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Abstract: European rural areas have changed considerably in the past decades. Agriculture intensified whilst in other areas it marginalized. The rural landscape changed and it will continue to change in future. The forces driving that change are increasingly global by nature: demography, economic growth, climate change and international trade policies. The Eururalis 2.0 project assesses the combined impact of these driving forces. The results are published on a computer based tool to support discussions and to raise awareness of future changes in rural areas. The tool was made suitable for a wide audience, with policy makers as the main target group.

 Keywords: Discussion support, globalization, rural area, impact assessment, land use change, tool, dissemination.

1.   INTRODUCTION

What will happen to Europe's rural areas in the forthcoming years? What kind of threats as well as opportunities for socio-cultural, economic and ecological values can we expect? Can Europe's rural communities maintain their livelihood?

European rural areas have changed considerably in the past decades. Agriculture intensified whilst in other areas it marginalized. The rural landscape changed and it will continue to change in future driven by forces that are increasingly global by nature such as demography, economic growth, climate change and international trade policies. The Eururalis 2.0 project assesses the impacts of these combined driving forces and publishes them in a tool to support discussions and to raise awareness on the impacts of land use changes.

The discussion support tool developed within the Eururalis 2.0 project [Wageningen UR/MNP, 2007; Rienks, 2008, Eickhout, 2008] aims to help policy makers to obtain insight in the future development of rural Europe towards the year 2030. The longer term time horizon, the uncertainties about global trends, the huge spatial variety within Europe, let alone the various topics involved in discussions about rural areas make this a complex field. With the help of a series of multi scale models an extensive database was created. Only with the use of a computer based tool this database can be unlocked for the broader public.

This paper discusses how requirements for the tool have been gathered and managed: how end users and stakeholders were consulted and what happened with specific user feedback. Additionally it evaluates how the tool is disseminated on several international meetings with policy makers and scientists and in education programs.

2.   COMPUTER BASED SUPPORT TOOLS

2.1. Introduction

In 1991, Sage established the concept of "the Decision Support System" or DSS as a source of advice for tackling management problems [McIntosh, 2007]. Around the same time, modellers started referring to the potential decision support functions of their product.

In the last few decades a large number and variety of decision support systems have been produced and published. The variety of the models can be classified according to the uncertainty and causality dimensions (Figure 1): 'If uncertainty in the system and model is apparent, "what-if" type questions can be addressed. If uncertainties are small the probability of future events can be assessed. If causality of the model is prominent, a more systematic approach is possible. If causality is lacking, only regressive or deductive methods are available leading to projections or speculations of future events and conditions' ([Becker, 1989] as quoted by [Van Ittersum, 1998]).
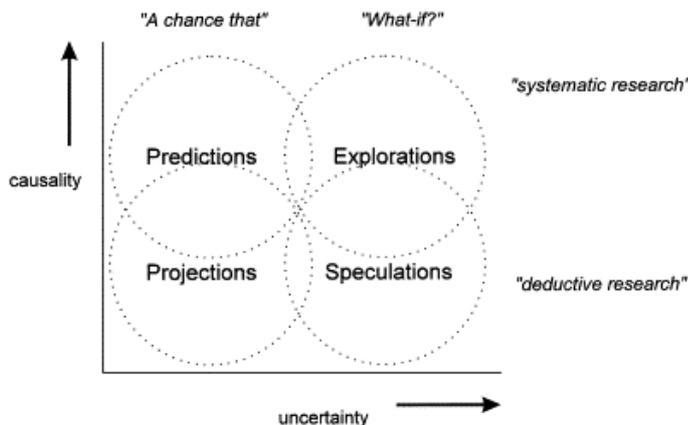

Figure 1: model classification (Becker, 1989)

2.2. Discussion support system

In the beginning of the nineties, the concept of policy life cycle was introduced: 'Initially, there is no awareness of a problem. The first signs of a potential problem may come from the society (…). There is a period of discord and quarrel; people may even deny that there is a problem. After some time a common understanding eludes and governmental organisations begin to recognise that the problem exists. The political importance increases and policies and regulations are prepared' ([Winsemius, 1990, Janssen, 2007] as quoted by Adriaanse [1997]). Subsequently, the policies and regulation have to be evaluated, eventually implemented and progress monitored at later stages.

