



Project no. **004074**

Project acronym: **NATURNET-REDIME**

Project title: **New Education and Decision Support Model for Active Behaviour in Sustainable Development Based on Innovative Web Services and Qualitative Reasoning**

Instrument: **SPECIFIC TARGETED RESEARCH PROJECT**

Thematic Priority: **SUSTDEV-2004-3.VIII.2.e**

M7.2.2

2nd NNR user group workshop on Qualitative Reasoning and Modelling

Due date of deliverable: **<15/04/2006>**
 Actual submission date: **<11/04/2006>**

Start date of project: **1st March 2005**

Duration: **30 months**

Organisation name of lead contractor for this milestone:
University of Jena¹

Revision: Final

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

¹ Content provided by: Tim Nuttle (UoJ); Jochem Liem, Anders Bouwer, and Bert Bredeweg (UvA); and Paulo Salles (UnB).

Abstract

This document describes the goals, contents, and results of the second WP4/WP6 workshop on qualitative reasoning and modelling, held at the Central Laboratory of General Ecology, in Sofia, Bulgaria, 27-31 March 2006.

Document history

Version	Status	Date	Author
01	Draft	10/04/2006	Nuttle
02	Draft	11/04/2006	Liem, Salles, Bouwer
03	Final	11/04/2006	Nuttle, Bredeweg

1 INTRODUCTION

This workshop was the second in a series of training workshops for WP4 and WP6. The goal of this workshop was to support the WP6 participants in continuing work on their QR models of case studies [6,9,13]. After WP6 partners presented their current status in developing models, focus turned to hands-on work with the Garp3 QR modelling workbench, with the goal of making progress towards transforming conceptual ideas into implemented QR models [1,3,4]. Bert Bredeweg presented the current version of the software (Garp3) [2]. Anders Bouwer discussed ongoing work on the collaborative sketch environment in the Garp3 workbench [5], and Jochem Liem presented the formalisation of models in the Web Ontology Language (OWL) and future work on the implementation of a qualitative model repository [5,7]. With support from the UvA team, the workshop participants worked on practical exercises developed by Bert Bredeweg (UvA) and Paulo Salles (UnB), which focused on model debugging and building reusable QR model fragments. Paulo Salles made a presentation on how to develop progressive learning routes through QR models that take advantage of the hierarchical structure of model components [11,12]. Tim Nuttle (UoJ) facilitated a brainstorming session on how to organize concepts of Sustainable Development into a web that can be developed and explored, integrating the case studies into a unified curriculum about SD [8,10].

2 Participation

Representatives from each WP6 partner were present and actively involved in all aspects of the workshop.

UvA:	Bert Bredeweg, Anders Bouwer, and Jochem Liem
UnB:	Paulo Salles
UoJ:	Tim Nuttle, Michael Neumann
CLGE:	Yordan Uzunov, Emily Varadinova, and Elena Nakova
DDNI:	Eugenia Cioaca and Silviu Covaliov
UoH:	Richard Noble
BOKU:	Andreas Zitek

Additionally, Desiree Tullos from Oregon State University (USA) participated in the workshop.

3 Workshop Agenda

MONDAY

- Presentations from each case study on the current status.
- Presentation of WP4 software developments and new features.

TUESDAY

- Ways to view and manage simulations. Presentations and hands-on work with example models. Example topics: states and transitions, cycles, causal model, hierarchy of entities and model fragments.
- Hands-on work building models in small groups, focusing on complex assignments.
- Presentations by each group on work accomplished. Feedback given.

WEDNESDAY

- Debugging procedures. Presentations and hands-on work with example models.
- Hands-on work building models in small groups

- DDNI, CLGE, UnB working on models of case studies
- UoH and BOKU working on textual description of case studies
- Presentations by each group on work accomplished. Feedback given.

THURSDAY

- Brainstorming: develop a concept map of major SD issues to explore in the Curriculum and how/whether these can be taken from case studies.
- Constructing progressive learning routes through QR models. Presentation and discussion.
- Hands-on work building models in small groups, focusing on creating causal chains that can be re-used and integrated into more complex models.
- Presentations by each group on work accomplished. Feedback given.

FRIDAY

- Administrative issues and software evaluation.

