex (5-valent) bargaining arenas around specific concerns.

Identifying the bargaining arenas

Each triangle in the network can be described by a 3-letter code reflecting a particular combination of the original 6 strategic functions. On the basis of work on coding the declaration issues according to these functions, a tentative indication of the significance of each code is given here in [Figure 4](#). The significance of the codes appears in two columns. The left-hand column indicates a *development-focused application of the strategies*. The right hand column indicates an *environment-sensitive application of the strategies*. In both cases typical problems resulting from inappropriate implementation are indicated. Keywords from that indication have been inserted into the network diagram.

It becomes clear that on a single network pattern ([Figure 3A](#)), two triangles appear with the same code, and are therefore used here to indicate the development-focused and the environment-sensitive keywords for that code combination. They are on opposite sides of the network (notably when displayed in three dimensions). Only half

of the 20 possible combinations appear on that pattern. A further 10 appear in the second version (Figure 3B). The two versions result from the different orders in which the functions can appear. The complete range of Earth Summit issues and related strategies is effectively mapped onto these two networks.

Re-interpreting the bargaining challenge

In contrast to that approach, *the patterning exercise here emphasises the necessarily global structure of the network of issue-specific bargains*. Namely it starts from an assumption of inter-sectoriality (functional globality) and allows specific sectoral (functionally local) concerns to emerge as features of the pattern of strategic options. From this perspective, *it seems extremely doubtful that local issue-specific bargains (emissions, forests, etc) can be effectively struck in isolation from the global context of strategic dilemmas -- as tends currently to be assumed*. Any such isolated bargains would therefore tend to be unsustainable in the longer-term.

De-stressing issue-specific bargains

This perspective does however suggest that articulation of these dilemmas within a global framework may redistribute the tensions, which currently make it extremely difficult to achieve issue-specific bargains of any consequence in isolation. This redistribution may well provide unsuspected contextual support for such bargains by rendering explicit a new pattern of checks and balances. *Where bargains are no longer treated in isolation, tensions which would otherwise have to be dealt with explicitly within a given bargaining arena (reducing the probability of success) may now be recognised implicitly as contextual to that bargain*.

This stresses the importance of treating the totality of Earth Summit issues as a set of inter-weaving strategic options in order to reduce the difficulty of achieving success on particular fronts.

This approach *points to new policy possibilities in which the degree of global consensus required is reduced to a minimum* (in a design sense) by localising the patterns of disagreement. In this way *disagreement no longer acts globally -- tearing apart the global community*. Rather it is locally confined and understood as a long-term strategic dilemma on which "consensus" can only be achieved in the short-term. *Sustainability thus lies at the global level not at the local level*.

Catalytic imagery

There is a need for richer, and more challenging, imagery to capture the complexity of strategic options to clarify new options both for policy makers and wider audiences. The two-dimensional representation, for "local" purposes, of the "global" structure of the Earth clarifies the challenge. The importance of the shift to three-dimensional representation is particularly obvious in this geographical parallel between representations of the Earth as a globe, and the many efforts to project such information onto 2-dimensional maps -- each with their special distortion. It is the inadequacy of the 2-dimensional representation that highlights the value of the 3-dimensional structure in stressing *globality* and providing a context for *local* issue-specific arenas.

Both in the two- and three-dimensional forms the imagery proposed here is *an invitation to reflection along new lines*. As intended, it deliberately breaks with

familiar patterns. It invites further reflection and experiment to better portray the relation between global and local -- and the strategic opportunities that emerge. It is possible that the main value of the structures presented lies in the mapping exercises that they encourage, namely in the creativity and reflection that they evoke, rather than in any particular pattern that may be favoured.

Possible interpretation refinements

The merit of the 3-dimensional representation of the Earth Summit issues is that it may be used to clarify why strategic dilemmas appear to emerge. Bargain arenas have been recognised here in pairs of triangles in a network pattern. *The "dilemma" in each case may be seen as a failure to recognise the global properties of the structure* which separate the two complementary (but distinct) arenas -- for these are on opposite sides of the spherical structure. Collapsing the distinctions into a two-dimensional representation, in which the triangles are super-imposed, is what guarantees the appearance of a dilemma. It is an appropriate global consensus, which allows them to be understood as separate, thus eliminating the dilemma.

