Source: Hummel, D./ Hertler, C./ Niemann, S./ Lux, A./ Janowicz, C. (2004): Supply Systems as Subjects of Socio-Ecological Research: Food and Water. Versorgungssysteme als Gegenstand sozial-ökologischer Forschung. demons working paper 2, Frankfurt am Main

Summary

This working paper seeks to provide a conceptual framework for analysing supply systems as subjects in social-ecological research.

Every society faces the problem of supplying its people with basic goods such as water, food, energy, and housing, transport, traffic, social security, medical care etc... This task needs to be fulfilled in a way that, on the one hand, basic needs are satisfied, quality of life is warranted, so that productive living is possible, while, on the other hand, environmental conditions do not deteriorate.

During the time, in every region populated by humans, specific structures have been developed to provide people with goods; we call these structures *supply systems*. They may be seen as parts of *life support systems* meaning "any natural or human-made system that furthers the life of the biosphere in a sustainable fashion" (Becker 2002; Sage 2001: 1xv). The main character of life support systems is that together they provide the basis for the reproduction and continuation of life. These needs go far beyond biological and physiological requirements. Life support systems establish ecological, economic and social minimum conditions for the continuation of societal life. Human life and societal development depend strongly on the functioning of a highly complex set of interacting natural and social systems. Thus, supply systems for water, energy and food are embedded in a fragile natural environment, which requires intelligent regulation in order to satisfy the needs of a growing population now and in the future.

"Supply system" is a rather compromising term for a lot of interactions within the nature-society-nexus. As components of life support systems they mediate between society and nature. Hence, their analysis has to be inter- and transdisciplinary and must contain aspects of social science and natural science.

In a conventional perspective, the notion of supply system is often too much restricted to technical aspects. Related problems, so far, are mainly described either as problems of infrastructure or as problems of one specific sector (water, energy, housing ...). However, different supply systems are linked with each other and cannot be analysed in an isolated manner. This becomes obvious in, for instance, the relation of water", "food" and "health". Food supply systems, for example, are again closely linked with the globalized economy and can therefore not be analysed without taking that into account.

Supply systems are determined by needs, necessities and demand. As human needs and equally demand change, supply system are and must be variable; furthermore they are dependent on the respective historical and socio-economic contexts. This

means, research has to take specific social differenciations (gender, income, specific needs of women, elder people, migrants, ...) into account. The wide range of forms into which supply systems can evolve may be seen as the result of different historical developments in different regions. Thus, statements concerning any particular region's supply systems cannot simply be transferred into other contexts. Nowadays, as they are very much influenced by processes of globalisation, more and more elements and processes are linked to each other on a technical level, for instance. With this increasing connectivity, the possibility of mutual influences and dependencies, and thus also the susceptibility for any kind of disturbances and critical developments, is growing.

Supply systems tasks and performances depend on the populations' needs and lifestyles, thus the demography sets a framework for supply systems and vice versa. Currently the satisfaction of basic human needs is threatened in many parts of the world. This may lead to social-ecological problems, which can intensify to a critical point. As a consequence of this, the question of interactions between demographic trends and supply systems features more and more on the political, social and scientific agenda.

One of the paper's main aims is to structure supply systems as subjects of social-ecological research and to demonstrate specific inherent problems. The project *demons* concentrates on those supply systems where production, distribution, use and consumption of physical goods which are based on natural resources, are concerned. In order to analyse the effects of different demographic developments we investigate supply systems with both global importance and various shapes on a regional level. Additionally, the selected supply systems are linked with others in order to demonstrate interactions.

All this applies strongly to food and water – both are goods serving basic needs, they are increasingly threatened and/or currently in transition. Food and water are closely connected: Problems in one area are inevitably linked with difficulties of the other. Several aspects can be identified in the overlapping of both supply systems: the fundamental role of water as a basic food item itself, irrigation as an important means of food production, and the concept of "virtual water". In the *food supply system* like in the *water supply system*, aspects of feeding mingle with more symbolic ones, aspects of consumption merge with aspects of pleasure. Thus, in a comprehensive view, one can state that a food supply system must be seen as "a system of provision, the chain of activities connecting initial production to final consumption" (Fine 1994: 520). When analysing *food supply systems*, two types of distinctions seem to be important: first the one between the bio-physical level on the one hand and the socio-cultural on the other, then the one of production, usage, and distribution of food against access, preparation, and consumption of food. These distinctions are also more or less valid again for the *water supply system*, too.