4 Assignments and hands-on modelling

The goals of the assignments were to familiarize participants of the functionality of the Garp3 workbench, to provide hands-on practice building models, and to develop skills in trouble-shooting (or debugging) models. Assignments on teaching Garp3 functionality covered topics like how to view simulation results, including interpreting state graphs, viewing transition histories, and displaying dependencies and causal models in different states. Assignments on model-building were designed to increase understanding of how to use the QR modelling ontology and Garp3 workbench to capture knowledge, create models, and run simulations. One set of assignments involved small groups working on a set of basic processes that we expect to occur repeatedly in the Curriculum about Sustainable Development. It was expected that different groups would come up with different solutions about how to model a given process. By comparing and contrasting different representations, thinking was stimulated about which approach would be better under different circumstances. Assignments on trouble-shooting and debugging consisted of a series of models that had specific errors inserted into them. Most of the errors were ones that are commonly found in QR models that result in unexpected or 'no' behaviour, in which Garp3 cannot produce a simulation because the model specifies mutually inconsistent information. The goals of the assignments were to find and fix the bug, and therefore to improve understanding of the modelling primitives.

5 Brainstorming about Sustainability

On Thursday morning, Tim Nuttle facilitated a brainstorming session to stimulate ideas about how to integrate the case studies into a curriculum for learning about sustainable development that transcends the separate case studies. Nuttle reviewed the concepts of the pillars or dimensions of SD and framework established by the Millennium Ecosystem Assessment, as presented in D6.8, Framework for Sustainable Development Curriculum [8]. We then broke into four groups of three participants and developed concept maps using post-it notes about important issues that could be explored in a curriculum. We then integrated the concept maps from the four groups into a single concept map to form the basis for constructing progressive learning routes through all of the models in the QR curriculum (see Figs. 1 and 2). The final concept map was transferred into the software CMAP-tools (Figure 3) and work has begun to re-organise these ideas into a structure that can be animated and placed on the NaturNet web portal and linked to online learning materials (Figure 4).



Figure 1. The fourth group integrates their concept map into the evolving concept map laid out by the first three groups (pictured in foreground left to right: Elena Nakova, Paulo Salles, Richard Noble).



Figure 2. The final concept map resulting from all the participants. Concepts in the left circle represent issues most closely related the economic, social, industrial, and institutional dimensions of sustainability. Those in the right circle represent those most closely related to the environmental dimension. There was the idea represented that the societal side (institutional, social, technological, and economic) can behave like a cycle moving in either clockwise or counterclockwise direction. Society can control the direction of cycling. However, society cannot control the direction of the cycling of the environmental side. When the two sides cycle in incompatible directions, conflict arises. When they cycle like cogs in a machine, there is no conflict.

