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NATURNET-REDIME team wish you all a HAPPY NEW YEAR

Call for Collaboration of EC DG RTD Projects Relating to Sustainable Development

Peter K A Barz

The NNR Project is inviting the coordinators, dissemination work package leaders and partners of ongoing DG RTD projects relating to sustainable development (SD) to link with the NNR Portal and use its added facilities for the promotion and dissemination of project contents and results across Europe and internationally.

The NNR STREP project has been commissioned by DG RTD to provide forward-looking, interactive web services for sustainable development that integrate existing research, knowledge, educational practices and content of SD with the most advanced information and communication technologies.

The DG RTD Project Synergy Meeting in Brussels in June 2005 stated that the NNR project was able to assist in overcoming current problems in terms of the need for increased project integration and the promotion of the SD agenda, and further stressed the importance of the collaboration of existing projects with the NATURNET web portal for improved project synergy.

It is hoped that the new NNR Portal facility will be of interest to the coordinators, work package leaders and partners of the 20 or so ongoing DG RTD projects, who are invited to contact NNR project partner Environmental Network Limited (pkab@env-net.com) for further details.

Garp3 – Workbench for capturing conceptual knowledge

Bert Bredeweg, Anders Bouwer and Jochem Liem

Figure 1: Main screen of the Garp3 workbench

Garp3 is a software package for qualitative modelling and reasoning (Figure 1). It offers an integrated set of tools for building conceptual models as well as for running and inspecting simulations based on those models. Conceptual models (also referred to as qualitative models) are formal models that provide insight in the causal mechanisms behind the simulated behaviour of a system without the need for numerical data or complex mathematical formulas. This makes the Garp3 workbench especially useful for issues such as sustainable development, because it can be used by stake-holders as a means to develop insight and argumentation.

Garp3 implements a compositional approach to qualitative modeling. The reasoning engine works on the basis of three main constructs: scenarios, model fragments and transition rules (Figure 2). *Scenarios* specify initial situations for the simulator to start behavior prediction. *Model fragments* capture knowledge about behavior of system parts, and are used to assemble states of behavior. *Assumptions* may be used to further detail the applicability of a

model fragment. *Transition rules* determine valid transitions between states of behavior. After selecting a scenario the engine proceeds with the prediction task by recursively consulting the library for applicable model fragments. This search is exhaustive and each consistent subset of model fragments represents a behavior interpretation that matches the selected scenario.

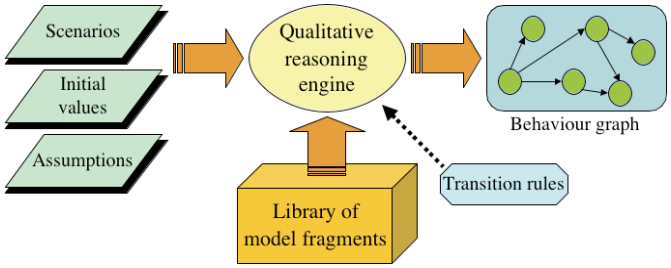


Figure 2: Basic architecture of the qualitative reasoning engine

To support modelling, Garp3 offers a graphical toolkit that allows the user to build a qualitative model of a particular system in an intuitive way. A model is built by creating building blocks, such as entities and quantities, and combining these into aggregates, such as scenarios and model fragments. The graphical modelling toolkit of Garp3 contains multiple screens in which different parts of the model are specified. This supports users in managing their model building tasks. Furthermore, restrictions built into the software prevent users from creating grammatically incorrect models.

There is no space in this newsletter to explain all the details concerning the Garp3 workbench. Readers are advised to visit the QRM sub-portal of the NaturNet-Redime project for additional details (http://hcs.science.uva.nl/QRM/). User group meetings are planned for those who want to learn to work with the software. Please check the website regularly for information on this (or send an email). However, as an illustration consider Figure 3 which shows a small model fragment made with the workbench.

Figure 3 illustrates how typical characteristics of populations can be represented. For instance, there is an entity population (which applies to 'any population') that has three quantities: *Number of*, *Birth*, and *Death*. The quantity *Number of* can take on four values: *Zero* (there is no population), *Small*, *Medium*, and *Large*. *Birth* and *Death* can be *Zero* (there is no birth or death) or *Plus* (there is a certain amount of birth and death). *Birth* has a positive influence (I+) on *Number of*: due to the *Birth* rate the population increases in size. The death process details are similar, except that there is a negative influence (I–): due to the *Death* rate the population decreases in size.The P's is Figure 3 represent 'indirect' influences. The P+ from *Number of* on Birth states that changes in the former cause similar changes in the latter (if the size increases, more individuals will be born, if the size decreases less individuals will be born).

The P+ from *Number of* on *Death* represents a similar notion. The V's between the zero values of the quantities is a value correspondence. It specifies that when the *Number of* is *Zero* (that is: the population does not exists), there is also no *Death* and *Birth*.

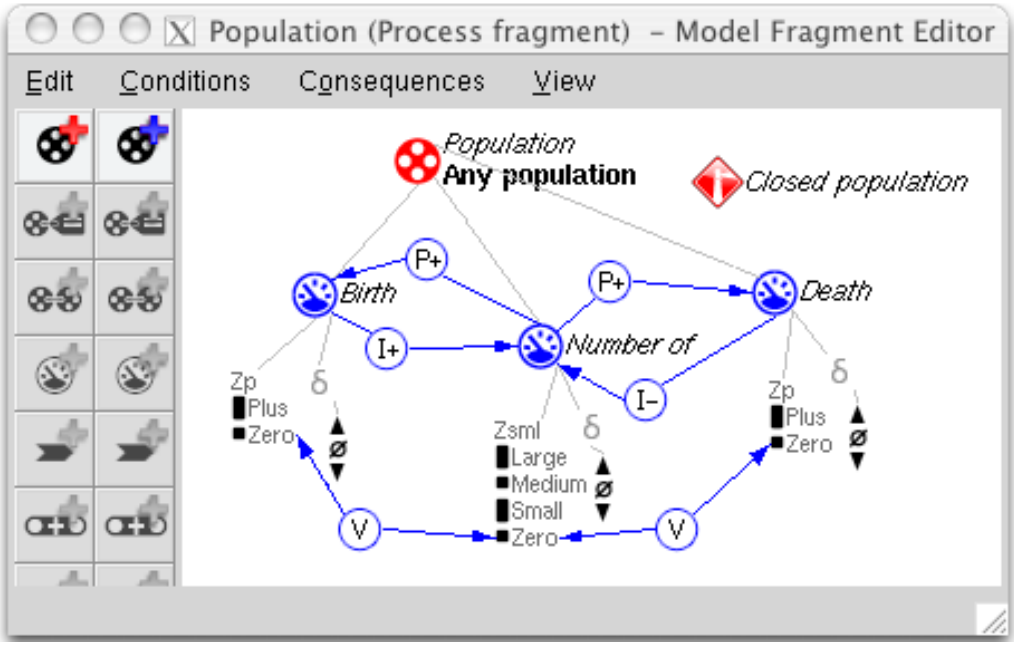


Figure 3: Garp3 – A model fragment representing typical population features

When a model is sufficiently specified, it can be used to run simulations. The built-in simulation engine generates a state-graph based on a particular scenario (Figure 4, LHS). The state-graph represents the possible behaviour(s) of the system, given the knowledge specified in the model. Each state represents the system at a particular point (or interval) in time. Garp3 includes adaptable views to inspect this state-graph and the contents of specific states in detail. Figure 4 (RHS) shows one of those views, namely the value history.

Let us consider the facts in Figure 4 in more detail. The state-graph shows the simulation results for the possible behaviours of the imaginary 'Green frog' population. For more advanced models see e.g. Bredeweg, B. and Salles, P. 2005. *The Ants' Garden: Complex Interactions between Populations and the Scalability of Qualitative Models*. AI Communications, Volume 18, Issue 4, pages 305-317.

In this particular scenario Birth is greater (or equal to) Death, hence the population grows and stabilises. The state-graph starts in state 1, in which the quantities Number of, Birth and Death are all Zero and increasing (meaning: the population becomes into existence). This state of behaviour may change into the behaviour represented by state 2 (small and steady) or state 3 (small and further increasing). State 2 has no successors and is apparently an end-state. State 3, on the other hand, has successors 4 (medium and steady) and 5 (medium and increasing), and state 5 has successors 6 (large and steady) and 7 (large and still increasing). State 4, 6, and 7 are all end-states. Summarising, under the conditions specified in the scenario (including: Birth ≥ Death) this population start at Zero and may grow to its largest possible size, or it may stabilise at certain intermediate sizes. This result reflects a typical feature of a qualitative simulation, namely showing all possible behaviours of a system.

While each of the tools in Garp3 has considerable value in itself, the complete set of tools for model building and inspecting simulation results constitute a uniquely powerful software package. As a whole, Garp3 allows users to build interactive knowledge representations that reflect and support their understanding of the behaviour of systems in ecology and other domains.

