Presentation linked to topics of the Eco Navigation project

Soft Systems Methodology
a tool for handling and developing complex systems

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1 Introduction

The Eco navigation project aims to understand and invent sustainable ways for living and working, and further to manage the holistic system of food and energy production and consumption.

This includes an analysis of particular areas, systems, and people, and in order to connect theory and praxis in analysing, and improving the particular parts, with the aim to increase its performance and sustainability.

According to the broad field of ecology, it might be an interesting goal to become able to understand and to use "systems thinking" as a key to a complex (not only scientific) world, more and more influenced by human need for nutrition, consumption and cultural development.

Our particular environment – how to analyse it?

In order to describe the systems and environments we are living in, different tools can be used for description, and especially for figuring out the key issues. The multifunctionality of systems of consumption, including energy and agricultural system has been assumed and so the process of analysis is divided in two main methodologies: first describing, gathering information and than taking them into comparison in order to get the information in a more distinctive way of the system one analyses. This leads directly to the next part "Systems thinking - systems practice" that is one of the main basic parts of applied sustainable living.

1.1 Systems thinking – systems practice

The following part deals about systems thinking. Before going into detail in applying it to a certain system, a briefly description should be given about the tenets of systems thinking and its purpose in using it for the food system analysis.

What is *"systems thinking"*? Senge (1992) describes Systems thinking in the following way: "…it deals about understanding of a phenomenon within in the context of a larger whole; to understand things systemically literally means to put them into a context, to establish the nature of their relationships. "It sounds quite natural that systems thinking links different phenomenon in a larger scale. System thinking becomes more and more popular (BAWDEN, 2362:1991) because it enables one to grasp and manage situations of complex and uncertainty in which there are no simple answers. Systems thinking helps especially in messy situation which are quite complex, to understand the situation systematically, so ones can get a big (rich) picture and sees the connectivity between the elements in the situation (SENGE, 1992).

The way one treats a "system" does not automatically mean, that everybody who is looking at the system in question gets the same picture or system structure of it. Having different *perspective* depends on how one rates the importance of something, or what the meaning or purpose of it is, at least in ones interests. For the further procedure, the

choice of perspective has the biggest influence on systems thinking and how the boundaries have been set in the system one analyses (Bawden, 2363:1991, Pretty, 1250:1995).

It needs *boundaries* in a system in order to differentiate and to coordinate things. Briefly said: boundaries are the borders of the system, determined by the observer, which define where controlled action can be taken: a particular area of responsibility to achieve system purposes (Senge, 1992). The boundaries are "artificial" in the system and could be also treated as "connections" between the environments of the things one deals with it (Butler, 2001).

To put all information, impressions and interactions etc. together, one uses *models* all the time to make sense of the world around one in order to give it meaning (Senge, 1992). But one has to take it into account, that systems are wholes or treated as wholes, because their parts are connected or related in such ways respectively, that they give rise to a sense of wholeness (von Bertlanffy, 1981 *cited in*: Bawden, 2366:1991. Like mentioned before, it depends much on the perspective one chooses, so the opportunities in modelling are nearly unlimited. Making models helps to handle complex systems or stuff respectively, and it enables people to have a convention about markets, social live or production systems (agriculture) etc. in order to compare and communicate problems and solutions.

The previous part leads to the *emergent properties*. Emergent properties are often mentioned in the context of systems thinking. They are treated like emergency and they are probably the fundamental property of systems. This idea is implied in the well known sentences: "The whole is greater than the sum of its part". But in some cases, this is incomprehensible like Wright (1992) climes and suggests in modifying it into: "The whole exhibits properties that are different from those found in any of its parts", or in another way: "The idea of emergence has something to do with the properties of wholes, rather than the parts". In connecting different properties to each other, it is sometimes difficult for one, to overcome the conventional point of view and not to put something together only because we are used to do this.

Before reflecting the experience of the group about the application of the theory of systems thinking to the example of Buskerud food system, one last, but important step, should be briefly mentioned.

Systems thinking deals with a new learning system (Pearson, 1992), new way of learning and dealing with experience. Dealing with complex situations allows sometimes no final conclusions or answers, naturally dependent on the ones perspective. Assuming, that the world is a engineered system (hard facts) which can be characterised by its name is even more oriented to goal-seeking when ones enters a complexity which one can not fix to one system even closer to an intellectual, abstract system. Therefore, different authors distinguish between "soft" and "hard" systems and as an example of description, the table

(Table 1) of Ceckland (1985, *cited in:* PEARSON, 1992) helps to understand the difference and need for this differentiation.