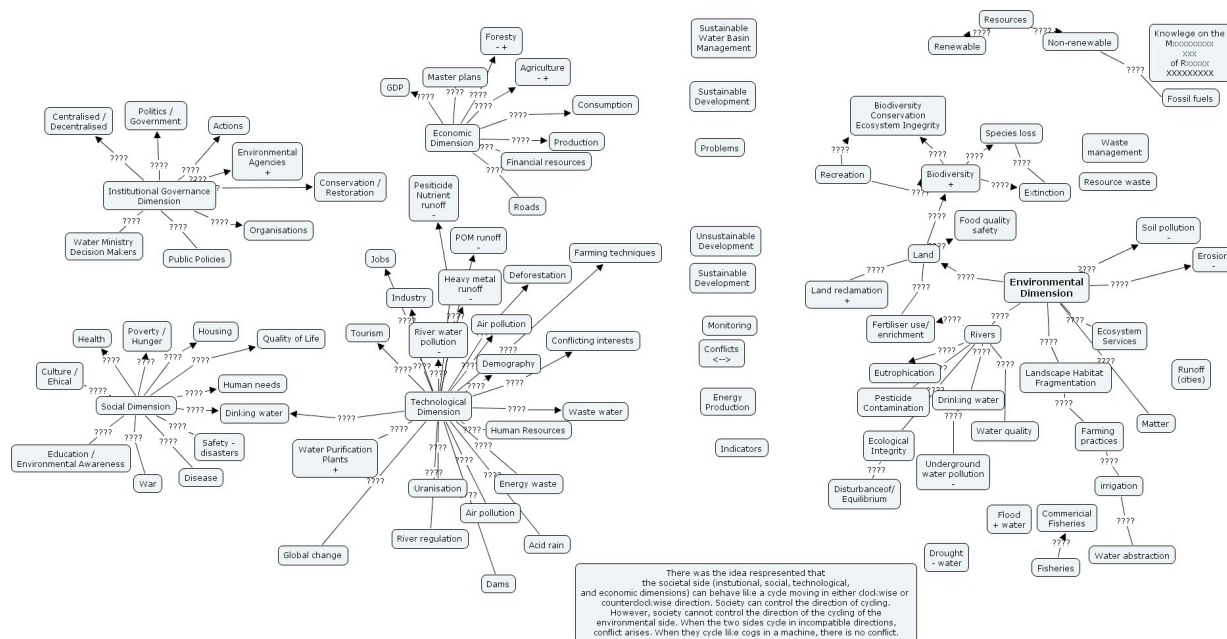


Figure 3. First transfer of the concepts from Figure 2 transferred into CMAPTools.

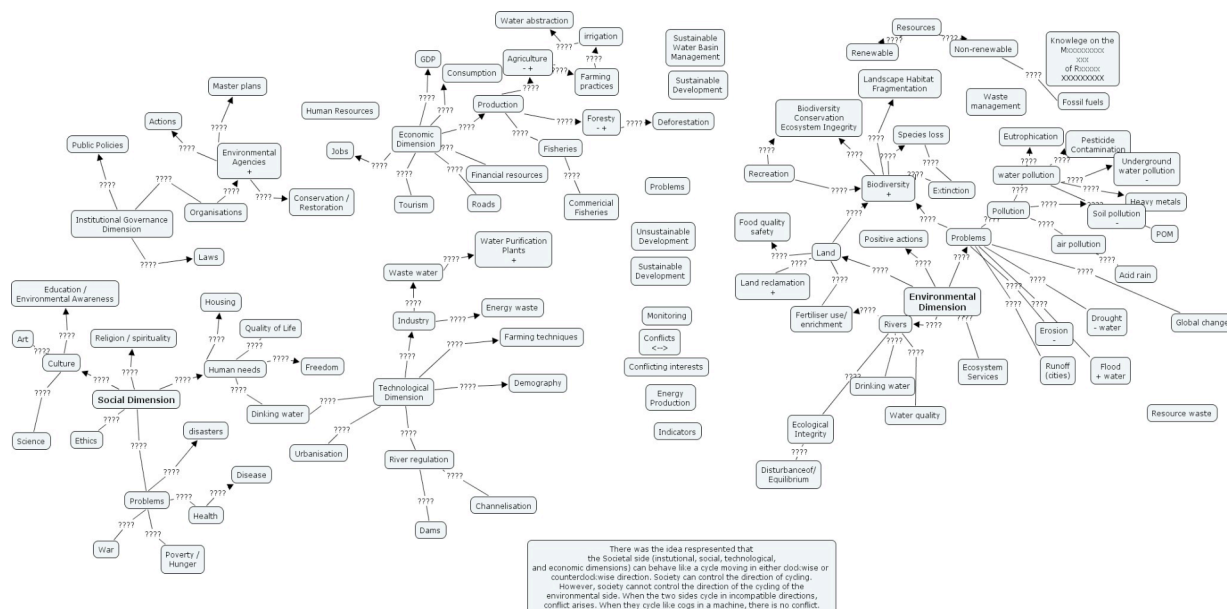


Figure 4. Reorganizing concepts from Figure 3 to facilitate development of progressive learning routes about SD (this is a work in progress).

6 Questionnaire

Participants in the workshop completed a questionnaire to assess the understandability of the various icons used in the Garp3 modelling workbench. The participants had to link icons to functionality. The basic idea is that by repeated use of the icons will facilitate learning what the icons mean. These results will be combined with those from the previous workshop to assess the transparency of the motifs used in the icons. If certain icons are constantly linked to the wrong functionality, the graphic of that icon might have to be updated in a future version of Garp3.