For those interested in learning more about the QRM ideas and software, the following information is available online:

http://hcs.science.uva.nl/QRM/software/
(the Garp3 software)

http://hcs.science.uva.nl/QRM/models/
(model examples)

http://hcs.science.uva.nl/QRM/documentation/
(Garp3 – User manual)

http://hcs.science.uva.nl/QRM/community/
(mailing-list for modellers)

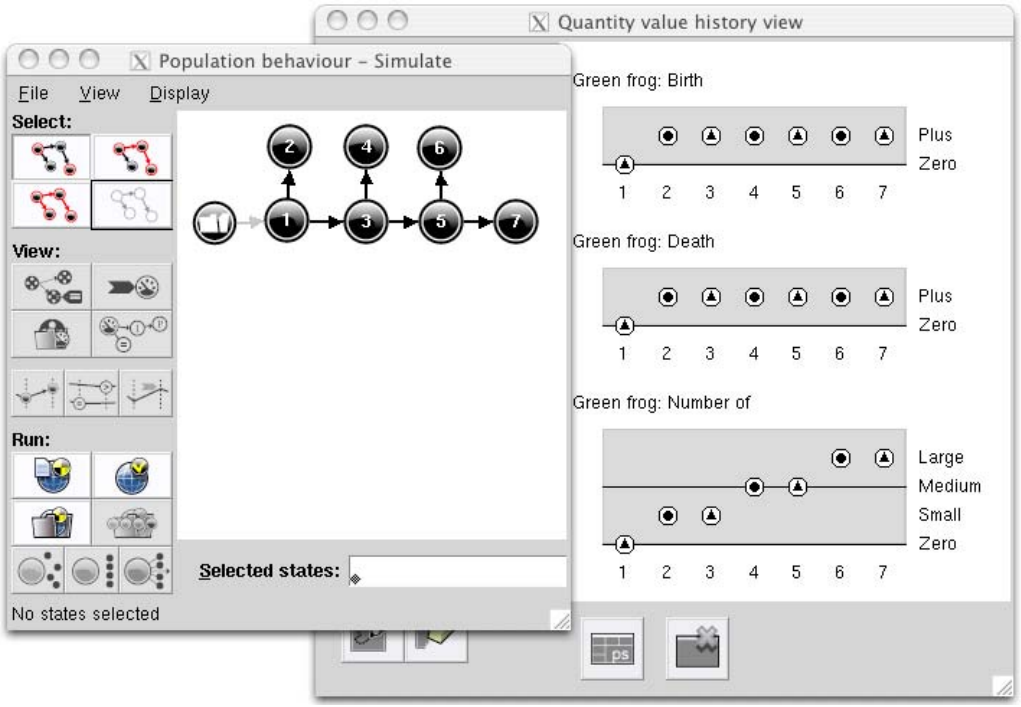


Figure 4: Garp3 – Some simulation results (LHS: state-graph and RHS: value history)

Information sources for Sustainable Development

Enviromental Network Limited

This review of the sustainable development (SD) information resource on the Internet is part of the establishment of the background of the NATURNET-REDIME (NNR) project for the establishment of the SD Portal for the European Commission. This report is provided in the context of the development and provision of the necessary information and educational content of this web portal and the information and communication technology (ICT) required for this purpose.

There are Sample Search Results

Google standard search	
sustainability	60,100,000
"sustainable development"	47,900,000
"sustainability resource"	16,400
"sustainability resources"	156,000
"sustainable development resource"	743
"sustainable development resources"	890

The following are to establish in how far sustainability is recognised in these subjects:

Ecology +sustainability	4,570,000
Economics +sustainability	8,100,000
Governance +sustainability	8,170,000
Sociology +sustainability	2,530,000
IT +sustainability +software -GI –GIS	4,890,000
Environment +sustainability	31,000,000

Obviously as with all 'Google' and other search engine searches these results will include a large number of miss-hits, especially where a common word such as 'sustainability', applied in many other contexts, is used on its own or in phrases without double quotes. Using such general search terms also tends to invoke portal sites and directories. The user seeking direct access to more specific information would be better to use search terms related to the particular field of interest for example: "sustainable agriculture", "Agenda 21" or "sustainable energy use" +UK.

Users may be distinguished by the level and detail of information they require and divide in to ‘professional’ and ‘general’ users.

By the general user, we refer to all potential users requiring SD information, that neither are environmental science academics nor primarily professionally involved in the field of SD; including students, teachers, planners, industrialists, developers, farmers, concerned citizens and etc.

There is still some way to go before SD information delivery, via the internet, achieves a true 'user friendliness'. For example; a person wishing to build a sustainable dwelling, with sustainable materials, by sustainable means while complying with all necessary local regulation, would still have a considerable task in assembling and correlating all the necessary pertinent information for their specific project.

Similarly, a problem of information still exists for the many tradesmen, farmers, and businessmen etc. who desire to achieve a more sustainable working practice and for consumers who aspire to a more sustainable lifestyle - but are unclear how best to achieve this.

The current focus of most data service providers and web publishers in general, could be characterised as academic whether it is aimed at primary school level or professional research. There is a need to develop/design systems that better supply the data resource and assessment needs of those undertaking actual practical SD projects.

A first hurdle for many users is the plethora of jargon used. In particular there is a ubiquitous use of acronyms. Acronyms are not just often obscure to non-initiates, they frequently have numerous different meanings within different disciplines, and sometimes they even have more than one meaning within a single discipline. It is good practice to expand an acronym to the full text at least at its first use in any document/web-page in order to establish its definition at the outset for further use.

A similar possible cause of confusion is where a new meaning has been coined for a word within a specialist field. This is exampled by the use of the word 'ontology' in the esoteric world of 'semantic web initiatives' ("defined as a semantic system that contains terms, the definitions of those terms, and the specification of relationships among those terms"). It is important to remember that if the user recognises such a word at all they are most likely to know it in the context of its original meaning (ontology, in philosophy is the most general branch of metaphysics, concerned with the nature of being, it can also mean, a theory of existence, or a particular theory of being). If a new coinage, that has a tenuous connection to the original

usage, must be used it is advisable to make the new definition clear. It would of course be even better, wherever possible, to avoid jargon and use words as defined in a dictionary particularly for users who are not native speakers of the language in use.

Many potential users will be seeking SD information under time constraints. One of the problems for all web users is the number of occasions on which the net is used, hoping it will be a quick way to find information, only for it to take longer than getting the same information from a book. Information providers should attempt to mitigate this problem using all available strategies, including:

- Immediately obvious, logical and intuitive site navigation
- Logical site structure
- Clear descriptions of resources linked to
- Avoidance of unnecessary or useless page elements
- Avoidance of over large file sizes, inappropriate file types and slower technologies such as 'Flash' where there is no good reason to use them.
- Proper site maintenance

A more imaginative structuring of links to information would be useful to many potential non-academic users. While the current use of categorised directory structures are appropriate for many purposes we feel there is an opportunity for a new approach. What we see a place for is a structure of information access that is predicated on predicted user requirements.

To expand on this, the conventional conceptual structures according to which data is organised are dictated by the nature of the information, analogous to the taxonomic classification of plants or animals. The directory tree offered to the user conventionally mirrors this kind of structure. Thus if we take the sample scenario, mentioned at 4.1, of the imaginary house builder he will be forced to take multiple paths through the tree to different limbs. First seeking information on techniques, and then starting again at the bottom of the tree to look for information on regulation, and so on. At each top level stage the user is presented with data that is mostly irrelevant to his project (usually because it applies to a geographic or political region he is not operating in). We suggest instead a user centred paradigm for structuring information. It should be possible to predict likely user needs and produce a user path that fits these needs, so that the user will finally arrive at an appropriate cross section of the data tree. Something like the following:

- 1st Page - user chooses from likely user projects
- 2nd Page - user makes choices based on location, project level etc

Final page offers links to data/information sources in a variety of knowledge areas, but all relevant to the users project and environment.

The web is a truly international medium, a state which some web publishers are slow to adapt to. For example some national organisations declare themselves as such on their home pages without realising it might be helpful if they mentioned in the text which nation that might be. A similar fault is shown by sites aimed at local audiences which frequently use designations that are geographically ambiguous to those outside the locality, e.g. a typical phrase might be "we are dedicated to a sustainable future for the two rivers region".

Clarity is particularly important if the information relates to a localised human construct as is the case with most legislation and regulation. Europeans often find the U.S.A. can be insular, but it would seem sometimes to be a human trait, common to all, to assume the local condition is the universal condition.

Ironically the web also contains much out-of-date information, e.g. pages that refer to “next June” when what is being referred to actually happened in 2002. The inconvenience of this can be greatly mitigated by clear dating of time-sensitive information near the top of pages or consistent indication of publishing/updating dates.

A clear description of linked files is desirable. One often finds oneself waiting for very large PDF files to download, hoping they contained the information one required, only to find they were irrelevant or frequently a scan of a printed flyer with no extra information.

Within NNR a great deal of energy has been spent on discussing metadata and Resource Description Framework (RDF), (see http://www.w3.org/RDF/) and while this is of undoubted importance, it is vital to remember that for many users the most important resource descriptor, is what is said about the resource, in plain language, on the page that links to it. Honesty in describing resources is desirable. In the course of compiling this report we have encountered grandiose descriptions of resources that turn out to be mediocre, not completed to a point of usefulness or not functioning at all.

The web is a notorious source of misinformation as well as information, and represents a medium whose novelty often makes it harder for users to make sound evaluations of information sources. The ultimate responsibility for evaluating the value of information has to lie with the user; however the providers of the information resource should give what assistance they can in making such an evaluation. Most of the ways this can be done are standard good practice in serious writing but are often forgotten by web authors, such as:

- checking sources - where possible accurately attributing the original source of information (so that a user may make their own value judgments concerning the source, i.e. distinguishing between 'statements of fact' as they occur in scientific papers, governmental information, journalism or polemic).
- stating how statistical information is collected and or calculated so users may make valid comparisons or evaluate the comparisons of others. For instance, it is necessary to know how gross domestic product, GDP is calculated before making a valid judgement of it as an indicator of economic wellbeing, or making direct comparisons between economies with different methods of calculation).
- keeping information up to date or making it clear where it is historical

An important factor, in the assessment of Sustainable Development Information Resources on the Internet, is the different approaches to the concept of SD that different authors and publishers of information have. Although almost all publishers would concur with the definition *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*[1]*."* This definition however leaves plenty of room for differences of opinion on how that result may be achieved.

The different approaches to SD cover a wide spectrum of diverse ideologies and originate from many different cultural sub-groups. At one extreme is the consumerist approach of those commercial enterprises that see SD as a branding opportunity for the selling of products and services, at the other extreme are individuals and organisations with an activist anti-globalisation agenda. Between these two extremes are numerous different 'flavours' and levels of the SD concept according to the sub-group providing the information, to typify some of the data providers they include:

- Governmental organisations - divided as local, national and inter-national
- Concerned with economic, political, social or environmental considerations (thus different interpretations of SD may be being espoused by different sectors of one regime.)
- NGOs, the International Aid Community and a wide variety of voluntary organisations.
- Academic Institutions, with sub-divisions relating to different academic disciplines:
- Environmental Sciences
- Economics
- Social Sciences
- Agricultural Science
- Commercial organisations - covering a wide spectrum from small consultancies to multi-national companies and their lobby organisations.
- International organisations as diverse as the UN and the WTO.
- Groups and individuals with diverse activist agendas.

As with other WWW resources a primary assessment of who exactly is providing the resource and therefore what bias may exist, can be problematic. It often depends on quite subtle semiotics complicated in occasional cases by a degree of intentional dissembling. Examples of such semiotic deception are activist or politically motivated organisations that use a title that suggests an academic institute. The same device is also sometimes adopted by some commercially motivated organisations.

