Evaluation "Images of sustainable development - Thresholds to the Future: Visualizing Regime Shifts in socio-ecosystems" (WP-046)

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Introduction

Sustainability issues are part of complex systems, in which multiple stakeholders, with multiple values and interests, interact with each other and with the "physical" world. So how can one identify drivers for change towards sustainability in a complex system? Working towards change makes curious about the future. Unfortunately, foresight hardly ever is straightforward.

Generally speaking, the future cannot be predicted. However, some techniques exist that help explore some tendencies of the future, and to better understand the complexities of the systems involved. One approach that is especially tailored to the communicative requirements of multi-stakeholder systems is *participative scenario development*. In participative scenario development, multiple stakeholders are invited to think about the past, the present and the future to produce credible scenarios of what the future holds in store and how we'll get there. Making such scenarios can help to improve one's understanding of the complex systems involved, and can give a better awareness of the obstacles and opportunities ahead. But how does one produce good scenarios?

First and foremost, participative scenario development is aimed at dealing with complexity. Scientists that take the perspective of complex adaptive systems hold that a good scenario takes into account sudden shifts and non-linear behaviour; integrates knowledge from multiple perspectives; takes into account multiple spatial and temporal scale levels; and is "at once bold and careful." But between exploring the future and being part of a complex adaptive system, stakeholders often lose track of such a complicated message. The theoretical concepts about complex adaptive systems do not lend themselves very well for communication, let alone for application in scenario development.

Participative scenario development already is rich in content, so the characteristics of complex adaptive systems can only be incorporated if they are easily communicated. The use of *visualisations* can make a difference. By visualisation, we mean the act of making something visible, making an image. Using the right visualisation technique, implicit assumptions, different value orientations, and different interests can be made explicit and tangible to others. Resulting images ease the communicative processes, especially when the system complexity exceeds the communicative bandwidth shared by the project team—as the saying goes, a picture is worth a thousand words. The trick is to choose a visualisation technique that is appropriate for the problem involved—for instance, when buying a car, it does not pay to visualise its inner workings if you're interested in its colour. A good visualisation makes it possible to take complexity into account in a scenario, without the need to have a full understanding of the theoretical underpinnings about complexity.

Aim

The aim of Joost Vervoort's research was to enhance participative scenario development with visualisations.

Set-up

The use of visualisation in participative scenario development is relatively uncharted. Vervoort started with a literature review to compare all the different ways in which visualisations can facilitate participative scenario development. He compared various visualisation techniques with regard to feasibility, flexibility and

participation; capturing the characteristics of complex adaptive systems; and communicative clarity and engagement. On the basis of this comparison he selected two approaches for further research and development. These are abstract *representational tools* and more *concrete visualisations*.

Vervoort's studies can be seen as *design research*. Vervoort has developed various visualisations, and scientifically tested the effects of their use in participatory scenario development. As a consequence, the research results include the development of an abstract representational tool (the Future Perspectives Test) and an online scenario development suite based on Google Earth, which includes animation, and the evaluation of their effectiveness in several case studies.

The Future Perspectives Test
Representational tools depict an abstract aspect of a system within a scenario, much like how an emoticon might be used as a representational tool for someone's mood. Likewise, a picture of a ball in a cup can be used as a representational tool to visualise robustness (also see Figure 1). Vervoort developed a new representational toolbox named the Future Perspectives Test. This is an on-line tool designed to elicit the perspectives of many stakeholders on future issues of land use and natural resources management. It consists of three complementary components: the Myths of Nature test (Figure 1), the Scale Perspectives Test (Figure 2) and the Circles Test (Figure 3). The Myths of Nature test and the Circles Test already existed. Vervoort's contribution resides in the development of the Scale Perspectives Test and combining it with the other two tests.

The Myths of Nature Test captured participants' perspectives on the dynamics of ecosystems under human influence. The Scale Perspectives Test revealed which future issues were most relevant to the participants, as well as their perspectives on the key spatial and temporal levels of these issues. The Circles Test captured multiple aspects of participants' engagement with the future.