7 Administrative issues

A list of upcoming dissemination opportunities was prepared by Bert Bredeweg and Paulo Salles. There are several opportunities for presenting the models and other deliverables from WP6 in upcoming workshops and conferences that are likely to lead to submissions to special issues of journals. A plan was presented and agreement on co-authorship for upcoming papers was made. Deadlines and the format of the next milestones/deliverables, and next WP6 workshop were also discussed. It was agreed that each case study would be evaluated at a training event in the respective region, either by expert evaluation of content or in an educational setting. We also set up a schedule for model-building support using Skype and VNC, between UvA and other WP6 partners. Finally, Tim Nuttle provided support for WP6 members on the preparation of project documents, such as the annual report, costs justification and the C-form.

8 Conclusions

The second NaturNet-Redime workshop on QR modelling was a great success in training researchers within the project to use the new QR modelling workbench, Garp3. Significant progress was made towards developing skills in model building and inspection. Additionally, the brainstorming session about concepts of sustainable development was very fruitful in stimulating ideas and discussion about how to orient the individual case studies towards the ultimate goal of contributing to a unified curriculum about sustainable development. Finally, it was encouraging to learn of the many upcoming dissemination opportunities in high-profile international conferences, and to develop a plan for evaluation and training within the regions.

9 Acknowledgements

Special thanks are given to Yordan Uzunov, Elena Nakova, Emily Varadinova, and the whole staff of the Central Laboratory of General Ecology, Bulgarian Academy of Sciences, for hosting the workshop.

10 References

- [1] Bouwer, A., Liem, J., and Bredeweg, B. (2005) User Manual for Single-User Version of QR Workbench. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D4.2.1.
- [2] Bredeweg, B., Bouwer, A., and Liem, J. (2006) Single-user QR model building and simulation workbench. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D4.1.
- [3] Bredeweg, B., Liem, J., Bouwer, A., and Salles, P. (2006) Curriculum for learning about QR modelling. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D6.9.1.
- [4] Bredeweg, B., Salles, P., Bouwer, A., and Liem, J. (2005) Framework for conceptual QR description of case studies. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D6.1.
- [5] Bredeweg, B., Bouwer, A., and Liem, J. (2005) Requirements analysis and re-design for collaborative workbench. Naturnet-Redime, STREP project co-funded

- by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project milestone M4.2.
- [6] Cioaca, E., Covaliov, S., David, C., Tudor, M., Torok, L., and Ibram, O. (2006) Textual description of the Danube Delta Biosphere Reserve case study. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D6.2.1.
 - [7] Liem, J., and Bredeweg, B. (2006) Document Type Definition (DTD) for QR Model Fragments - Redime. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D2.3.1.
 - [8] Nuttle, T., Salles, P., and Bredeweg, B. (2005) Guidelines for Sustainable Development Curriculum. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D6.8.
 - [9] Salles, P., and Caldas, A.L. (2006) RF - Textual description of Riacho Fundo case study. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D6.4.1.
 - [10] Salles, P., Bredeweg, B., and Nuttle, T. (2005) Qualitative Models of Indicators of Environmental Sustainability of the Millennium Development Goals. In Picardi, C.; Salles, P. & Wotawa, F. (eds.) Notes of the 2nd MONET Workshop on Model-Based Systems (MONET 05), pp. 66-72. Workshop included in the official program of the 19th International Joint Conference on Artificial Intelligence (IJCAI-05), held in Edinburgh, Scotland, 30th July 2005.
 - [11] P. Salles, B. Bredeweg, S. Araujo, and W. Neto. 2003. Qualitative models of interactions between two populations. *AI Communications*, Volume 16, Issue 4, pages 291-308.
 - [12] P. Salles and B. Bredeweg. 2001. Constructing Progressive Learning Routes through Qualitative Simulation Models in Ecology. *Proceedings of the 15th International workshop on Qualitative Reasoning, QR'01*, G. Biswas (editor), pages 82-89, San Antonio, Texas, USA, May 17-19
 - [13] Uzunov, Y., and Elena Nakova, E. (2006) Textual description of River Mesta case study. Naturnet-Redime, STREP project co-funded by the European Commission within the Sixth Framework Programme (2002-2006), Project no. 004074. Project deliverable D6.3.1.