Some SD sites that are very good in concept are compromised by a poor functionality or major design faults. Most of these faults are common on the web but a few SD sites seem to suffer to a disproportionate degree, especially considering the high profile/pretensions of some of the site publisher organisations. One major cause of problems would appear to be that online resources are established in a state of enthusiasm or a condition of good funding that then wanes, leaving the site subsequently neglected and un-maintained. Other faults are simply the result of poor design at the inception.

Common faults observed:

- Old fashioned frame designs without an escape route, resulting in users entering from a search engine being trapped on a single page, with no site navigation.
- An excessive proportion of broken external links.
- Incomplete sites where internal links lead to pages labelled 'under construction' although they are not of recent date.
- Use of underlining for text items that are not links.
- Missing files, including image files used as navigation buttons.

[1] from the World Commission on Environment and Development (WCED). *Our CommonFuture.* Oxford: Oxford University Press, 1987 p. 43

- Broken internal links, one site in particular, at http://www.eurofound.ie/themes/sustainability/ the SD section of the web site of the European Foundation for the Improvement of Living and Working Conditions, an autonomous agency of the EU (and as such belonging within the constellation of EU bodies) had many of these, the site claims to host 5 separate databases none of which I have managed to access, due to the server being offline, despite several attempts over an extended period of time.
- Miscellaneous small faults: such as uncorrected, typos/spelling errors, incompetent design (such as floating navigation bars obscuring text), and layouts insufficiently checked at different screen resolutions, links that do work but are to the wrong file etc.
- A failure on the part of site creators to take into account the level of understanding of likely users.

There are numerous subscription-based, or otherwise restricted-access Data Service Providers active on the internet that provide registered users (usually academic institutions or similar organisations) with access to scholarly publications and research data through online databases. Many organisations utilise access management systems such as, the Athens Access Management system which provides UK users with a single sign-on to numerous web-based data service providers (DSP) throughout the UK and overseas see: http://www.athens.ac.uk/. Similar services exist specific to other countries. This class of resource is currently likely to be already available to the proposed NNR portal users who are in the Higher Education sector or are members of other already registered organisations.

Free registration is also available to individual researchers for services such as, the ingentaJournals (http://www.ingentaconnect.com/) a full-text delivery service offering a single point of access to a fast-growing range of full text electronic journals from leading publishers. This web-based service allows anyone, anywhere in the world, to search and browse a database of articles free of charge, and to display bibliographic information and abstracts (the availability and cost of the full-text depending on the individual publisher). As such database-based academic resources cover many disciplines they will not have a high-rank in the results of search engine searches, using terms such as "sustainability". However they are liable to be of great importance to those looking for precise (primary source) scientific, economic, regulatory or sociological information at the higher academic levels. Edinburgh University's http://edina.ac.uk/ in particular covers several topic areas relevant to SD.

The economic realities of site maintenance costs and copyright mean data service providers and publishers need to generate income. The result is many potential individual users will be excluded from some of the best internet information resources on the grounds of the costs of subscriptions to databases or fees charged for individual documents.

There is a plethora of Internet resources devoted to the sustainable development (SD) concept. All conceivable SD themes are being covered on the web. There are several excellent portal sites in existence, run by independent networks, academic organisations and NGOs. Inevitably given the complexity and comprehensiveness of the subject these portals can require the new user to spend some time learning how best to utilise them.

On moving through from these portals to the next strata of resource, that relating to specific topics or geographic areas, the theory and political rhetoric of SD is well represented. At the level of specific practical information, although much of this type of information is available, users need to show some determination to actually get to it.

NaturNet Redime SDI

Frank Hoffmann, Karel Charvat, Petr Horak

The NaturNet Redime analysis demonstrate, that there exist lists of spatial data, which are currently available through the NNR portal, portals of the project regions or external data sources, which could be used by the NNR portal for training.

The data & service resources now located at and to be served from NaturNet-Redime (NNR) GeoPortal, developed and integrated by HSRS (CZ) will now be used by CCSS as the main platform to support the NNR project team. This will give the opportunity to network all the sources publicly available between ŕNNR portal, ŕportals of the pilot regions or test regions, as well as ŕthe external portals with open data & services that will be used for internal or external training actions.

This part of the analysis could not identify, study and analyze all the sources, but it can be used for future implementations in and extensions of the NNR portal..

There are some recommendations, from the period of analysis, which have to be taken into consideration in the next stage of the design of the portal:

- It is important to support an ease of searching for regions within the application. When the user is starting from a global scheme and would like to find regions, it can be a complicated process. It is recommended that a gazetteer based NUTS GISCO data is implemented.
- For users, who are not specialists in SDI it is difficult to work with a single layer derived from different data sources. There has to be the possibility of defining map compositions, where maps will already have been predefined from several layers by specialists.
- It is necessary to have the possibility of storing user defined applications, which could be accessed by other users.
- It is necessary to prepare a GI&SDI training environment.

The UML scheme shows the result of analysis of available data sources. This deployment diagram demonstrates the model for data deployment. Detailed interfaces and descriptions of single modules and interfaces will be described in D3.1.

NNR portal – this is the project foundation stone, where users will find appropriate learning objects to lead them through the learning process. The web portal has internal functional and data components for system management, e-learning and information technologies. There are also implemented interfaces for a communication with external data servers, functional and analytical servers on the Open Source base.

- Micka – Catalogue client with ISO 19115 implementation, which could be integrated into the map application. It works on OGS specification base.
- Analytical tools – non server analytical tools, which can be implemented for decision support exactly into the NNR portal
- Gazetteer – supporting geographical search based on NUT5 boarders
- Visualization tools – non-server tools for providing a data visualization on the different levels including mobile visualization and 3D-visualisation.
- Thesaurus Client supporting search for themes
- Authorization server – authorization and verification utility
- Web Services Server – server offers Web Services on W3C and OGC standards
- Project Manager – Utility for project managing and controlling including workflow management

NNR SDI server – this is the primary project data server, which contains the main global data for the project (typical data which covers all or most of Europe). The data are now stored on NNR facilities, in future, if this data will be available, it is expected to use this data directly from Eurostat and EES servers.

- GISCO
- CLC 2000
- Image 2000

On the NNR server there will be available also metadata for data stored on this server and on regional servers, which will not have their own metadata system (Krimulda, Francavilla, Gybon).

- ISO19115 Metadata (Micka)

External Data Servers NNR – these are data servers of project partners and regions where the project testing will be provided. The used component

from each of the servers could be data sources, metadata and functions offered as Web Services. All data will be accessible through the NNR Web portal, through WMS, and a part of the data for analysis will be available through WFS, WCS.

- German SDI includes German Catalogues and data servers
- Liberec data server includes the Metadata system Micka, regional data and a Web service data server
- Krimulda includes regional data and a Web service data server. In the initial phase the server is allocated on CCSS premises and will be moved to Krimulda later on
- FMI data server includes the Metadata system Micka, OPRL data and a Web service data server.
- Gybon server stores data prepared by students and teachers. In the initial phase the server is allocated on CCSS premises and will be moved to Gybon later on.
- Hradec server includes regional data and a Web service data server
- Francavilla regional data and Web service data server. In the initial phase the server is allocated on CCSS premises and will be moved to Francavilla later on
- Corsica data server includes a Metadata system, regional data and a Web service data server
- Vysocina data server includes the Metadata system Micka, regional data and a Web service data server

ILIAS Server: main server where tools, methods, metadata and data for e-Learning are stored. To ILIAS a plug-in from NNR portal for visualization and a metadata search will be implemented. Also a client to exchange data with Micka will be implemented.

- SCORM metadata
- Internal learning Data
- e-Learning tools

Functional and Analytical Servers – external servers, which provide services or analysis on demand and return the results to the NNR portal.

- Grass
- eTrails
- Other analytical tools on the base of analysis from WP5

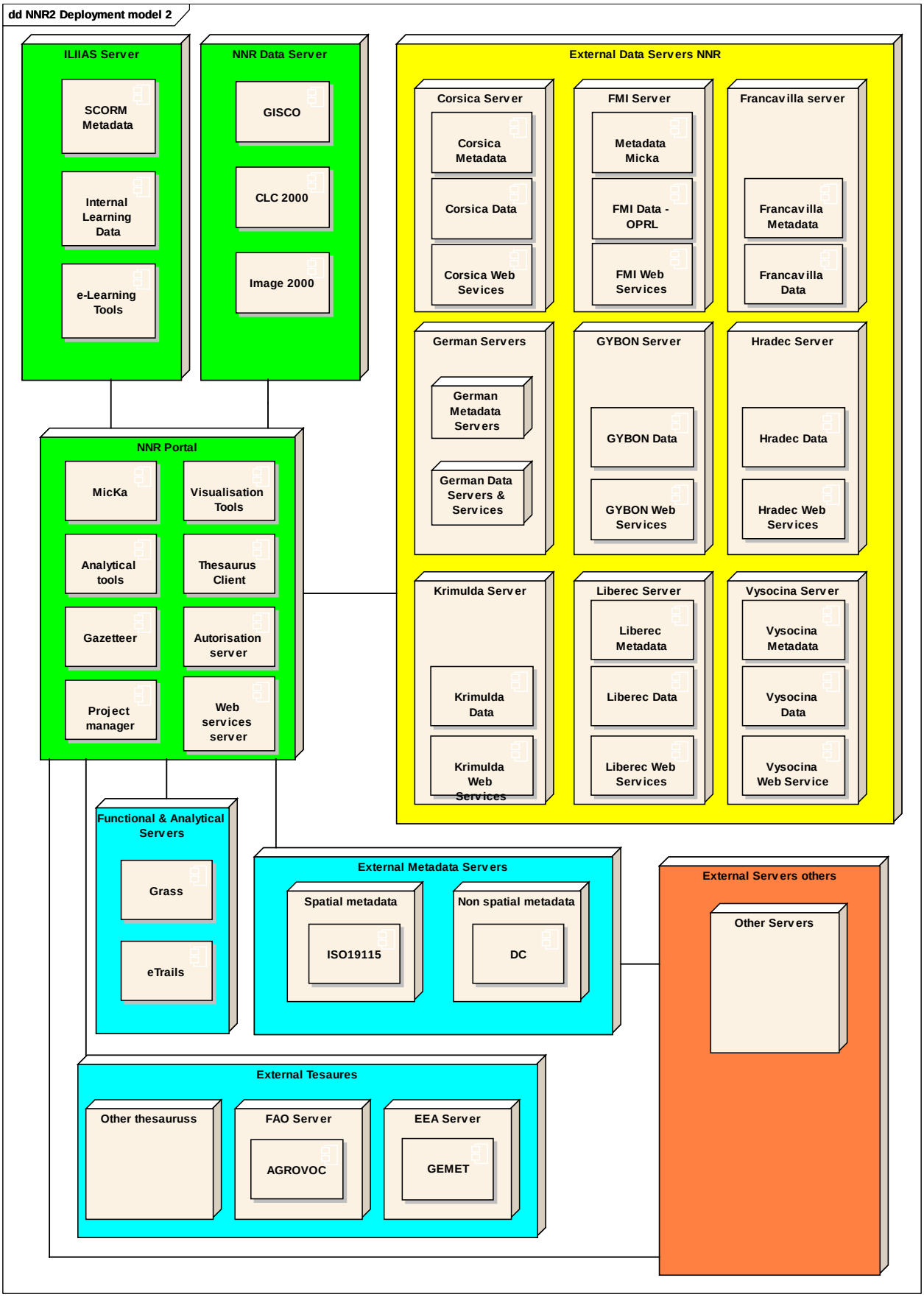
External Thesaurus for searching terms and supporting multilingualism. The Thesaurus will be used directly from FAO, EEA, etc.