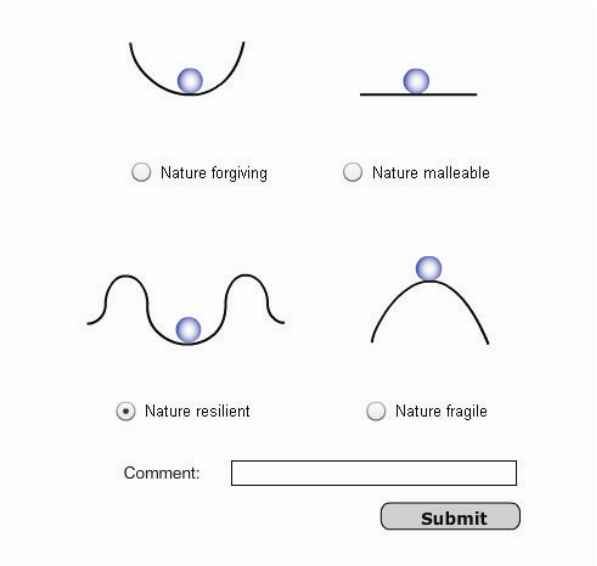

Figure 1. The Myths of Nature Test with an input example. Each image depicts the dynamics of natural systems in response to change: the slope of the 2d "landscape" shows where the balance will end up after the ball, representing the current system state, is displaced due to disturbance. Participants pick the myth of nature that most closely resembles their perspective.

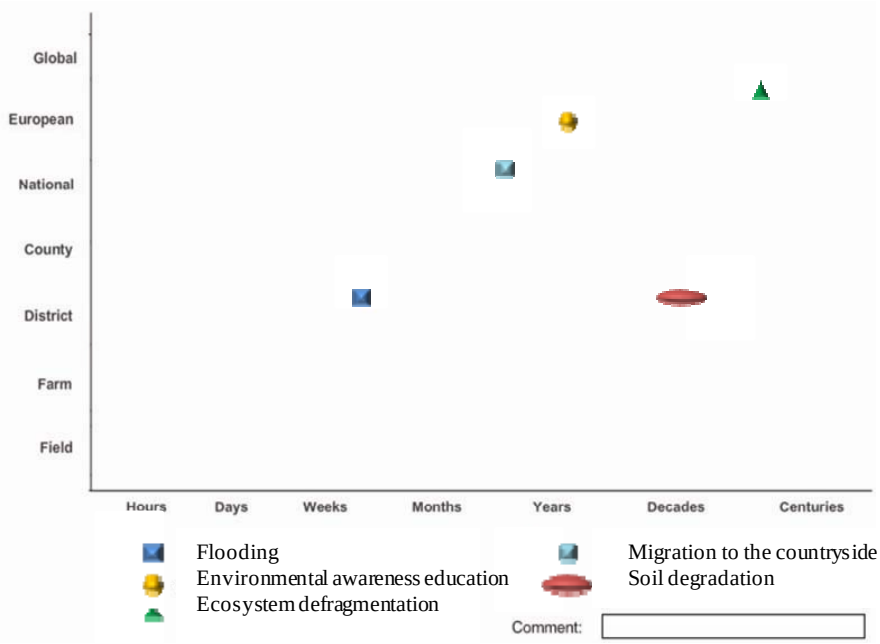

Figure 2. The Scale Perspectives Test with an input example from a single participant. Users move their pre-selected issues on this fixed scale space of time and geographic space, and place them on the levels that reflect their perspectives.

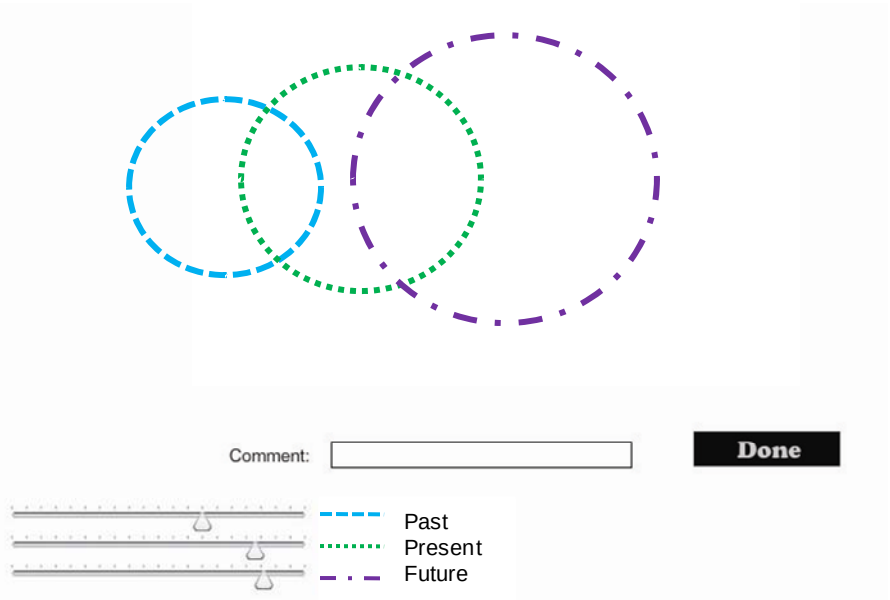

Figure 3. The Circles Test with an input example. Past, present and future are represented by the blue, green and purple circles, respectively. The circle size reflects the relative importance this time zone has for the participant. The degree of overlap reflect how much he/she sees these parts as connected. The positions in which the time zones are placed reflects the participant's view on the flow of time.