Table 1: The "hard" and "soft" thinking traditions of systems thinking compared (Source: CHECKLAND, 1985, *cited in*: PEARSON, 31:1992)

Hard system thinking	Soft systems thinking
Oriented to goal-seeking	Oriented to learning
Assumes the world contains systems which can be "engineered"	Assumes that the world is problematical but can be explored by using System models
Assumes System models to be models of the world (ontologies)	Assumes System models to be intellectual constructs (epistemologies)
Talks the language of "problem" and "solutions"	Talks the language of "issues" and "accommodations"
Advantages	*Advantages*
Allows the use of powerful techniques	Is available to both problem owners and professional practitioners; keeps in touch with the human content of problem situations
Disadvantages	*Disadvantages*
May need professional practitioners	Does not produce final answers
May lose touch with aspects beyond the logic of the problem situation	Accepts that inquiry is never-ending

That this leads not to the assumption, that 'hard' Systems thinking is appropriate in well-defined technical problems, shown in the next figure (Figure 1) where everything has clear proportions and boundaries.
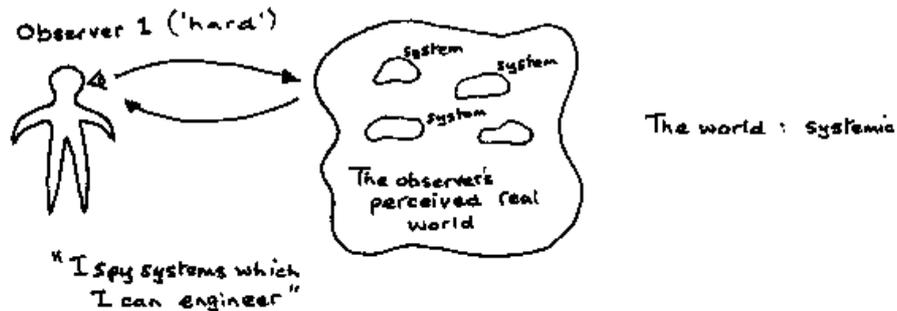

Figure 1: The "hard" systems practice (Source: CHECKLAND, A 10:1999)

"Soft' Systems thinking is more appropriate in fully ill-defined situations involving human beings and cultural considerations, Checkland (1999) gives a second figure (Figure 1), explaining what he means, when he says that the definition stems from how the word 'system' is used, that is from the attribution of systemicity.
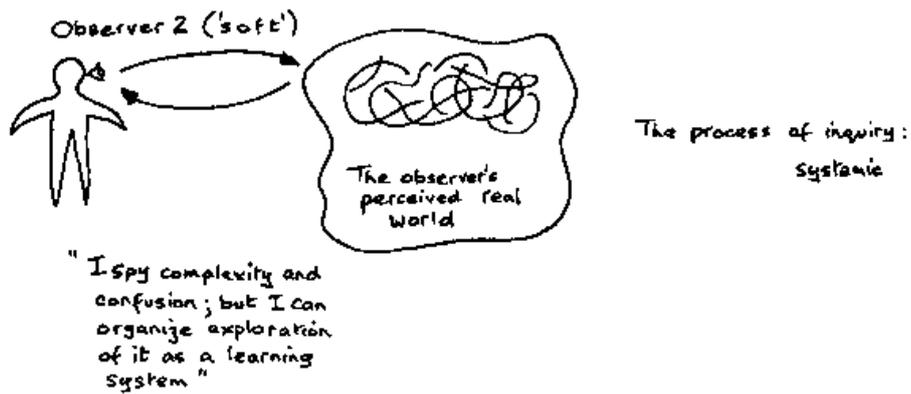
Figure 2: "soft" systems practice (Source: CHECKLAND, A 10:1999)

During project work, the systems thinking ("hard" and "soft") will be mixed in practice often and further, describing a certain system, the picture of this system will be influenced by the way that interviewees will give the information according to their priorities and perspective and world view ("weltanschauung"). At least the different backgrounds of the person investigating and the "pre-conditioning" through the environment the person comes from will influence the persons approach analysing the system its system (s).

2 Improving the ecological system, considering food production, energy production and consumption and employment - from which perspective?

2.1 Reflection about ones way to find a perspective

2.1.1 The very first steps of finding a perspective

The following chapter tries to give answers to the questions raised in the previous chapter (chapter 1.1) and how one can create ones perspective in order to find some other matters in difference. Before going into the real process of finding a perspective to work on for example developing a strategy how to manage food production, energy production and consumption and employment to improve the ecological system, some factors which could be also seen as important parts of the frame the project was set in, should be mentioned before, in order to make it clear why not more facts (regarding of choosing a perspective) could have been considered.