The policy life cycle is also relevant for the policy making process aimed at changing land use. In each phase of such a process, different types of models are appropriate: projective, predictive and exploratory land use models [Van Ittersum, 1998]. In the first stage awareness is raised by exploring the problem. Within this stage - with people denying that there is a problem in the first place - there may be strongly biased discussions. In these discussions great uncertainty typically coincides with strong causality as well as with conflicting effects. E.g. in the field of rural areas discussions are about statements such as 'biofuels contribute to a better environment'

or 'trade liberalization is negative for rural areas and agricultural production in the EU'. Using the model classification from Figure 1, this type of problems is classified as explorative. Explorative tools are in particular useful in the phase during which awareness is raised, i.e. to facilitate the discussion.

2.3. Eururalis 2.0 tool

Eururalis 2.0 is dealing with the future of rural Europe and especially focuses on the way this future is influenced by global developments and strategic EU policies. The future of rural Europe is closely linked to current issues like:

− the enlargement of the EU internal market, since new Member States have joined
− ongoing liberalization of global trade
− reform of the European Common Agricultural Policy (CAP)
− climate change
− stimulation of bio-energy
− urbanization and infrastructural developments

As the future is uncertain and developments are increasingly hard to predict, Eururalis uses four contrasting future projections, or scenarios. They are based on the IPCC scenarios [Nakicenovic, 2000] and they represent uncertainties (1) in the way the world might develop and (2) in policy choices. Key driving forces are macro-economic growth, demographic- and political developments. The four future projections relate to different plausible developments defined by: (1) a global vs. a more regional approach to problems and strategies and (2) an open market vs. a higher level of intervention and regulation by governments.

Policy makers have a large variety of policy instruments which mostly aim at influencing the behaviour of relevant actors in society in relation to these issues. The Eururalis tool implements a subset of these instruments with a high effect on such behaviour: (i) market support; (ii) income support; (iii) ambition to stimulate bio fuel and (iv) stimulate less favoured areas.

The cause-effect relationship of both scenarios and policy instruments is implemented by a series of linked models in such a way that:

− the participants would be confirmed or rather confronted by the model results in their expectations;
− it would lead each of the participants to reflection; and
− it would fuel the debate on policy goals and instruments.

Scenario and policy effects are represented in the form of maps and graphs which show the variation of indicators within the EU at scales ranging from square kilometres to subregional level. Indicators are quantitative tools that synthesize or simplify relevant data relative to the state or evolution of certain phenomena. They are tools for communication, evaluation and decision making that can take quantitative as well as qualitative form depending on the purpose of the indicator [Gallopin, 1997]. Indicators concern the people, the planet and profit – the so-called 3Ps [Elkington, 1997]. A few additional indicators were categorized under the denominator "land use".

3.   DESIGN PROCESS

In this chapter the design process of Eururalis is explained. This process was a combined effort of scientific research institutes, software engineers as well as policy makers. They worked together to further develop Eururalis – from version 1.0 to version 2.0. In section 3.1 the start of the design process was described. Section 3.2 describes the interaction between policy makers, software engineers and scientists in the process of making choices about the content and the look and feel of the tool. Section 3.3 gives details on how the data were managed and on how the user interface of the tool was designed.