- GEMET (EEA thesaurus)
- AGROVOC (FAO thesaurus)

External Metadata Servers

- Spatial Metadata based on OGC standards and supporting exchange of information
- Non Spatial Metadata based on OGC standards and supporting exchange of information

Other External Servers will be recognized in a later stage and will be accessible through external metadata tools.


dd NNR2 Deployment model 2
ILIIAS Server
SCORM Metadata
Internal Learning Data
e-Learning Tools
NNR Data Server
GISCO
CLC 2000
Image 2000
External Data Servers NNR
Corsica Server
Corsica Metadata
Corsica Data
Corsica Web Sevices
FMI Server
Metadata Micka
FMI Data - OPRL
FMI Web Services
Francavilla server
Francavilla Metadata
Francavilla Data
German Servers
German Metadata Servers
German Data Servers & Services
GYBON Server
GYBON Data
GYBON Web Services
Hradec Server
Hradec Data
Hradec Web Services
Krimulda Server
Krimulda Data
Krimulda Web Services
Liberec Server
Liberec Metadata
Liberec Data
Liberec Web Services
Vysocina Server
Vysocina Metadata
Vysocina Data
Vysocina Web Service
NNR Portal
MicKa
Visualisation Tools
Analytical tools
Thesaurus Client
Gazetteer
Autorisation server
Project manager
Web services server
Functional & Analytical Servers
Grass
eTrails
External Metadata Servers
Spatial metadata
ISO19115
Non spatial metadata
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FAO Server
AGROVOC
EEA Server
GEMET

Progress in developing cognitive models of sustainability: case studies from European and Brazilian river basins

Tim Nuttle (University of Jena, Germany), Ana Luiza Rios Caldas and Paulo Salles (University of Brasilia, Brazil), Elena Nakova, Emilia Varadinova, Yordan Uzunov (Central Laboratory of General Ecology, Bulgaria), Eugenia Cioaca (Danube Delta National Institute, Romania), Richard Noble (University of Hull, England), Andreas Zitek (University of Natural Resources and Applied Life Sciences, Vienna, Austria), Bert Bredeweg, Anders Bouwer, Jochem Liem (University of Amsterdam, The Netherlands), Michael Neumann (Federal Environment Ministry, Germany)

The goal of work package 6 of the NaturNet-Redime project is to develop cognitive simulation models that can be used to teach diverse kinds of learners about sustainability. These models are based on qualitative reasoning (QR), which is a modeling paradigm that approximates how human beings actually think about cause and effect. By using such a natural ontology, our models should be especially useful for development of deep understanding that people can apply to the sustainability issues that affect them.

An important step towards this goal is to gather and organize expert knowledge about the processes that affect sustainable use of Earth's ecosystems. Our approach follows five case studies of different river basins in both Europe and in Brazil. We chose a catchment-based approach because rivers integrate the many processes happening in the surrounding ecosystem. Hence, by assessing the quality of the aquatic environment in the river—and how that affects human society—one can learn a lot about the processes going on in the entire ecosystem. By studying river catchments, we address a variety of environmental pressures that affect us all, whilst also having a concrete focus that everyone can relate to.

In October 2005, work package 6 partners gathered in Amsterdam for hands-on training in using the newly developed *Single-User QR Workbench* (NNR deliverable 4.1) and were introduced to the *Framework for conceptual QR description of case studies* (NNR deliverable 6.1). This document, prepared by the University of Amsterdam and University of Brasilia teams, lays out a step-by-step procedure to identify, focus, and organise the various kinds of information that lead to the successful development of a QR model. This procedure is being followed throughout the process of developing cognitive models based on case studies from Brazil, Bulgaria, and Romania, leading up to NNR deliverables that lay the groundwork of documentation for each case study (NNR deliverables 6.2.1, 6.3.1, and 6.4.1) and then the fully implemented QR models (NNR deliverables 6.2.2, 6.3.2, and 6.4.2). A similar procedure will be followed later in the project for case studies from England and Austria, using the *Collaborative QR Workbench*; these case studies will focus on interacting with models in collaborative modelling and learning environments. Additionally, the University of Jena is using the *Framework* in developing cognitive models of a variety of sustainability issues to support the Curriculum for Learning about Sustainable Development Using QR (NNR Task 6.10) and the University of Amsterdam is using the Framework in educational settings to teach QR modeling and sustainability to university students (NNR Task 7.2).

Members of the Bulgarian, Romanian, and Brazilian teams have so far completed two milestones towards their models (NNR milestones 6.1 and 6.2, one from each case study). The first milestone identifies the focal system, specifies the main goals for each model, and describes the structural relationship between components of the system.

Table 1. Main modeling goals identified in Milestone 6.1 for three case studies

Romania: 	To understand connections between water pollution in the Danube River catchment basin and health of human populations in and around the DDBR, for education of decision makers and stakeholders. These must be based on the best current understanding of the phenomena which occur within and beyond the delta, including the whole basin of the Danube and the Black Sea
Bulgaria: 	To develop an understandable and manageable model of the River Mesta, a mountain stream, ,that can be used for education of different community groups to understand how organic pollution affects functioning of stream ecosystems.
Brazil: 	To improve understanding of environmental systems and problems that may affect sustainability in the Riacho Fundo basin (near Brasilia); to demonstrate the effects of human actions, both positively and negatively influencing different aspects of the Riacho Fundo basin system; and to support communication between stakeholders, scientists, and the public.

Specifying modeling goals is very important step because no model can cover everything. Furthermore, by clearly identifying the goals to start with, it helps narrow down the topics to cover and through identifying whom the target audience is, helps focus what level of detail needs to be incorporated. Table 1 identifies the main modelling goals for each of the three case studies.

Each case study also includes a concept map of how the various processes and components relevant to the case study and model goals inter-relate. The concept map serves as a valuable heuristic both for the modeler in the development process and for communication to learners. An example for the Riacho Fundo, Brazil, case study is provided in Figure 1. The concepts in the concept map are then further developed, outlining specific interacting entities and how they should best be represented in the model. These details are specified in the milestone, and will be incorporated within the first deliverable for each case study.

The second milestone for each case study builds from the first. This milestone details the *Global Behaviour* for each model, identifying causal processes, scenarios to investigate with the model, and expected outcomes based on those scenarios. Here, we provide some examples from the milestones, which should be viewed as works in progress. Figure 2 shows some causal processes related to biological activity in the River Mesta, Bulgaria, just a part of the global behavior of the whole River Mesta system. The relations within these processes show how values or changes within the system affect other system components. Figure 3 shows how many processes might be interconnected into a single causal model of the entire Danube Delta Biosphere Reserve. Scenarios relevant to each of these models include specifying the degree of pollution, the starting conditions for biotic and abiotic factors (like algal populations and dissolved oxygen, contaminant levels), and the activity of polluting factors like industry and agriculture. Expected behavior outlines how the causal processes should lead to change in the components of the model. For example, if pollution gets worse, the behavior graph should show how the status of the biotic and abiotic components changes over time. These details are also contained in the milestone and will be elaborated in the first deliverable.

The Framework for conceptual QR description of case studies has so far provided an excellent platform for developing cognitive models of the three case studies, as well as additional models on other sustainability issues for other tasks of the NaturNet-Redime project. The next phase of work for the case studies is to translate the conceptual ideas of the first two milestones into the more formal language of the QR workbench. This will be accomplished in the next milestone. These three milestones collectively form the first deliverable for each case study, which will provide a springboard for the actual programming of the model into the QR workbench. Beyond the scope of the NaturNet-Redime project, this process is proving of great value for building up expertise in using the novel QR approach to modeling ecological systems. These case studies are helping to expand the frontier of QR modeling in ecology, which we anticipate will be help achieve a greater public understanding of processes affecting the sustainable use of services we all rely on that are provided by Earth's ecosystems.

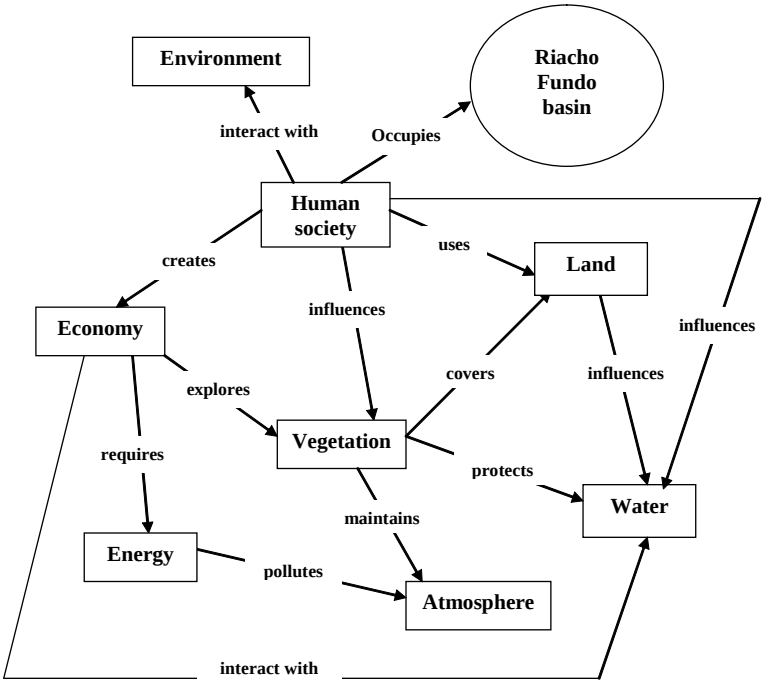


Figure 1. Concept map of sustainability issues in the Riacho Fundo basin, Brazil. Boxes represent things, arrows represent relations.