   I. What is the approach or purpose of the project one wants to work with?

  II. What should be the outcome of the project?

 III. How much time does one have?

 IV. Who is going to work with one in the project/ resources etc?

2.1.2 Evaluating different research models/ perspectives

Very early after searching different sources of information beside some basic "frame" information, one should find quite soon a perspective for the next information gathering and creating a model. Finding a perspective will be much linked to projects purpose and the persons working with it their personal background (personal experience and education).

To summarize some typical points in discussions, some key words or key issues/ questions in finding the perspective are listed below:

- What is the purpose of the system one is discovering?

- How much/ which kind of information one misses when one take the perspective in question?

- How far should one go towards reductionism or holism in order to talk later the same language of the stakeholders and to bridge the gap between different world views (Weltanschauung) respectively?

- How/ which research system (BAWDEN, 1991) one can build up considering the four factors (I- IV) as mentioned before?

Considering these questions, the so called "researched system" where the researcher is working as a systems analyst (Figure 3) would be the best solution to meet the requirements of the project working with Improving the ecological system, considering food production, energy production and consumption and employment.
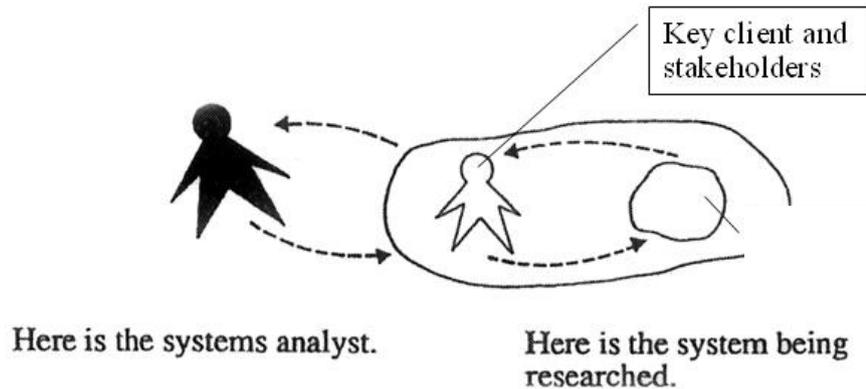
Figure 3: The researcher as systems analyst (Source: BAWDEN, 26:1991)

According to Bawdens (1991) systems thinking theory, the "structurally coupled action researching system" (Figure 4), where the researcher becomes an integral part of the system itself, is seen as the best way to learn and to improve the situation.
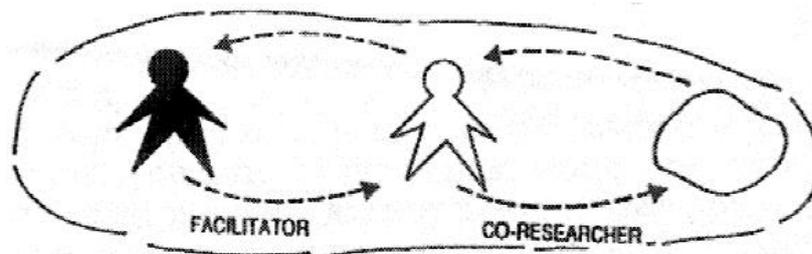

Figure 4: A structurally coupled action researching system (Source: BAWDEN, 26:1991)

The "ideal" action-researching (soft) system is committed to create better social ecologies where the person who takes action is seen as an action researcher, actively participating with others in the critical exploration of complex and dynamic issues which relate to the relationships between people and their physical and socio-cultural environments.

This approach of improving the system needs logically more time and research activities in general. This example has been mentioned in order for the better understanding of the difficulties or advantage/ disadvantages respectively the investigator when one uses the "researched system" (Figure 3). Concluding the comparison between the two perspectives, one could say that the researched system produces in a shorter time more results and leads to a quicker action taking and the action researching system needs more time but the output would be more successful and sustainable.

2.1.3 Information gathering from a research systems perspective

As already mentioned in the beginning of chapter 1.1, one has maybe already some (basic) facts about the system one wants to analyse and develop.

So the information gathering might be divided into several parts (interview, measurements etc.) and levels.

After the collecting of data and interviews, the questions can be summarized in short reports according to the research (standardized) questions mentioned in the previous paragraph.