3.1. The start of the process

There are many ways to develop a software tool. The development process of Eururalis can be characterized as evolutionary development. Figure 2 shows the typical stages of such a process [McConnell, 1996]. The process was stakeholder-driven: the stakeholders involved were scientists, policy makers and other end-users.
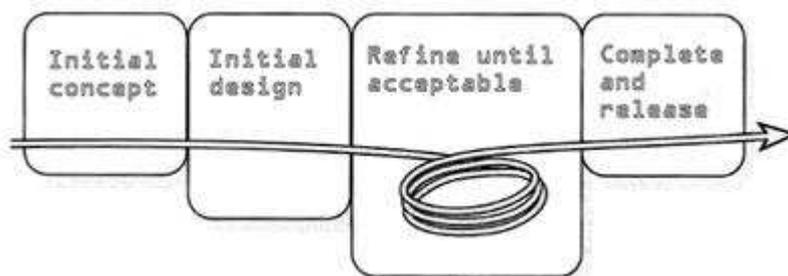

Figure 2: Evolutionary development model (derived from McConnell, 1996)

In figure 3 the design process of Eururalis is presented graphically; the typical stages described by McConell can be derived from this scheme.
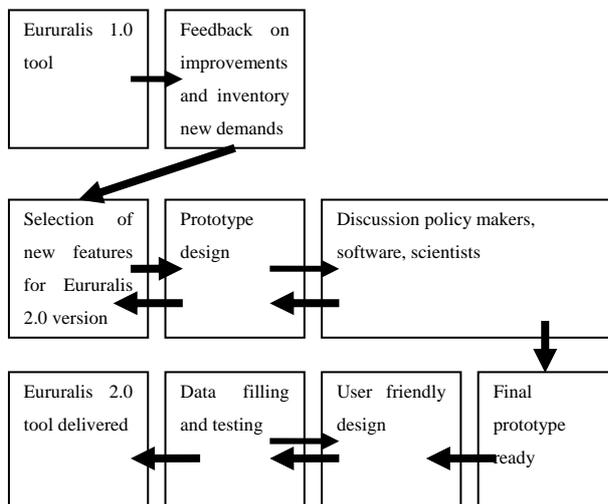
Figure 3: design process of the Eururalis 2.0 interactive tool

The initial phase of the design process started with the Eururalis 1.0 tool. The first Eururalis project was carried out in 2004. From the beginning, the tool was conceived as a discussion support tool [Klijn, 2005]. Since there was huge time pressure in the Eururalis 1.0 project, only little emphasis was given to the design and user friendliness of the tool. Potential end-

users were not involved in the design process, that was elaborated by software engineers in interaction with scientists only. Most effort in developing the Eururalis 1.0 tool was put in modelling and data gathering. Version 1.0 of the tool was released by the end of 2004 [WUR, 2004]. It was aimed to support discussions about the future of rural areas in Europe. This involved issues which go beyond the borders of single Member States.

The CD-ROM with the Eururalis 1.0 tool contained the mentioned scenarios, providing explorations as to how agriculture and the rural areas could develop towards the year 2030. Results were provided in the form of maps and graphs showing indicators. Users could indicate which indicator they wanted to study, for which time period and for which member state of the EU. This way, they could evaluate results by themselves. A summary of the conclusions and a number of fact sheets about important developments were added to the Eururalis 1.0 CD-ROM.

The Eururalis 1.0 tool was presented at various occasions, e.g. in the office of DG Agriculture in Brussels and during a meeting of the heads of the department responsible for rural areas (the directors) of the Member States organized during the Dutch presidency of the EU. During the latter meeting the Eururalis tool was installed on laptops of the directors of EU Member States to explore the model output during a two-day meeting. On the basis of this tool, a discussion was held about the future of rural Europe. The directors especially appreciated the possibility to employ the tool as a card index and visualize the output in land use maps. These features helped them to get an overview of the diversity in developments and interdependencies in rural areas both at national and EU level [Sterk, 2007].
After these meetings, the CD-ROM with the Eururalis 1.0 tool was widely distributed among a relative diverse audience by handing out copies to policy workers and scientists at congresses and other meetings. The project team of Eururalis received feedback from users – regarding both subject and technical matters.