In practice the construction of three-dimensional spherical structures (like geodesic domes) requires understanding of more than those surface features with which the bargaining arenas have been associated here. According to the principles of tensegrity (namely tensional integrity) explored by R Buckminster Fuller, new types of global structures may be created that are self-sustaining by a particular three-way pattern of tensile forces. Such a structure is not supported or maintained (by special authority structures). It is pulled outward into sphericity by inherent tensional forces, which its geometry also serves to restrain (see the earlier figures illustrating tensegrity structures). It responds as a system with local stresses being uniformly distributed throughout the structure, and uniformly absorbed by every part of it as a classic example of synergy. It is not necessary that these structures should be patterned on regular polyhedra, but the tension networks are most economical when their strands run for considerable distances without changing direction --and preferably along great-circles.

Tensegrity structures clarify ways in which individual bargains need to be interlocked using local elements of disagreement ("compression elements") within the global network of agreement ("tension elements"). *Tensegrity structures are effectively patterns of sustainability.* The challenge is to find useful ways to encode such patterns to offer insights into the strategies of sustainable development.

Limitations and further possibilities

It is necessary to use two alternate versions of the network pattern with this approach. This may not be the case with other coding approaches along these lines. Complementary projections are however also required in geographical mapping. Organic molecules essential to life (notably benzene) are based on resonance between two complementary structures. Most tensegrity structures exist in right- and left-handed versions.

It is important to recognise that there are whole families of network patterns that correspond to different spherical structures in three dimensions. That presented here suggests just one way of "cutting the strategic cake". There are indications that increasing the complexity of the network in order to explicitly capture more detailed issues could provide global contexts that make it even easier to handle issue-specific

bargains. What is required is a special database, which could enable people to shift between different levels of functional detail as is done between maps in geographical atlases and in geographical information systems.

1.28 Annex F: Further challenges on UIA server

Speed of response issue

Hardware level

Switched to Dell Poweredge 2400

Operating system level

Successfully switched to *Windows 2000* server (after upgrading Dell hardware drivers)

Web Server

O'Reilly level

Maintaining latest upgrade, but without switching to secure server mode
Consideration given to Linux based alternatives

OpenInsight / CGI script level

Continuing program of improvement

SECURITY

Continuing program of improvement

PROGRESS ON POSSIBLE DEVELOPMENTS

Amount of info in output profiles

Switch to a mode in which amount supplied is variable

Search criteria and user category

Constraining complexity of permissible search

User time-limit

Constraining period of access, by database and by type of user (including trial mode)

Commercial issues

Adapting access to e-commerce constraints

Links from other media

Links from Folio CD

Links from static page entries

Usage statistics

Continuing development

Copyright / Disclaimer Issues

Continuing review

USER MANAGEMENT

Development of user management programs within OpenInsight

PROGRAM DEVELOPMENT

INTERFACES / USER HELP FACILITIES

Calendar issues

Development of meeting database facilities

Other interfaces (or variants)

Development of other interfaces

Aesthetics / Design

Under continuing review

Language options

Under continuing review

INDEX SEARCH / LISTING

Multiple database search
Browser redirect possibility
Check additional SQL formats
Indexing high frequency terms
Advanced search options feature
Development of unobtrusive tagging
Comments present
Edits present

PROFILE / ENTRY PAGES

Continuing development

Search engine options (generalize syntax management)

Extraction of keywords from multiple titles for:

- References
 - Amazon
 - Other?
 - Meetings from PRO / STR / ORG
 - Meeting websites from CAL
 - Images
 - Maps
 - External links to discussion fora:
 newsgroups, usenet, listservers
- Translation facility

Internal query search links on profiles

- to ORGS
- to CAL

COMMENTS / LISTING

Continuing development

Editing existing entries / profiles
Size check
List own comments
User evaluation / selection
Voting on comments
User selection of comment level by stars
Colour: Amplification (Correction) / Critique (Condemnation) / Appreciation
New (original) profiles from users
Inclusion
Indexing? "New"

22 August 2000

Information Context for Biodiversity Conservation**Comment management**

Comment file structure to handle quantity (64k problem)
Comment flag red / green for criticism / improvement
Subject line addition + Appreciation code
List subject lines

Security related

Deleting comments

EDITING FACILITY (as distinct from Comment facility)

Continuing development

BROWSE / SUBJECT CLUSTER LISTING

Implemented

GEOGRAPHICAL MAPPING

Colour-fill applet required

GRAPHICS

Platform/Browser-related issues of compatibility

SOUND

Continuing development
Extension of *Koan/Java* interface

DATABASES

Addition databases

- French-language organizations
- Meetings
- Specialised databases (on static sit