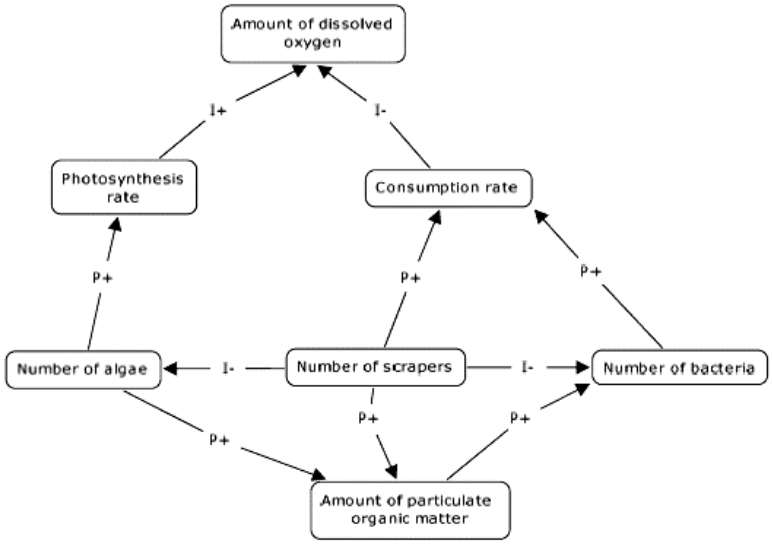


Figure 2. Some biotic processes in the River Mesta, Bulgaria. P's and I's show different kinds of influences. P+ means, for example, "if Number of algae goes up, then Photosynthesis rate tends to go up". I+ means, "if Photosynthesis rate is positive, then Amount of dissolved oxygen goes up." Negative signs have the opposite effect.

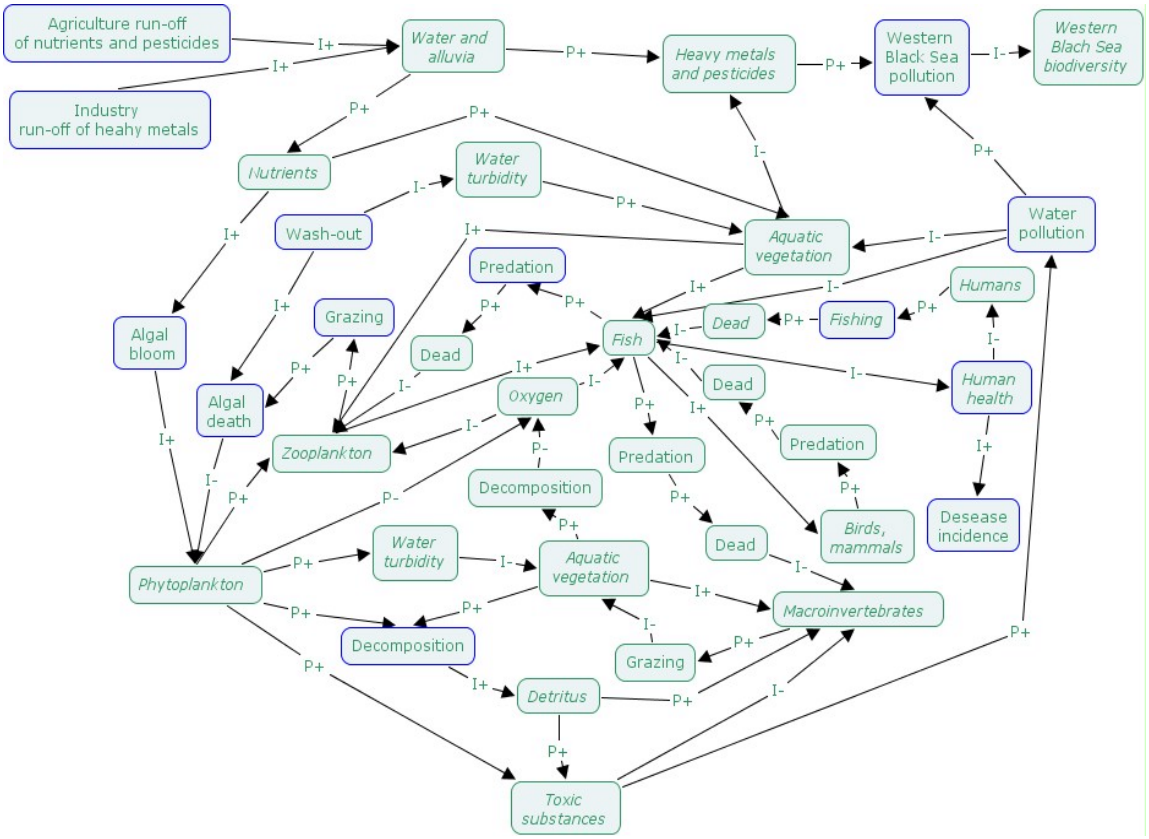


Figure 3. Draft causal model for effects of water pollution on Danube Delta Biosphere Reserve. This causal model includes many separate interacting processes that combine to form the global behavior. See Figure 2 for explanations of the different kinds of influences (I's and P's).

Analysing Broadband Access for Rural Development

Martine Ruzza

A-BARD (Analysing Broadband Access for Rural Development) is a "Coordination Action" within the EU's Information Society Technologies (IST) Programme. A-BARD is running for 2 years having started in January 2005. During this time A-BARD aims to research rural broadband provision and use and to make recommendations on possible future initiatives for rural areas. A-BARD provides a technology watch function, convenes workshops and undertakes strategic and issues analysis in order to encourage total rural broadband coverage in the immediate future. Broadband is recognized as an external driver of change in rural economies and its widespread deployment is seen as critical to the future well being of Europe's rural areas. The focus of the Coordination Action is rural and the inhabitants and economies of rural areas. Rural areas tend to equate with the less developed regions of Europe particularly in the context of telecommunications infrastructure supply. They are also synonymous with areas that are becoming increasingly disadvantaged and excluded from the emerging Information Society. At present broadband penetration figures compiled by the European Commission are showing that broadband penetration and take up are growing faster in Urban and sub-urban areas than in rural arewas. This may due to these rural areas having less access to broadband infrastructures but also to a lack of knowledge and awareness of rural populations regarding the potential offered by the internet and by fast connections. The central mission of A-BARD is to identify and propose strategies that will rectify this situation. In this context, A-BARD is a policy-orientated research study that will identify how information technologies can be used both to protect and transform rural areas. Rural areas are a fundamental and core element underpinning the economic potential and cohesion of a larger and more integrated European Union, especially in the context of the eEurope Action Plan the I2010 strategy. European rural areas are at present in a state of flux, ongoing CAP reform, impact of enlargement and changes in world trade are impacting on the nature of employment, social fabric and make-up of rural areas. REPS and other CAP schemes have had a major impact on rural environment preservation. LEADER has demonstrated opportunities for new types of employment.

The advent of the Information Society and the widespread adoption of Information and Communications Technologies (ICT) offer even greater opportunities to facilitate structural changes in rural areas. ICT can offer new work opportunities, but more importantly, a better and more cost effective approach to deliver other services that can enhance the "quality of life" in rural areas. In this context ICT can act as a major external factor in the widespread transformation and improvement in the rural domain.

Key questions that A-BARD addresses include:

- What applications and services exist, what is emerging, how, when and who should implement the solutions?
- When will they be accessible and affordable in rural areas?
- What socio-economic aspects need to be considered to ensure that meaningful applications and services development and implementation takes place in rural areas? Usability and acceptability issues are critical to the widespread deployment and use of ICT in rural areas and will have a far reaching impact on the extent that ICT can act as an external driver of change in rural areas.

A-BARD uses a research methodology that examines and reports on rural broadband deployment on a continual basis. This approach includes examining current experience with rural broadband developments in the form of case-studies. Rural broadband issues and themes are also developed in preparation for discussion in rural based workshops. In this manner it is expected that A-BARD will provide a grassroots feedback and endorsement to any emerging initiatives in this area.

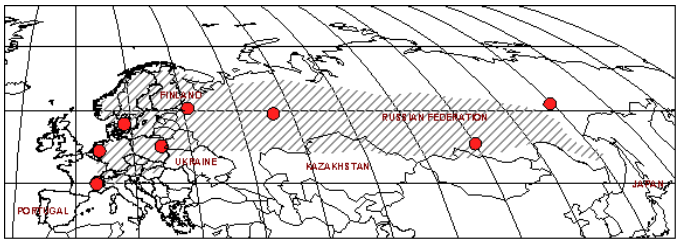
In this manner A-BARD provides a rolling continuous monitoring, reporting and analysis of current trends and developments in broadband provision, access and use in the rural areas of Europe. Dissemination of his on-going intelligence and findings identified by A-BARD is continuous and relayed in the publications of eNewsletters, themes and Issues reports, Cases studies and Technology Watch reports.

e-LUP
Land Use Processes

Mikael Pihlström

The strength of the Sustainability Impact Assessment approach, is paying equal attention to all "three pillars" of sustainable development (environment, economy, society) and their holistic integration, at the same time making a proportionate analysis and weighing = impacts differ in importance.

- case studies in forested landscapes over a large Eurasian area (figure below) will provide examples for simulation tools and texts.



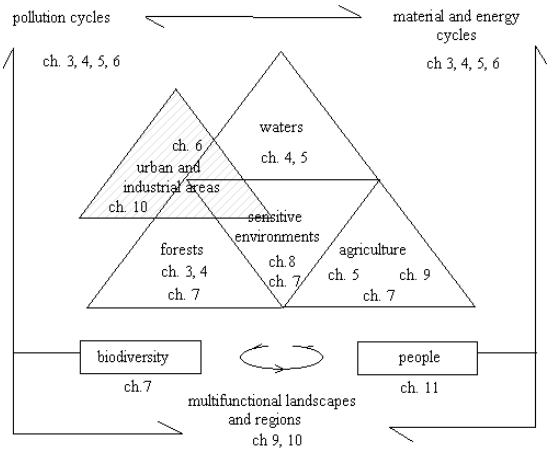
- end-users are primarily policy makers, but also professionals from land-use and spatial planning sectors, students and teachers, scientists, local stake-holders, industrialists and NGO's … people who need to accurately assess complex impacts.