3.2. Policy science interaction
According to Sterk [2007] Eururalis has not only played a heuristic role in creating awareness about future trends and threats concerning rural areas, but also an explicit community-creating role. The results of the tool served as a stepping stone for a discussion about the future of rural areas and functioned as a common language. Without the Eururalis tool the directors network for rural areas would fall apart. A third role Sterk mentions is the symbolic role for Eururalis (putting things on the agenda).

Halfway 2005, the Dutch Ministry of Agriculture, Nature and Food Quality commissioned the development of a new version Eururalis, i.e. version 2.0. Aim was to extend the existing model framework and the tool of Eururalis to support strategic policy discussions concerning the future of European rural areas (the EU-27). Target group were all those involved in policymaking on rural areas and agriculture at EU level as well as NGOs and scientists working in related fields.

The philosophy used for the further development of Eururalis was to preserve the good of Eururalis 1.0 and to improve the points which were indicated as weak. As strong points the following were mentioned: good balance between the 3Ps and land use, global context and common

language. A minor review of the four storylines was carried out. Integration of the used simulation models was improved.

Important points to elaborate on according to the consulted international policy makers and scientists (end-users) were:
− the implementation of interactive policy options
− development of a more balanced set of indicators
− the wish to look behind the results and know about the assumptions
− the wish to have results also at the level of EU regions.
The third point was often mentioned by scientists who put huge emphasis on the so called causal tracing of the results. The other points were raised by both policy makers and scientists.

The actual development of Eururalis 2.0 started by the end of 2005. The elaboration on the above-mentioned points were leading. Right in the beginning of the design process an interactive session was organized with both policy makers and scientists from several EU countries. Part of this session was to form smaller discussion groups and to make an inventory of wishes concerning interactivity, policy options and indicators in each of those groups. In this session it became more clear what kind of content policy makers wanted to have added to the tool. It also became clear which additional indicators they wished. In fact, a long list of wishes was obtained and it was immediately clear that not all could be realized given time constraints as well as technical constraints. The project team used these requirements to make an initial design of the content of the new Eururalis 2.0 tool.

It was clear that the requirements could not be presented in the framework of the Eururalis 1.0 tool. A complete redesign of the tool was needed to accommodate the extra demands. A first prototype of Eururalis 2.0 was developed and proposed to potential end users, i.e. policy makers. This group of policy makers from several Member States, the so called Policy Advisory Group, was consulted a number of times to give feedback on the consecutive prototypes. In those consultative meetings both content and technical design of the new tool were discussed. In this iterative process the Eururalis scientific project team, software engineers and policy makers gradually adjusted the tool and also adjusted their expectations of the tool. These meetings were organized because of the perceived importance of contextualization and network building among modelers, potential users and stakeholders for the acceptance of the tool and the models behind the data [Sterk, 2007].

3.3. Appearance and data management
The interactive use of results by the end-user was considered as very important. Results – i.e. maps and graphs - had to be available to the user instantly. Given the complexity and broadness of the field of rural areas and the complex multi model framework of Eururalis it was not feasible to calculate results on the fly within the tool. End-users specifically asked for an interactive tool. In order to guarantee needed real time results, a reference book approach (Wien, 2007) was opted for, with all modeled results built-in in a pre-cooked form. The data on the tool consists of 37 unique scenarios that show results for four time slices, for over 500 European regions that fully cover the 27 EU Member States, at 5 spatial scale levels and for 24 indicators in the people, planet, profit and land-use

domains. The results can be visualized in both maps and graphs. Fact sheets with interpretation of the results and general conclusions drawn by the project team are part of the tool.

The tool was designed in such a way that it has an appealing appearance with strong graphical content and an intuitive interface. The set-up of the tool is such, that the end-user is appealed to explore the impact of different scenarios and policies. The tool is equipped with controls by which the end-user can adjust scenarios and policy options and can view the effects on various indicators, in the form of zoomable maps and customizable graphs (Figure 4). Effects can be studied on different temporal and spatial scales and the users themselves can choose of which indicators they want to assess the impact.