This approach to ask predominately standard questions gives one the chance to put later the information in a so called "rich picture" together like a puzzle, looking where are the connections in the system and where are some parts missing

Using the engineered model for the flow of matter, it might became little difficult to do the same with the flows of communication in a certain system; at the same time it can help to use this as a tool when discussing the results or checking if there are more things to investigate, improve or to put together following a certain perspective. Here it can be absolutely necessary to handle complex things from a holistic approach including the different perspectives of the people and not to try to put them into a uniform box with the name behind of the company or field they belong to.

The model of the flows of matter can be used to get an overall idea of the investigated system. It will became clear how complex the system is to interact in the time one can work with, for example with very concrete and detailed plans. Here one has to focus on what already exists and to prove it if it could be probably used to facilitate the ideas the group developed using "visionary thinking".

It's important that one agrees about what are the boundaries of the systems investigated and what does one understand when one speaks for example about a local or regional food system? How regional can a food system be as long as it not becomes a national one?

Following the Soft Systems Methodology[1] (CHECKLAND, 1999), one will manifest its perspective of improving the system in doing the root definition as the 3rd step of the Soft Systems Methodology.

The root definition (here showing it from an example where a region is improving its food system):

> *"The system is supported and operated by ………. It is a system that all the actors in the present situation ………..from, and it is also focused on …………..supporting the needs of future generations.*
>
> *Organic and locally produced food has the same opportunity to get access to the market as conventional, and the awareness among the consumers is high. This leads to a good quality of life, including environmental soundness, healthy people and a living and dynamic region. The biggest constraints in 20XX were XXX etc. and the consumption habits of the consumers of XXXX. Through the implementation of projects the ef-*

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[1] The Soft Systems Methodology is composed on seven steps: 1st stage: Enter situation considered problematical, 2nd Stage: Express the problem situation, 3rd Stage: Formulate root definition, 4th Stage: Build conceptual models of the systems named in the root definition, 5th Stage: Compare with real world activities, 6th Stage: Define possible changes which are both feasible and desirable, 7th Stage: Take action to improve the situation.

fect of these big processors was reduced, and the consumers' awareness of local and
organic food was increased."

2.1.4 Proving and discussing the models together with the protagonists

Still having the perspective as an outsider, as a systems researcher, one uses the models as a supporting tool for ones imagination of what could be or towards the system would develop if it would go in the same way as it goes now. So it can be very helpful to discuss it with the people involved in the system. The models can used by the key client for instance to describe the system or to remember something about the differences of the particular system. And it can be also like a mirror for one, what the investigator, consisting on the facts which have been gathered before to, think about the way the system is working.

So following the recommendation of Bawden (1991) when he speaks about the responsible action researcher which has to present the public his results of the research and his action, the exemplary situation would look like it follows. "The researching system must be so coupled with its environments that it can subject its outcomes to those environments for critical response." Referring to Bawden's action research system, Bawden presupposes in the case of having a critical public that the outcomes (of the research) can be subjected for review and the public is sufficiently informed to be able to provide a sensible critique.

2.1.5 Example for the limitation of the chosen perspective and its consequences

Presenting the work to the people of the system, may sometimes open the investigators and project leader's eyes.

Sometimes findings can be totally new for the particular people and it can take a while to open a new window for them, to show them ones perspective and the way one valued the "things" in the particular system. The explanation for this difficult transfer of the results can happen when one has nearly no contact to parts of the system thus no idea of the thing(s) in question. This would be than an example in the sense of Bawden, that the researcher treats the researched system like a (black) box and puts a purpose on it, regarding to his solutions and his world view (Weltanschauung).

Finally the change would happen only to him and not for the rest of the stakeholders because it would need their strong involvement and new way of learning, so at last, one could say that this way in showing this new perspective will be not sustainable and feasible because this process is clear defined as a process which has to happen in a larger society or community or to say it with the words of Bawden (1991): "…and it is important to emphasise that the basis for improvements in the relationships between people and their environments (including of course, other people) must lie in a collective ethic for what is in the public-cum-environmental good!"

3 Systems practice

Improving the systems, changing things to a better state, the findings during the Eco navigation project might be worked with following the Soft Systems Methodology in order to clarify the findings and take the next step to conduct new projects.

The Soft Systems Methodology is composed on seven steps:

1st stage: Enter situation considered problematical,
2nd Stage: Express the problem situation,
3rd Stage: Formulate root definition,
4th Stage: Build conceptual models of the systems named in the root definition,
5th Stage: Compare with real world activities,
6th Stage: Define possible changes which are both feasible and desirable,
7th Stage: Take action to improve the situation.

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