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SOCIOLOGY AND ECOLOGY – A NEW THEORETICAL SYNTHESIS

Abstract. Sociology has been confronted since several decades with theoretical and methodological challenges to contribute to the analysis of changing forms of interaction of society and nature and environmental problems resulting from that. In the classical way of academic science to react to new research problems, by driving specialization further, a new subdiscipline of environmental sociology was established. Environmental sociology in Western countries developed a research agenda with five themes as described by the American sociologist Fred Buttel: interaction of nature and society, environmental awareness, environmental movements, political economy, technological risks. Today environmental sociology is confronted with the analysis of problems formulated in ecological terminology as global environmental change, including phenomena of anthropogenic climate change, reduction of biodiversity and land use change. It has meanwhile lost its pioneering role to interdisciplinary ecology that drives, e.g. as new social ecology, a rapidly progressing theoretical analysis and reflection of nature-society interaction in late modernity under notions of «social-ecological systems», «societal relations to nature» and «societal metabolism». Even natural-scientific ecology has, under the impression of rapid environmental change for the first time developed a theory of society to analyze the social and environmental changes in the historical epoch called «anthropocene» for which Western industrialization has been the starting phase. An interdisciplinary opening of sociology in theoretical reflection seems required to regain intellectual strength. Some theoretical and methodological questions of this boundary crossing are discussed further, a synthesis of sociological and ecological knowledge and connections with the neighboring fields of environmental economics and environmental anthropology.

In the sociological work of Y.N. Davydov ecology or environment is not a relevant theme. Nevertheless his theoretical and methodological thinking can inspire theory development in environmental sociology – following his principles of integrating philosophical and sociological analysis, of using knowledge from different disciplines, and of studying the development of sociological theory historically. Global social and environmental change challenges sociological thinking, is discussed much more outside sociology, even with regard to social change which was a weak point in many earlier sociological theories [1]. One obvious reason for the difficulties to deal with the new theme in sociology is the complexity of global change. Reducing sociological theory to reflections about society, social systems, social problems or social reality seems insufficient for theorizing societal interaction with nature where the present natural-scientific and ecological knowledge about global ecosystems needs to be connected to sociological analysis. Complexity, discussed by Luhmann and later as «complexity turn», came into sociology with the naturalistic methodology of functionalism; with that methodology it re-surfaces again in the recent analysis of social-ecological systems. But the complexity term is a formal one, not yet fit for an analysis of socio-ecological interactions. Biermann [2, p. 326] describes the situation of global change research as a dilemma: it «is too elusive for natural scientists and too ambitious or too normative for social scientists». The challenge to pursuit contradicting objectives, to be objective, encompassing and normative, should be accepted in sociological theorizing: not as an articulation of theoretical hubris, but in continuing the tradition of critical theory that requires to reflect interests and value orientations critically in the research process itself. The critical theory tradition in sociology, starting with Marx's theory of society, includes the critical theory of the Frankfurt School (Horkheimer, Adorno, Marcuse, Habermas), and similar approaches

to critical sociology (Wright Mills, Wallerstein); it needs to be renewed and reformulated to deal with present global environmental problems. Furthermore, the ecological discourse in the second half of the 20th century happened mainly outside sociology. Recent debates in ecological Marxism (the latest offspring of academic Marxism), ecological economics, political ecology, and social ecology, can help to develop a new sociological theory by taking up from different perspectives questions of interaction between society and nature.

The complexity of global systems, the interaction of the economic world system and the ecological earth system, requires transgressing the disciplinary borders of sociology that were never exactly formulated. Using knowledge from natural sciences reminds of the early times of sociology, when it was called «social physics». In contrast to early sociology it is not required today to copy the positivist methodology of the natural sciences, but to synthesize knowledge that is produced in different epistemological and methodological approaches. In environmental sociology, one of the youngest sub-disciplinary specializations of sociology, analysis of environmental problems is done in a research agenda with five themes described by the American sociologist Buttel: interaction of nature and society, environmental awareness, environmental movements, political economy, technological risks. This agenda needs to be renewed through another interdisciplinary opening of sociology, with new knowledge about global environmental and resource use problems. Interdisciplinary research have developed rapidly, in recent years with «transdisciplinarity», «mode 2» (Nowotny et al), and «triple helix» (Leydesdorff) discussions, for reasons that are valid for global environmental problems too: «problems are interrelated; problems are more complex to solve; disciplines are growing more specialized; and the very nature of interrelated and complex problems creates the necessity to integrate the efforts of highly specialized