With small user groups and amongst the research team, test sessions have been organized to remove flaws and to enhance the performance. Subsequently the dissemination of the tool was organized. The tool was packaged in such a way that it can be installed from a DVD as well as directly online (see http://www.eururalis.eu). It was made suitable for other operating systems than Windows alone.
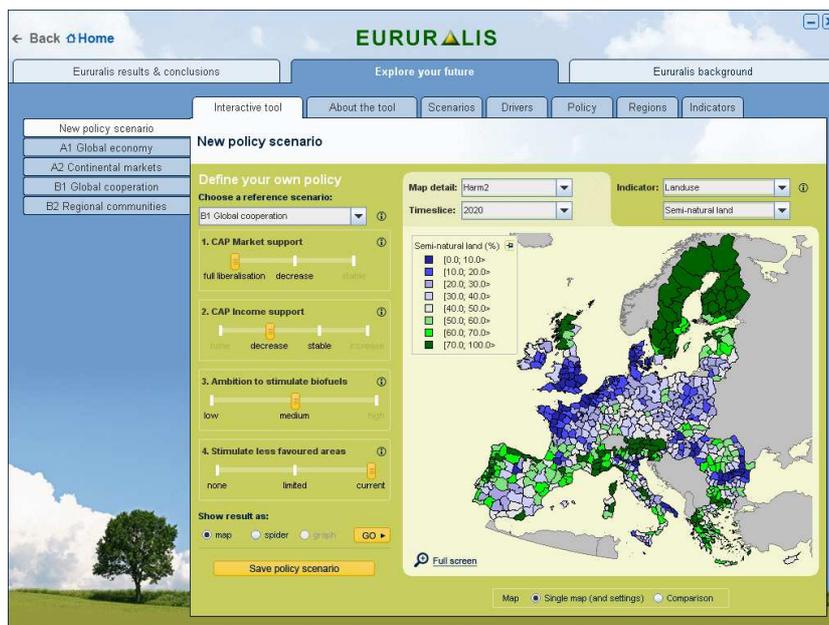

Figure 4: screen shot of the Eururalis application

4.   IMPACTS OF EURURALIS 2.0

In this chapter, section 4.1 describes the dissemination process. Subsequently section 4.2 explains the spin-off of Eururalis 2.0.

4.1. Dissemination efforts
The Eururalis 2.0 tool is disseminated in various ways amongst the target groups of both the research community and strategic policy makers of the Member States, in Brussels and of NGOs.

Firstly at various places throughout Europe the results of Eururalis have been presented by the project team of Eururalis researchers. The audience varied from policy makers, consultants, NGO staff to scientific colleagues. Most presentations were structured in such a way that the main results of Eururalis were first presented orally and after which then the possibilities of the tool were exhibited. The audience and moderator interactively browsed the content of the tool. Sometimes a number of laptop computers were made available to let those present explore the results themselves; sometimes the audience was given the opportunity to ask questions for the moderator to answer interactively with the Eururalis tool.

Secondly some 3000 DVD copies have been printed and circulated at both scientific and policy oriented conferences and in the network of the Eururalis project team. The upcoming months further dissemination will take place. The DVD offers the user the possibility to explore the results of Eururalis.

Thirdly a number of sessions in education have been conducted especially about the future of rural areas and land-use change in Europe. Students were instructed how to use the tool and had to execute assignments such as analyses of changes of biodiversity or land-use in a specific scenario with help of the Eururalis tool.

Fourthly at the website www.eururalis.eu the interactive tool is made available. Potential users can download the tool there to their own computers. The first month of the launch of Eururalis 2.0 some 300 people used this opportunity. On the basis of e-mail contact resulting from the dissemination, it can be derived that users are mainly coming from research institutes.