Aim

- To develop a new tool for training on sustainable impact assessment (SIA), applicable in a broad Eurasian context. The tool will be easy to use and easy to disseminate: a freeware electronic textbook and simulation tool based on complex, proven dynamic models.
- To train in particular the use of dynamic models in policy assessment. To train modern landscape analysis and sustainability assessment tools in a unified exercise primarily for training in strategic policy analysis, but secondarily for other end-users also (e.g. local and regional administrations, research, education).
- To embed the project and it's main deliverable at the science/society interface, mainly by involving administrations, company personnel, researchers and students from the start, in producing the material for the e-textbook and in the last year of the project testing it.

Main outcome

The measurable and verifiable outcomes in chronological sequence are: (a) case studies, which are (b) combined with models in visualization software, which forms (c) the core of the e-textbook on SIA developed in co-operation with other societal sectors and tested by end-users (d) all during project time. In the e-textbook the user identifies the issue and is guided to different chapters addressing e.g. the land use topics in the figure below



Development of Long-term shared vision on AMI Technologies for a Networked Agri-food sector

Sixth Framework Programme, Priority, Information Society Technologies.

Fernando Ubieta

The objective of AMI@Netfood project is to support the implementation of the IST Research Priority and Framework Programme, providing a long-term vision on future trends on Scientific and Technology Research oriented to the development and application of Ambient Intelligence technologies to the agri-food domain. The project will be carried out developing an **ERA Pilot** joint collaboration platform resulting from a roadmap the area of **Applications and services for collaborative working**.

As a result AMI@Netfood provides a path, in the form of a **Strategic Research Agenda**, common to a number of EU Member States and Regions, which will be designed to guide RTD in ICTs to provide an answer to identified needs of the sector. The project provides a framework to discuss about the increasingly demanding need of having collaborative and mobile applications and services and innovative ways to tackle social issues and to bring benefits to consumers, industry and the environment. AMI@Netfood results will specifically focus on the solutions adaptable to the needs of local/regional SMEs in the Agri-food sector in themes like **innovative extended products and services, rural development, efficient knowledge creation; sharing and exploitation through collaborative activities involving the individual - the mobile user and worker.**

AMI@Netfood analysis will be developed involving key regional and national policy makers with responsibility in the design of RTD policies and programmes in the area of ICTs and Rural development at regional and/or national scale. By this, the project will generate a basis to identify mechanisms to mobilise public-private partnerships and investment needed on Research. Project results will also be widely **disseminated** so that they can be used to help in preparations for future Community, National or Regional research and technological development policy activities. AMI@Netfood will help creating a **sustainable network** that will be used as the basis for the definition of a set of common objectives that would be applied to a potential Technology Platform for the EU research in the area of ICTs for agri-food and Rural Development.

See http://ami-netfood.com/index.html

RAEIRLS

'Rural Areas as Engines for Implementing the Renewed Lisbon Strategy'

Conclusion of the Conference

Brussels, 29 November 2005

Patrick Crehan, Adam Turowiec, Karel Charvat

Background

The Valencia Declaration

A conference held in Valencia on 3 and 4 February 2003 and entitled **Information Society as a Key Enabler for Rural Development** resulted in the elaboration and adoption of **The Valencia Declaration** [1]. This recognized that rural development needs to be a key public policy area for the 21st Century and emphasized the role that new technologies would play as a tool for territorial cohesion and for socio-economic equality in rural areas. It called upon all stakeholders to work together to achieve goals in terms of:

- infrastructure and services
- traditional Sectors and new business opportunities
- Information Society for All

With a view to harnessing new technologies as enablers for the development of rural regions it called upon stakeholders to support:

- the development of communications infrastructure for rural areas,
- the location of new activities in rural areas,
- the design of active policies by those involved in public administration,
- multi-disciplinary research to enable a better understanding of the drivers of the information society and their impacts on rural areas, and
- continued dialogue on projects, initiatives and good practices relating to the use of Information Society technologies in the rural regions of Europe.

So as to realise these ambitious goals the Valencia Conference the first @rural conference was organized in Brussels[2] on 15th September 2003 by EFITA and the CCSS with support from the DG INFORMATION SOCIETY AND MEDIA. A second European @rural Conference was held in Brussels on 29 November 2005. The title was 'Rural Areas as Engines for Implementing the Renewed Lisbon Strategy'. It put special emphasis on enlargement and the role of new member states.

The second @rural meeting reviewed progress made since Valencia and acknowledged initiatives intended to contribute towards achieving the Valencia Declaration goals. Its significance was confirmed by active participation of representatives from DG Agriculture and Rural Development, DG ENVIRONMENT, DG INFORMATION SOCIETY AND MEDIA, DG Science and Research, and ESA – the European Space Agency. The views of key speakers provide a basis for understanding how a Knowledge Society could contribute to reaching rural development goals and objectives laid out in various policy domains.

This meeting was an opportunity to review the Valencia Declaration and to see how, with the wisdom gained since then, we might refine the Declaration's goals and key statements so as to guide our work for the future and better direct research efforts in support

[1] http://europa.eu.int/information_society/activities/atwork/hot_news/eventspages/2003_02_erural/the_valencia_declaration.pdf

[2] http://europa.eu.int/information_society/activities/atwork/erural_at_work/index_en.htm

of rural development as one of the key public policy areas of the 21st Century.

What has been achieved since Valencia?

One of the most significant achievements since Valencia has been the development of networks for stakeholder dialogue and the exchange of good practice on issues relating to the development of an Information Society in rural areas. With support from FP6 IST funded initiatives such as MOSAIC and COMIST[3] a series of horizontal and vertical networks have been established known as the AMI@Work Communities. The four horizontal networks are:

- Knowledge@Work
- Collaboration@Work
- Mobility@Work
- SEEM@Work[4]

The five vertical networks are:

- Rural@Work
- Engineering@Work
- Logistics@Work
- Well-being@Work
- Media@Work.

All of these address IST challenges of interest for the development of rural regions, but one in particular gets to grips with the specificities of the rural environment – the Rural@Work Community.

This community proactively addresses the rural dimension of the Information Society in the enlarged European Union. At the conference in Brussels in November 2005, Rural@Work representatives welcomed the launch of four new initiatives under the umbrella of EFITA. These take the form of highly focused working groups:

- The agri-food@rural Working Group
- The broadband@rural Working Group
- The eLearning@rural Working Group
- The eContent@rural Working Group

They will cooperate closely with the Rural@Work community and their work will be supported by access to on-line collaborative spaces at the BSCW[5] portal provided by the FP6 financed COMIST project.

These initiatives bring together stakeholders with representatives from industry, academia and civil society to develop a dialogue on future research needs in these domains. They provide feedback to the European Commission, national research programmes, local administration and the private sector on relevant policy issues with a view to shaping the research agenda and driving investment in research in line with the Lisbon goals.

An important milestone since Valencia has been the Rural Wins Roadmap for rural broadband and ICT adoption[6]. Progress has also been made in traditional and new areas of rural business. Specific projects have been implemented in areas such as the use of mobile internet technologies to support precision farming and food traceability. Other initiatives addressed issues such as farm related administration, documentation and cross compliance.

Although some conference speakers referred to the challenge faced by large agrifood value chains, it is worth noting that most of the current research work seems to address needs of large farms or production systems based on contract farming. The application of IST to other economic sectors has also been considered. Examples provided in Brussels in November include applications to forestry and fresh water recreational fishing.

One of the many insights gained since Valencia was the key role of logistics in the sustainability of the rural economy. This insight led to the establishment of the fifth vertical AMI@Work Community - Logistics@Work, in the mid-2005.

New or Emerging Questions

Despite such progress, further work remains to be done not only in areas already being addressed but perhaps in new areas as well:

- The use of information technologies to support alternative, non traditional or non-farm related employment in rural areas.
- The application of information technologies in the context of small scale production systems that involve part-time or mixed-production farmers and local processing.

[3] http://www.mosaic-network.org/comist

[4] SEEM stands for the Single European Electronic Marketplace

[5] To join a working group go to http://www.mosaic-network.org/pub/bscw.cgi/d142219/rural@work.html

[6] http://www.ruralwins.org/RW_D5.3.pdf

- The provision of advanced services in rural areas, in particular services required by innovative small and medium sized actors involved in the development of rural production systems. These services include consulting, sourcing and contract research to solve well defined complex technical problem solving or technical service provision and they may be supplied by public or private research organisations.
- Value-chain collaboration on strategic issues such as research and innovation, in particular to enable systemic change that is incremental or discontinuous in nature.
- Raising awareness of new technologies and methods of the work in the broader community.

As discussions evolve it is hard not to be impressed by the sheer complexity of issues faced by planners and stakeholders in the sustainable development of rural regions. The sustainable development of rural regions will require trade-offs, compromise and accommodation on complex issues that involve the economy, society and the environment. However, tools to support the forms of collaboration required to achieve these goals are not well developed. Strategy and planning, whether for the public or private sector, are important forms of knowledge intensive work. Due to a trend towards the decentralisation of planning processes and the need to demonstrate transparency and inclusiveness in what are essentially political processes, they are increasingly participative in nature. Furthermore, the development of significant dialogue on such complex issues requires the involvement of independent experts capable of explaining and extrapolating trends in technical issues. Improved tools and practices are required to support such work. In particular tools and practices are required to facilitate collaboration in visualising complex issues with a strong spatial dimension, to support dialogue for elucidation and exploration of issues, scenario development, simulation and decision making on complex cross-cutting issues involving large groups of stake-holders. Existing tools supporting decision processes are not adept at supporting dialogue involving inhomogeneous groups of stakeholders and they have considerable difficulties representing information that is qualitative and subjective.

Towards a New Rural Development Strategy

Just as the ministries for agriculture in many countries have positioned themselves (or are in the process of positioning themselves) as ministries that address not only agricultural production but the development of fully diversified rural economies and the management of the natural environment, regional administrations need to re-invent themselves as well. This will require foresight[7] - new visions of rural regions in terms of what they will be like in 20 years time, what kind of economic activity and life-styles they will support and the nature of their evolving relationship with urban spaces and centres of economic activity. These changes are not purely rational changes. They are highly subjective and political in nature. They are rooted in local concepts of value and local visions of preferred future. Foresight is a learning mechanism that informs and facilitates the choices that underpin these change processes. It operates at the level of the individual citizen, community or policy expert. It incorporates complex knowledge and relies upon participative forms of qualitative reasoning.