scientists in their solution» [3, p. 62]. However, the task of renewing sociological theory is more than an epistemological one of a new Kantian revolution in philosophical thinking. Recent knowledge syntheses in climate change research (International Panel for Climate Change) or in the assessment of global ecosystems (Millennium Ecosystem Assessment) show that epistemology is hardly used to help solving the methodological and practical difficulties of integrating knowledge from different disciplines and research areas, nor to find ways to formulate new interdisciplinary theories. Smelser's [4] truism «The subject—matter studied by social sciences is itself becoming more complex all the time» is not sufficient to argue for a theorizing of global complexity discussed here; it is rather a way to defend the limited explanatory success of sociological or economic research. The global financial and economic crisis in recent years is, for example, taken as reason to argue that economic systems and their functioning have become complex and cannot be explained with earlier theories and methods. However, the real complexity of globally interacting socio-economic and ecological systems is still not addressed in such diagnoses. This complexity is approached in the following theoretical and methodological hypotheses of interdisciplinary boundary crossing and synthesis of sociological and ecological knowledge.

1. *The development of a critical, interdisciplinary theory of global environmental problems seems possible with a renewed critical theory of society that connects knowledge from social ecology and similar research, e.g. in environmental economics (showing the unsolved distribution problems in the global economy) and environmental anthropology (showing the heterogeneous social realities created by cultures). Anthropological research is useful to complement the theoretical systems analyses of political, economic and societal systems that do not yet reveal the everyday functioning of systemic*

mechanisms in social action. Wallerstein [5] identified complexity and culture studies as the two critical forms that question the dominant mode of scientific knowledge production that separates the search for truth from the philosophical search for the good society or life. Non-dualistic forms of knowledge generation where nature and culture, science and philosophy, the true and the good, facts and values are not methodologically and epistemologically separated, but integrated and critically reflected, seem to give a compass for renewing critical societal theory. For that purpose the analysis of societal metabolism in economic processes is a starting point.

2. *Systems theory that returns with social-ecological systems analysis and resilience research does not grasp significant properties of nature/society interaction* although it is part of the theoretical work to do. Systems theory bridges conceptually social and natural scientific research about the interaction between social and ecological systems, half of the task, but the other half is lacking: to formulate conditions and pathways for transforming the globalized capitalist system into a new one that is more sustainable. Ecological limits of resource use or «planetary boundaries» do not yet help to formulate transition paths to sustainability. The ways to global sustainability are unclear, unknown, presently formulated in global scenarios only. In the analysis of social-ecological systems and in «panarchy»-theory (Holling, Gundersen, Folke) knowledge about societal systems is limited to such that fits in the descriptions of change of ecosystems and human use of natural resources, whereas the systemic mechanisms in society, economy, politics that block the transition to sustainability are not analyzed. Ecosystem research needs to be transformed into typologies of coupled social and ecological systems to describe more adequately qualities, states and directions of change in society/nature interaction. The social ecology by Fischer-Kowalski et al. can be seen

as a step further in that direction, analyzing with theoretical concepts as societal metabolism and socio-ecological regimes transformations of social-ecological systems; the breakthrough is in the analysis of interaction of nature and society in historically specific forms. In sociological theory, with postmodernism, such anti-dualistic thinking has gained influence, e.g. with actor-network theory, but limited to questions of construction of nature-society interaction, neglecting the analysis of material and systemic interactions in terms of resource and energy flows that is a domain of social-ecological research.

3. *A future theory of global interaction between man, society and nature* from which to develop a theoretical critique of the limits of sociological knowledge as well as of the ecological discourse, requires detailed reconstruction of the complex processes of «interaction between society and nature» or «societal metabolism», including analysis of socio-ecological regimes, ecological distribution conflicts, unequal ecological exchange, material and energy flows, and human appropriation of ecological net primary production. Little of that is found in earlier variants of sociological research and critical theory. Habermas' efforts to integrate several sociological concepts and theories in a theory of communicative action and rationality resulted in the loss of critical analysis of the capitalist system and in irrelevance for the ecological discourse; both themes are insufficiently addressed with its guiding hypothesis of colonialization of lifeworlds through systemic mechanisms. As critical variants of theory that survived the fall of political Marxism and can give some input to the newly emerging theory of social-ecological systems (SES) remain historical world system theory (Wallerstein) and ecological Marxism (O'Connor, Altvater, Foster). As new critical analyses of societal interaction with nature developed in the past two decades the socio-ecological discourses in Austria and Germany, the latter influenced from the older Frankfurt

School by the idea, that «*a science of society would have as essential task to investigate the laws in which the interaction unfolds and to derive the varying gestalts that individual, society and nature adopt in its historical dynamics*» (own translation from: [6, p. 43]). Today this critical tradition is followed in the work of the Frankfurt Institute for Social-Ecological Research (ISOE, Becker, Jahn et al.). The Austrian school of social ecology (Fischer-Kowalski, Haberl et al.) complements this approach with an ecologically situated analysis of global resource flows. A third approach, international sustainability science, lacks the diagnostic capacity of these two, is a more «light version» of society-nature interaction in theory-poor, natural science dominated variants of analysis, neglecting the historically specific structures of societal and economic systems. Somewhat exceptional is the recent emergence of a natural-scientific analysis of present global society in the theory of the «anthropocene» (Crutzen et al.).