Online Participatory Scenario Development with Animations
Vervoort carried out another study in which participants collaboratively produced scenarios for the development of Oxfordshire, UK. In this case study, Vervoort used concrete visualisations to support the participants. By concrete visualisation, we mean that pictures or animations are used to display some of the content of a scenario. For instance, a picture of houses in a wooded are might be used to depict a future that includes human habitation in forested areas. Vervoort developed a tool-suite for online, community-based scenario-development, using animations and Google Earth for visualisation. This suite was used in live workshops in Oxfordshire with local stakeholders.

Figure 4. Scenes from the animations used as regional context scenarios. These images visualise various scenarios from the Millennium Assessment, which were used as the context for scenario development in Oxfordshire.

Main findings
The Future Perspectives Test
Overall analysis showed a significantly different spatial and temporal focus for future land use issues, depending on the time orientations and myths of nature associated with these issues. Differences in the temporal and spatial focus of land use issues were also linked to demographics. The separate components of the Future Perspectives Test elicit information that was evaluated to be directly useful for participatory processes. The combined output from Future Perspectives Test indicates significant relationships between perspectives on space, time and system dynamics. The overall test outcomes show the value of defining together with stakeholders what spatial and temporal levels a participatory process should be focusing on, on which assumptions about system dynamics it should be based, and how past, present and future should be represented. The Future Perspectives Test is suitable for this type of exploration.

Online Participatory Scenario Development with Animations
In the Oxfordshire study, participants developed their own regional scenarios on-line. Animations and Google Earth were used as visualisation aids to help the participants to include more information about complexity in their own scenarios. The concrete visualisations were expected increase the extent to which participants were able to incorporate multi-scale dynamics and non-linear system behaviour in their scenarios. Data analysis is still ongoing as of this writing.

Conclusion
The use of visualisations appears valuable for participative scenario development, because visualisations can coerce participants to consider aspects of complexity that otherwise would not have been considered, and because different value-orientations can be made explicit by using visualisations.

Meaning for TransForum
TransForum is working on a transition towards sustainable development. This requires out-of-the-box thinking, addressing different value orientations, and taking into account the complexity of the associated systems. The Future Perspectives Test has demonstrated the diversity in stakeholder perspectives concerning multiple aspects of this complexity in several cases. Visualisations specifically tailored to help stakeholders gain intuitive access to the complexity of agro-innovation systems can help in the creation of better scenarios for a more sustainable future.

Implications for connecting values
In an innovation experiment, the stakeholders involved (entrepreneurs, NGO's, government, knowledge institutes) have to connect their values to produce innovative, triple P value proposition. The Future Perspectives Test can help to make the different perspectives on sustainable development explicit. It has been shown to uncover the diversity of perspectives in a group of actors in terms of the dimensions of issues and the expected changes in systems. This is essential as a starting point for connecting values—the first step towards connecting values is to map out the existing diversity in perspectives among the stakeholders involved. This is in important prerequisite for connecting values.

Furthermore, the pictures and animations used in Vervoort's online collaborative scenario development suite can become "boundary objects" for the stakeholders involved. This means that they can serve as a focus point for communication between different stakeholders. And in that role, they can help the stakeholders to bridge their differences. Used in this ways, Vervoort's tools can act as a form of image management.

Vervoort's studies thus have yielded tools that can facilitate connecting values in an innovation experiment.

Implications for the agro-innovation system
An agro-innovation system can work towards a more sustainable future. But in order to direct the efforts involved efficiently, it is important to explore what the future may have in store. Participatory scenario development is a technique for doing this, but it highly taxes the communicative capabilities of the stakeholders, and it is very hard to do it just so, that the associated system's complexity is taken into account. The visualisations that were developed by Vervoort can help explore the future in an agro-innovation system, by framing perspectives on the inner workings of the system through interactive, abstract visualization, and then putting flesh on the bones of future visioning by using concrete, experiential storylines.

Vervoort's tools and results are especially relevant for Metropolitan Agriculture, which is rife with value diversity.