Globally seen, the total population is constantly increasing – although most countries' population's growth rates are declining. This is a result of the so-called

"population momentum" (Lutz et al. 2004). Acording to the UN medium variant, global population is expected to rise from currently 6.3 billion to 9.3 billion in 2050. Therefore future development must expect a rising need for food and water. The increase of food production obviously necessary could either be achieved by its intensification or by extensification. Both, however, are possible only at the expense of serious ecological consequences. Expansion of the agriculturally productive land, for instance, is hardly possible and only conceivable on use of further resources, e.g. water. Intensification of the cultivation procedures often leads to soil degradation, desertification and thus to a reduction of arable land.

Besides the ongoing, but declining growth of global population numbers we face, however, a decreasing birth and mortality rate, an older-aged population because of increasing life expectancy, and more migration and urbanization. This is part of what has commonly been described as the "new international population order". Due to the rising divergence between and within regions, heterogenous and sometimes disperse population dynamics moving in opposite directions are to be considered. As far as their relation with supply systems in concerned, research has to differentiate between very complex demographic trends in different regions and also on a different scales.

In *industrialized countries* the demographic development concerns almost any aspects of supply systems. Apart from regions with a population decrease because of migration or reduced fertility rate, often a change in household composition and in the number of people per household can be observed. Here, the perception towards basic goods has undergone profound changes. While their sheer availability is more or less secured and taken for granted, in particular the quality of goods (like food) increasingly becomes an issue of individual luxury. Problems in quality are often much more important than difficulties of quantity.

The population growth is mainly taking place in *developing countries*. There, food security depends among other things on technological developments, on the geographical conditions, on the political situation and on infrastructure. Rising incomes and a better living standard change for their part the demands for food. Increasing urbanisation and changes in utilisation are both relevant to food and water supply systems. For most developing countries self-sufficiency will not be achieved in the near future, i.e. the countries will remain dependent on food imports. However, acquiring a more appropriate share of the global food market presupposes economic growth. Although aspects of food and water quality are certainly important, in developing countries and in water-poor regions, problems of quantity and of the access to food and water are mostly of top priority. Especially concerning aspects of supply, however, it is hardly possible to talk about "the industrialized countries" vs. "the developing countries". The differences within the group of developing countries, for instance, seem to be bigger than those between developing and industrialized countries.

Access is an important issue in connection with supply systems. Numerically, an increase in the number of people corresponds to a decrease in the per-capita availability. However, one has to differentiate between the potential and the actual availability of food and water. This becomes very clear in the example of food supply: not the potential yield but the access determines the scope for population dynamics. So far, research has very much been restricted to the potential side. Concentrating the focus on mere quantitative aspects of population dynamics would certainly not be sufficient for the analysis, "the sheer number of people does not on its own explain the dire state that many ecosystems are in – how people and institutions use those resources, the technologies used to extract them, and policies influencing consumer behaviour are important" (PERN 2003: 2). A Malthusian concept of scarcity does not reflect institutional arrangements, access, the importance of power, and other social, political, or psychological issues.

There are, as it has been stated, several important similarities in food and water supply systems. One of the main differences, however, is the fact that water supply is, in most cases, based on a net of grid lines (canal, pipeline, pipes,). In phases of a decrease in population such net-based supply systems come under pressure, if the existing material infrastructure cannot be adapted to this change. This clearly demonstrates the need for demand orientated supply systems and management. Not satisfying a future need extrapolated from an existing, fixed, current one is the future's main challenge but opens possibilities to satisfy a highly flexible demand. This also applies to any basic goods, but becomes a major task in such ones (like water) distributed in a material net system. Here, it is, moreover, important, to establish purpose-differentiated supply systems. The over-all goal to be pursued is to supply the population (as well as the other water consumers such as agriculture and industry) with a good that is, in terms of quality, adapted to the respective customers' requirements. For drinking purposes there are certainly higher requirements than for other purposes.

This *demons working paper* presents the structure and problem description of the supply systems from a social-ecological perspective. The first chapter introduces our overall model of supply systems as social-ecological systems. Based on this general concept, chapters 2 and 3 illustrate supply systems for water and food separately, in order to depict their specific characteristics: General social-ecological problems are described as well as moments of transformations. Both chapters analyse the role of demographic changes and address selected specific issues, which are examined in disciplinary subprojects and case studies.

The aim of the working paper is to provide the basis for a more detailed conclusion about the significance of population dynamics on the one hand, and the analysis of the interactions of water and food supply systems on the other hand. These are the issues of the last chapter, which concludes with some hypotheses for further research.