The future of rural regions is an increasingly important issue for policy makers and gains increasing visibility in decision making bodies. This will result in certain legislative support, reflected for example in regulations for teleworking, and the practical implementation of regional and national development strategies. When supported by changes in education and initiatives to stimulate awareness among rural workers and citizens, the perception of IST and its benefit or utility as well as the demand for new ICT will significantly increase in rural areas.

By 2010 the currently existing digital gap should have been significantly decreased, thus allowing for new ways of working and living in rural areas. Due to developments in infrastructure, migration from rural areas will have stopped by then and a younger generation of rural workers will begin to take over. What is more, reverse migration will occur as companies and people living in cities decide to move to rural areas due to better living conditions and lower costs along with IST-based ease of work and communication. In this way new working practices and jobs will significantly increase in rural regions, while many traditional activities will be supported by ICT[8].

The rural regions of Europe now need to re-invent themselves for a sustainable future, and perhaps the best way to address this will be to explore

[7] See the website of the EFMN or European Foresight Monitoring Network at http://www.efmn.info

[8] compare „Roadmap for creating innovation in Rural and Regional Work for M-worker and M-workspace", being a deliverable of the MOSAIC project (downloadable from http://www.mosaic-network.org) or article by A.Turowiec, B.Gonzálves Ruiz "Roadmap for stimulating innovation of m-working environments within European regions" (downloadable from http://www.mosaic-network.org/pub/bscw.cgi/d139965/MOSAIC_Newsletter_No_4.pdf)

it on the basis of living laboratories that use existing technologies, push them to the limits, and continuously help to define and refine research agendas for the sustainable development of rural regions. It must however be remembered that setting-up living labs or pilots especially in remote regions and specifically in the short- and medium-term will certainly require external assistance in the form of government funding. Probably from structural funds or dedicated research programmes.

The successful development of rural areas will also rely on collaboration involving key players and on the creation of rural business support services. The key issue here will be to extend this towards cooperation on regional, national and EU level. For entities from New Member States, where partnering and clustering in rural regions is still a rather rare phenomenon, this should be a priority. In a long-term perspective such initiatives will lead to a strengthening of rural economies by the stimulation of demand and by accelerating innovation and development. The most natural way of implementing this is to continue and to intensify activities of EFITA and the Rural@Work Community.

Close cooperation with the different Directorates General of the European Commission is indispensable. Without this cooperation Directorates currently addressing rural issues such as the DG Agriculture and Rural Development, DG Science and Research, DG INFORMATION SOCIETY AND MEDIA as well as the DG ENVIRONMENT will pursue independent or competing agendas and miss out on opportunities for high impact initiatives at EU level.

It is necessary to align education, training and research systems at all levels to the actual needs of the modern rural economy and to promote good practice in these domains. Thins is especially urgent in less developed regions where traditional work and values prevail. Many experts consider learning-by-watching the work of professional peers as the most effective way of raising the awareness and increasing demand.

Proceedings

The RAEIRLS conference featured about 40 presentations and 28 of these can now be downloaded from the conference website[9]. It is impossible to refer to all of these and do justice to each individually, so we confine ourselves to issues that are emerging or of special significance at this time.

[9] Go tohttp://efita.net or http://www.efita.cz/conference.php

Issues and Opportunities

Elena Saraceno from DG Agriculture and Rural Development presented a Commission proposal for a New Rural Development Policy[10]. This focused on three key areas: the agrifood economy, the environment and the broader rural economy and population. An important part of rural development strategy will be **encouraging the take-up and diffusion of ICT**. The agrifood sector as a whole has been identified as lagging in the take-up of ICT technologies. This is particularly the case for smaller businesses. Apart from large multinationals and their main suppliers, the adoption of e-business applications is still relatively low. Rural development funds should complement future Commission initiatives such as i2010 in the fields of e-business, eskills and e-learning particularly in relation to Small and Medium sized Enterprise. This policy refers to the programmig period 2007-2013. The DG INFORMATION SOCIETY AND MEDIA and its main instrument the FP7 IST programme can make an important contribution to the new rural development policy by encouraging the identification and adoption of good practice in ICT fior rural areas as a point of reference for investment on the basis of structural funds. This is an important area where cooperation between DG INFOSO and DG Agriculture and Rural Development could enable a high impact on the shaping rural Europe over the next ten years. Further work is required however to transform this generally acceptted wisdom into a set of actionable recommendations for each DG concerned.

Hugo de Groof of DG ENVIRONMENT presented INSPIRE[11], an EC-funded initiative to develop an '**Infrastructure for Spatial Information in Europe**'. Spatial information plays a very important role in the lives of all involved in agricultural production. It plays a short term role by linking cadastral information with data on land-use that is essential for the management of agricultural subsidies. It provides the basis for precision farming and the improvement of farm productivity using modern planning, management and monitoring techniques. It plays an increasingly important role in medium to long term planning issues. Due to the multi-functional nature of land-use this is not only of significance for those living in rural areas but for those based in urban areas as well. The full potential of these technologies and methods has not yet been fully realised. It is mainly, but not solely, due to the lack of

[10] Proposal for a**COUNCIL DECISION on Community strategic guidelines for Rural Development Programming period 2007–2013,** presented by the Commission as SEC(2005) 914 avauilable at http://europa.eu.int/comm/agriculture/capreform/rdguidelines/impact_en.pdf

[11] http://inspire.jrc.it

harmony in standards and the lack of coordination on spatial data at the EU level.

INSPIRE directly addresses this challenge with a view to the quality of data, enabling its use in cross-border regions as well as its re-use in different applications and services. INSPIRE supports the development of an EU Directive for Spatial Data Infrastructure in Europe[12] that is expected to come into effect some time between 2009 and 2013. The drafting of the directive is supported by the work of a number of SDICs – Spatial Data Interest Communities. The importance of establishing an SDIC for agriculture and rural development was discussed in some detail. This is a fundamentally important issue in relation to which interests of DG INFORMATION SOCIETY AND MEDIA and DG ENVIRONMENT overlap and where their complementary initiatives could provide significant added value.

Marta Iglesias from DG-RTD described an emerging vision for the rural regions based on the concept of Europe as a Knowledge-Based-Bio-Economy or KBBE[13] and described the main goals for Rural Development Policy for the period 2007-2013 as being to:

- improve the competitiveness of farming, forestry through support for re-structuring, modernisation, innovation and quality,
- improve the quality of life in rural areas by supporting economic diversification, and
- to enhance the environment and the countryside through support for land management.

Such a bio-economy would:

- assist rural development and sustainability,
- ensure the long-term competitiveness of the European agriculture, food and chemical industries, and
- reduce climate-changing greenhouse gas emissions.

Daniel Debye of DG Science and Research highlighted areas where Information Society Technologies could play an important role in policy for rural development and in land-use management at different levels of governance. Specific challenges include the:

- impact assessment of land use, exploratory modelling and scenario development,
- the use of models that are multi-functional and can view the world simultaneously in economic, social and environmental terms,
- multi-scale assessment, for example field, farm, region, nation, EU and global level assessments.

Bert Bredeweg presented the Naturnet-Redime[14] project. This introduced an interesting and significant distinction by highlighting the need for:

- **VALUE DRIVEN** approaches to decision making at the local, regional or community level, in addition to
- **DATA DRIVEN** approaches at national, EU or global level.

The meeting featured talks by experts in non-IST areas of research such as agriculture, the environment and sustainable development. These inputs highlighted the complexity of the rural development challenge, the inter-linkage of issues that are, at the same time, economic, social and environmental. They indicated an important specificity of the rural economy, the fact that the rural spaces of Europe provide dispersed public goods essential for the sustainability of the economy as a whole. This has dramatic implications for future policies and highlights the need for collaboration to create knowledge that crosses the boundaries of major disciplines in IST, Agriculture, Energy and Transport.

This issue was addressed by Felix Bopp from the Club of Amsterdam[15] who gave a presentation highlighting the role of foresight in dealing with such issues and presented the **Club of Amsterdam Model** for dialogue on complex cross-cutting themes.

The A-BARD[16] project is now in full swing and addresses the goal of **'Analyzing Broadband Access for Rural Development'**. Bob Horvitz of Open Spectrum identified a number of complementary issues that should be addressed in the future. Legislation that takes the form of rules that restrict licences or constrain the use of spectrum, bandwidth and power is sometimes unjustified in a rural context. Unwittingly such legislation precludes the development of otherwise viable applications and markets for wireless communication systems. Bob explained how **spectral**

[12] EC Proposal COM(2004) 516

[13] More info is available at http://www.europa.eu.int/comm/research/conferences/2005/kbb/index_en.html

[14] Go to http://www.naturnet.org

[15] Go to http://www.clubofamsterdam.com and subscribe to free bimonthly Club of Amsterdam Journal

[16] http://www.**a-bard**.org

reform could make a significant contribution to the achievement of rural broadband coverage and how Article 5 of the Authorization Directive of 2002 provides an opportunity to address the problem of poor wireless infrastructure in rural, remote or sparsely populated areas. For these reasons he strongly advocates an approach based on **rule-change** and the non-commercial or community provision of broadband access as a way to develop broadband in rural areas.

Guy Waksman and Ian Houseman presented EFITA as a pan European Initiative that provides a platform for experts in ICT, Agriculture and Rural Development and emphasised the importance of discussion and awareness.

Tunde Kallay presented the ERA pilot activity Ami@netfood[17], which is focused on developing the European Research Area for the application of IST in the Agrifood sector. It will analyse the main research issues in European countries in this domain and define EU level research priorities for the future.

Updating the Valencia Declaration

Clearly much has been achieved since the Valencia Declaration and many of the actions called for are now well underway. New issues have emerged as our understanding has evolved and it is right to consider a revision of the declaration that better informs the actions we should undertake today. The most important steps are steps to achieve:

- more explicit alignment and complementarity of the rural IST research agenda with the research agendas of related domains in particular food, traceability, health, forestry, the environment and sustainable development,
- increased alignment with the aspirations of rural populations on the basis of demographic change and lifestyle choices associated to the rural environment,
- increased alignment of IST related research on production systems with evolving concepts of land-use, based on realistic models for the future or farming, farm ownership and the changing nature of production due to climate change, the introduction of energy crops, more widespread adoption of the plant-factory paradigm and more recent models for the production of dispersed public goods due to the multi-functionality of land-use.