4.2. Spin off

The goal of Eururalis 2.0 is formulated as to support discussions about the longer term future of rural areas in Europe. In chapter 2 it is mentioned that Eururalis has an explorative character focusing on issues with a possible conflicting causality and high uncertainty. The results of Eururalis should be regarded not as predictions of the future but as a means to provoke discussions. The following types of spin-off can be observed.

First, in the process of designing and filling the Eururalis tool, a network of scientists and policy makers already used Eururalis as a means of discussing with each other. The Eururalis 2.0 tool served as a common language to talk about and discuss complex and uncertain topics. Examples of such discussions are the meetings of the heads of the departments responsible for rural areas of the various Member States. The different scenarios of Eururalis provided flexibility in the sense that it questions 'what are plausible changes in land-use'. It can accommodate diverse perceptions and can suit the explorative stage that the network of policy makers is in at the moment.

Second the results have been used by several scientific studies of third parties. Land-use results of Eururalis have for instance been overlayed with information of hotspots of agricultural birds and they have been used in workshops concerning the development of action plans for the Carpatian Mountain region. The results serve as a reference context for more targeted studies concerning nitrogen or forestry developments. For these

studies Eururalis unlocks the bandwidth of future trends at the global and EU level to which these studies can refer.

Third the results are used in vision development to explore what kind of opportunities and threats could happen in future. In Belgium the Eururalis land use results have been used in a forecast of spatial development. Another example is the use by the Standing Committee on Agricultural Research of the EU that used results from the Eururalis 2.0 to set out her vision for the future. Eururalis 2.0 is in the reference list of such projects. However given the explorative nature of the field Eururalis covers, the main contribution may be the impact it has in broadening the scope of thinking of the end-user and opening up discussions about the uncertainty of the future and the accommodation of different perceptions. This is something that is hard to measure, but needs further research.

5.   CONCLUSIONS AND LESSONS LEARNT

The discussion support tool developed in the Eururalis project offers a flexible framework which proved to be very useful in discussions and in raising awareness on the possible future of rural Europe. A complex issue as the possible development of rural Europe involves many different dimensions, a lot of ways to observe the problem domain and various geographical and temporal scales. Discussion support systems like Eururalis are a powerful means to support discussions on such complex topics. The tool offers functionality to easily focus on the problem from different angles, like geography, policy option or type of indicator. As such it supports users in focusing on their specific interests, but also facilitates getting insight in related areas of interest.

The iterative development process used to design and implement the tool and the interaction between scientists and policy makers in this process has proven to be a valuable approach. It allowed the software designers to make the right design and clear implementation decisions, while at the same time increasing the focus on the specific requirements from the user groups. It can be concluded that the success of Eururalis and the use of Eururalis results is highly related to the efforts made on dissemination of the results. Dissemination was in fact already embedded in the development process. Already in this early stage a lot of effort was put into involving potential users into the development process and informing the outside world on the ongoing work in the project. These efforts were directed at both policy makers and scientists. These networking and content development activities were continued in the implementation phase, and thus the tool was successfully introduced into the user community

In practice it can be observed that the Eururalis tool and its results are used by policy makers, scientists and consultants. The results of Eururalis however, focus on the long term and are of an explorative nature. They generally do not lead to direct and concrete actions. It is therefore hard to objectively measure the actual use of results. On the other hand, it is clear that using the Eururalis tool supports discussion and thinking and increases the awareness on the possible future directions of rural Europe and the possibilities to influence this direction through policy.

A broad user community, ranging from policy maker to researcher, are a challenge for a project team to conceptualise and construct a usable product. The policy makers are concentrating on clearly distinguishable policy options and conclusions, while the researchers are mainly interested in the parameterisable modeling and methodologies behind the conclusions. The Eururalis tool is accompanied by booklets that each focus on the policy maker and researchers respectively: 1) an anthology based on the results of the Eururalis scenario study and 2) technical background and indicator documentation. Together with scientific and other publications, booklets, oral presentations and workshops the tool is a valuable product for disseminating Eururalis knowledge and raising awareness.

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