4. *The new theory of global social-ecological systems is not intellectual creatio ex nihilo.* It has a rich historical repertoire to develop from, the *disjecta membra* of critical theory, ecological Marxism and social ecology with a series of critical concepts and analyses to reflect about nature's limits for society, manifesting in controversies about the Malthusian themes of population growth and resource scarcity, or in the renewal of a thermodynamic interpretation of economy by Georgescu-Roegen (that had as forerunner the Padolinsky controversy about a physical interpretation of political economy). To develop a historically specified theory of global interaction of society and nature requires to connect furthermore new topics emerging in critical ecological analyses of modern capitalism: recent philosophy of nature and ecological ethics; the sociological analysis of «Promethean revolutions» and of socio-technical energy systems as linking mechanisms between society and nature (Debeir, Deléage, Hémery); the changes in North/South- or

center/periphery-relations under globalization and the global unequal ecological exchange relations; the «limits to growth» debate indicating the return of Malthusianism in socio-ecological theory. More specific themes include the «ecological imperialism» hypothesis of Crosby (1986) and related work from critical environmental history, historical anthropology, historical ecology; the «tragedy of the commons»-debate (Hardin) and similar naturalistic variants of an analysis of previous accumulation; new forms of colonization of nature e.g. through genetic engineering in agriculture, pharmaceuticals and medicine; the study of new social and environmental movements as subjects of social transformation; the feminist discussion of dissolution of borders between private life and work and further debates about gender and nature; the critical analysis of the newly emerging sustainable development discourse, asking for solidarity-based intergenerational relations and a new society transforming the economy from *chrematistike* to *oikonomia* (Aristotelian terms).

5. *The work program of a theory of interaction of nature and society* includes a connection of theoretical terms in several steps of analysis, roughly said: the terms of symbolic and material relations to nature included in the process of societal metabolism which again is specified in the concept of «socio-ecological regimes». In contrast to non-historical and abstract terms such as sustainability or resilience the concepts above allow for more systematic and historically concrete analyses of culturally specific interactions between nature and society. To conceptualize social and ecological systems as coupled and the main problem as «overconsumption of resources» is not sufficient; the factors and structures in social and ecosystems shaping their interaction and allowing for resource depletion need to be assessed critically, for example, global ecological distribution conflicts and unequal exchange. Societal metabolism can be operationalized in the analysis of material

and energy flows in historically varying forms of economic production, exchange and consumption. With this analysis the debate about the dematerialization of economic production and consumption can advance through improved data and refined indicators for material and energy use, taking into account rebound effects and finally analysis of resource management strategies and practices to identify transition paths to sustainable resource management. The relevant research is dispersed in competing fields — social ecology, human ecology, ecological economics, ecological Marxism, world system theory, resilience research and sustainability science. However, competing research with a redundancy of concepts, models and knowledge can also be seen as a discursive mechanism to drive interdisciplinary knowledge, critical reflection and knowledge synthesis better than the conventional idea of coordination of research under one universally accepted framework or basic paradigm that seems to be the — unrealistic — epistemic model of global climate research.

6. *The work program drafted above is a Polanyan project of decommodifying resource use.* It shows some theoretical and methodological progress, e.g. in formulating theory-based indicators of resource use such as material and energy flow accounting or human appropriation of ecological net primary production. The critical sociological and economic discourses developing around consequences of ecological distribution conflicts (Martinez-Alier), unequal ecological exchange (Rice), and global resource flows (Fischer—Kowalski et al.) evoke, however, further methodological and normative questions of resource use, environmental justice, redistribution and the sharing of resources. These complex problems are to be discussed under the guiding notion of global sustainable development, more exactly: the global transition towards sustainable socio-ecological regimes and their material and symbolic components that require ethical discourses to find solutions.

For the third «great transformation» in human history as global sustainability is called, a more exact calculation of material and energy use and redistribution of resources within and between generations and is required. But the necessary changes of economic and political power structures are until now hardly themes in scientific and political discourses, in sociology and elsewhere.

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