In particular there is a need to explore the concept of the Information Society in rural regions. We need to understand this better and develop realistic human-centred reference models for sustainable rural life-styles. Evidence suggests that there is a range of different concepts or visions that we can use to provide guidance for IST research in this domain. A simple transposition or variation of the 'Silicon Valley' model does not respond to the needs of citizens across all the regions of Europe. A better understanding of this issue will provide a more social and inclusive approach to the development of knowledge economies for rural areas and enrich Europe by accommodating regional diversity in the future-visions of its citizens.

The decision to live in a rural area of Europe is rarely taken on the basis of the existence of broadband networks or WiFi hot-spots. Where these exist they will enhance the viability of rural living and working, but they do not provide a rationale for living there. For now at least such decisions are life-style choices that individuals and families make on the basis of their culture, identity and personal value system. To achieve better alignment between a rural IST research agenda and needs of stakeholders in sustainable rural regions we need to ask basic questions to orient our future work and thinking:

- Who will live in the rural regions of Europe?
- How will they support themselves?
- What will they need in terms of proximity to urban centres?
- What will they need in terms of access to public and private infrastructure?
- How will they achieve fulfilment in their working lives, their personal and social lives, their participation in community life and local politics?

The future of a region is not always a continuation of existing trends. Policies, and political interests and long-term planning all intervene to alter the trajectory of a region. IST has a role in supporting a European policy dialogue that will address the full complexity of sustainability and provide solutions as numerous as its regions and the communities that reside there.

Follow-Up to the Conference

The conference proceedings and discussions immediately afterwards indicate some immediate opportunities for future actions and suggest steps to be taken in the short term.

Actions for the Future

Actions to develop broadband infrastructure for rural regions including:

[17] http://www.ami-netfood.com/

- conferences on related issues such as spectrum reform and rule change to alter the cost structure of network development and operation,
- pilot projects to validate and demonstrate the feasibility of such approaches and
- awareness actions to sensitize regions to the possibility of using structural funds to develop community networks and broadband infrastructure for remote or sparsely populated areas.
- newsletter supporting exchang of information and sharing of knowledge between policy makers, researchers, rural stakeholders and citizens

Accompanying measures that apply available techniques for foresight, modelling and visualisation to understand the future of rural regions in terms of:

- changes to rural regions due to:
  - abandonment of farming activity,
  - accession and CAP reform,
  - climate change,
  - demographic change,
  - changes in life-style preferences and
  - policies for the environment, transport and construction.
- Relations between the rural and urban spaces.
- Governance of sustainable rural economies and the implicit social contracts.
- The knowledge needs of rural areas, innovation and research infrastructure that is rural region specific and complementary to national research efforts.
- Life-style opportunity and work-life balance and the well-being of both urban and rural citizens.

Accompanying measures to:

- discover and explore the meaning of sustainability in specific rural regions,
- develop realistic and socially acceptable concepts of a knowledge society for rural areas,
- implement complex solutions encompassing comprehensive education at all levels, and not only these which are directly focused on ICT skills but also 'soft' skills such as entrepreneurship, marketing and business development. From a long term perspective these will stimulate demand for IST/communications services.

Research to develop projects, pilots and prototypes in the use of spatial data to support the needs of researchers, policy experts and stakeholders in the rural economy:

- use of spatial data via easy-to-use tools for communication and for the exploration of complex issues relating to society, the economy and the environment,
- development of techniques for handling uncertainty, and incomplete data,
- development of techniques for handling trade-offs, achieving 'consensus' or 'accommodation' on complex issues involving heterogeneous stakeholder groups,
- techniques for the collaborative exploration of complex futures and scenarios,
- qualitative decision making based on culture, values, identity and human need.

Research on collaboration tools and organisational paradigms for:

- policy development as work that is participative, transparent and knowledge intensive, work that bears the burden of educating stakeholders, managing dialogue involving experts and citizens, dealing with issues that are complex, spatial and subject to uncertainty,
- research as work that is guided by the needs of society, routinely interfaces with stakeholders, addresses the need to confront uncertainty, make trade-offs (between economy, society and the environment, between public and private goods and services) and support decisions that are value based or subject to trade-off.

These actions should take account of the need to address the multi-functional nature of land-use, the co-ownership of rural spaces with urban communities. They should try to address more explicitly the social contracts that are implicit in the Common Agricultural Policy and its variations in interpretation and implementation across the EU. They should explicitly refer to the ambition of Europe to achieve sustainability at regional, national, European or global level.

The use of the 'living laboratory' is a paradigm of choice for the organisation of research that is complex, dynamic and multidisciplinary, and which require participative multi-stakeholder involvement.

Towards a 'Prague Declaration' in May 2006

Further work is now required to:

- draft a revision of the Valencia Declaration,
- extend it with a set of specific high-level goals to be achieved in the course of FP7,
- integrate these with a detailed action plan for research activities that will help to achieve these goals,
- indicate specific areas for synergy between the activities of DG INFORMATION SOCIETY AND MEDIA and DG ENVIRONMENT, DG SCIENCE AND RESEARCH, DG REGIO as well as DG AGRI and Rural Development.

This action plan can be revised on a regular basis taking account of on-going research projects, progress with structural initiatives such as INSPIRE and insights emerging from complementary activities of the other Directorates General relating to the future of sustainable rural economies.

This work will be carried with support from EFITA and the AMI@Work Communities in particular with support from the four @rural working groups.

The intention is to announce the launch this as the 'Prague Declaration' at the Information Systems in Agriculture and Forestry Conference to be held in Prague in May 2006.

Events of interest

9th – 10th February 2006, Prague

Preparing for eContentplus I – Geographic Information Systems.

http://www.econtentplus.net/index.phtml?articleId=186

6th – 7th March 2006

International Annual Symposium 2006 EU-Funds: ERDF, ESF, EAGGF (resp. EAFRD) - Implementation of current period. Innovations, strategic and operative aims for the coming period 2007-2013. Venue: Berlin, Deutschland http://www.europaeische-akademie.net/seminar_pdf/W-38_EU.pdf

3rd – 5th May 2006, Pretoria

IST-Africa 2006 Conference and Exhibition, CSIR International Convention Centre, Pretoria, South Africa, http://www.ist-africa.org/Conference2006/default.asp

16th and 17th May 2006, Prague

Information Systems in Agriculture and Forestry, http://www.iszl.cz/index_en.htm

31st May – 3rd June 2006

7th EC conference on Safeguarded Cultural Heritage Understanding & Viability for the Enlarged Europe. The conference will take place in Prague, The Czech Republic. www.arcchip.cz/ec-conference

18th – 21th June 2006, Santorini

9th International Conference on Technology Policy and Innovation "SCIENCE, SOCIETY AND SUSTAINABILITY" Santorini, Greece http://laertis.chemeng.ntua.gr/santorini/

24th – 26th July 2006, Orlando

The 4th World Congress of Computers in Agriculture and Natural Resources, Orlando, Florida, USA from. It is a collaborative effort among agricultural information technology associations worldwide, http://www.wcca2006.org

30th August – 1st September 2006, Grenoble

POSITIVE SYSTEMS: THEORY AND APPLICATIONS, POSTA06 - Second Multidisciplinary International, Grenoble (France), http://www.lag.ensieg.inpg.fr/POSTA06/index.php

22nd – 24th November, Helsinky

IST 2006, Helsinki, Finland, http://europa.eu.int/information_society/activities/istevent/index_en.html

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Project no.	004074
Instrument:	SPECIFIC TARGETED RESEARCH PROJECT
Thematic Priority:	SUSTDEV-2004-3.VIII.2.e
Start date of project:	1st March 2005
Duration:	30 months
Web:	http://www.naturnet.org

Co-odinator	Contact person	Country	E-mail
Czech Centre for Science and Society	Karel Charvat	CZ	ccss@ccss.cz

Partner	Contact person	Country	E-mail
Environmental Network Ltd http://www.env-net.com/	Peter Barz	UK	pkab@env-net.com
Albert-Ludwigs University of Freiburg https://portal.uni-freiburg.de/felis/	Barbara Koch	DE	barbara.koch@felis.uni-freiburg.de
Municipality of Francavilla di Sicilia http://www.stepim.it/	Nino Paterno	IT	npat@stepim.it
Gymnazium Bozeny Nemcove http://www.gybon.cz/	Jan Sterba	CZ	sterba@gybon.cz
INNOVATION. Grenzüberschreitendes Netzwerk e.V http://www.IGN-SN.de	Frank Hoffmann	DE	320052219146@t-online.de
Institute of Mathematics and Comp. Science, Univ. of Latvia http://www.lumii.lv/	Maris Alberts	LV	alberts@acad.latnet.lv
Joanneum Research http://dib.joanneum.at/	Alexander Almer	AT	alexander.almer@joanneum.at
KRIMULDA - Municipality	Juris Salmins	LV	krimulda@rrp.lv
APIF MOVIQUITY SA http://www.moviquity.com/	Wendy Moreno	ES	wmp@moviquity.com
Mission TIC de la Collectivité Territoriale de Corse http://www.mitic.corse.fr	Jerome Granados	FR	jerome.granados@mitic.corse.fr
Region Vysocina	Jiri Hiess	CZ	Hiess.J@kr-vysocina.cz
University of Jena, Institute of Ecology http://www.uni-jena.de/ecology.html	Tim Nuttle	DE	Tim.Nuttle@uni-jena.de
	Michael Neumann		mn@mneum.de
Human Computer Studies Laboratory, Informatics Institute, Faculty of Science, University of Amsterdam http://hcs.science.uva.nl/projects/NNR/	Bert Bredeweg	NL	http://hcs.science.uva.nl/~bredeweg
Bulgarian Academy of Sciences, Central Laboratory of General Ecology (CLGE)	Yordan Uzunov	BG	uzunov@ecolab.bas.bg
Danube Delta National Instit. for Research and Development http://www.indd.tim.ro/	Eugenia Cioaca	RO	eugenia958@yahoo.co.uk
University of Brasilia, Institute of Biological Sciences	Paulo Salles	BR	psalles@unb.br
University of Hull, International Fisheries Institute	Ian Cowx	UK	i.g.cowx@hull.ac.uk
University of Natural Resources and Applied Life Sciences, Department of Hydrobiology, Fisheries and Aquaculture	Stefan Schmutz	AT	stefan.schmutz@boku.ac.at